BUDGET JUSTIFICATIONS

The United States
Department of the Interior

and Performance Information
Fiscal Year 2009

U.S. GEOLOGICAL SURVEY

NOTICE: These budget justifications are prepared for the Interior, Environment and Related Agencies Appropriations Subcommittees. Approval for release of the justifications prior to their printing in the public record of the Subcommittee hearings may be obtained through the Office of Budget of the Department of the Interior.

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U.S. GEOLOGICAL SURVEY
FY 2009 BUDGET JUSTIFICATION

TABLE OF CONTENTS

Organization
Organization Chart v
Acronyms vi

A – General Statement
Overview A-1
Table: Total 2009 Budget Estimates A-1
Table: 2009 Budget Request by Interior Mission Area A-1
Strategic Plan A-9
2009 Performance Summary
Achieving Department Mission Goals A-10
Resource Protection A-12
Resource Use A-13
Serving Communities A-14
Management Excellence A-16
Means and Strategies A-17
Science Planning A-18
Science Strategy A-19
Geospatial Data Production A-21
Internal Controls A-22
Program Evaluations A-22
Data Validation and Verification A-23
Partnerships A-24
President's Management Agenda
Performance Improvement A-30
Human Capital A-33
Competitive Sourcing A-33
Financial Performance A-33
E-Government A-34
Asset Management A-36
Executive Order 13423 ..... A-38
Energy Management A-39
Transportation (Fleet) Management A-40
Environmental Management A-40
Environmental Safeguards A-41
Research and Development
Research and Development Investment Criteria A-41
Basic, Applied, and Development A-48
Research and Development Funding by Goal A-49

B – Key Increases
Water for America B-1
Birds Forever B-3
Healthy Lands B-6
Oceans and Coastal Frontiers B-9

C – Goal Performance Information
Funding Goals Table C-1
Bureau Goal Performance Table C-2

D – 2009 Budget at a Glance
2008 Budgetary Changes at a Glance Table D-1
Program Increases D-7
Program Decreases D-13

E – Surveys, Investigations, and Research
Analysis by Activity E-1
Appropriation Language E-2
Justification of Proposed Language Change E-3
Appropriation Language and Citations E-4
Administrative Provisions Language E-9
Justification of Proposed Administrative Provisions Language Change E-10
Administrative Provisions Language and Citations E-11
Justification of Fixed Costs and Related Changes: USGS E-14
Summary of Requirements E-17
Proposed Budget Restructure
Global Change E-21
Technical Adjustment for Enterprise Information and Science Support E-31
Facilities E-33

F – Science on the Landscape —Initiatives, Regional and Crosscutting Activities
USGS Integrated Science Initiatives F-1
Water for America F-2
Birds Forever F-14
Healthy Lands F-20
Ocean and Coastal Frontiers F-25
Climate Change F-33
National Land Imaging Program F-41
Regional and Crosscutting Activities F-46
Regional Realignment F-47
Regional Planning, Performance, and Partnerships F-48
Workforce Planning F-49
Science on the DOI Landscape F-51
Priority Ecosystems Science F-53
Department Crosscuts F-59

G – Geographic Research, Investigations, and Remote Sensing
Activity Summary G-1
Land Remote Sensing Subactivity G-9
Geographic Analysis and Monitoring Subactivity G-25

H – Geologic Hazards, Resources, and Processes
Activity Summary ..... H -1
Geologic Hazard Assessments Subactivity
Earthquake Hazards H-7
Volcano Hazards H-23
Landslide Hazards H-31
Global Seismographic Network H-39
Geomagnetism H-47
Geologic Landscape and Coastal Assessments Subactivity
Earth Surface Dynamics H-53
National Cooperative Geologic Mapping H-59
Coastal and Marine Geology H-71
Geologic Resource Assessments Subactivity
Mineral Resources H-83
Energy Resources H-95

I – Water Resources Investigations
Activity Summary I-1
Hydrologic Monitoring, Assessments, and Research Subactivity
Ground-Water Resources Program I-7
National Water-Quality Assessment I-19
Toxic Substances Hydrology I-33
Hydrologic Research and Development I-41
National Streamflow Information Program I-51
Hydrologic Networks and Analysis I-61
Cooperative Water Program Subactivity I-71
Water Resources Research Program Act Subactivity I-81

J – Biological Research
Activity Summary J-1
Biological Research and Monitoring Subactivity J-5
Status and Trends of Biological Resources J-13
Contaminant Biology J-16
Fisheries: Aquatic and Endangered Resources J-17
Wildlife: Terrestrial and Endangered Resources J-20
Terrestrial, Freshwater, and Marine Ecosystems J-23
Invasive Species J-25
Biological Information Management and Delivery Subactivity J-37
Science Centers and Field Stations Summary J-51
Cooperative Research Units Subactivity J-57

K – Enterprise Information
Activity Summary K-1
Enterprise Information Security and Technology Subactivity K-7
Enterprise Information Resources Subactivity K-15
National Geospatial Program Subactivity K-21

L – Global Change
Global Change L-1

M – Science Support
Science Support M-1

N – Facilities
Activity Summary N-1
Rental, Operations, and Maintenance Subactivity N-5
Deferred Maintenance and Capital Improvement Subactivity N-13

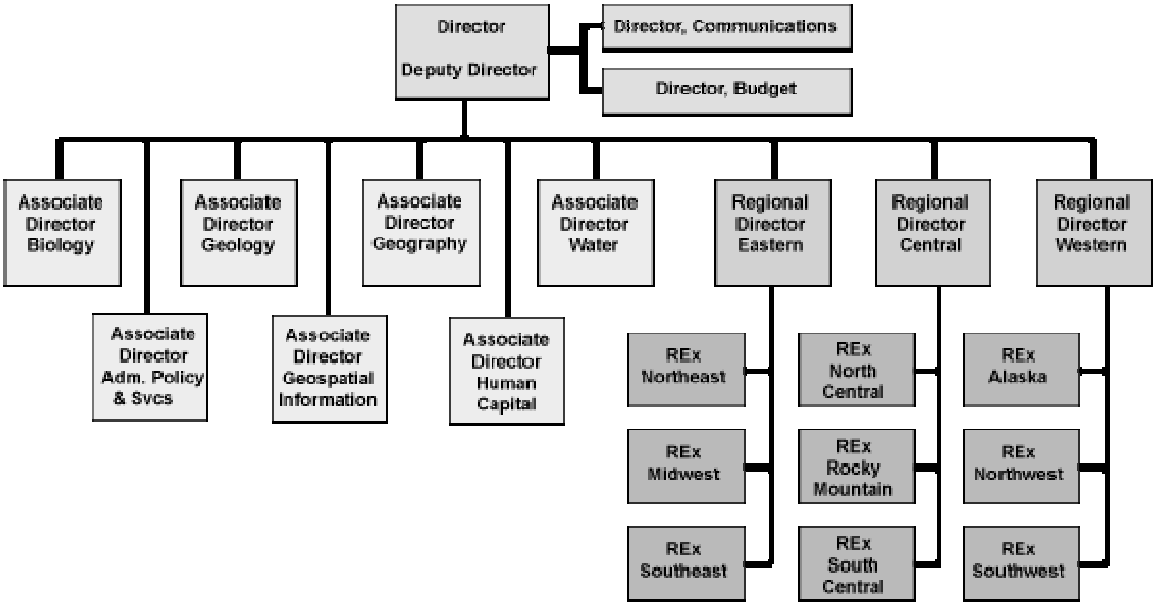
O – Working Capital Fund
Working Capital Fund Overview O-1
Appropriation Language and Citations O-3
Program and Financing O-5
Balance Sheet O-6
Object Classification O-7
Employment Summary O-7

P – Surveys, Investigations, and Research – Exhibits
Summary of Requirements by Object Class P-1
Program and Financing P-3
Object Classification P-5
Employment Summary P-7

Q – Sundry Exhibits
Funding of U.S. Geological Survey Programs (Obligations) Q-1
Contributed Funds Q-15
Employee Count by Grade Q-19
Mandatory Budget and Offsetting Collection Proposals Q-20
Program/Project Support of Bureau, Department, and Government wide Costs Q-21

R – Authorizations
Authorizations R-1

U.S. Geological Survey



USGS Regional Structure

Alphabetical List of Acronyms

AAAS	American Association for the Advancement of Science
AAPG	American Association of Petroleum Geologists
ABC	Activity-Based Costing
ABC/M	Activity-Based Costing/Management
ABP	Asset Business Plan
ACI	American Competitive Initiative
ACP	Artic Coastal Plain
ACWI	Advisory Committee on Water Information
AFWA	U.S. Air Force Weather Agency
AMP	Asset Management Plan
ANSS	Advanced National Seismic System
ANWR	Arctic National Wildlife Refuge
APHIS	Agricultures Animal and Plant Health Inspection Service
APS	Administration and Policy Services
AR	Accounts Receivable
ARMI	Amphibian Research and Monitoring Initiative
ASC	Alaska Science Center
ASIWPCA	Association of State and Interstate Water Pollution Control Administrators
AVHRR	Advanced Very High Resolution Radiometer
AVO	Alaska Volcano Observatory
AWIFS	Advanced Wide Field Sensor
BASIS+	Budget and Science Information System
BBL	Bird Banding Laboratory
BBS	Bird Breeding Survey
BEN	Balkan Endemic Nephropathy
BGN	Board of Geographic Names
BIA	Bureau of Indian Affairs
BIS	Commerce - Bureau of Industry and Security
BLM	U.S. Bureau of Land Management
BLT	Business Leaders Team
BMID	Biological Information Management and Delivery
BNP	Biscayne National Park
BOR	U.S. Bureau of Reclamation
BPC	Bureau Program Council
BRD	Biological Resources Division
BRM	Biological Research and Monitoring
BSR	Business Strategy Review
CA	Condition Assessment
CAC	Civil Applications Committee
CALFED	California Federal (Bay-Delta Authority program)
CAP	Cooperative Agreements Program
CARA	Circum-Arctic Resource Appraisal
C&A	Certification and Accreditation
CC	Cost Center
CBLCM	Chesapeake Bay Land Cover Management
CBM	Coalbed Methane
CBP	Chesapeake Bay Program
CCOAT	Coast Chesapeake Online Assessment Tool
CCSP	U.S. Climate Change Science Program

CDC	Centers for Disease Control and Prevention
CENR	Committee on Environment and Natural Resources
CEAP	Conservation Effects Assessment Project
CEGIS	Center of Excellence for Geographic Information Science
CEOS	Committee on Earth Observation Satellites
CEQ/NSTC	Council on Environmental Quality/National Science and Technology Council
CERC	Columbia Environmental Research Center
CERP	Comprehensive Everglades Restoration Plan
CFO	Chief Financial Officer
CISN	California Integrated Seismic Network
CMGP	Coastal and Marine Geology Program
CNMI	Commonwealth of the Northern Mariana Islands
CNS	Central portion of the North Slope
CORE	Committee on Resource Evaluation
CPIC	Capital Planning and Investment Control
CR	Central Region
CRADA	Cooperative Research and Development Agreement
CRSSP	Commercial Remote Sensing Space Policy
CRU	Cooperative Research Units
CRUISE	Columbia River USGS Integrated Science Explorer
CRWA	Charles River Watershed Association
CSRS	Civil Service Retirement System
CTBTO	Comprehensive Test Ban Treaty Organization
CTM	Cooperative Topographic Mapping
CUES	Comprehensive Urban Ecosystems Studies
CUSEC	Central United States Earthquake Consortium
CVO	Cascades Volcano Observatory
CWD	Chronic Wasting Disease
CWP	Cooperative Water Program
CWS	Canadian Wildlife Service
DCIA	Debt Collection Improvement Act
DEM	Digital Elevation Model
DEP	[State] Department of Environmental Protection
DEQ	[State] Department of Environmental Quality
DFRs	Departmental Functional Reviews
DGH	Indian Directorate General of Hydrocarbons
DHS	Department of Homeland Security
DiGIR	Distributed Generic Information Retrieval
DMCI	Deferred Maintenance and Capital Improvements
DOE/BPXA	U.S. Department of Energy - BP Exploration (Alaska)
DOI	U.S. Department of the Interior
DPAS	Data Processing and Archiving
DSS	Decision Support System
EAL	Energy Analytical Laboratory
ECO	Energy Conserving Opportunities
ECS	[U.S.] Extended Continental Shelf
EDEN	Everglades Depth Estimation Network
EDMAP	Education Mapping program (in National Cooperative Geologic Mapping Program)
EDRR	Early Detection, Rapid Assessment and Response
EEOC	Equal Employment Opportunity Commission

EFT	Electronic Funds Transfer
EGIM	Enterprise Geographic Information Management
EHP	Earthquake Hazards Program
EI	Enterprise Information
EIST	Enterprise Information Security and Technology
ELA	Enterprise License Agreement
ELT	Executive Leadership Team
EO	Executive Order
EOL	Encyclopedia of Life
EOP	Executive Office of the President
EPA	U.S. Environmental Protection Agency
EPCA	Energy Policy and Conservation Act
EPMA	Ecosystem Portfolio Model
EPN	Enterprise Publishing Network
ER	Eastern Region
ERA	E-Risk Assessment
ERAS	Remote Access Services
EROS	Earth Resources Observation and Science
ERP	Energy Resources Program
ESD	Earth Surface Dynamics
ESRI	Environmental Systems Research Institute
ETM+	Enhanced Thematic Mapper Plus
EVMS	Earned Value Management System
FAA	Federal Aviation Administration
FACA	Federal Advisory Committee Act
FAER	Fisheries Aquatic and Endangered Resources
FASAB	Federal Accounting Standards Advisory Board
FBMS	Financial Business Management System
FBWT	Fund Balance with Treasury
FCI	Facilities Condition Index
FEA	Federal Enterprise Architecture
FECA	Federal Employee Compensation Act
FEDMAP	Federal lands Mapping program (in National Cooperative Geologic Mapping Program)
FEGLI	Federal Employees Group Life Insurance
FEHB	Federal Employees Health Benefit
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FERS	Federal Employees Retirement System
FFMIA	Federal Financial Management Improvement Act of 1996
FGDC	Federal Geographic Data Committee
FICA	Federal Insurance Contributions Act
FISC	Florida Integrated Science Center
FISMA	Federal Information Security Management Act
FMT	Field Managers Team
FMFIA	Federal Managers' Financial Integrity Act of 1982
FMMS	Facilities Maintenance Management System
FOS	Flight Operations Segment
FOT	Flight Operations Team
FRAMES	Fire Research and Management Exchange System
FRB	Federal Reserve Board

FRPP	Federal Real Property Profile
FSA	Farm Service Agency
FTE	Full-Time Equivalent
FWS	U.S. Fish and Wildlife Service
GAAP	Generally Accepted Accounting Principles
GAM	Geographic Analysis and Monitoring Program
GAO	Government Accountability Office
GBIP	Great Basin Information Project
GBIS	Global Biodiversity Information Facility
GCDAMP	Glen Canyon Dam Adaptive Management Program
GC-IMS	Global Change-Information Management System
GCP	Global Change Program
GCMRC	Grand Canyon Monitoring and Research Center
GEO	Group in Earth Observations
GEODE	GEO-Data Explorer
GeoMAC	Geospatial Multi-Agency Coordination
GEOSS	Global Earth Observation System of Systems
GFDL	Geophysical Fluid Dynamics Laboratory
GIS	Geographic Information System
GLSC	Great Lakes Science Center
GNIS	Geographic Names Information System
GOE	Geospatial One-Stop
GOS	Geospatial One-Stop
GPRA	Government Performance and Results Act
GRB	Green River Basin
GPS	Global Positioning System
GPSC	Geospatial Products and Services Contract
GSA	General Services Administration
GSN	Global Seismographic Network
GWRP	Ground-Water Resources Program
HAZUS	Federal Emergency Management Agency's Earthquake Loss Estimation Program
HBN	Hydrologic Benchmark Network
HDOA	Hawaii Department of Agriculture
HEDDS	Highly Pathogenic Avian Influenza Early Detection Data System
HHS	[Department of] Health and Human Services
HIF	Hydrologic Instrumentation Facility
HLI	Healthy Lands Initiative
HNA	Hydrologic Networks and Analysis [program]
HPO	High Performing Organization
HR	Human Resources
HR&D	Hydrologic Research and Development [program]
HSPD	Homeland Security Presidential Directive 12
HUD	US Department of Housing and Urban Development
HVO	Hawaii Volcano Observatory
HWATT	Hemlock Woolly Adelgid Action Team
IAGA	International Association of Geomagnetism and Aeronomy
ICL	International Consortium on Landslides
ICRP	Internal Control Review Plan
ICWP	Interstate Council on Water Policy
IEAM	Integrated Environmental Assessment and Management

IGPP	Institute for Geophysics and Planetary Physics
ILM	Integrated Landscape Monitoring
IOOS	Integrated Ocean and coastal Observing System
IP	Investment Plan
IRB	Investment Review Board
IRIS	Incorporated Research Institutions for Seismology
InSAR	Interferometric Synthetic Aperture Radar
ISO	International Organization for Standardization
IT	Information Technology
ITILOB	Information Technology Infrastructure Line of Business
JFA	Joint Funding Agreement
KSF	Thousand Square Feet
LAS	Local Action Strategy
LDCM	Landsat Data Continuity Mission
LDGST	Landsat Data GAP Study Team
LEAG	Long-term Estuary Assessment Group
LHP	Landslide Hazards Program
LiDAR	Light Detecting and Ranging
LIMA	Landsat Image Mosaic of Antarctica
LMV	Lower Mississippi Valley
LOA	Level of Authentication
LRS	Land Remote Sensing
LTRMP	Long-Term Resource Monitoring Program
LTWG	Landsat Technical Working Group
LVO	Long Valley Volcano Observatory
MBtu	Million British thermal units
MD	Management Directive
MEO	Most Effective Organization
MHDP	(Integrated) Multi-Hazards Demonstration Project
MITS	(Department) Management Initiatives Tracking System
MMS	Minerals Management Service
MOC	Mission Operations Center
MODIS	Moderate Resolution Imaging Spectroradiometer
MRDS	Mineral Resources Data System
MRERP	Mineral Resources External Research Program
MRLC	Multi resolution Land Characteristics Consortium
MRP	Mineral Resources Program
MSCP	Multi-Species Conservation Program
MSH	Mount St. Helens
MSS	Multi Spectral Scanner
MTBE	methyl tert-butyl ether
MUSIC	MIT-USGS Science Impact Collaborative
NABCI	North American Bird Conservation Initiative
NACO	National Association of Counties
NADP	National Atmospheric Deposition Program
NARA	National Archives and Records Administration
NAS	National Academy of Sciences
NASA	National Aeronautics and Space Administration
NASQAN	National Stream Quality Accounting Network
NAWQA	National Water-Quality Assessment

NBC	Department of Interior - National Business Center
NBII	National Biological Information Infrastructure
NCAR	National Center for Atmospheric Research
NCAP	National Civil Applications Program
NCEP/NOAA	National Centers for Environmental Prediction
NCGMP	National Cooperative Geologic Mapping Program
NCIA	National Competitiveness Investment Act
NCPP	USGS National Coastal Program Plan
NCRDS	National Coal Resources Data System
NDOP	National Digital Orthoimagery Program
NED	National Elevation Dataset
NEHRP	National Earthquake Hazards Reduction Program
NEIC	National Earthquake Information Center
NEPA	National Environmental Policy Act
NETL	National Energy Technology Laboratory
NGA	National Geospatial-Intelligence Agency
NGAC	National Geospatial Advisory Committee
NGIC	National Geomagnetic Information Center
NGMDP	National Geologic Map Database Project
NGO	Nongovernmental organization
NGP	National Geospatial Program
NGTOC	National Geospatial Technical Operations Center
NHD	National Hydrology Dataset
NHWC	National Hydrologic Warning Council
NIEHS	National Institute of Environmental Health Sciences
NIFC	National Interagency Fire Center
NIH	National Institute of Health
NISC	National Invasive Species Council
NIISS	National Institute for Invasive Species Science
NIST	National Institute of Standards and Technology
NIWR	National Institutes for Water Resources
NLC	National League of Cities
NLCD	National Land Cover Database
NLIC	National Landslide Information Center
NLIP	National Land Imaging Program
NOAA	National Oceanic and Atmospheric Administration
NPN	National Phenology Network
NPRA	National Petroleum Reserve, Alaska
NPS	National Park Service
NRIS	Natural Resource Information System
NRC	National Research Council
NRCS	Natural Resources Conservation Service
NRMP	National Resource Monitoring Partnership
NRP	National Research Program (research organization in USGS Water discipline)
NRPP	National Resource Preservation Program
NSDI	National Spatial Data Infrastructure
NSF	National Science Foundation
NSGIC	National States Geographic Information Council
NSIP	National Streamflow Information Program
NSLRSDA	National Satellite Land Remote Sensing Data Archive

NSMP	National Strong Motion Program
NSPD	National Space Policy
NSTC	National Science and Technology Council
NTN	National Trends Network
NVEWS	National Volcano Early Warning System
NWIS	National Water Information System
NWQL	National Water Quality Laboratory
NWQMN	National Water Quality Monitoring Network
NWS	National Weather Service
OAFM	USGS Office of Accounting and Financial Management
OAP	Ocean Action Plan
OBIS	Ocean Biogeographic Information System
OBP	USGS Office of Budget and Performance
OEPC	Office of Environmental Policy and Compliance
OES	Office of Emergency Services
OFEE	Office of the Federal Environmental Executive
OFR	Open-File Report
OGC	Open Geospatial Consortium
OIA	Office of Insular Affairs
OIG	Office of the Inspector General
OGDB	Organic Geochemistry Database
OLI	Operational Land Imager
OMB	Office of Management and Budget
OMS	Office of Management Services
OPM	Office of Personnel Management
ORPP	Ocean Research Priority Plan
ORPPIS	Ocean Research and Priorities Plan and Implementation Strategy
OSHA	Occupational Safety and Health Administration
OSM	Office of Surface Mining
OSTP	Office of Science and Technology Policy
OWRS	Office of Western Regional Services
PAGER	Prompt Assessment of Global Earthquakes for Response
PART	Program Assessment Rating Tool
PDA	Personal Digital Assistant
PDRs	Preliminary Design Reviews
PES	Priority Ecosystems Science
PFM	(Department) Office of Financial Management
PMA	Presidents Management Agenda
PP&E	Property, Plant, and Equipment
PI	Principal Investigator
PRB	Powder River Basin
PSNER	Puget Sound Near Shore Ecosystem Restoration
PTWC	Pacific Tsunami Warning Center
PWRC	Patuxent Wildlife Research Center
QOL	Quality of Life
R&D	Research and Development
RCM	Regional Climate Models
RCOOS	Regional Coastal Ocean Observing Systems
RFP	Request for Proposals
RGIO	Regional Geospatial Information Office(r)

RIF	Reduction in Force
RSSI	Required Supplementary Stewardship Information
RTS	Reports Tracking System (Water Resources)
SAFOD	San Andreas Fault Observatory at Depth
SAIN	Southern Appalachian Information Node
SAR	Synthetic Aperture Radar
SBFD	San Francisco Bay and freshwater delta
SBSP	South Bay Salt Pond Restoration Project
SCEC	Southern California Earthquake Center
SCR	System Concept Review
SDR	Subcommittee for Disaster Reductions
SES	Senior Executive Service
SETAC	Society of Environmental Toxicology and Chemistry
SFBD	San Francisco Bay Delta
SFWMD	South Florida Water Management District
SLC	Scan Line Corrector
SGL	Standard General Ledger
SIR	Surveys, Investigations, and Research
SOW	Statement of Work
SPARROW	SPAtially Referenced Regressions on Watershed Attributes
SPRESO	South Pole Remote Earth Science Observatory
SRR	Systems Requirement Review
SRTM	Shuttle Radar Topographic Mission
STATEMAP	State mapping program (in Cooperative Geologic Mapping Program)
STIG	Security Technical Implementation Guides
SWAQ	Subcommittee on Water Availability and Quality
TCOM	Tahoe Constrained Optimization Model
TM	Thermatic Mapper
TMDL	Total Maximum Daily Loads (Clean Water Act requirement)
TSP	Thrift Savings Plan
TRIP	The Road Indicator Project
TROR	Treasury Report on Receivables
TRPA	Tahoe Regional Planning Agency
URISA	Urban and Regional Information System Association
USACE	U.S. Army Corps of Engineers
USAID/OFDA	U.S. Agency for International Development/ Office of Foreign Disaster Assistance
USDA	U.S. Department of Agriculture
USDOE	U.S. Department of Energy
USFS	U.S. Forest Service
USGCRP	U.S. Global Change Research Program
USGEO	U.S. Group on Earth Observations
USGS	U.S. Geological Survey
USNG	United States Nation Grid
VHP	Volcano Hazards Program
VOIP	Voice over IP Systems
V&V	Validation and Verification
VSIP/VERA	Voluntary Separation Incentive Payment/Voluntary Early Retirement Authority
WAN	Wide Area Network
WCF	Working Capital Fund
WFRC	Western Fisheries Research Center

WLCI	Wyoming Landscape Conservation Initiative
WNV	West Nile Virus
WPA	World Petroleum Assessment 2000
WR	Western Region
WRIR	Water Resources Investigation Report
WRRA	Water Resources Research Act
WRRIs	[State] Water Resources Research Institutes
WSC	[USGS State] Water Science Center
WSWC	Western States Water Council
YMP	Yucca Mountain Program
YVO	Yellowstone Volcano Observatory

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General Statement

Total 2009 Budget Request

(Dollars in Thousands)

Budget Authority	2007 Actual	2008 Enacted	2009 Budget Request	Change 2009 from 2008
Discretionary	988,050	1,006,480	968,516	-37,964
Mandatory	8,968	1,177	699	-478
Total	**997,018**	**1,007,657**	**969,215**	**-38,442**
FTEs	*8,368*	*8,308*	*8,008*	*-300*

2009 Budget Request by Interior Mission Area

(Dollars in Thousands)

Mission Area	2007 Actual	2008 Enacted	2009 Budget Request	Change 2009 from 2008
Resource Protection	787,495	801,099	792,933	-8,166
Resource Use	97,044	97,367	73,031	-24,336
Serving Communities	103,511	108,014	102,552	-5,462
Total	**988,050**	**1,006,480**	**968,516**	**-37,964**

Overview

The 2009 request advances Administration priorities, ensures the continued implementation of the President's Management Agenda, and addresses the planned outcomes of the Department's Unified Strategic Plan. In making funding and priority decisions, the USGS considered the following criteria in weighing the value of the science: interdisciplinary, collaboration and partnerships, results of program evaluations, demonstration of progress toward advancing both Department performance goals and the USGS Science Strategy, and the Administration's research and development investment criteria—performance, quality, and relevance.

The USGS continues to be a valuable source of research and information for the American taxpayer. Under the proposed request, the USGS will continue to —

- Work closely with Interior bureaus to ensure that their science and information needs are an integral part of USGS science plans,
- Carry out large-scale, regional and national, investigations that build the base of knowledge about the Earth,

- Apply multi-disciplinary scientific expertise in the fields of biology, geography, geology, hydrology, and geospatial information,
- Sustain long-term monitoring and assessment of natural resources,
- Collect, monitor, and analyze data and provide scientific understanding about natural resource conditions, issues, and problems, and
- Provide relevant, timely, impartial, peer-reviewed natural resource information and products.

These combined efforts, coupled with a non-regulatory and non-land management mission, position the USGS as a leader in understanding complex natural science questions of the day; performing objective, policy-neutral analysis; and providing the scientific products that lead to solutions. For more than a century, natural resource managers, emergency response organizations, land use planners, decisionmakers at all levels of government, and citizens in all walks of life have come to depend on the USGS for reliable information to use as tools to address pressing societal issues such as public safety and health, natural resource management, and environmental protection.

2009 Major Focus

The 2009 budget request is based on the 2008 Consolidated Appropriations Act. It includes fixed costs, a travel reduction and an elimination of a one-time increase. Secretarial Initiatives are funded at $20.0 million; other increases total $14.9 million and decreases total $87.8 million. Decreases proposed for 2009 include a one-time 2008 increase of $4.7 million for repairs to the Patuxent Wildlife Research facilities and all unrequested Congressional increases in the 2008 Consolidated Appropriations Bill. The focus of the 2009 budget request is Secretarial Initiatives in Water for America, Birds Forever, Healthy Lands, and Ocean and Coastal Frontiers. Other highlights include Climate Change, the National Land Imaging Program and Priority Ecosystems.

Budget Highlights

Secretarial Initiatives

Water for America (+$8.2 million)
Water is vital to the U.S. economy in general, and to agricultural production, energy independence, the viability of cities, and environmental quality in particular. If the Nation is to manage this vital resource well, good information and predictive tools are needed to guide decisions made by the private sector, localities, Tribes, States, and the Federal Government. A net increase of $8.2 million along with an internal redirection will provide $9.5 million to conduct a water census and upgrade the Nation's stream gage network. The Committee on Environment and Natural Resources of the National Science and Technology Council is preparing an interagency plan for a water census, with the USGS playing a key role in this multi-agency effort. This component of the initiative would involve partnerships with State and local agencies. For purposes of improved geologic characterization of aquifer systems it would include USGS and State geological surveys efforts through the National Cooperative Geologic Mapping Program (see page F-2).

Birds Forever (+$1.0 million)
The Department is requesting new funds in 2009 to address threats that have led to rapid declines in the populations of many migratory bird species. The USGS will complement the efforts proposed by the U.S. Fish and Wildlife Service (FWS) by providing new or increased research and monitoring capacity to better understand large scale drivers of migratory bird populations and habitat change such as global warming, deforestation, and urban development. This initiative supports monitoring efforts in such activities as the Breeding Bird Survey, Strategic Habitat Conservation, and other migratory bird monitoring activities, which are critical to the FWS (and other partners) achievement of its migratory bird trust resource goals and objectives (see page F-14).

Healthy Lands (+$3.5 million)
The Healthy Lands Initiative (HLI) was a central component of the President's 2008 budget proposal. In 2009, the request is an increase to fund HLI at the level proposed in 2008. In 2009, the USGS as a significant partner in this multi-bureau initiative will conduct an ecological assessment in additional HLI areas to develop a baseline of scientific information related to wildlife habitat and development activities occurring or planned for these areas. The scientific tools, models and protocols which were developed as part of the 2008 work in southwest Wyoming, will be transferred and applied as initial steps in assisting land management agencies to determine best management practices to meet the needs of multiple stakeholders. Additionally, strategic integrated monitoring protocols will be identified and applied to provide more scientifically based information for management decisionmaking and adaptive management applications (see page F-20).

Ocean and Coastal Frontiers (+$7.0 million)
The Department's Ocean and Coastal Frontiers Initiative builds on work begun in response to the U.S. Ocean Action Plan (OAP) issued December, 2004 and the Ocean Research Priorities Plan issued January 2007. Through Executive Order and the OAP, the President directed that Federal agencies enhance existing partnerships by expanding coordination and consultation on ocean-related matters and encouraged State collaboration with Federal agencies to address regional ocean and coastal issues.

The initiative addresses the Department's priorities in responding to the broad direction of the OAP and responds to national priorities that intersect the priorities and needs of developing regional alliances. The three components of this initiative are to provide the geologic base for development of a claim to the U.S. Extended Continental Shelf that will vastly increase the area of public lands for which the Department has management and regulatory responsibility; to develop, in collaboration with other Federal agencies, the tools, information, and management frameworks required to address pressing national issues where they are deemed critical to regional priorities; and to enhance the work initiated in 2008 to implement the OAP (see page F-25).

<u>Other 2009 Highlights</u>

Climate Change ($5.0 million)
In 2009, the USGS is sustaining $5.0 million of the $7.4 million unrequested congressional action in 2008. Work will continue to develop the framework for a comprehensive, national climate effects research and monitoring network and to adapt scientific findings of the network into several real life applications. Concurrent with this initiative, USGS proposes a budget restructure to align global change work under a single budget activity. In addition to the climate change initiative, the 2009 proposed activity will include $26.6 million in funding as part of the

USGS contribution to the Climate Change Science Program (CCSP) of $31.4 million. An additional $3.7 million for the National Satellite Land Remote Sensing Data Archive in the Land Remote Sensing sub-activity in Geography and $1.1 million in the Biological Research and Monitoring activity contributes to CCSP and are not included in the proposed new activity (see page F-33).

The climate change funding will allow the initial steps in the development of a comprehensive monitoring of the Nation's Federal lands. The initiative will include two components:

- **Climate Change Science Strategy** will provide critical science, monitoring, and predictive modeling of information related to our changing climate and its effects on the landscape and the Nation's resources.
- **Climate Change Science Adaptation** will provide understanding of the effects of climate change on Interior lands and how these projected changes are likely to interact with other important factors affecting physical and biological systems at local to regional scales; such factors include soil type, land use, and biotic interactions.

National Land Imaging Program (+$2.0 million)
The request for 2009 will enable the USGS to begin working with the Department to develop a National Land Imaging Program. During 2008, the USGS will initiate planning for startup of this national program by establishing the Federal Land Imaging Council and a FACA Committee. The increase in 2009 will allow the USGS, through a collaborative process, to define priorities for land imaging (see page F-41). The program will —

- Establish policy and program management capabilities,
- Develop charters for a Federal Land Imaging Council and a Federal Advisory Committee focused on the future needs for moderate-resolution land imaging,
- Define the core operational capability for U.S. moderate-resolution land imaging,
- Develop a strategic plan for U.S. civil operational moderate-resolution land imaging, and
- Formalize a governance model to coordinate land-imaging affairs.

Priority Ecosystems Studies ($10.4 million)
Priority Ecosystems Science PES) program provides integrated science to better understand the interactive nature of resources and the environment in targeted ecosystems. The USGS proposes to consolidate funding in two budget subactivities. In 2009, a total of $10.4 million will be dedicated to work in six study areas—Greater Everglades, Chesapeake Bay, San Francisco Bay, Mojave Desert, Platte River, and Yellowstone. PES funding from Geographic Analysis and Monitoring ($1.9 million), Earth Surface Dynamics ($2.4 million), and Toxics Substances Hydrology ($2.3 million) is being eliminated and PES funding in Biological Research and Monitoring is being increased by $6.6 million. (see page F-53).

Across-the-Board Travel Reduction (-$3.3 million)
The Department is undertaking a $20.0 million effort to reduce travel and relocation expenses across the board. The allocation of shares of this travel reduction is based on each bureau's and office's percentage of the Department's total 2007 budget object class 21 expenses. The USGS share of this reduction is $3.3 million. USGS will create a strategy to manage and control travel and relocation costs that promotes improved efficiency in allocating available travel funds to highest priority uses, locations, and functions. The bureau will review policies and business practices for managing travel and relocations to ensure that these policies and

business practices emphasize travel priorities, reduce costs through improved management and efficiencies, and increase accountability for managing travel priorities and cost. Options that the bureau will consider in reducing 2009 travel expenses include —

- Reduce number of travelers to meetings, conferences, seminars, etc. to only essential personnel (i.e., primary decisionmaker, presenter, representative),
- Increase use of teleconferences, video-conferencing technologies, on-line meeting capabilities, etc. in lieu of traveling to events,
- Combine meetings, conferences, seminars, and other events to reduce the number of individual travel events, and
- Increase use of on-line booking and travel management services.

The individual program reductions are included in the 2009 program changes category of the introductory table of each activity and subactivity and are identified in a footnote to that table.

Facilities Restructure
The request for 2009 includes a technical adjustment to combine the Rent and the Operations and Maintenance subactivities. The result will provide the USGS with funding flexibility that is needed to meet asset management goals and carry out Executive Order 13327. Among our key asset management goals is improving the condition of owned facilities. Routine operations and maintenance of owned USGS facilities is currently under-funded which results in continued growth to the deferred maintenance backlog and continued degradation of facility condition. Given current budget constraints, USGS proposes to address this issue internally by downsizing rented space and using the savings to fund operations and maintenance at a sustainable level. Combining the two subactivities provides the structural capability to carry out this strategy. (see page E-33).

Departmental Crosscuts

For most departmental crosscutting activities, USGS science is preserved or increased within funding levels in this budget. Activities range from environmental issues such as coral reef protection in the Pacific Islands to resource management issues such as salmon recovery in the Pacific Northwest. Other activities include the National Invasive Species Management Plan, California Bay-Delta, Middle Rio Grande, the Everglades, climate change, Geospatial One-Stop, and other electronic government initiatives, and the Klamath River Basin Federal Working Group.

Base Analysis

For the purposes of developing the 2009 budget request, USGS analyzed the productivity that would remain in each of its programs at the 2009 funding levels, including the program's remaining effectiveness for meeting goals and objectives, customer and partner expectations for base efforts, and the impact of the base reductions on reimbursable income and receipt of in-kind services.

The USGS conducts quarterly reviews of its programs' performance and fiscal status, examining availability of funds, expenditures, and obligations to date; actual expenditures compared to plans; carryover balances; earned unbilled revenue; delinquent debt; unliquidated obligations; FTE usage; working capital fund investments; estimates of reimbursable income; and

performance relative to the Government Performance and Results Act (GPRA), scorecard and Program Assessment and Rating Tool (PART) targets and milestones. Senior managers are apprised of financial and performance status and expected to address any necessary actions.

The USGS regularly conducts internal control reviews of its programs and organizations. Selected programs are reviewed each year, with the objective of all programs being reviewed once every five years for program management, accountability to program goals and objectives, and responsiveness to customer requirements. The organizational internal control reviews, which include administrative and financial reviews, are conducted at the science centers to review organizational management, fiscal responsibility, program management, and customer satisfaction.

Use of Cost and Performance Information

Creating efficiencies in administrative reviews: Since 2004, employee opinions have been sought in advance of administrative reviews at science centers. At least 10 versions of an on-line questionnaire have been used to gather employee opinions. Starting in 2008, a single standard questionnaire has been adopted for use in all regions. This standardization reduces the time required to create the on-line questionnaire from an average of one hour to no more than ten minutes. The new standard questionnaire eliminates duplicative questions from the most common previously used version, reducing by half the average time required to complete the questionnaire and to analyze the results. Total savings are estimated as about 200 hours per year.

Continual renewal of the USGS scientific talent base to meet the Nation's future science needs is both a necessity and a responsibility of the bureau. To this end, USGS has been offering a Voluntary Separation Incentive Program and Voluntary Early Retirement Authority (VSIP/VERA) to employees in all of its science disciplines to tool its workforce to meet the science needs of today and the future. In addition, the USGS has utilized VSIP/VERA authorities in selected administrative and publication support areas in order to adjust skill sets and realign support services. With continued use of this tool, the Bureau will be better positioned to meet changing program goals and priorities that need a different balance of workforce skills and carry out new strategic opportunities and directions in the face of level or decreased funding.

Cost and performance information as well as R&D criteria are also factors that are considered in setting priorities and justifying programs. All decisionmaking requires various processes to ensure objectivity, and also to ensure an equitable use of subjectivity. It is important to acknowledge these processes as well as use of cost and performance data in a formal decisionmaking process. Examples include —

Geology Program focuses on Science Plan Goals and Strategic Actions — Since 1996, Geology Programs have been leaders in conducting a discipline-wide competitive project proposal process using a prototype of the Budget and Science Information System (BASIS+) now in use across the bureau. Geology issues an annual call for project proposals called the Geology Annual Science Plan which contains scientific and funding guidance for all projects. The annual plan uses the Geology Science Strategy and Program 5-year plans for its organizing framework. Scientists are required to submit annual project work plans into BASIS+ for program review. The system is used to examine strengths and weaknesses in staff, scientific methodology, progress on goals, budgetary structure, use of funds and capital investments, and formulate final funding allocations. Reviews are conducted by scientific peers and include external scientific or stakeholder review.

Water Resources Cost/Benefit Analysis — The National Hydrologic Warning Council (NHWC) completed an evaluation of the USGS streamgaging program in 2006, seeking to answer two questions:

- Does the benefit derived from the streamgage network exceed the cost of building, operating, and maintaining this network, thereby justifying the investment?
- Does the incremental benefit of an expanded network equal or exceed the incremental cost of the expansion?

The evaluation was limited to consideration to only flood-related issues (rather than all nine uses of the information identified in the NHWC report) and included case studies involving use of streamgage data for flood prediction and warning (including emergency response), for reservoir operation, for floodplain mapping, and for the design of flood management projects.

The study concluded —

> "… even though we cannot assign with certainty a total benefit to the network, the benefit clearly exceeds the estimated cost. Each of the uses that we consider herein, in fact, yields benefits that exceed much of the cost, even when considered in individual cases. In the aggregate, nationwide, the benefits of gages in the context of reducing flood damages greatly exceed the costs of collecting the data used for decision making."

Based on this and other recent analyses, the USGS continues to seek additional support for the network, bearing in mind that annual funding adjustments will be needed to keep program performance level in the face of rising costs.

Program Evaluations

Another tool used in analyzing the base budget is program evaluations. In 2007, 154 reviews were performed within 4 types of components:

- Program (83),
- Information Technology (5),
- Administration (Administrative, Financial, and Departmental Function Reviews) (65), and
- Other (Human Capital, Facilities, Safety & Environmental) (1).

Departmental Functional Reviews (DFRs) are included in these reviews. As directed, selected DFRs are performed on information technology systems, property and acquisition management, accounting system compliance, and other functional areas deemed necessary. These reviews were performed to comply with various regulations such as the OMB Circular A-123 and the Federal Managers' Financial Integrity Act.

USGS will continue to implement internal and external program reviews, which can take several years to complete. The recommendations provided from the reviews are used by USGS to improve accountability and quality of programs, identify and address gaps in programs, redirect or reaffirm program direction, identify and provide guidance for development of new programs, and reward and motivate managers and scientists. The plans for continuous improvement of the program components are annual for the PART improvement plans but other external program reviews are not routinely scheduled two years in advance. The external program reviews completed in 2007 are Earth Science Applications from Space, River Science Program,

Center of Excellence in Geospatial Information Science, and Research Priorities in Earth Science and Public Health. The Water Resources and Volcano Hazards program evaluations will be completed in 2008.

USGS will also continue to improve upon and implement Activity Based Costing (ABC) in cooperation with the Department. The continued commitment to ABC will improve the overall analysis and use of all funding within USGS, including base funding. USGS continues to verify and validate data, improve understanding and process application, and has also worked to standardize ABC, Strategic Plan, and PART outputs so that the building blocks of the Strategic Plan can be costed, relationships understood, and management information leveraged. In 2007, USGS realigned ABC activities to the new Mission/Goals within the revised Strategic Plan. USGS also met the Department's requirement to cost key reference measures rather than outputs or end outcome goals. For USGS these were defined as our three end outcome measures which are indicative of the cumulative impact of our research (i.e., use by land and resource managers for decisionmaking). The Department has now begun to cost intermediate measures to further define the tie or link between cost and performance. USGS has begun identifying a process to cost intermediate measures. Close linkages will allow for improved costing of work, understanding of relationships, and leveraging of management information. The use of ABC will help USGS better explain how it serves the public and what the American public in turn, gets from the funding invested in the USGS.

USGS will also continue to improve upon its established budget, allocation, and spending processes where and when necessary to ensure that all funds, including base funding, are obligated in a timely manner, spent for the intended purposes, and accurately reported. The USGS will continue to monitor its base funding through annual planning for the use of the funds, quarterly and monthly reviews of all spending, and review of funds allocation changes over $25,000. Budget planning to object class and activity will continue to be done in the BASIS+ system, which ties budget to intended use and provides easy verification for the use of funding in an analysis. Allocation tables are constructed from BASIS+ and the Federal Financial System to provide monthly and quarterly spending information for review of obligation and debt of the bureau and its programs so that corrective action can be taken if necessary. The USGS continues to improve its base analysis through the monthly and annual review of project budgets by line and program managers, including the review and certification of unliquidated obligations. In its quarterly status of funds reviews, USGS also continues to improve the use of reporting against performance goals.

Using ABC to Track Work Performed for the Federal Energy Regulatory Commission

The USGS is participating in a Department-wide initiative to help defray the costs of conducting hydropower licensing reviews by receiving a portion of the hydropower licensing fees collected by the Federal Energy Regulatory Commission (FERC). The USGS will have increasing responsibilities to perform FERC hydropower-related activities, which can result in increased workload and costs. These increased responsibilities can include, but are not limited to (1) implementation of FERC's Integrated Licensing Process, which became the default process in 2005, (2) trial-type hearings and alternative mandatory terms and conditions under Energy Policy Act of 2005, (3) capacity amendments, and (4) new project proposals and preliminary permits for ocean hydrokinetic and wave energy projects.

The USGS will compile and provide the appropriate annual cost documentation to the Office of Financial Management (PFM). With assistance from the Office of Environmental Policy and

Compliance (OEPC) and PFM, the USGS will assure that annual cost submissions meet FERC's cost reporting requirements.

Estimated annual costs of FERC hydropower activities for the USGS are —

	2007	2008	2009
Total annual costs ($000)	$16.17	$16.665	$15.18

By securing partial cost recovery of the Department's costs of participating in FERC hydropower activities, this proposal will in turn allow the USGS to recover resources needed to address its increased responsibilities.

For a fuller description of the cost recovery approach, see the OEPC budget proposal in the Departmental Management budget request.

Strategic Plan

The Department of the Interior's GPRA Strategic Plan 2007-2012 can be found at *http://www.doi.gov/ppp/Strategic%20Plan%20FY07-12/strat_plan_fy2007_2012.pdf.*

Science lies at the foundation of Interior programs. USGS programmatic outcomes directly contribute to the Resource Protection, Resource Use, and Serving Communities mission areas and indirectly as a byproduct support Recreation goals. USGS goals are designed "to improve understanding of" —

- Resource Protection: National ecosystems and resources (Enterprise Information's National Geospatial Program, Biology, Geography, Geology, and Water Resources),

- Resource Use: Energy and mineral resources (Geology's Energy and Mineral Resources programs), and
- Serving Communities: Natural hazards (Geology's Hazards programs).

USGS also supports Management Excellence goals through two budget activities (Science Support and Facilities), as well as infrastructure functions of Enterprise Information. Interior's science mission has clearly defined goals and performance measures to gage progress in achieving this mission. Several of these performance measures derived their origin from the PART evaluation process, making a close linkage of the plan to the programs and performance budget. In the construct of the strategies to achieve the end outcome goals for science, the Administration's Research and Development criteria are the accountability premise for science investments. These criteria are performance, quality and relevance. Therefore, the first strategy for each science goal focuses on performance and the second strategy on quality and relevance with standardized language as follows:

Performance:	**1. Ensure availability of ... scientific data and information...**
Quality and Relevance:	**2. Ensure the quality and relevance of science information and data to support decision making**

USGS met the representative measures monitored during 2007. The measures not met predominantly resulted from diversion of efforts to disaster-related data collection, deployed funding for multiple catastrophic events, and changing priorities of partners who contribute funds or data. Planned data collection will resume when immediate priorities are met.

2009 Performance Summary

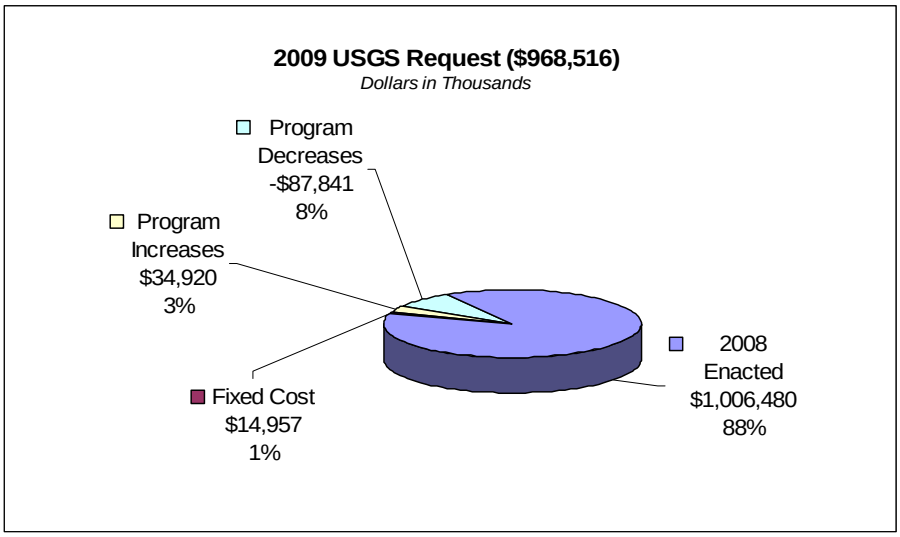
Achieving Department Mission Goals

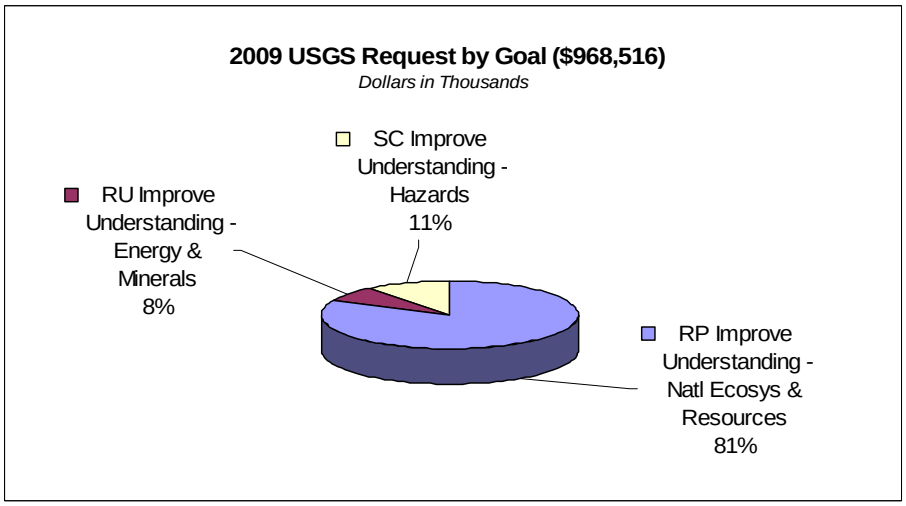
The 2009 request is for $792,933,000 in **Resource Protection**, 81 percent of the total USGS budget and a net total decrease of $8,166,000 from the 2008 enacted level. This request includes net programmatic change of $20,157,000 from the 2008 enacted level budget, including program increases totaling $34,920,000 for Water for America, Birds Forever, Healthy Lands, Ocean and Coastal Frontiers, Climate Change, National Land Imaging Program, and Priority Ecosystem Science and program decreases totaling $55,077,000 for National Water-Quality Assessment, Toxic Substances Hydrology, Earth Surface Dynamics, National Biological Information Infrastructure (NBII), a portion of the one-time Patuxent Facilities Repair, a portion of the travel reduction, and unrequested Congressional actions. The Resource Protection goals represent nearly 100 percent of the proposed USGS program increases and 62 percent of proposed program decreases. Fixed costs and related charges account for the remaining increase of $11,991,000. In 2007, all programs supporting the Resource Protection goal have met or exceeded their GPRA performance measures, have scored "Moderately Effective" or better on their PART evaluations, and continue to meet milestones documented, monitored and tracked in their PART action plans.

The 2009 requests $73,031,000 for **Resource Use**, 8 percent of the total USGS budget and a net total decrease of $24,336,000 from the 2008 enacted level. This request includes program decrease totaling $25,955,000 for Minerals Assessments and Activities, a portion of the travel

reduction, and a portion of the one-time Patuxent Facilities Repair. The Resource Use goals represent less than one percent of proposed USGS program increases and 30 percent of proposed decreases. Fixed costs and related charges account for the remaining increase of $1,619,000. In 2007, the two programs supporting the Resource Use goal have met or exceeded their GPRA performance measures, have scored "Moderately Effective" on their PART evaluations, and continue to meet milestones documented, monitored and tracked in their PART action plans.

The 2009 budget requests $102,552,000 for **Serving Communities**, 11 percent of the total USGS budget and a net total decrease of $5,462,000 from the 2008 enacted level. This request includes program decrease totaling $6,809,000 for Earthquake grants, unrequested Congressional actions, a portion of the travel reduction, and a portion of the One-time Patuxent Facilities Repair. The Serving Communities goals represent 8 percent of the proposed decreases. Fixed costs and related charges account for the remaining increase of $1,347,000. In 2007, the programs supporting the Serving Communities goal have met or exceeded their GPRA performance measures, have scored "Moderately Effective" on their PART evaluations, and continue to meet milestones documented, monitored and tracked in their PART action plans.





The USGS vision, mission, and strategic direction focus on responsiveness and customer service, underscoring the application of science to customer, partner, and other stakeholder needs. They direct the combined expertise of the bureau's scientific disciplines and define its commitment to pursuing a multidisciplinary approach to providing science for a changing world. An overview of how the USGS science and information support the Department's Strategic Plan follows.

Resource Protection

Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment

Interior's resource protection mandate has grown dramatically, both in terms of the numbers and types of resources involved and in the complexity of the associated management issues. Interior administers resource protection programs on thousands of upland, wetland, and aquatic parcels within the Department's direct jurisdiction and provides resources for conservation activities on non-Federal lands. Extreme changes in the environment are less costly if their likely effects can be mapped, quantified, and anticipated. Resources can be more efficiently used if the impacts of their development and extraction can be predicted and mitigated. Damaged or endangered ecosystems can be repaired more effectively if the natural processes that form and maintain them are accounted for in remediation and restoration plans. Strategies for conserving and using the Nation's lands and resources are improved when natural processes are incorporated into predictive models and management plans in an adaptive manner. USGS science programs collaborate with many organizations across the country to provide critical information that assists land and resource management agencies, partners, stakeholders, customers, and the general public with timely information to inform their decisions.

Interior addresses four outcome goals in the resource protection mission area: lands and waters, fish and wildlife, culture and heritage, and improving understanding of ecosystems and natural resources. To improve understanding, the USGS produces scientific assessments and information on the quality and quantity of our Nation's water resources; collects, processes, integrates, archives, and provides access to geographic, geospatial and natural resource data; generates and distributes information needed in the conservation and management of the Nation’s biological resources; and conducts multi-purpose natural science research to promote understanding of earth processes. USGS' multiple

USGS Analyzes 70 Years of Coastal Cliff Retreat in California

Coastal cliff retreat is a serious and chronic coastal hazard along California's coast. Many analyses of cliff retreat have been conducted along the California coast, but they covered only small, specific areas and used different methods with varying accuracies, making it difficult to compare retreat hazards from one area to the next. This USGS study is the first comprehensive quantification of coastal cliff retreat in California. It included the development of repeatable methodologies that use both historical data and modern, state-of-the-art LIDAR (light detection and ranging) data. The database is designed to be expandable as additional data become available in the future.

Produced as part of the National Assessment of Shoreline Change, the new report is entitled "*The National Assessment of Shoreline Change, Part 4: Historical Coastal Cliff Retreat along the California Coast*."

A companion volume offers data that can be used in geographic-information-system (GIS) applications entitled "*The National Assessment of Shoreline Change: A GIS Compilation of Vector Cliff Edges and Associated Cliff Erosion Data for the California Coast*."

These reports will be used by State and local agencies for planning and regulatory applications and by the scientific community in regard to coastal-hazard assessments.

scientific disciplines combine their diverse expertise in interagency ecosystem initiatives across the United States, from South Florida to Alaska, where scientists are working together to understand, evaluate, and provide options for better resource management decisions. The development of new methods and techniques allows USGS scientists to work more efficiently and cost effectively. For example, the USGS developed data collection protocols for use with personal digital assistants in the field for collecting amphibian and hydrologic information. This technology allows field scientists to collect data in real time without having to return to the office to enter the data on computers.

Resource Use

Improve the understanding of energy and mineral resources to promote responsible use and sustain the nation's dynamic economy

Managing the vast resources of America's public lands has been a core Interior responsibility since the Department was founded in 1849. The lands and offshore areas that fall under Interior's sphere of influence today supply roughly 30 percent of the Nation's domestic energy production, including 35 percent of the natural gas, 35 percent of the oil, 44 percent of the coal, 17 percent of the hydropower, and 50 percent of the geothermal energy. Managing resources has become increasingly more complex. Today, Interior is often called upon to determine where, when, and to what extent renewable and non-renewable economic resources on public lands should be made available. That task demands that the Department balance the economy's call for energy, minerals, forage, and forest resources with their resource protection and recreation responsibilities. USGS research on and assessments of undiscovered energy and nonfuel mineral resources assist the Department's land management agencies in their goal of providing responsible management of resources on Federal lands.

Assessment of Undiscovered Oil and Gas Resources of the East Greenland Rift Basins Province

The Arctic is an area of great petroleum potential, extreme geological uncertainty, sparse data, significant technological barriers to development, and high environmental sensitivity. The USGS has undertaken a comprehensive assessment of the Circum-Arctic in order to provide consistent and comparable geologically based estimates of the potential additions to world oil and gas reserves.

Knowing the potential resources of the Arctic is critical to our understanding of future energy supplies of the United States and the world. Further, understanding the petroleum potential of the Arctic is important for governmental and non-governmental organizations to develop long-range, realistic scenarios for development and protection of the resources found there, whether they be petroleum, biological, or other resources.

Northeastern Greenland is the prototype for the USGS Circum-Arctic Oil and Gas Appraisal and the first analysis and assessment to be completed. USGS released the assessment of the oil and gas potential of Northeastern Greenland, and will be releasing assessments of all the Circum-Arctic provinces over the next year.

Each Interior bureau has a role in implementing the President's National Energy Policy and the Energy Policy Act of 2005 addressing more than 100 actions dealing with the development of renewable and alternative energy sources such as solar, geothermal, wind, gas hydrates, and oil shale. The USGS is the primary provider of earth science energy resource information and assessments for a variety of stakeholders in addition to Interior, including Federal agencies such as the U.S. Department of Agriculture (USDA) Forest Service, and Department of Energy, local and State agencies and electric power producers, the environmental community, academia, and the general public. The USGS Energy Resources Program conducts national

and global energy research on and assessments of oil, natural gas, coalbed methane, gas hydrates, coal, geothermal resources, oil shale, and uranium; evaluates environmental and human health impacts associated with production, use, and occurrence of energy resources; and provides information for the Nation to make sound decisions regarding increases or changes in domestic energy production or mix with an understanding of potential impacts on the environment.

The United States is the world's largest user of mineral commodities. Processed materials of mineral origin accounted for more than $542.0 billion in the U.S. economy in 2006, an increase of 14 percent over 2005. U.S. manufacturers and consumers of mineral products depended on other countries for 100 percent of 17 mineral commodities and for more than 50 percent of 45 mineral commodities that are critical to the U.S. economy. Current and reliable information about both domestic and international mineral resources and the consequences of their development informs decisions about supply and development of mineral commodities. The USGS Mineral Resources Program is the sole Federal provider of scientific information for objective resource assessments and unbiased research results on mineral potential, production, consumption, and environmental effects. Life cycle analysis of nonfuel mineral systems demonstrates the connections between various natural and anthropogenic processes through which minerals are made available to sustain developed societies. Land managers and policymakers use this information to support resource use decisions to enhance public benefit, promote responsible use, and ensure optimal value. Among the tools and technologies developed and employed in these functions are assessments for as-yet undiscovered mineral deposits in the United States and around the world, and Web-based data delivery tools that serve 128 years of mineral resource, geochemical and geophysical data to land managers, Federal agencies responsible for national security and economic policy, the public, and other research scientists.

Serving Communities

Improve the understanding, prediction, and monitoring of natural hazards to inform decisions by civil authorities and the public to plan for, manage, and mitigate the effects of hazard events on people and property

The Department is responsible for protecting lives, resources, and property; providing scientific information to reduce risks from earthquakes, landslides, and volcanic eruptions, and fulfilling the Nation's trust and other special responsibilities to American Indians, Native Alaskans, and residents of Island Communities. The United States is subject to a variety of natural hazards that can result in considerable human suffering and billions of dollars in property and business losses. The occurrence of these hazardous events is inevitable and largely uncontrollable. However, the extent of damage and loss of life can be reduced through preventative planning; social, economic, and engineering adaptations; real-time warning capabilities; and more effective post-event emergency response. Central to this preplanning is the availability of accurate, scientifically based geologic hazards assessments and real-time warning systems that define the nature and degree of risk or potential damage. The more precisely risks can be defined the greater the likelihood that appropriate mitigation strategies will be adopted (e.g., building codes for new construction and retrofitting; land-use plans; and design and location and routing of critical infrastructure such as highways, bridges, subways, water, sewer, gas, electric, local zoning regulations, and petroleum-distribution networks). The more quickly information reaches emergency response centers the faster teams can be dispatched to resolve time-sensitive medical, utility, or other infrastructure problems. Under the Stafford Act (P.L. 93–288),

Interior is responsible for issuing timely warnings of potential geologic disasters—earthquakes, volcanoes, and landslides—to the affected populace and civil authorities in the United States and delegates this responsibility to USGS. In addition, the National Oceanic and Atmospheric Administration (NOAA) uses USGS seismic data to support its delegated Stafford Act responsibility for tsunami warnings; NOAA and the U.S. Air Force use data from USGS geomagnetic observatories for solar-storm warnings; and USGS and NOAA are collaborating on a pilot debris-flow and flash flood warning system in southern California. For foreign disasters, the USGS works with the Agency for International Development's Office of Foreign Disaster Assistance in responding to appeals for technical assistance from affected countries.

USGS geologic hazards programs conduct targeted research, gather long-term data, operate monitoring networks, perform assessments and modeling, and disseminate findings to the public, enabling the Nation's emergency management capabilities to warn of impending disasters, better define risk, encourage appropriate response, and mitigate damage and loss. These programs are designed to produce information and understanding that will lead to a reduced impact of natural hazards and disasters on human life and the economy.

For earthquakes, the USGS operates the Advanced National Seismic System (ANSS), which includes a national backbone network, the National Earthquake Information Center (NEIC), the National Strong Motion Project, and 15 regional seismic networks operated by USGS and its partners. USGS also partners with the National Science Foundation to support the Global Seismographic Network (GSN), which NEIC uses to issue notifications of global earthquakes. When earthquakes strike the United States, ANSS delivers real-time information, providing situational awareness for emergency-response personnel. In regions with sufficient seismic stations, that information includes—within minutes—a ShakeMap showing the distribution of potentially damaging ground shaking reported by those stations, information used to target post-earthquake response efforts. At the end of 2007, five metropolitan regions had dense enough instrumentation to incorporate Shakemaps into their emergency procedures. When fully implemented, ANSS will provide dense station coverage for all at-risk urban areas. Information from ANSS is a key input to the USGS National Seismic

Southern California Hazards Research Benefits the Nation

The tragic consequences of recent wildfires in southern California are ever-present reminders of the hazards that face this region, and the threats posed to large populations. After the fires were contained, USGS researchers from multiple disciplines supported wildfire response and worked with partners to develop flash-flood inundation and debris-flow probability maps for burned areas ahead of severe winter storms hitting denuded slopes above populated areas.

In 2007 the USGS embarked on an innovative project designed to address the complicated and interrelated hazards facing Southern California—home to more than 25 million people and growing.

The Southern California Multi-Hazards Demonstration Project takes advantage of the talent in all of our disciplines and our ability to work with external partners to help land managers and decision makers at all levels.

State, Federal, university, county, and local partners and members of the emergency response community work with the USGS in this "laboratory without walls," prioritizing research and tools and ensuring useful products.

The project is intended to demonstrate how developments in methodology and products can help improve our management of natural hazards in an urban environment, for application across the Nation. In 2008, the project is delivering a planning scenario based on a major southern San Andreas fault earthquake that triggers landslides and wildfires. This scenario is being used in emergency planning and public preparedness exercises to improve disaster response and enhance recovery. Additional funds in 2008 are enabling expansion of the multi-hazards initiative to the Pacific Northwest, Gulf Coast, and Central U.S. In 2009, within base funds, the project will initiate a multi-hazard scenario for impacts of severe winter storms including flash floods, debris flows, and coastal erosion.

Hazard Maps, which help communities in earthquake-prone regions develop safer building practices.

For volcanoes, the USGS has made steady annual progress on both monitoring and hazard-assessment efforts. Using funds transferred by the Federal Aviation Administration, the volcano monitoring network has been expanded, on average, each year to include two previously unmonitored volcanoes. At the end of 2007, the program monitored 52 volcanoes in the United States and territories. On average, one to two volcano hazard assessments have been released to customers each year, and there has been steady progress on development of community response plans in the Cascades. The program estimates that 256 counties or comparable jurisdictions are threatened by volcano hazards. At the end of 2007, 214 (or 83.6 percent) had adopted or were served by emergency management organizations that had adopted response plans based on USGS volcano hazard assessments. Development of a National Volcano Early Warning System (NVEWS) is now a major goal of the USGS following an assessment of volcanic threat and monitoring capabilities for all 169 of the Nation's active volcanoes (USGS Open-File Report 2005-1164, *http://pubs.usgs.gov/of/2005/1164/.*

For landslides, hazard assessments provide the scientific basis for land-use, emergency management, and loss reduction measures. Landslide hazard research concentrates on understanding landslide processes, developing and deploying instruments that monitor threatening landslides, and forecasting the onset of catastrophic movement of future landslides. Research into processes and forecasting methodologies is conducted on the types of landslides that produce losses in the United States such as landslides related to steep slopes, heavy rains, and vegetation loss due to wildfires. The USGS deploys near-real-time monitoring systems at sites in California, near Yosemite National Park and in Oregon in Portland and near Newport. These sites provide continuous rainfall and soil-moisture and pore-pressure data needed to understand the mechanisms of landslide occurrence. The USGS provides timely information through the National Landslide Information Center (NLIC) which maintains several databases: the Landslide Bibliography (more than 15,000 entries), the International Landslide Experts Roster of about 2,000 entries, and Major Landslide Events of the United States (part of the USGS National Atlas). The NLIC also has real-time measurements from on-going landslide monitoring projects available for viewing via the Internet. These measurements are used to forecast landslide movement or changes in an individual landslide's behavior. Monitoring can detect early indications of rapid catastrophic movement. Up-to-the-minute or real-time monitoring provides immediate notification of landslide activity, potentially saving lives and property. Continuous information from real-time monitoring also provides a better understanding of landslide behavior for scientists, engineers, and public officials.

Management Excellence

Manage the Department to be highly skilled, accountable, modern, functionally integrated, citizen-centered, and result-oriented

Successful management is imperative to meet strategic mission goals. To succeed, USGS will need increased accountability for results, more effective means of leveraging available resources, and the continuous introduction and evaluation of process, structural, and technology improvements. The Department's management approach is guided by the Secretary's key business principles: accountability, modernization, and integration. In the Interior Strategic Plan, our goals of Accountability, Modernization, and Integration and the President's Management Agenda converge to form a non-mission area of the strategic plan—Management

Excellence. Like the programmatic mission areas, Management Excellence is structured to include outcome goals and strategies with associated performance measures. Each aspect of the President's Management Agenda is reflected within this framework. USGS supports Management Excellence goals throughout the organization with dedicated funding in Science Support and Facilities as well as the information security, technology, and resource components of Enterprise Information (EI).

Employee Feedback

Gaging employee opinions is one of the most important things an organization can do to determine the effectiveness of management decisions. USGS conducted an Organizational Excellence Assessment Survey in 2007. The survey was administered electronically to all USGS employees and active Scientist Emeriti by a third-party vendor, The Hay Group.

Feedback was requested on the employee's immediate organizational unit as well as regional and bureau-level management. The results of the survey are being used by the Executive Leadership Team as they consider changes that improve management effectiveness and efficiency.

Science Support funds the executive and managerial direction of the bureau, as well as bureau sustaining support services. Science Support has four components: leadership activities, the Office of Administrative Policy and Services, the Office of Human Capital, and bureau-wide costs. Facilities funds provide safe and functional workspace and facilities for accomplishing the bureau's scientific mission. The appropriated funds cover approximately 76 percent of recurring USGS facilities costs. Customers, through reimbursable funding provide approximately 21 percent, and USGS science programs provide the remaining funds. The Facilities Activity comprises rental payments, operations and maintenance, and deferred maintenance and capital improvement.

The EI Activity serves as the focal point for the bureau's information-related resources and activities: information technology security and infrastructures (networks, hardware and software); information management policies and standards; national geospatial data acquisition and archive, and information services (such as libraries, information centers, publications, and the USGS presence on the Internet). Through a telephone survey in 2006, the Pew Internet and American Life Project found that about 23 percent of Internet users have been to the main website of the USGS, considered the main U.S. government site for earth science information at *http://www.pewinternet.org/PPF/r/191/report_display.asp.* EI strengthens scientific inquiry both within USGS and the broader natural science community by ensuring a reliable and streamlined path to relevant USGS data, information, and enhanced access to science information that can easily be understood, shared, and applied.

Means and Strategies

USGS employs a robust and cyclic requirement for science planning, program reviews, science center reviews, internal control reviews, peer reviews, and capital planning and investment control, and continues to refine these processes. This array of tools is coordinated with PART evaluations, base analysis, and is also beginning to include the results of ABC/M to further instruct our planning processes.

At the USGS, science is our mission and the business behind the science is equally important in helping to keep our research going. Leaders must stay on top of ever-increasing mandates and internal controls related to management and administrative issues while supporting employees, customers, and the science. Quarterly Status of Funds and Performance reviews with the Executive Leadership Team and Quarterly Investment Review Board (IRB) meetings maintain cognizance an accountability of leadership of the infrastructure supporting science,

expenditures, and results. Employees, for both science and administrative functions, are made aware of requirements and held accountable to ensure compliance.

Workforce planning and strategic management of human capital are crucial to achieving science goals and are an integral part of the USGS planning processes. Workforce plans focus on building and maintaining internal capacity and using creative solutions to address rapid changes in technology and ensuring workforce flexibility through the use of contractors and term appointments. USGS organizations continue to implement various strategies such as utilization of VSIP/VERA authorities, restructuring programmatic activities, organizations and positions, and training and targeted recruitment to achieve workforce goals. Organizational development efforts continue through the use of the USGS Organizational Excellence Model as a tool to analyze the linkage between organizational dimensions (people, processes, structures and leadership and management) and organizational performance in order to focus on the most critical levers for success and to effectively manage organizational change brought about by competitive sourcing, workforce adjustments and restructuring activities. To aid in this analysis, a USGS all-employee survey was conducted in the spring 2007. This survey, coupled with the results of the Federal Human Capital Survey, provides very useful information that helps the USGS assess organizational excellence. Utilizing these results, the USGS management teams and the Director will develop strategies to address the findings and identify actions that benefit our science and our employees and will advance Interior's strategic plan.

As required by the USGS Green Plan for Competitive Sourcing, 2005–08, Business Strategy Reviews were completed. Business strategy reviews are a preliminary step in determining whether cost-savings and greater efficiency can be achieved by competitively sourcing or reengineering all or parts of the business area—or leaving it as it is. The reviews take into consideration future program/function directions; organizational and geographic structures; current and future workforce skills; and those activities that need to be accomplished by USGS employees. These are discussed further in the President's Management Agenda section.

Science Planning

Planning Process — One of USGS strengths is the variety of backgrounds and perspectives represented in our disciplines and many offices across the Nation. The value of this variety holds especially true at the highest levels of decisionmaking; that is why the Bureau Program Council (BPC) was created by the Director in 2005. The BPC reports to the Director and consists of the Discipline Associate Directors, Regional Directors, Associate Director for Administrative Policy and Services (also serves as the Bureau's Chief Financial Officer), and the Director of the Office of Budget and Performance. These leaders represent USGS major science, administrative, and regional offices. Using the priorities identified in the Bureau Science Strategy and Director's Annual Guidance as reference, they guide high-level funding decisions and program planning at the USGS.

Program planning is the process through which good ideas become excellent science. This process depends on collaboration; collaborative program planning helps ensure that ideas that originate at every level of the USGS have a chance of being implemented. This process brings a level of corporate commitment to endeavors. The BPC —

- Conducts the annual program planning process across organizational structures and disciplines,

- Ensures the planning is responsive to the Director's Annual Guidance, meets the Department's bureau science needs, and supports decisionmaking by customers and partners,
- Seeks input from chief scientists, program coordinators, regional executives, and science center directors, as well as customers and stakeholders, and
- Reviews program 5-year plans and recommends approval by the Director.

By bringing unique viewpoints from their various backgrounds, BPC members work together to review ideas from throughout the bureau and from our partners and stakeholders. The BPC then uses these ideas to help guide future USGS activities with recommendations to the Director of USGS.

During 2008, the BPC formed a group to look at the current bureau planning model and adapt the process based on the Bureau Science Strategy, regional realignment, and the need to formulate integrated science teams. The group agreed upon a set of underlying principals for the planning process, determined implementation steps, roles, and funding models, and established a dynamic and interactive planning portal to facilitate communication and implementation of the planning process and Science Strategy.

Underlying Principals for the Planning Process

1. Advances the implementation of the Bureau Science Strategy as well as our core mission activities,
2. Facilitates cross-Discipline, cross-Region, and cross-program activities bureau-wide,
3. Provides for a dynamic future planning procedure — not a static single year effort,
4. Gets the science done; not just the operational process,
5. Supports a goal-driven interactive process, and
6. Leverages funds, capabilities, facilities, and staff across programs, disciplines, regions, and partners.

New Interactive Planning Portal — USGS has established a planning portal that will be dynamic, informative, and engage the employees of the USGS in the planning process and implementing the Science Strategy. The portal utilizes communication technology such as “wikis,” blogs, and e-mail to catalyze interest groups, develop the Director’s Annual Guidance, plan projects, and communicate and receive feedback. As the planning process is developed, scientists and managers will review and provide feedback. The portal will not be the sole communication venue, but its use will help achieve a dynamic and transparent planning process.

Science Strategy

The development of the USGS science strategy comes at a time that global trends and rapidly evolving societal needs pose important natural-science challenges. The emergence of a global economy affects the demand for all resources. The last decade has witnessed the emergence of a new model for managing Federal lands—ecosystem-based management. Also, the Earth is facing enormous pressure from growing human populations and the increasing impact of societal activities. The challenges associated with observing, understanding, interpreting, and

managing natural resources require broad thinking and concerted action. In response to this need, in 2007, the USGS developed a Science Strategy outlining the major natural science issues facing the Nation in the next decade. The Science Strategy consists of six science directions of critical importance, unified by a focus on technology and data integration. These areas focus on natural science and where it can make a substantial contribution to the well-being of the Nation and the world. This does not mean that USGS is abandoning its core programs and activities, but rather the bureau will be using the Science Strategy to help identify the most significant opportunities for advancement and benefit to society to help USGS establish its science priorities for the next decade.

The USGS Science Strategy "Facing Tomorrow's Challenges: U.S. Geological Survey Science in the Decade 2007-2017" presents the following six science directions (not in priority order):

- Understanding Ecosystems and Predicting Ecosystem Change: Ensuring the Nation's Economic and Environmental Future,
- The Role of the Environment and Wildlife in Human Health: A System that Identifies Environmental Risk to Public Health in America,
- A Water Census of the United States: Quantifying, Forecasting, and Securing Freshwater for America's Future,
- A National Hazards, Risk, and Resilience Assessment Program: Ensuring the Long-Term Health and Wealth of the Nation,
- Climate Variability and Change: Clarifying the Record and Assessing the Consequences, and
- Energy and Minerals for America's Future: Providing a Scientific Foundation for Resource Security, Environmental Health, Economic Vitality, and Land Management.

Several complementary priorities influenced the development of the 2009 USGS budget request. In August 2007, the Office of Science and Technology Policy and the Office of Management and Budget issued the Administration's 2009 Research and Development Budget Priorities, which include investments in climate change science, ocean science, water availability and quality, global earth observations, decision support tools that integrate information across natural hazard scenarios, such as landslides and disease, and understanding complex biological systems. The report specifically recommends aligning program with Subcommittee on Water Availability and Quality and National Land Imaging Program reports. For 2009 budget development, the Secretary emphasized water availability, ecosystem change, and oceans and coastal areas. These priorities align with those in the USGS science strategy which provides direction in areas that include climate change, ecosystems, water availability, hazards, and integrating data. In 2009, priorities outlined in the Science Strategy were used to develop budget initiatives for Water for America, Ocean and Coastal Frontiers, Birds Forever, Healthy Lands, Climate Change, and National Land Imaging Program.

The six strategic science directions outlined above are themselves interrelated. Their interaction, correlation, and interplay reveal the complexity of the Earth's natural, physical, and life systems. Developing new understanding therefore requires a "systems" approach that calls upon the full range of USGS capabilities. The USGS, with its breadth of scientific expertise, can provide an important perspective on the entire web of interrelated natural processes that affect national and global well-being. Each strategic direction contains an associated set of

recommended strategic actions that are designed to achieve this systems approach and enhance the USGS tradition of science in service to the Department of the Interior and the Nation.

To demonstrate the importance and commitment of the USGS to implementation of the Science Strategy, the USGS is conducting a regional realignment that combines all the integrated science capabilities of the bureau (see page F-47).

USGS Circular 1309, *Facing Tomorrow's Challenges – U.S. Geological Survey Science in the Decade 2007-2017* can be viewed at *http://pubs.usgs.gov/circ/2007/1309/*. Copies of Circular 1309 have been provided to each USGS employee and to a number of partners and collaborators; during the coming year effort will be given to further interaction with the external community regarding the strategic directions recommended in the Science Strategy.

Geospatial Data Production

Current, accurate, and consistent geospatial data that describe the landscape of America and locate features that can be integrated and displayed are the starting point—the basic framework—from which land and resource decisions and economic and environmental policies are made. To achieve this end state, USGS is moving forward on two fronts: (1) modernizing its geospatial production activities to take advantage of technological advances and innovations in data acquisition and data access to better meet mission objectives and (2) completing a 24-month Tactical Plan for *The National Map*, designed to optimize and accelerate the usability of *The National Map* products and services across the country.

Begun in July 2007, the Tactical Plan's focus is threefold:

- Incorporate high quality geospatial data from Federal, State, and local agency partners, coordinated across all 50 States by the USGS National Spatial Data Infrastructure (NSDI) Liaison network.
- Establish complete and up-to-date *National Map* base geospatial data layers along an approximately 50-mile-wide coastal swath from Delaware to Texas (at a minimum the swath is two counties inland from the coast). From these layers, customers will be able to print current, accurate, and consistent digital graphic products.
- Revitalize a national update of the USGS flagship product, the primary series topographic map.

In 2009 and beyond, USGS will expand the geographic coverage for these improved *National Map* products and services.

USGS map production activities were consolidated between 2005 and 2007 by establishing the National Geospatial Technical Operations Center (NGTOC) and closing two of four mapping centers (in Menlo Park, California, and Reston, Virginia) as an outcome of a competitive sourcing study. The permanent government workforce has been reduced from approximately 400 to 188 people. In June 2007, USGS concluded the study and operates the NGTOC from the remaining centers in Rolla, Missouri and Lakewood, Colorado. The target timeframe for having the two-site NGTOC fully up and running is the second quarter of 2008. Technological advances and innovations are being incorporated into its operation.

Internal Controls

The USGS regularly conducts internal control reviews on its programs and organizations in accordance with the OMB Circular A–123, Management's Responsibility for Internal Controls. The USGS has completed to date all key actions noted by the Department to conform to the new OMB requirements. Reviews are reported on the USGS Internal Control Review Plan (ICRP) in accordance with the Department's Internal Control guidance. In 2007, USGS used the PART scores to evaluate the programs' risk in delivering mission. Controls were defined as the action plan milestones, and testing and monitoring of controls were conducted by selecting a random sample of 20 percent of the total milestones for which the program managers were required to provide evidence as to how and when the milestones were completed. Also in 2007, the administrative and financial component reviews were selected based on risk assessment. The Departmental Function Reviews on property, acquisitions and information technology were reported on the ICRP. The reviews conducted under the Operations component were conducted in accordance with their respective departmental guidance.

Program Evaluations

Program evaluations are an important tool in analyzing the effectiveness and efficiency of our programs, and evaluating whether they are meeting their intended objectives. Programs are evaluated through a variety of means, including performance audits, PART, financial audits, internal control reviews, and external reviews from Congress, OMB, Office of the Inspector General, and other organizations, such as the National Academy of Public Administration and the National Academy of Science. These reviews, which may take several years to complete, are critical to maintaining the USGS reputation for scientific excellence and credibility as well as providing guidance for future research needs. The evaluations improve the accountability and quality of programs, but also identify and address gaps in programs; redirect or reaffirm program directions; identify and provide guidance for development of new programs; and review and motivate managers and scientists.

Two external reviews of the USGS Cooperative Water Program (CWP) were conducted by the Advisory Committee on Water Information. The most recent, in 2004–06, was a progress review on implementation of recommendations from the first review, conducted in 1999. To see the Task Force report and the USGS response, visit *http://acwi.gov/coop2004/* and click on the links under "Reports." To date, USGS has adopted 48 of the 59 recommendations from the report.

The review Task Force found that "Significant progress has been made by the USGS since the release of the 1999 Cooperative Water Program Task Force report. Although the total number of water monitoring stations is slightly lower now than in past years, the number of stations across the country for which real-time water resources monitoring data are available is significantly higher, which has been of great benefit to water users, water managers and the general public. Furthermore data quality has improved, due in part to the ability of the new telemetry equipment to help identify faults in a timely manner and the advent and use of acoustic technology."

Both internal and external reviews are conducted by USGS and non-USGS scientists, technicians, or specialists not involved in the specific proposal, project, program, or product under review. The goal is to conduct an independent external peer review of ongoing programs about every 5 years, combined with more frequent independent internal management reviews.

Additional examples of program reviews

2007 Completed
National Academy of Science/National Research Council
• Earth Science Applications from Space: National Imperatives for the Next Decade and Beyond
• River Science at the USGS
• A Research Agenda for Geographic Information Science at the USGS
• Research Priorities in Earth Science and Public Health
2008 Planned
National Academy of Science/National Research Council
• Water Resources Program
• Volcano Hazard Program External Review
2009 Planned
National Academy of Science/National Research Council
• Strategic Directions for the Geographical Sciences in the Next Decade

Data Validation and Verification

In keeping with Department and OMB policy for performance data validation and verification, USGS complies with requirements for performance data credibility. The USGS approach to achieving performance data credibility includes providing Budget and Performance Integration and ABC/M training, linking performance measures to the appraisals of Senior Executive Service (SES) and subordinates, and the implementation of the Department Data Validation and Verification (V&V) Assessment Matrix. During 2009, USGS will continue the Data V&V process and procedures including USGS-specific measures, outputs, PART, and Management Excellence performance measures. This extends assurance of performance data verification and validation standards to more performance data, certifying usability for management decisionmaking, and oversight.

The completion of the Department's Data V&V Assessment Matrix for all performance data is vital to support audits which ensure that quality assurance measures are in place to verify and certify performance data accuracy. The Department's contractor, Grant Thornton LLP, performed a review of performance V&V practices throughout the Department. Grant Thornton's report dated April 18, 2006, states —

"USGS complies with the requirements for performance data credibility, utilizing an approach that includes providing Budget and Activity Based Cost Management training, SES performance measure alignment, and implementation of the Department Data V&V Assessment Matrix. In 2004, USGS expanded the initial scope for data V&V to include USGS-specific

Stakeholders Cooperate on Complex Issues at a Wildlife – Energy Interface in Wyoming's Green River Basin

In the true spirit of cooperative conservation, in May 2007 an unprecedented gathering in Wyoming drew 150 representatives from such diverse quarters as Federal and State government, conservation and recreation groups, oil companies, and academia met to identify the highest priority needs and share current knowledge of the southwest Wyoming landscape, where world-class energy reserves lie beneath world-class habitat that supports numerous threatened and endangered species. The USGS, host of this successful workshop, and attendees such as the Wyoming State geologist, Nature Conservancy, a local cattle rancher, grazing, hunting and fishing, and petroleum associations, BLM, FWS, and BOR strengthened partnerships and set the stage for ensuring on-the-ground coordination to meet land management needs. The role of the USGS is to provide the scientific framework necessary to support restoration and conservation efforts. Workshop results informed the USGS strategic science plan for the 2008-09 Healthy Lands initiative (HLI) and contributed to advancing the goals of the Wyoming Land Conservation Initiative (WLCI), a long-term science based effort to enhance aquatic and terrestrial habitats at a landscape scale in southwest Wyoming, while facilitating responsible energy development.

measures, outputs, all PART and Management Excellence performance measures. Strong compliance of data V&V procedures was found across all program offices within the USGS. The USGS has a standardized checklist of validation and verification procedures that is distributed to all program offices. This standardized form has worked well for USGS, and has the potential to be a model for how other Bureaus and agencies in DOI document validation and verification procedures."

Grant Thornton also made four recommendations for improvement and USGS developed an Action Plan to address recommendations. USGS has implemented all the recommendations and will encourage Program Coordinators to take departmental training when it becomes available.

Partnerships

One of the pillars of achieving Interior's Strategic Plan is developing partnerships to advance our missions. The USGS values collaborative relationships and actively seeks out opportunities to build mutually productive partnerships. The importance of partnerships in keeping science relevant and in leveraging scarce resources has been demonstrated throughout the description of achieving mission goals. Various types of partnership vehicles employed by USGS programs are described at *http://www.usgs.gov/aboutusgs/working_with_us/partnerships.asp* to encourage and facilitate collaborative endeavors.

The USGS has actively supported the Administration's Cooperative Conservation initiative and is proactive in support of the Department's two new partnership and collaboration performance measures that were created in the revision of the Strategic Plan. In 2008 USGS received $1.5 million for the Wyoming Cooperative Conservation initiative, part of the Healthy Lands Initiative. The 2009 budget includes a request of $3.5 million to build on the successes of the project to date. The landscape and habitats of southwest Wyoming are undergoing rapid change in response to energy resource development. In support of the initiative, the USGS is collaborating with the Bureau of Land Management (BLM), FWS, U.S. Forest Service, Wyoming State agencies, industry, and non-governmental organizations to build the geospatial framework for sharing information, assess the health of habitats and their resources, and monitor changes in landscape and habitats as energy development proceeds, all to ensure the long-term viability and sustainability of wildlife and terrestrial and aquatic habitat in energy development areas. After ascertaining partner needs for science information, the USGS will establish and implement a monitoring strategy and protocols that provide information needed to implement alternative management solutions and assist partners as they develop habitat restoration strategies that benefit species of concern.

Using an integrated monitoring landscape approach, the USGS conducted an extensive survey of 270 wetlands in the prairie pothole region in support of the USDA's Conservation Effects Assessment Project (CEAP). The prairie pothole region became the first area of the United States for CEAP-Wetland regional assessments and is currently used as a model and template for the design of other regional assessments. The Survey developed and applied unique approaches to estimate changes in five ecological services including restoration of native plant communities, atmospheric carbon sequestration, floodwater storage, reduction of sediment and nutrient inputs, and wildlife habitat enhancement that result from conservation programs. More than 2 million hectares of wetland and grassland habitats in the prairie pothole region of North America have been restored since implementation of conservation programs of the Department of Interior and the Conservation Reserve Program and Wetlands Reserve Program of the USDA. Environmental benefits derived from these conservation programs provide significant

ecosystem services to landowners, State and Federal land management agencies, and to private citizens. Evaluating environmental benefits achieved by federal conservation programs is particularly important to the President's Budget and Performance Integration Initiative and to reauthorization of the Farm Bill.

The USGS served as the lead author for the Department's Adaptive Management Technical Guide to help in the complex land management decisions made by the Department's bureaus. Adaptive management offers a tool consistent with the President's vision of Cooperative Conservation to help agencies make better decisions in this context of uncertainty while agencies are accumulating more information. The Guide represents an important step in the Department's efforts to engage partners in the conservation and management of our Nation's natural resources. The Guide includes case studies, such as the BOR's management of Glen Canyon Dam and the FWS's determination of annual waterfowl harvests, to demonstrate how adaptive management can be applied. Adaptive management will be especially valuable in achieving the Department's stewardship goals. The document sets a high standard for natural resource management in the Department, providing a general management framework that can be tailored to specific agency resource and partnership arrangements. The Guide will be a key component of the Department's adaptive management training program and Web site. The Adaptive Management Technical Guide can be found at http://www.doi.gov/initiatives/AdaptiveManagement/TechGuide.pdf

At the urging of partners, the USGS plans to build on the success of its 2006 Modeling Conference with another conference in 2008 that will focus on Integrated Landscape Monitoring and Modeling, Ecosystems, Hazards and Risks, and Global Change. Modeling is a fundamental component of USGS science. USGS scientists develop and use increasingly sophisticated models as a way of understanding complex systems and phenomena

Each node of the NBII is developed through the collaboration of the partners and customers involved with that node. All together, NBII has over 250 partner organizations and agencies that help define the direction both of individual nodes and of the NBII as a whole.

The USGS and NOAA's National Weather Service (NWS) continue a partnership to develop and strengthen a debris flow warning system. This partnership began in southern California, where the USGS is working with emergency managers at the State, county, and local level to give accurate and detailed

The Department of the Interior COOPERATIVE CONSERVATION AWARD for *Delisting of the Western Great Lakes Wolf Populations*

After 40 years on the Endangered Species List, the Western Great Lakes wolf population was formally declared as no longer threatened or endangered in the Western Great Lakes region and de-listed on March 12, 2007.

This significant conservation victory was accomplished through the dedicated efforts of numerous Federal and State agencies, private organizations, and individuals working toward the common goal. Outstanding among them are the U.S. Fish and Wildlife Service, USGS, U.S. Department of Agriculture, U.S. Forest Service, Minnesota Department of Natural Resources, Wisconsin Department of Natural Resources, Michigan Department of Natural Resources, International Wolf Center, Timber Wolf Alliance, Timber Wolf Information Network and many private citizens. This achievement is exceptionally important because it involved long-term pioneering scientific studies on wolves to resolve the complex disagreements and understandings of this large predator in the functioning of healthy natural ecosystems. The USGS researched wolf natural history, ecology, behavior, movements and relation with prey to provide sufficient understanding of wolves to allow attainment of appropriate population levels, interim management, and to appraise and adjust state post-delisting management plans. This joint effort provided the political, cultural, and biological conditions that allowed the wolf population in the Western Great Lakes area to increase from about 750 in Minnesota when listed to 4,000 in Minnesota, Wisconsin, and Michigan upon delisting.

warnings for this natural hazards that take lives and cause millions of dollars of damage annually. Through close cooperation, USGS landslide scientists provide warnings that are then issued by NWS within their flash flood watches and warnings. This partnership is looking for opportunities for expansion of the warning system into the Pacific Northwest and in carefully targeted areas in the Appalachian Mountains in 2008.

In 2006, the USGS, FWS, the National Park Service (NPS), and BLM signed an agreement with the Association of Fish and Wildlife Agencies (AFWA). Building on a previous agreement among the USGS, the FWS, and AFWA, this new accord expanded, combined, and strengthened resources on common science and research issues. Through coordination by AFWA, this agreement encourages the agencies to work together to address threats of diseases such as avian influenza or the West Nile virus, handle the ecological impacts of hurricanes, or measure the economic effects of invasive and prevalent species, as well as other challenges that threaten our Nation's human, wildlife, and land health.

USGS and NASA are working in partnership to ensure the continued acquisition and availability of Landsat-like data to support long-term global monitoring and other programs of national significance *http://ldcm.usgs.gov*. In addition, the USGS through the Multi-Resolution Land Characteristics (MRLC) Consortium leads the production of a comprehensive land cover database for the nation called the National Land Cover Database. Composed of eleven Federal agencies, the MRLC consortium ensures that nationally consistent satellite remote sensing and land-cover data are publicly available *www.mrlc.gov*.

For energy resources, the USGS works closely with its partners and customers in defining priorities, developing science plans, and carrying out research in support of their need for an improved understanding. Key partners in many of these endeavors include Interior bureaus, other Federal agencies, States, academia, industry, Native corporations and nongovernmental agencies, as well as international entities. One endeavor includes USGS research and partnership efforts related to the study of gas hydrates, a crystalline solid formed of water and natural gas that is potentially one of the most important energy resources for the future. The USGS has provided technical assistance and helped the Department of Energy (DOE) develop its latest interagency roadmap for methane hydrate research and development, available at: *http://www.netl.doe.gov/technologies/oil-gas/publications/Hydrates/pdf/InteragencyRoadmap.pdf*

The USGS is also working with the Minerals Management Service (MMS) as MMS develops its Outer Continental Shelf gas hydrate resource assessment methodology. The USGS continues efforts to assess the recoverability and production characteristics of permafrost-associated natural gas hydrates on the Alaska North Slope. One of these is a cost-shared study with DOE in which technical support and data access are supplied by industry and academic cooperators. The USGS also has cooperative efforts with BLM and Alaska Department of Natural Resources (DNR) in which USGS research will provide BLM and Alaska DNR with knowledge of where potential gas hydrate development may take place. The USGS participates in a number of international consortia, including the Mallik Research Consortium and the Joint Industry Project. The USGS is also currently working closely with the Indian Directorate General of Hydrocarbons in their effort to study, characterize, and explore for hydrates off the coast of India.

The USGS serves as the primary source of hydrologic information to many other Federal agencies and to American Indian and Alaska Native governments. USGS work through reimbursable and cost-share programs prevents the need to duplicate a hydrologic staff in the partner agencies and ensures that the collected data will be entered into a standardized national database so the information will be readily available to all potential users. The diverse

programs also result in new techniques and capabilities that are then put to use in the appropriated programs of the USGS.

In 1998, the NPS and USGS initiated the NPS/USGS Water Quality Partnership Program. This partnership built upon a foundation established earlier in the decade when the NPS and the USGS NAWQA program worked together to implement a pilot water-quality monitoring program in national parks. To date, 145 partnership projects have been implemented in 104 national park units. The program supports a range of science activities focused on providing park resource managers information necessary to make scientifically defensible management and policy decisions. Partnership activities range in scope from basic technical assistance to fixed station monitoring to intensive and synoptic projects. One of the most important benefits of the partnership so far has been the interaction among park staff and USGS scientists. In many cases, the parties had not worked together prior to coordinating on partnership projects. Through the activities of the partnership program, new relationships are being established and are likely to lead to future opportunities for collaboration.

The USGS has a long history of partnering with State and local entities to increase the coverage of geographic data. USGS interacts with these organizations by participating in state and regional geospatial information coordination groups and through bilateral agreements with State and local government agencies to help build the National Spatial Data Infrastructure. USGS Geospatial Liaisons work with State, local, and tribal agencies, and field offices of Federal agencies to address geospatial needs and promote long-term partnerships. The Liaisons organize, maintain, and document partnership agreements and help partner organizations make their web mapping services and data available through The National Map. They identify geospatial data needs within the States they represent, evaluate partner databases and web mapping services, participate in State and regional geospatial data councils, and provide for outreach to local communities of users. The USGS is committed to establishing NSDI Partnership Offices in every State to enable the Geospatial Liaisons to most effectively interact with partners.

Examples of the depth of partnerships are documented throughout the budget document. The breadth of USGS coordination may be demonstrated in the following representative listing of USGS cross-cutting relationships with Federal, State, local, and non-government, and international organizations.

Federal
National/Governmentwide: National Geospatial Program Office, The National Map**,** National Spatial Data Infrastructure, National Biological Information Infrastructure, National Earthquake Hazards Reduction Program, U.S. Global Change Research Program, National Atlas, Geographic Names, Imagery, elevation and hydrography data collection programs, Civil Applications Committee
Agriculture/Forest Service: Endangered Species, Conservation genetics, Habitat management, Forest planning, Wildlife, Invasive species, Fire science, National Forest maps, Drought/Fire fuel monitoring and management, Energy and mineral resources, Natural hazards, Mine lands, Land cover characteristics, Hydrologic data collection/studies. Topographic maps, digital orthophoto and elevation data, *The National Map,* National Hydrography Dataset, and geographic names
Commerce/NOAA: Endangered Species, Salmonid restoration, Coral reefs, Hazards monitoring and research, Geomagnetism, Vegetation change, Coastal erosion, Fish habitat, Marine sanctuaries, GIS, Commerce/NIST: Earthquake Hazards, coastal and bathymetric mapping
Defense: Geospatial Coordination with States, Endangered Species, Salmonid restoration, Coral reefs, Coastal erosion, mapping support during conflict, Natural hazards, Test ban monitoring, Strategic minerals and energy resources, Geomagnetism, Terrain visualization, Hydrologic data collection/studies. Environmental contamination and remediation studies on military bases, NORTHCOMM, High-resolution imagery over urban areas
Defense/Army Corp of Engineers: Endangered Species, Habitat assessment, Fish behavior, Fish physiology, Dam impacts, Wetlands restoration, Seafloor mapping, Shoreline stability, Floodplain morphology, Mine lands, Energy resources, Natural Hazards, Hydrologic data collection/studies
Energy: Endangered Species, Bio-resource monitoring, Contaminant cause and effects, Gas Hydrates, Mining technology, Energy resources, Geologic hazards, Groundwater framework, Coalbed methane, Hydrologic data collection/studies
EPA: Endangered Species, Endocrine disruption, Contaminant effects, Status/Trends, Mine lands and drainage, Emissions modeling/clean air, Water quality, Seafloor mapping, Geochemical analyses, Coal resources and mining, Urban dynamics/land characterization, Hydrologic data collection/studies Remote sensing, Mineral baselines, GAP Analysis, National Hydrography Dataset
FERC Permittees/Licensees: Hydrologic data collection/studies, Restoration of Threatened and Endangered migratory fish
Homeland Security/Federal Emergency Management Agency: Hazards monitoring and mitigation, Hydrologic data collection/studies, Floodplain mapping, providing emergency maps, elevation data
Health and Human Services: Chemical Analyses
Intelligence Community: Information coordination, Environmental/ resource studies, Hazards Support, Geospatial data coordination.
Interior/BLM: Rangeland Health, Wild Horse Management, Invasive Species, Abandoned Mine Lands, Air Quality, Threatened and Endangered species, Water Quality, Mineral Resource Assessments, Prescribed Fire, mapping of National Petroleum Reserve/Alaska (NPR/A), mapping and geospatial data and analysis, National Hydrography Dataset
Interior/BOR: Water quality, Ecological models, Decision Support Systems, Seismic Monitoring.
Interior/FWS: Inventory and Monitoring, Aquatics and Contaminants, Biological resources, Threatened and Endangered species, Water Quantity/Quality, GAP Analysis, Geospatial data
Interior/MMS: Gas hydrates
Interior/NPS: Water quantity/quality, Geologic mapping, Biological resources, Volcano hazard assessment, mapping and geospatial data, National Hydrography Dataset
Interior/OSM: Acid mine drainage
Justice: GIS
Labor: Energy resources
National Academy of Science: Hazards studies, Geographic research, Evaluating licensing of geospatial data, K-12 geography curricula

National Aeronautics and Space Administration (NASA): Planetary research, Landsats 5 and 7 operations, design of Landsat Data Continuity Mission. Natural hazards, Earth Science research, Data management, Land Processes Distributed Active Archive Center, GIS, United Nations Environment Program clearinghouse, Remote sensing, Spaceflight support; Shuttle Radar Topography Mission
National Institutes of Health: Human health and environment, West Nile virus mapping with CDC
Interior: FWS, NPS; USDA: Animal and Plant Health Inspection Service, the Centers for Disease Control and Prevention: Highly Pathogenic Avian Influenza
National Science Foundation: Hazards studies, Antarctic research and mapping, Global seismology
Smithsonian Institution: North American vertebrate collections, Volcanic hazards
State: Natural hazards, Energy resources, Global seismology, Hydrologic data collection/studies, Famine Early Warning System, Pan American Institute of Geography and History, Geospatial Support.
Tennessee Valley Authority: Hydrologic data collection/studies
Transportation/Federal Highway Administration: Hazards studies, Hydrologic data collection/studies
Transportation/Federal Aviation Administration: Volcanic hazards
U.S. Agency for International Development: Geologic hazards, Hydrologic data collection/studies, Energy resources, Atmospheric moisture index
State and Local Government
Airports: Volcanic hazards
American Indians/Alaska Natives: K-12 educational resources, Streamgaging, Water quality/ quantity, Technical training and capability upgrade, Environmental hazards, Fisheries research, Invasive species, NativeView for American Indian colleges and universities, and geospatial support
Civil Defense: Hazards mitigation
Departments of Natural Resources/Geographic Information Councils: Volcanic hazards, Map data integration, Hydrologic data collection/studies , Orthoimagery
Departments of Environmental Protection/Quality/Health: Hydrologic data collection/studies, Mapping data
Departments of Fish and Game/Conservation Commission/Wildlife and Parks: Endangered species, Population dynamics, Habitat requirements, Fire management, Fisheries, Wildlife disease, Invasive species, Waterfowl surveys, Bird banding, Aquaculture, GAP Analysis, Geospatial support
Offices of Emergency Management: Hazards monitoring and mitigation, Providing emergency maps
Planning Commissions/Transportation/Engineering/Municipalities: Conservation plans, Hydrologic data collection/studies, Topographic mapping, Hazards monitoring/assessment, Creating decision support systems for local decisionmaking
State Geological Surveys: Geologic and topographic mapping, Hazards assessment
Higher Education: University participation in AmericaView
Water Resources Authorities/Public Works/Sanitation: Contaminant Transport, Hydrologic data collection/studies
Non-government Organizations
American Farm Bureau/American Society of Civil Engineers/Chemical Manufacturers Association/etc.: Coordination of hydrologic programs
American Red Cross: Hazards monitoring and mitigation
Electric Power Research Institute: Coal quality
Industry: Spatial data modeling, Spatial data browsing and retrieval, Product development, registration, and production, Environmental monitoring, Acid rain deposition program, Hazard monitoring, research and assessments
The Nature Conservancy: Endangered species, Species at Risk, Ecological research, Biological Status/Trends, Coordination of hydrologic programs, GAP Analysis, Decision Support System
National Geographic: Geospatial information coordination
Universities/Cooperative Fish and Wildlife Research Units/State Water Resources Research Institutes: Planetary research, Space-based instrumentation, Natural science information delivery, Natural science research and applications, Hazards research and monitoring networks, Training/education, Geologic mapping, Hydrologic data collection/studies, GAP Analysis

Southern California Earthquake Center (University consortium): Earthquake hazard research and assessment
Utilities: Seismic studies, Hydrologic data collection/studies
NatureServe: NBII, Geospatial Support, Decision Support System
Association of Fish and Wildlife Agencies: chronic wasting disease
Ducks Unlimited: database development and data access for Latin American And Caribbean waterfowl surveys
The General Public: Breeding bird survey, Bird banding, Water resources education/outreach, topographic maps, topographic mapping
International
Global: The USGS has conducted earth science studies and provided natural hazards support in foreign countries for over 50 years. Authorization is provided under the Organic Act, as revised, and the Foreign Assistance Act and related legislation when such studies are deemed by the U.S. Department of the Interior and Department of State to be in the interest of the U.S. Government.

President's Management Agenda

Performance Improvement

The integration of budget and performance is critical to the planning for and evaluation of success achieved by the USGS in the application of its science to building long-term bodies of data and information and ensuring their relevance to partner and customer need. Since 2002, USGS has worked with the Department and the Administration to establish accurate and meaningful performance measures for its programs and to tie the performance to resources in accordance with the President's Management Agenda. The USGS has been particularly successful in this endeavor, owing to the physical integration of its budget, regional, and planning and performance teams in its Office of Budget and Performance. Working in constant contact, these teams jointly develop and produce budget and performance documents that are fully integrated with respect to description of base programs and analyses, their funding and FTE implications, what the standards of their performance will be and how they will be evaluated. The three teams work closely with bureau program staff to understand, evaluate, and plan the science programs' budget and performance levels, ensuring responsiveness to USGS executive management decisions, departmental concerns, and Administration policies. USGS has been commended for outstanding program management as evidenced in the consistently high ratings that USGS has received from the PART. PART outcome and continuous program improvement being major criteria for defining scorecard success, USGS has consistently scored well. The USGS is further advancing performance to the next level in a new set of measures and goals in the legislatively mandated 3-year revision of the Department's Strategic Plan published in December 2006 and implemented in 2007.

Program Assessment Rating Tool — The USGS has a long and rigorous record of conducting external peer reviews for research, performance evaluations for programs, and management control reviews. The PART is another tool for the bureaus' evaluation processes. Both peer and management reviews as well as PART evaluations are conducted to improve the accountability and quality of programs, identify and address gaps in programs, redirect or reaffirm program direction, identify and provide guidance for development of new programs, and reward and motivate managers and scientists. The National Academy of Science, National Research Council has conducted recent program reviews of River Science at the USGS, A Research Agenda for Geographic Information Science at the USGS, Research Priorities in Earth Science and Public Health, and Earth Science Applications from Space: National Imperatives for the Next Decade and Beyond. Recent Scientific Advisory Committee reviews include Earthquake

Hazards Program and the National Cooperative Geologic Mapping Program. Program reviews planned for 2008 include Water Resources Program and Volcano Hazard Program External Review.

USGS has particularly focused on program improvement through the PART process. By the end of 2007, USGS PART evaluations stand at nine programs "moderately effective," one program "effective," and none rating "adequate," "ineffective" or "results not demonstrated." Every program that had been PARTed created a PART Summary and set of follow-up actions, which addressed PART findings and improved program performance published on *www.ExpectMore.gov.* These PART Improvement Plans are renewed each year to continued improvement in all evaluated programs. USGS has addressed all PART recommendations with action plans having milestones and targets approved by the Department and OMB and tracked in the Department's Management Initiatives Tracking System (MITS). All actions are on schedule or, when milestones appear to be delayed for cause, are renegotiated with OMB and the Department and amended in MITS. The Department quarterly reviews ensure accountability of PART programs, milestone progress explanation, target delay explanations and any pertinent implementation impacts of Action Plan implementation.

Cost and Performance — The Department and its bureaus have been working together to execute Activity Based Costing/Management (ABC/M) in concert with a Unified Strategic Plan since 2004. USGS continues to verify and validate data, improve understanding and process application, and has also worked to standardize ABC, Strategic Plan, and PART outputs so that the building blocks of the Strategic Plan can be costed, relationships understood, and management information leveraged. With the last budget submission, the Department began to cost end and intermediate outcome measures rather than outputs or end outcome goals. End outcomes by their nature are the cumulative effect of many end and intermediate outcome "measures" which in turn result from the cumulative effect of many outputs. USGS has one end outcome measure for each goal. These were selected as key reference measures by the Department. With this budget submission, the bureaus have been asked to cost “intermediate outcome measures” which will be more of a challenge due to the fact that measures are not necessarily mutually exclusive for costing purposes and many measures are not budget sensitive and are therefore not costed. Although challenging, USGS plans to spend 2008 analyzing their ABC data and developing reports and processes to meet this requirement where applicable by using measures that can be costed.

Analysis of ABC data led USGS to conclude that more granularity was needed and USGS began capturing ABC data at the task level rather than project level in 2006. Continued efforts are being applied to standardize processes and ensure consistency of interpretation so that ABC data can be confidently used to manage and general ABC reports and data can be extracted by all managers at all levels on a daily basis for verifying and validating and for performing analyses for decisionmaking. While several years of implementation will be needed to identify trends in the data that can lead to programmatic decisions, ABC/M data are currently used especially for changing and monitoring direction of program activities.

Examples of how USGS is using ABC/M data follow. Additional examples are provided in each budget activity.

- In the geologic hazards programs, USGS wants to make sure that investments in data collection (monitoring networks), data management (Web sites, national databases, data consortia), and assessments (hazard assessment and mitigation) do not impact robust research on improving our understanding of landslides, earthquakes, and volcanoes. It

is this research that is critical in creating the next generation of monitoring and assessment methodologies. In earthquake hazards, for example, USGS tries to retain a steady investment of at least 20 percent of the funding for research through its external grants program and internal research activities. **ABC/M data enable USGS to maintain the correct balance of monitoring, assessment, data management and research for long term viability of the programs.**

- In the coastal States there has been a growing need for technical assistance, hazard monitoring, and hazard assessments with the increase in fires, hurricanes, flooding and population growth. These increases impact investments in other areas, which means a need to shift priorities and funding, create a sustainable increase in emphasis in those areas, plan efficiencies, and leverage coastal State and Federal resources more to ensure investments in supporting activities like coastal hazard research. **ABC/M data enable USGS to monitor long term trends and define regional patterns for the kinds of work our partners need.**
- ABC data for 2004–07 demonstrate that the cooperative water program has maintained a rough proportion of half data collection activities and half research. Given Administration priorities and PART recommendations for emphasizing data collection, USGS has chosen to reduce research studies (systematic investigations) to maintain data collection (number of streamgages reporting real-time) to the extent possible. **ABC/M data enable USGS to monitor operations to mitigate the effect of erosion of buying power on priorities.**

Capital Asset Planning and Investment Control — Interior uses capital planning and investment control processes to ensure that investments (costs) in capital assets best advance mission goals with minimal risk and lowest life-cycle costs. The USGS IT Capital Planning Coordinator is responsible for developing a maturity framework and goals to ensure that effective capital planning procedures and policies are developed and implemented consistently throughout the bureau. The IT Capital Planning Coordinator manages the process to review and submit USGS capital asset plans for major IT investments, non-major IT investments, and contributions to Department and E-government initiatives. This review includes validation of business cases against current plans by subject matter area experts. The USGS IRB meets quarterly to review IT investments. The USGS IT portfolio business cases approved by the USGS IRB are provided to the Department's Information Technology Management Council and IRB for review. Successful business cases are then included in the Department's IT portfolio as part of the Interior budget submission.

GPRA Performance Data Validation and Verification — In keeping with Department and Administration policy for performance data validation and verification, USGS complies with requirements for performance data credibility. The USGS approach to achieving performance data credibility includes providing Budget and Performance Integration and ABC/M training, SES performance measures linked to appraisals, and implementation of the Department Data V&V Assessment Matrix. USGS continues performance data V&V to include USGS-specific measures, outputs, PART and Management Excellence performance measures with an annual recertification process and procedures. Completion of Department Data V&V Assessment Matrix for all performance data is vital to support performance audits ensuring that quality assurance measures are in place to verify and certify performance data accuracy.

During 2006, USGS provided 2005 Data V&V materials and data sources to the Department's contractor, Grant Thornton, who performed a review of performance V&V practices throughout the Department. Grant Thornton's findings cited USGS as having V&V certificates in place not

just for key Interior measures but for **all** measures—bureau specific and PART as well. Grant Thornton also made four recommendations for improvement. USGS addressed all recommendations.

Human Capital

A critical aspect of achieving USGS science goals is an effective human capital management strategy for recruiting, developing, retaining, and managing a highly skilled, flexible, motivated, and diverse workforce. During 2009, human capital initiatives will focus largely on continuing our 2008 efforts of workforce planning and adjustments; succession planning; the completion of business strategies studies in various scientific, management, and administrative program areas for the purpose of competitive sourcing consideration and gaining organizational efficiencies; implementing and updating diversity activities in support of Equal Employment Opportunity Commission (EEOC) Management Directive 715 (MD–715); implementing core competencies for supervisors and managers with additional emphasis on performance management and partnering and collaboration skills; developing core competency models for mission critical occupations; identifying organizational effectiveness measures; developing and deploying E-government initiatives for more effective and efficient human capital program operations; assisting, researching, and providing logistics on training across the bureau; analyzing organizational changes and supporting change management; and considering the implications of the Human Resources Line of Business initiative.

Competitive Sourcing

USGS performs scientific and support activities through a combination of Federal employees and external capabilities and staff. Maintaining an effective workforce balance for all scientific and administrative activities is crucial to our continued mission success and is represented in our commitment to accurate reporting in the Federal Activities Inventory Reform (FAIR) Act.

In 2007, USGS completed its execution of its Business Strategy Review process outlined in the USGS Competitive Sourcing Green Plan 2005–08. All FTE positions have been grouped into nine functional business areas. Information Technology was the last to be completed accounting for approximately 700 FTE. In 2007, USGS completed the standard study for functions at the National Water Quality Laboratory, accounting for approximately 112 FTE, resulting in selection of the in-house Most Efficient Organization (MEO) as service provider. Transition and full Implementation of the MEO will occur in early 2008. In 2008 and 2009, USGS will continue to support OMB and Department of the Interior objectives for Competitive Sourcing as they are defined.

Financial Performance

In 2007, USGS was rated Green for improved Financial Management under the President's Management Agenda criteria. The bureau is continuing to work with the Department and OMB to assist the Department in meeting the "getting to green" requirements by demonstrating the successful use of financial management data for decision making purposes. Additionally, USGS received its fifth consecutive unqualified financial audit opinion expressed by our independent auditors on the 2007 Annual Financial Statements. As a result, these achievements meet the Department's defined criteria to allow USGS to undergo a "limited scope audit" to support Departmental 2008 consolidated statements. The limited scope audit will eliminate USGS' need to publish a Performance and Accountability Report, streamline the audit process and recognize cost savings for the bureau.

During 2008, USGS developed a comprehensive training plan to ensure that administrative officers and other financial staff receive training in various bureau specific financial procedures. USGS formed a team to develop standardized financial training that will be offered annually and available to all cost centers in the bureau. This training is designed to match the employee's level of understanding and provide hands on experience so that attendee's come away with a better awareness of their areas of financial responsibility.

In support of the President's Management Agenda, the Department on July 31, 2007, awarded the E-Gov Travel Task Order to Northrop Grumman's GovTrip. The goal of the E-Gov Travel initiative is to improve internal efficiency and effectiveness of the Federal government by providing an automated governmentwide Web-based end-to-end travel management service that delivers an easy to use cost saving travel experience, supports effective management of travel practices, and results in superior customer satisfaction. GovTrip provides travelers with a one-stop, self-service shop for all their travel needs, from reservation and ticketing to authorization, to vouchering. USGS will pilot the new Travel Authorization and Vouchering System on behalf of the Department. The pilot period is scheduled to commence in early the second quarter of 2008 and last until May with the intent to migrate the bureau to the new product by June. Once fully implemented, USGS envisions leveraging improved reporting and data collection capabilities of GovTrip for business intelligence and performance measurements.

The USGS will continue to pursue excellence in financial management, identifying opportunities to streamline and automate functions and improve internal controls. USGS has refined reporting to senior managers on financial progress in several areas to reflect the results down to individual cost centers level. These financial status reports include statistical results of internal audits on bankcard and invoice charges, travel, and reimbursable agreements. The bureau's financial mangers use this information to identify problems and implement corrective actions. Additionally, the financial status reports will form the basis for USGS' 2008 Circular A–123 report to the Department that it has effective internal control over financial reporting. Also, USGS will work with the Department to implement a new comprehensive, integrated, risk-based internal control program departmentwide in 2009.

USGS continues to dedicate significant resources to the development of the Department's new Financial and Business Management System (FBMS). Interior began work with a new integrator, IBM, during March 2006 and successfully implemented two bureaus in November 2006 with core finance and limited executive management information system functionality.

The scope of the project is to provide a departmentwide solution that significantly improves access to reliable, accurate, current, and complete financial and business management information to support the decision-making process throughout all levels of the Department, affecting all employees and operations. FBMS will replace current systems for budget formulation, core finance, personal and real property, financial assistance, acquisition, fleet management, and the executive management information system. High level functionality for budget formulation and project planning will also be replaced.

The Department revised the implementation schedule for out-year bureaus. The changes to the new schedule include bringing up all functional areas in deployments beginning in 2009 and advancing USGS on the FBMS conversion schedule from 2011 to 2010.

E-Government

In 2009, the bureau will contribute $4,871,000 to support the President's E-Government initiatives through the Department's Working Capital Fund Account. The Departmental

Management budget justification includes amounts for each initiative and describes the benefits received from each E-Government activity.

Capital Asset Justifications for the bureau's major IT investments can be viewed at *http://www.doi.gov/ocio/cp/index.html.*

Geospatial One Stop (GOS) — In 2009, USGS has a goal of serving between 22,000 and 27,000 users per month through the Geospatial One-Stop portal. At the end of 2007, the GOS portal catalog contained more than 130,000 geospatial references from Federal, State, local, Tribal, and private industry partners. An additional portal feature links information on planned geospatial investments with users seeking information, in order to encourage collaborative projects and leverage resources. These services help promote discovery of and access to geospatial data resources to enhance sharing and reduce duplication. In 2009, USGS will be in year three of its managing partner role for GOS, responsible for hosting, leading, and managing the project which has become a fundamental part of the National Geospatial Program. The USGS also provides the operational funds for the GOS portal. In 2009, USGS will continue to enhance the portal to better feature Authoritative Data Sources and Services (ADS) that are identified through the Geospatial Line of Business and other Department-specific enterprise efforts. The GOS portal infrastructure will also be leveraged by and better integrated with the data from the National Atlas of the United States and *The National Map,* which provide reusable catalog, search, and viewing capability for all systems.

Through funding, in-kind technical expertise, collaboration, and scientific data, USGS also contributes to other E-government initiatives, including Disaster.Gov, Recreation One-Stop, SAFECOM, and E-Records Management.

Enterprise Geographic Information Management (EGIM) — The USGS leads the Department's EGIM team and its project “Analytical Tools to Support Advanced Integrated Science.” Key focus areas of EGIM in 2009 will include —

- Pilot efforts to further implement ADS for key geospatial data layers in OMB Circular A-16 and “orphaned” data layers such as “Roads & Trails.” These ADS will provide reusable templates for taking data sets from field offices and moving them to a compiled enterprisewide source to meet business needs in the Department.
- Continue reducing overall GIS training costs.
- Consolidate GIS software test lab functions.
- Enable more effective software release and update distribution mechanisms.
- Integrate the GIS Help Desk support across the Department.

Information Security — In 2009, USGS will continue to maintain compliance with the IT security mandates in the Federal Information Security Management Act (FISMA). The resulting improvements to the USGS security infrastructure will include (1) stronger IT security plans, (2) enhanced computer incident response capabilities including reporting of security incidents to the Department of the Interior Computer Incident Response Center and United States Computer Emergency Readiness Team, (3) annual incident response training of all USGS Security Points of Contact, and (4) standard procedures for system configuration and patch management.

Ensuring that bureau networks and systems are secure and protecting the integrity of scientific data assets are two critical activities in USGS. These will include annual IT security awareness

training for users and role-based training for employees and contractors with significant IT security responsibilities. IT security compliance reviews will also be conducted, involving periodic testing and evaluation, Management and Internal Control Planning and Reviews, and on-site reviews.

Enhancements will be made to the current intrusion detection and monitoring system to more efficiently detect security intrusions, and to respond effectively to IT security events and incidents. Penetration testing and vulnerability assessments of systems and network devices will continue to ensure security compliance is achieved and risks mitigated. The USGS continues to emphasize the improvement of the information security program as one of the bureau's highest priorities.

IT Security Certification and Accreditation — In 2009, USGS will continue to maintain certification and accreditation (C&A) for all 12 of its major IT systems. In addition, the bureau will support the recertification of systems as mandated by Federal law. The USGS continues to maintain its systems in compliance with FISMA. All 12 C&A documentation packages are current and independently validated. The USGS C&A manager will continue to work closely with system owners across the bureau to ensure that all requirements are satisfied. The USGS submits all 12 C&A documentation packages on a semi-annual basis to the Department's Office of the Chief Information Officer and updates the Department's Enterprise Architecture Repository databases as needed. Improving the quality of IT contingency plan documents and testing procedures continue to be high priority activities for USGS.

Federal Enterprise Architecture — In 2009, the USGS architecture team will work closely with the bureau IRB, National Geospatial Program, and the Department of the Interior Enterprise Architect in developing and implementing the geospatial blueprint for the Department. The USGS architecture team serves as a liaison between the Department and USGS programs to complete modernization blueprints initiated by the Department.

The USGS Enterprise Architecture builds upon the Federal Enterprise Architecture (FEA) and Department of the Interior Enterprise Architecture frameworks and identifies requirements that are unique to USGS. The USGS architecture team works closely with bureau programs to understand the business and strategic direction of the agency. This includes articulating the mapping between the FEA Business Reference Model, the Department's Strategic Plan, ABC Coding and goals of the bureau programs. Through understanding the business strategy in the context of the strategic plan, the architecture for USGS scientific and administrative systems of high strategic value will be recognized. The USGS Enterprise Architecture (EA) team will continue to populate and maintain the Department's Enterprise Architecture Repository with IT systems and investments. The USGS EA team works closely with the USGS IRB and the bureau C&A team to ensure alignment between investments, systems security, and the architecture.

Capital Planning and Investment Control — The USGS will continue to maintain successful, repeatable processes in the selection, evaluation, and control of major IT investments in 2009. The Capital Planning and Investment Control (CPIC) program will continue to address major IT investments, non-major IT investments, and bureau-specific infrastructure IT investments in the CPIC selection, evaluation, and control process.

Enterprise Services Network (ESN) — By 2009, the Department's ESN telecommunications project will have matured to the point where all Interior bureaus will have completed the three phases of transition, migration and connection. This means that (1) all bureaus will have their

routing and some security equipment managed by the ESN 24x7x365 Network Operations and Security Center, (2) all bureaus will have migrated to the ESN network architecture of vBNS+ (the "flattening" of the network phase), and finally, (3) all bureaus will be using the ESN Security Architecture. Additionally, many bureaus will have started their conversions to the ESN Remote Access service, while others will be using this service as their sole Remote Access service. With the General Services Administration Networx contract award in May 2007, there may be significant changes occurring in the ESN backbone which could impact USGS.

By 2008, USGS will have completed the Migration Phase and completed connecting all field offices to ESN. These connections were previously dedicated circuit connections. USGS will continue its active oversight of ESN service to ensure that all Service and Operational Level Agreements are met. To allow the USGS to complete the trilogy of Transition – Migration – Connection, the Internet 2 connections were transferred to the Department for technical and administrative management. Internet 2 is now institutionalized as a departmentwide service, not just a USGS-provided service. By 2009, some of the previously migrated sites may require further bandwidth increases or redundancy activated.

During 2009, USGS will have completed the migration of its many remote access servers to the Department service, avoiding duplicate expenditures and making the remote access sites easier to manage.

Asset Management

The USGS continues its efforts to manage both real property and other assets and to implement Executive Order 13327, Real Property Asset Management. Asset management principles and practices provide the tools that help USGS provide the space and facilities that are appropriate for world-class science while controlling costs.

Inventory — The USGS completed the requirement to provide 24 specific data elements for all USGS owned, leased and State or foreign government-owned assets into the Federal Real Property Profile (FRPP) as required by the Department's Asset Management Plan. The inventory included 58 land, 365 buildings, and 274 structures records. The Department's Asset Management Plan Three-Year Rolling Timeline and the Real Property Score Card require each Interior bureau to establish a Strategy to Ensure Accurate and Complete Reporting into the Federal Real Property Profile. As part of this strategy, a verification and validation review process was developed and requires a 25 percent sample review of the USGS inventory. Using the FRPP Performance Assessment Tool during the verification and validation process, the USGS identified candidate assets for disposition and targeted other assets that require attention. In 2008, USGS completed updating the 2007 FRPP database, including revising inventory data elements as stated by the FRPC. In 2009 and 2010, the USGS will update respectively, the 2008 and 2009 FRPP databases. USGS will also continue to refine the inventory and participate in Department workgroups that are meeting to develop inventory information in the Financial and Business Management System.

Planning — In 2008, USGS completed its second update to the bureau Asset Management Plan in accordance with the Department's Asset Management Plan. The USGS Plan provides a framework, strategic vision and plan of action for effective bureau facilities management. It is a succinct document that is being used by field and management staff for implementing the Department's Asset Management Plan requirements.

In 2007, USGS completed detailed site-specific asset business plans for USGS regions, key science centers, and installations. These plans describe the life-cycle issues and portfolio characteristics for the site. They present a 5- and 10-year snapshot of associated assets using standard performance metrics, integrate science and facility planning and thereby align mission needs to facilities in terms of space types, amount of space, cost, location, timing, and space quality. These site-specific asset business plans were updated in June 2007.

The USGS 5-Year Space Management plan was updated in September 2007. The USGS 5-Year Space Management plan supports the bureau's Asset Management Plan and Site Specific Asset Business Plans. This plan provides a framework, strategic vision, and plan of action for effective bureau space management of General Services Administration (GSA)-provided space, USGS direct leases, and owned property. It is used by USGS management to implement bureau space goals, including consolidation, collocation, and disposal. Information contained in this document is focused on mission dependency and program requirements for space.

In 2009, USGS will continue developing planning requirements outlined in the Department's Asset Management rolling 3-year timeline. These include: establishing targets for meeting performance metrics identified by the FRPC, reporting accomplishments in asset performance, and implementing a standardized practice for calculating the current replacement value of facilities and repair projects.

Governance — The USGS has implemented capital planning and investment control procedures to manage more effectively the entire USGS real property portfolio. The USGS IRB reviews proposed facility renovation and construction investments valued at $2 million or more and proposed leases and GSA occupancy agreements costing $1 million or more annually. Each USGS region also has a regional investment review board that reviews projects before they are sent to the bureau IRB and reviews projects below the dollar thresholds established for USGS-level review. In another key governance action and pursuant to Executive Order 13327, the USGS has established a Senior Asset Management Officer position to provide executive oversight of bureauwide asset management.

Maintaining Facilities — The USGS conducts comprehensive condition assessments of owned facilities on a 5-year cycle. In 2008, nine assessments were performed, bringing the total number of assessments completed to 33 of 44 in this second 5-year cycle. In 2009, an additional 12 assessments are planned for completion. These assessments provide baseline information on facility deficiencies and are used to develop a rolling 5-year deferred maintenance plan. Trend analysis on the deferred maintenance backlog can begin as the second round of assessments is completed.

Executive Order 13423

The Department of the Interior is committed to meeting the goals set forth in Executive Order (EO) 13423, Strengthening Federal Environmental, Energy, and Transportation Management. Secretary Kempthorne issued a memorandum on April 4, 2007, directing the Department to lead by example on implementation of the EO requirements. Specifically, the EO requires additional reductions in greenhouse gas emissions by reducing energy intensity in buildings, reductions in water consumption intensity, acquisition of more environmentally sound products, reduction in the use of chemical and toxic materials, increased implementation of environmental management systems, incorporation of sustainability strategies in new and existing buildings, continued reduction in petroleum consumption in vehicles, and increased use of alternative fuels in motor vehicles.

EO 13423, requires agencies to use Environmental Management Systems (EMS) as the primary management approach for addressing environmental aspects of internal agency operations and activities, including energy and transportation functions, to meet the goals of the EO. The Deputy Secretary approved the Department's EMS Implementation Plan on March 21, 2007. On March 28, 2007, the Chairman of the Council on Environmental Quality issued mandatory implementation instructions for complying with EO 13423 to Heads of Executive Branch Departments and Agencies. Additionally, the Department committed to fully implement EMS by the end of 2009 in the 2007–12 Strategic Plan.

USGS activities to date include —

- Preparation of a USGS EMS policy,
- Identification of appropriate organizational/facility significant aspects and impacts and targets and objectives,
- Senior management review and approval of EMS, and
- Continued aggressive pursuit of Environmental Management Systems (EMS) implementation and documentation efforts, with the expectation to have all 28 appropriate facilities (those facilities with large enough scope of environmental operations/activities to warrant implementation of EMS) reaching self-declaration by December 2008.

The USGS is committed to promoting procurement of green products in accordance with the Department's draft affirmative procurement plan, comporting requirements, and guidance within USGS policy, inclusive of screening construction requirements for green purchasing opportunities. The USGS has developed a personal computer disposal policy to support Electronics Stewardship and future reuse and recycling of computer electronics and green purchasing/life cycle management. EMS Conformance and Environmental Compliance audits are accomplished annually and documented within the USGS Inspection and Abatement or Environmental Management Facilitation Systems as appropriate. These systems allow all organizational levels to self-assess environmental compliance, inclusive of tracking findings through final abatement action. Using increased funding in 2009, USGS included two new modules to the EMS system: Pollution Prevention and Green Purchasing. The EMS system has tracking and reporting capabilities for the new performance goals outlined in EO 13423 (e.g., Water Conservation). The new EMS system will help 28 existing EMS locations to continue moving forward as they strive to meet the new performance goals. The new EMS system will also aid USGS in creating a bureauwide EMS to capture those facilities that affect the overall EO 13423 goals but which have not implemented EMS. In summary, USGS efforts to improve the effectiveness and efficiency of EMS implementation are expanding throughout the bureau.

Energy Management — The USGS is dedicated to achieving the energy and water reduction and renewable energy consumption goals set forth in the Energy Independence and Security Act of 2007 and EO 13423. The USGS has implemented an energy management plan to guide programs toward meeting the mandated goals. In 2007, a contract for a Web-based system to capture, store, and analyze utility cost/consumption data was initiated for a 2008 award. The contract requires the vendor to collect energy data required from all USGS facilities which pay utility companies directly. Regional Energy Managers were identified and energy management meetings were held monthly. Energy management strategies shared during these meetings

included implementation of a bureau metering plan, training for energy and facility managers, and Energy Conserving Opportunities (ECOs) in-place or planned across the bureau. ECOs for 2007 included the installation of a dual-fuel summer boiler at the John W. Powell Building to reduce facility fuel consumption and emissions. In 2008 and 2009, USGS will continue efforts begun in 2007. In 2009 additional funding will be used for energy audits, the implementation of the bureau metering plan, and to initiate work on new ECOs. Planned ECOs include energy efficient lighting retrofits, heating, ventilation, and air conditioning improvements and replacements, and building envelope enhancements. This funding will support additional improvements in the overall energy management program and will help further reduce the bureau's energy consumption and help maintain green on the scorecard.

Transportation (Fleet) Management

The USGS remains committed to achieving the goals of the Energy Policy Act of 1992 and EO 13423 for fleet management. In support of the objectives, the USGS implemented a fleet management plan and developed vehicle justification criteria to assist in “right-sizing” the motor vehicle fleet. In 2007, the USGS implemented all the short-term goals of the Fleet Management Strategic Plan (FMSP) and began preparing to implement the long-term goals of the FMSP. In 2007, the fleet inventory validation and feasibility study was completed. The accuracy of fleet data continued to improve and programming changes were made to enhance the capabilities of the bureau's fleet data collection application. A memorandum was issued to field offices encouraging the purchase of Alternative Fuel Vehicles (AFVs) and the Office of Administrative Policy and Services funded an AFV for field use in the Central Region. The Fleet Management Improvement Team worked to promote the acquisition and use of AFVs in their regional fleets. The location of fuel stations for AFV continues to be a limiting factor. Hybrid vehicles are being considered even though their purchase and use does not direct impact our scorecard rating. In 2008 and 2009, the USGS will continue implementing the long-range goals of the FMSP, focusing on reducing fleet costs, the average age of the fleet, and fossil fuel consumption. In 2009, additional funding will reduce petroleum fuel consumption by allowing acquisition of additional new vehicles that use alternative fuels and (or) increase fuel efficiency. This funding will allow continued progress toward the scorecard goals and maintain green on progress.

Environmental Management

The USGS continues to aggressively pursue Environmental Management Systems (EMS) implementation and documentation efforts, with the expectation to have all 28 appropriate facilities (those facilities with large enough scope of environmental operations and activities to warrant implementation of EMS) reaching self-declaration by December 2008. The USGS is committed to promoting procurement of green products in accordance with the Department's draft affirmative procurement plan, comporting requirements, and guidance within USGS policy, inclusive of screening construction requirements for green purchasing opportunities. The USGS has developed a personal computer disposal policy to support Electronics Stewardship and future reuse and recycling of computer electronics and green purchasing and life cycle management. EMS Conformance and Environmental Compliance audits are accomplished annually and documented within the USGS Inspection and Abatement or Environmental Management Facilitation Systems as appropriate. These systems allow all organizational levels to self-assess environmental compliance, inclusive of tracking findings through final abatement action. Using increased funding in 2009, USGS plans to include two new modules to the EMS system: Pollution Prevention and Green Purchasing. The EMS system will also have tracking and reporting capabilities for the new performance goals outlined in EO 13423 (e.g., Water Conservation). The new EMS system will help 28 existing EMS locations to continue moving forward as they strive to meet the new performance goals. The new EMS system will also aid

USGS in creating a bureauwide EMS to capture those facilities that affect the overall EO 13423 goals but which have not implemented EMS.

Environmental Safeguards

The USGS is participating in a departmentwide management improvement initiative to safeguard Department of the Interior resources, visitors, employees, and infrastructure in all-hazards emergencies. This initiative covers protection of natural and cultural resource and historic properties under Emergency Support Function #11 of the National Response Plan (NRP), preparedness for and response to oil discharges and hazardous substances incidents under the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and coordination of activities related to preparedness for and response to incidents that affect Interior lands, natural and cultural resources and historic properties, facilities, employees, or visitors that are not carried out under the NRP or NCP but require coordination of departmental assets or expertise to safeguard these resources and people. The purpose of these activities is to provide for more effective and efficient environmental safeguards for departmental resources and people. USGS activities to date include —

- Preparation of a USGS Environmental Safeguards Plan for All-Hazards Emergencies, consistent with departmental requirements,
- Preparation of a gap analysis documenting the differences between exiting emergency management functions related to environmental safeguards and those required under the departmental plan, and
- Creation of the USGS Hazard Response Executive Committee to ensure effective coordination, eliminate redundancies, share resources, provide consistent and timely communications, and ensure that USGS response teams receive timely support from USGS leadership, in responding to all-hazards emergencies.

Gaps identified through the gap analysis include: plan for coordination with other bureaus in safeguarding the Department of the Interior environment, emergency exercise program and funding and staff to participate in emergency exercises. In summary, the USGS effort to improve the effectiveness and efficiency of safeguarding the environment in all-hazards emergencies is an ongoing endeavor.

Research and Development Criteria

The Department is using the Administration's Research and Development (R&D) investment criteria to demonstrate the value of its R&D programs. The criteria were developed by OMB in response to limited financial resources and the multitude of R&D opportunities that exists governmentwide. The criteria are used to rigorously justify new programs and to re-evaluate existing programs for modification, redirection, or termination, in keeping with national priorities and needs. The investment criteria evaluate the **relevance, quality, and performance** for all R&D programs.

USGS provides the Knowledge Creation and Management mode of delivery for the Government's Environmental Management, Natural Resources, Energy, and Disaster Management services for citizens as defined by the OMB Business Reference Model. The USGS primary product is scientific information. Quantitative measures of our **performance** are tangible and directly related to inputs, but they are primarily outputs (e.g., number of scientific papers published, data collected). The ultimate outcome related to our providing scientific

information is that a stakeholder has the information (land manager's inputs) with which to make an informed decision. Quantitative impact measures (e.g., the acreage of ecosystems restored by a land manager) are only indirectly linked to USGS outcomes. To get at the impact of USGS science on land and resource decisionmaking and therefore its **relevance**, USGS measures customer satisfaction with quality, availability and utility of our science products and measures the use of information in decisionmaking processes as end outcome measures. USGS also views our ability to leverage resources through partnerships as an additional indication of relevance and will use the Administrations R&D Budget priorities when issued in July as an additional relevance filter for 2009 initiatives.

Relevance

To further advance measurement of **relevance**, USGS has in the PART process pursued development of shared or paired performance measures with other bureaus or agencies. For example:

The National Cooperative Geologic Mapping Program has developed shared or linked measures with the National Park Service, the USGS Ground-Water Resources Program, and the hazard mitigation community. This linkage is possible because geologic maps are multi-purpose products (outputs) that contribute directly to a large variety of useful derivative products needed by decisionmakers. The three linked outcome measures will demonstrate how communities use these derivative products to (1) make informed management decisions in National Parks, (2) find and protect ground water resources necessary for the Nation's future, and (3) mitigate against a variety of natural hazards, such as landslides and earthquakes.

USGS NCGMP	Linked program
X% of geologic investigations in National Park Service (NPS) units that are cited for use by the NPS within three years of delivery	**NPS**: X% of completed data sets of natural resource inventories
X% of U.S. with geologic maps that are being integrated into ground-water availability status and trends to support resource management decisions	**USGS Water Resources**: X% of U.S. with ground-water availability status and trends information to support resource management decisions
# of counties or comparable jurisdictions that have adopted hazard mitigation measures based in part on geologic mapping and research	**USGS Geologic Hazards**: X% of communities/Tribes using DOI science on hazard mitigation, preparedness and avoidance

Biological Research has developed phased, paired measures with the FWS Migratory Bird Program (FWS–MBP). The paired measures and USGS performance are as follows:

USGS Biological Research	Linked program
Biological Research and Monitoring: Wildlife Subprogram improve the % of focal migratory bird species for which scientific information is available to support resource management decisionmaking	**FWS:** Improve the % of migratory bird populations at healthy and sustainable levels
Biological Research and Monitoring: Status and Trends Subprogram — improve the % of North American migratory birds for which scientific information on their status (species distribution and number) and trend are available to inform and improve conservation	
Biological Information Management & Delivery — % of North American migratory birds for which scientific information on their status (species distribution and number) and trends are available in a standardized and exchangeable format to improve conservation plans of Federal and State agencies	

In the PART process FWS–MBP established as a goal a net increase in the percent of migratory bird species at healthy and sustainable levels. Interior bureaus responsible for managing birds and bird habitat require scientific information from USGS to draft and execute effective management and species recovery plans. In the PART process for Biological Research and Monitoring, the USGS engaged the FWS–MBP in a dialog on how best to support FWS migratory bird conservation. The FWS and USGS agreed to a phased approach for the shared performance measure, in which the USGS and FWS are developing draft targets for the wildlife subprogram measure based on the list of FWS focal species. A review of the USGS science portfolio showed that USGS is currently conducting research on all nine of the initially identified focal species. Targets for the performance measure would be updated, and the performance measure refined, after the FWS completes action plans for focal species and works toward assembling the universe of management actions for migratory bird conservation. Thus far USGS has received plans for and established targets for six species.

To provide an indication of the increase in delivery of scientific information and technical assistance to natural resource managers to make decisions regarding management of high priority migratory bird species identified by the FWS, the USGS Wildlife subprogram based their measure on a critical factor analysis (state of available knowledge) of five biological factors: distribution/status; life history/demography; habitat; breeding biology; and conservation and management limitations. The USGS Status and Trends subprogram also developed a linked measure based on the Breeding Bird Survey, where extending the number of routes monitored with qualified volunteers increases the amount and quality (detectability/sensitivity) of status and trend data for an increasing proportion of migratory bird species, including FWS-identified focal species. The USGS Biological Information Management and Delivery program focused on making information available in a useful and useable manner.

The Biological Informatics Program has undertaken to build a species-by-species web-based resource for the migratory bird species designated as high priority by the FWS MBP. These pages were designed to incorporate the all elements of the species knowledge index developed by USGS, as well as the action plans developed by FWS. The page layout and proposed content for the pages was approved by both USGS and FWS. To date, pages are in place for 11 of the designated species of management concern, including the nine priority species identified by FWS. These may be viewed at *http://focalbirds.nbii.gov*. For each species, users may browse species data and information from multiple sources including species profiles with photographs, a bibliography of published literature on the species, as well as information on the species' conservation (inventory and monitoring, planning, management and protection, law and policy); distribution and abundance (with access to GAP distribution maps and data); natural history; and status and trends. Also, each species has a link to its taxonomy in the Integrated Taxonomic Information System and to the FWS action plan for the species if it is completed.

USGS Workshop on Partnering and Collaboration — Performance

The June 6–7, 2007, workshop brought together USGS scientists and managers to discuss experiences and approaches to working with stakeholders. As natural science issues become more complex and more integrated with societal issues, it is critical that we continue to build the expertise to work with stakeholders as effectively as possible. This was evident at a recent departmental SES workshop at which there was an important discussion about structured decision making and its role in linking science, decision making, and stakeholders together.

The workshop promoted a practitioner-based discussion so we can build upon successful USGS efforts in working with stakeholders. Our experiences may be different across regions and disciplines, and for this reason it is important for us to share information and learn from our collective experiences.

On a larger scale, competencies that will enhance and promote the relevance of USGS science to users needs are being developed and measured through the proactive support of the Department's two partnership and collaboration performance measures. Being baselined in 2007, the measures are:

- Cooperative Conservation Internal Capacity: Percent of organizations that have trained and developed employees in collaboration and partnering competencies and
- Cooperative Conservation External Capacity: Number of conservation projects that actively involve the use of knowledge and skills of people in the area, and local resources in priority setting, planning, and implementation processes.

To complete the baselining effort in 2007, USGS is continuing to define the population and performance parameters for these measures through analysis of cooperative agreements, identification of relevant training, identification of trained employees and organization affiliation, and reviewing the results of the organizational excellence assessment survey which included two questions relative to these measures. Additional information on science partnership opportunities with USGS can be found at *http://www.usgs.gov/aboutusgs/working_with_us/partnerships.asp.*

Quality

The scientific reputation of the USGS for excellence, integrity, and objectivity is one of the bureau's most important assets. This reputation for reliable science brings authority to data and findings, creates and protects long-term credibility, and ensures that the public trust is met. Survey Manual Chapter 500.25--Scientific Integrity describes the USGS policy "... for ensuring scientific integrity in the conduct of scientific activities and procedures for reporting,

investigating, and adjudicating allegations of scientific misconduct by USGS employees and volunteers." The concepts in this Chapter are not new to the USGS; scientific integrity has been the hallmark of the USGS for 128 years. The Chapter contains a "Code of Scientific Conduct" that not only documents our research standards, but also assures our customers, partners, and the general public that we abide by them in all aspects of the scientific work we perform.

The Director ensures that employees are made aware of the critical link between scientific integrity and our reputation for unbiased, reliable science and information products by encouraging each employee to read SM 500.25 and by having Science Center/Office managers lead discussions on the topic of Scientific Integrity with employees. He further encourages those who supervise volunteers to be diligent in ensuring they are briefed and that they fully understand their personal responsibilities with regard to scientific integrity. The USGS is committed to maintaining high standards of integrity.

Peer review has been the **quality** standard for USGS scientific publications and a documented component of USGS policy throughout its 128-year history. The USGS has developed a comprehensive policy framework addressing its Fundamental Science Practices *http://www.usgs.gov/usgs-manual/500/502-1.html*. The policy framework, which is part of the USGS Manual, includes a foundation policy; addresses planning and conducting data collection and research; peer review; review approval, and release of information products; and authority to approve information products. The USGS requires peer review for all of its information products that contain scientific and technical information, whether published by the USGS or an outside entity (see SM 502.3 and SM 502.4). The USGS has a vigorous program of publishing the results of its scientific investigations and research in its own information products (see SM 1100.3) as well as in scientific journals and other outside publishing venues (see SM 1100.4). The public may access information about USGS information products and may view and download many of them online through the Publications Warehouse at *http://pubs.usgs.gov*.

In accordance with OMB memorandum M–05–03, dated December 15, 2004, "Final Information Quality Bulletin for Peer Review." USGS developed specific guidance to respond to OMB guidelines and posted required information at *http://www.usgs.gov/peer_review/*

USGS Water Experts Hold Regional Conference
May 15-17, 2007, Tulsa, Oklahoma

USGS water scientists from 15 states convened with resource managers and policymakers to discuss and share innovations relating to our Nation's water resources. The purpose of the workshop was to raise the **efficiency and quality** of USGS water programs through training, exposure to new technologies and networking with other USGS scientists. The innovations in hydrologic science are directly related to flood and drought forecasting and response, ground-water and water-quality, environmental and watershed management, and water-based recreation — issues that affect Oklahoma, including most recently, significant flooding. Information and demonstrations on how USGS responds to floods, collects scientific data, and utilizes new technologies pertinent to flood warning were available.

Presenters included scientists from the USGS, U.S. Army Corps of Engineers, Water Survey of Canada, and private industry. Topics discussed included acoustic meters, bathymetry developments, electromagnetic seepage, monitor technology, lake water-quality platform design and collection, continuous water-quality monitors and safety of field personnel.

A scientific assessment is a subset of "influential scientific information" and is considered "highly influential" by OMB if: "the agency or the OIRA Administrator [Office of Information and Regulatory Affairs in OMB] determines the dissemination could have a potential impact of more than $500 million in any one year on either the public or private sector or that the dissemination is novel, controversial, or precedent setting, or has significant interagency interest." The

following titles will be peer reviewed as "highly influential science" and have Peer Review Plans posted on the Web at *http://www.usgs.gov/peer_review/:*

- *Southeast Extension of the Southern Whidbey Island Fault, Washington: Implications for Earthquake Hazards*,
- *Synthesis and Assessment Product 3.4: Abrupt Climate Change,* and
- *Synthesis and Assessment Product 1.2: Past Climate Variability and Change in Arctic and at High Latitudes.*

USGS programs are also evaluated to ensure the quality and timeliness of their science. The evaluations not only improve the accountability and quality of programs, but also identify and address gaps in programs; redirect or reaffirm program directions; identify and provide guidance for development of new programs; and review and motivate managers and scientists. External program evaluations were discussed on page A-22. In addition, all USGS programs evaluated by the OMB PART process have a "moderately effective" rating or better. All PARTed programs create an improvement plan addressing PART findings and targeting how the program will improve. Associated with the improvement plans are individual follow-up actions and milestones that describe the steps that will be taken over the next year to complete the improvement plan. In 2007, USGS has seventy-six milestones associated with the sixty-six follow-up actions.

The USGS regularly conducts internal control reviews of its programs and organizations. Selected programs are reviewed each year, with the objective of all programs being reviewed once every five years for program management, accountability to program goals and objectives, and responsiveness to customer requirements. Regular science-center reviews examine organization management, fiscal responsibility, program management, and customer satisfaction. In OMB's revision of Circular A-123, reviews are to be based on risk assessment and integrated into the fabric of business processes that are performed for the organization. USGS used the PART scores to evaluate the program's risk in delivering mission. Controls were defined as the action plan milestones, and testing and monitoring of controls was conducted by selecting a random sample of 20 percent of the total milestones for which the program manager was required to provide evidence as to how and when the milestone was completed. At mid-year 2007, all program managers were readily able to provide evidence of milestone completion.

R&D Investment Review Process

The bureau reviews R&D investments across its disciplines and weighs the value of existing programs against changing needs and priorities. In general, the USGS Director establishes program priorities for the budget year and issues a call for new initiatives in response to those priorities. He also accepts recommendations for all new ideas, regardless of whether they address the priorities. The Director prioritizes the proposed initiatives on the basis of the following criteria: interdisciplinary science; collaboration and partnerships with Department bureaus, other government agencies, and universities (**relevance**); results of program evaluations; and demonstration of progress toward meeting the Department's **performance** goals and objectives. He selects from the prioritized initiatives those that he feels he can accommodate within the funding target. The amount of increase is directly related to whether there is an allowance within the target for growth, whether all increases must be offset, whether the target itself requires reductions from base, whether fixed cost increases can be requested or must be offset and what efficiencies and economies can be achieved in meeting the priority.

The request also addresses those items specifically required by the Department. The Capital Planning and Investment Control process provides support for decisions on technology and facilities necessary to support science and the business processes of the bureau. The Investment Review Boards, chaired by the Deputy Director and comprised of senior executives from across the organization, ensure that the bureau's capital investment portfolio provides the best blend of investments that meet mission and strategic goals and holds asset managers accountable by quarterly review of cost and milestones.

R&D Funding

Research and development is the core of USGS mission. The current USGS 2009 R&D funding request is $546.0 million or 56.3 percent of the USGS budget, a net decrease of $40.0 million from the 2008 Enacted Budget. This decrease is due to an overall net funding reduction of $38.0 million from 2008, which impacts every R&D activity as seen in the table that follows.

(Dollars in Thousands)

Budget Activity	**2007 Actual**	**2008 Enacted**	**2009 Request**
Geographic Research, Investigations, & Remote Sensing	**44,216**	**47,489**	**41,863**
Provides scientific information to describe and interpret America's landscape by mapping the Nation's terrain, monitoring changes over time and analyzing how and why these changes have occurred.			
Geologic Hazards, Resources, & Processes	**217,761**	**218,848**	**185,403**
Geologic hazards programs gather long term data, operate monitoring networks, perform assessments and modeling, and disseminate findings to enable planners to design hazard resistant buildings in areas at risk and emergency responders to warn of impending disasters. Geologic resources programs assess the availability and quality of the Nation's energy and mineral resources. Geologic processes programs research, monitor, and assess the landscape to understand geologic processes to help distinguish natural change from those resulting from human activity.			
Water Resources Investigations	**125,837**	**128,134**	**106,707**
Conducts a wide variety of work related to water availability, water quality, and flood hazards, with efforts including(1) collection, management, and dissemination of hydrologic data, (2) analysis of hydrologic systems through modeling or statistical methods, and (3) research and development leading to new methods and new understanding.			
Biological Research	**180,962**	**179,871**	**180,329**
Generates and distributes scientific information needed in the conservation and management of the Nation's biological resources.			
Enterprise Information	**5,070**	**4,664**	**4,844**
Conducts information science research to enhance *The National Map* and National Spatial Data Infrastructure. Investigates methods to derive, display, and utilize seamless, generalized, consistent geospatial data from distributed Federal, State, and local government and private sector data sources. Federal Geospatial Data Committee grants fund developmental research on geospatial data topics.			
Global Change	**0**	**7,383**	**26,583**
USGS global change research examines the interactions among climate, earth surface processes, and ecosystems on time scales ranging from years to millennia. The goal is to improve knowledge and understanding of the Earth's past and present climate and environment, the forces bringing about changes in the Earth's climate, and the sensitivity and adaptability of natural and managed ecosystems to climate changes.			
TOTAL R&D	**573,846**	**586,389**	**545,729**
TOTAL BUDGET	**994,209**	**1,006,480**	**968,516**

Basic, Applied, and Development

In accordance with OMB Circular A–11, USGS research activities are classified as basic, applied, or developmental research. A definition of each of the categories follows:

Basic — systematic studies directed toward fuller knowledge or understanding of the fundamental aspects of phenomena and observable facts without specific applications toward processes or products in mind.

Applied — systematic studies to gain knowledge or understanding necessary for determining the means by which a recognized and specific need may be met.

Development — systematic application of knowledge or understanding, directed toward the production of useful materials, devices, and systems or methods, including design, development, and improvement of prototypes and new processes to meet specific requirements.

Of USGS $546.0 million R&D funding request for 2009, 7 percent is classified as basic research, 81 percent applied research, and 11 percent development. The distribution of basic, applied, and developmental research to goals is provided at the end of this section. USGS science is increasingly being used for decisionmaking, further demonstrating increasing relevance. That does not mean that the entirety of USGS science needs to be applied; as former Director Walter C. Mendenhall said, "There can be no applied science unless there is science to apply."

The following examples demonstrate the relationship of USGS **basic** and **applied research,** and **development.**

BASIC:
Efforts in restoring the Everglades provide an outstanding example of basic research with science applications that address issues resulting from nearly a century of wetland drainage and impoundment and that provide the information needed to restore the health of this unique ecosystem. The USGS provides the primary science support to the Department for resource management and restoration in South Florida. These and other studies are providing the highest quality scientific research and scientific information so that our partners at Interior and State and local agencies can fulfill their resource management and technical responsibilities.

APPLIED:
Research to Support Polar Bear Finding under the Endangered Species Act
Researchers with the USGS Alaska Science Center completed studies and delivered results to the U.S. Fish and Wildlife Service to support a finding and proposed rule to list the polar bear (*Ursus maritimus*) as threatened throughout its range. Supporting information developed by USGS included information on population, distribution and movement, food habits, and declines in condition of samples of polar bears attributable to reduction in food availability. Models were developed and data provided regarding the flux of sea ice and trends in the decline of sea ice that can potentially contribute to the species' decline. This information on polar bear populations and habits made possible an informed finding on the polar bear. This research addresses the Department of the Interior Resource Protection strategic goal of improving the understanding of national ecosystems and resources.

DEVELOPMENT:

NSDI Cooperative Agreement Projects (CAP) Create Visualization Tools

Completed in 2007, two NSDI Cooperative Agreement projects prototyped and documented access to standard geographic data championed by the Federal Geographic Data Committee. A collection of annual grants, the 2006 awards focused on aiding the development of NSDI. The Western Regional Air Partnership (a collaboration between the Western Governors' Association and the National Tribal Environmental Council) developed an "Interactive Mapping and Analysis Tool (IMAT)" that can be used to visualize regional air quality in the context of national geographic base maps. The "Carbon Project" was developed by a partnership between a private sector company, the North Carolina Department of Environment and Natural Resources, and the City of Charlotte, North Carolina. It is an incident response mapping and collaboration software program that is being used in North Carolina for natural hazards appraisal and response, using standardized national and local map data feeds. These software programs may be easily re-purposed to support other applications. See: http://victor.cira.colostate.edu/imat/ and http://www.thecarbonproject.com/gaia.php. For more information on the CAP please visit the project list pages on FGDC grants Web site, *http://www.fgdc.gov/grants.*

DOI Goals By R&D Type FY 2006 to 2009
(Dollars in thousands)

DOI Goals and R&D Type	FY 2006 Actual	FY 2007 Actual	FY 2008 Enacted	FY 2009 Budget Request
Resource Protection				
1.4 Improve the understanding of nat'l ecosystems & resources				
R&D Basic	24,577	24,372	25,485	27,596
R&D Applied	377,128	378,317	382,569	366,090
R&D Development	24,924	31,566	39,886	41,294
Subtotal, R&D for Resource Protection #1.4	**426,629**	**434,255**	**447,940**	**434,980**
Resource Use				
2.4 Improve the understanding of energy & mineral resources				
R&D Basic	15,364	15,357	15,442	10,584
R&D Applied	61,460	61,429	61,769	42,336
R&D Development	15	76	102	73
Subtotal, R&D for Resource Use #2.4	**76,839**	**76,862**	**77,313**	**52,993**
Serving Communities				
4.2 Improve the understanding, prediction, & monitoring of natural hazards				
R&D Basic	2,147	2,154	2,219	2,183
R&D Applied	34,788	37,035	36,494	34,838
R&D Development	21,087	23,540	22,423	20,735
Subtotal, R&D for Serving Communities #4.2	**58,022**	**62,729**	**61,136**	**57,756**
Total				
R&D Basic	42,088	41,883	43,146	40,363
R&D Applied	473,376	476,781	480,832	443,264
R&D Development	46,026	55,182	62,411	62,102
Subtotal, R&D for All DOI Goals	**561,490**	**573,846**	**586,389**	**545,729**
USGS Total Budget Authority	976,845	994,209	1,006,480	968,516

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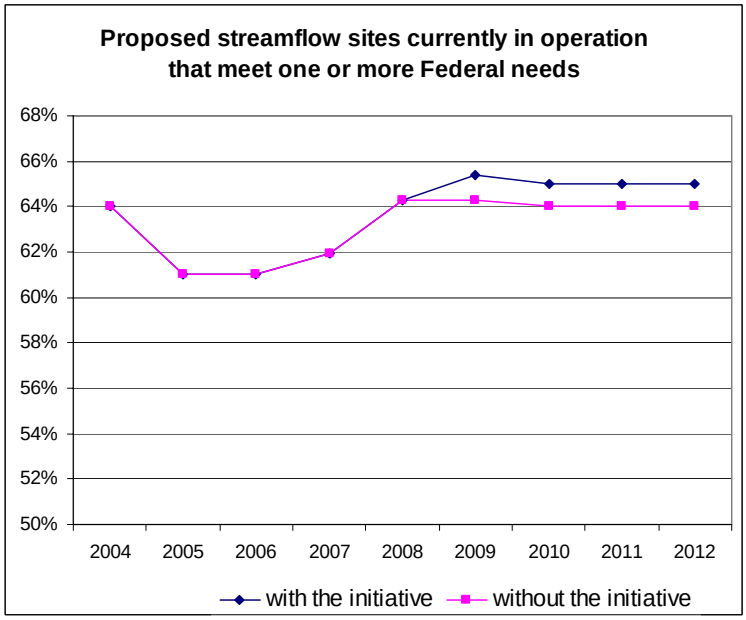
Key Increases

Water for America

To continue managing vital water resources well, good information and predictive tools are needed to guide decisions by the private sector, localities, Tribes, States, and the Federal government. The Nation needs a Census of Water that tracks changing flow, use, and storage of water, as well as models and predictive tools that will help to inform decisions. The last overall assessment of water resources for the Nation was published by the Water Resources Council in 1978. Much has changed since that time. These changes have been driven by economics, demographics, technology, law, and climate.

To meet the challenges resulting from these changes, the USGS is requesting a net increase of $8.2 million along with an internal redirection to provide $9.5 million to conduct a water census and upgrade the Nation's stream gage network as part of the Department's Water for America initiative in 2009. The initiative is described in detail in the Science on the Landscape section, which begins on page F-1.

A priority topic in the USGS science strategy (*http://www.usgs.gov/science_strategy/*) is a water census, the objective of which is identical to the objective of this 2009 initiative. The interdisciplinary capabilities of USGS scientists ensures that all aspects of earth science — water, geology, biology, and geography — will be brought to bear on this critical issue.



Note: scale on graph is exaggerated for better visibility.

Federal natural resource agencies are important partners for the Water Availability and Use pilot assessment underway in 2008, and for the Water for America initiative proposed in 2009. For example, the EPA uses streamflow data to estimate chemical loading to the Great Lakes, and the NOAA in conjunction with the USACE uses USGS data and analyses to forecast lake and river levels. In addition, other Interior bureaus use information on water availability for ecosystem evaluations in National Parks and National Refuges.

Performance Impact of the Initiative:

- +1% increase in the percent of proposed streamflow sites currently in operation that meet one or more Federal needs (see graphics above),
- +50 real-time streamgages reporting in NWISWeb,

Key Increases

Water for America +$9.5 million									
	2004 Actual	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Pres. Budget	2010 Estimate	2011 Estimate	2012 Estimate
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments									
% of proposed streamflow sites currently in operation that meet one or more Federal needs (denominator = 4,425) **(PART) (SP)**									
Performance at Proposed Budget Level	64%	61%	61%	62%	64%	65%	65%	65%	65%
Performance w/o Initiative	64%	61%	61%	62%	64%	64%	64%	64%	64%
Performance Change	0	0	0	0	0	+1%	+1%	+1%	+1%
Total actual/projected cost at Budget Level ($000)	55,313	35,100	36,450	37,017	39,830	41,978	41,978	41,978	41,978
Total actual/projected cost without initiative ($000)	55,313	35,100	36,450	37,017	39,830	41,253	41,253	41,253	41,253
Actual/projected cost per stream-gage (nat'l. average) (whole dollars)	12,500	13,000	13,500	13,500	14,000	14,000	14,000	14,000	14,000
Note: Because no decisions have been made on out-year funding levels, this table assumes funding will be provided at 2009 levels post-2009 and that costs will not increase due to inflation, and performance will not decrease due to inflation.									

- +1% in the percent of the United States with geologic maps that are being integrated into ground-water availability status and trends to support resource management decisions,
- +2% in the percent of river basins that have streamflow stations, and
- +1 new systematic analysis/investigation delivered to customers in 2009, with 16 more accruing in the outyears.

In the long term, these incremental changes in performance will lead to —

- Knowledge of the history and current status of the storage (in aquifers and reservoirs), flows (in rivers and aquifers), and use of water.
- Analyses of the limits of sustainable water development at regional scales, which would provide a framework for the water-allocation and water-development responsibilities exercised by the States.

Birds Forever

The North American Breeding Bird Survey (BBS) was launched in 1966, utilizing 600 roadside routes to obtain range-wide population data on breeding birds in the United States and Canada east of the Mississippi River. Today, the BBS provides the foundation for non-game, land bird conservation in North America with over 3,200 skilled volunteer participants sampling 3,000 routes annually across the continental United States and southern Canada. Each year long-term population trends are calculated for over 420 of the 650 bird species recorded on BBS routes. These trends inform researchers and wildlife managers of significant changes in bird population levels and are utilized, along with other indicators, by the U.S. Fish and Wildlife Service (FWS), Canadian Wildlife Service (CWS), state wildlife agencies and Partners in Flight to establish national and regional avian conservation priorities. Trends with both raw and summarized data are available on the internet *http://www.pwrc.usgs.gov/bbs/*. The USGS and the CWS jointly coordinate the BBS.

The BBS helps to provide the scientific support to achieve the objectives of the North American Bird Conservation Initiative (NABCI), including increasing the value of monitoring information by improving survey statistical design and protocol development. The NABCI focuses on managing the populations and habitats of birds that are protected, restored, or enhanced through coordinated efforts at the national, regional, State, and local level, guided by sound science and effective management.

In 2009, the USGS proposes an increase of $1.0 million and 3 FTE to support bird monitoring through the BBS. The FWS is also requesting new funds ($8.1 million) through the Birds Forever Initiative in 2009 to address threats that have lead to rapid decline in the populations of many migratory bird species. Program Changes associated with the Birds Forever Initiative are described in the Science on the Landscape section that begins on page F-1.

Performance Impact of the Initiative:

- The requested increase for the Birds Forever Initiative would result in 2 new systematic analyses and investigations delivered to customers and 2 new formal workshops and training provided to customers
- % of North American migratory birds for which scientific information on their status (species distribution and number) and trend are available to inform and improve conservation,
- Increase long-term precision (decrease bias) for existing species monitored through the Breeding Bird Survey to enable a detection of 50% population decline of relevant species within 20 years by expanding the number of BBS routes surveyed annually and by evaluating and refining methodologies to decrease survey bias, and
- % of focal migratory bird populations for which scientific information is available to support resource management decisionmaking (USGS in coordination with FWS).

Performance for Key Increases

Birds Forever +$1.0 million	2004 Actual	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Pres. Budget	2010 Estimate	2011 Estimate	2012 Estimate
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments									
Quality: X% of studies validated through appropriate peer review or independent review	UNK	UNK	UNK	UNK	118/118* 100%	118/118* 100%	118/118* 100%	120/120* 100%	120/120* 100%
Increase long-term precision (decrease bias) for existing species monitored through the Breeding Bird Survey to enable a detection of 50% population decline of relevant species within 20 years by expanding the number of BBS routes surveyed annually and by evaluating and refining methodologies to decrease survey bias (PART) (BRM)									
Performance at Proposed Budget Level	UNK	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008
Performance Change			0	0	0	0	0	0	0
% of North American migratory birds for which scientific information on their status and trends are available (SP) (PART) (BRM)									
Performance at Proposed Budget Level	UNK	26%	26%	26.6% (173/ 650)	26.6% (173/ 650)	27.13% (176/ 650)	27.13% (176/ 650)	27.13% (176/ 650)	27.13% (176/ 650)
Performance Change			0	0	0	+0.53%	0	0	0
% of focal migratory bird populations for which scientific information is available to support resource management decisionmaking (USGS in coordination with FWS) (PART) (BRM)									
Performance at Proposed Budget Level	UNK	UNK	56.88%	57.02%	57.16%	57.22%	TBD	TBD	TBD
Performance Change				+0.14%	+0.14%	+0.06%	--	--	--
# of systematic analyses delivered to customers. The 2009 proposed increase for the Birds Forever Initiative would result in 2 new systematic analyses or investigations delivered to customers in 2011.									
Performance at Proposed Budget Level	UNK	UNK	UNK	UNK	118*	118*	118*	120*	120*
Performance Change	0	0	0	0	n/a	0	0	+2	0
Total actual/projected cost at Budget Level ($000)	--	--	--	--	23,600	24,000	24,000	24,000	24,000
Total actual/projected cost without initiative ($000)	--	--	--	--	23,600	23,600	23,600	23,600	23,600
Actual/projected cost per systematic analysis (whole dollars)	--	--	--	--	200,000	200,000	200,000	200,000	200,000

Birds Forever +$1.0 million

	2004 Actual	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Pres. Budget	2010 Estimate	2011 Estimate	2012 Estimate
Comments	Systematic analyses, the product of research, require one to five years for completion. Some studies already underway in these areas will be completed in 2008 and 2009. The influx of new funding will accelerate completion of some research projects currently in progress as well as initiate other research projects that will conclude in the out-years. The USGS used an annual snapshot of the Resource Protection ABC research work activity cost data averaged over time as a surrogate cost per unit. To this the USGS added a proportional share of the cost derived for the Resource Protection science management activity. The average unit cost for systematic analyses is approximately $200,000 for the Resource Protection mission area which correlates to the average cost that the program had historically used before implementation of ABC.								
# of formal workshops and training provided to customers. The 2009 proposed increase for the Birds Forever Initiative would result in 2 new workshops and training provided to customers in 2009.									
Performance at Proposed Budget Level	UNK	UNK	UNK	UNK	6**	8**	8**	8**	8**
Performance Change	0	0	0	0	n/a	+9	0	0	0
Total actual/projected cost at Budget Level ($000)	--	--	--	--	480	640	640	640	640
Total actual/projected cost without initiative ($000)	--	--	--	--	480	480	480	480	480
Actual/projected cost per workshop (whole dollars)	--	--	--	--	80,000	80,000	80,000	80,000	80,000
Comments	For workshops, which support land managers in applying the science, and are a shorter term product, the USGS used the average unit cost of $80,000 based on the technical assistance and proportional share of the science management work activity for the Resource Protection mission. Other Interior goals will also accrue performance from workshops.								

* Total systematic analyses and investigations for the Status and Trends program.
** Total formal workshops and training for the Status and Trends program.

Note: Because no decisions have been made on out-year funding levels, this table assumes funding will be provided at 2009 levels post-2009 and that costs will not increase due to inflation, and performance will not decrease due to inflation.

Healthy Lands Initiative

The 2009 President's request for the Healthy Lands Initiative, which promotes the concept of cooperative conservation focusing on research that supports healthy upland landscapes, is $3.5 million. The role of the USGS is to provide the framework science necessary for Interior bureaus and other partners to use in restoration and conservation efforts. The landscape and habitats of Wyoming's Green River Basin are undergoing rapid change in response to energy resource development. The USGS will collaborate with BLM, FWS, USFS, Wyoming State agencies, industry, and non-governmental organizations to build the geospatial framework for sharing information, assess the health of habitats and their resources, and monitor changes in landscape and habitats as energy development proceeds, all to ensure the long-term viability and sustainability of wildlife and habitat in energy development areas.

Wyoming's Green River Basin

The USGS brings its portfolio of science expertise to address the real-time land management issues identified by Department resources managers to help decisionmakers build and implement adaptive management solutions. This work builds on past and present scientific studies and assessments in the Wyoming Green River Basin such as the recently completed energy assessment of the basin; land use and land cover studies, vegetative mapping studies, and long-term baseline water monitoring.

The USGS will work with Federal and State land management agencies to identify their highest priority issues that will guide the scientific priorities.

In 2009 the USGS, a significant partner in this multi-bureau initiative, will build on 2008 accomplishments such as inventorying species and habitats, monitoring and assessing water resources, integrating energy resources and habitat data, and providing a robust data inventory and models to inform land-use decisions for southwest Wyoming, which can be transferred to other HLI areas.

Initiative efforts will build upon the existing USGS knowledge base and expertise in conducting interdisciplinary studies to examine the environmental impacts of natural events and land use change. This initiative supports the Department's Resource Protection strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment. All programs contributing to this initiative have scored moderately effective or better in PART evaluations, and PART program metrics will be used to measure performance. Activities were defined within the framework of activity based cost/management including establishing and implementing a monitoring strategy and protocols and developing decision support models and adaptive management strategies. Peer review and customer satisfaction with new products will define the quality framework.

Performance Impact of the Initiative:

- 11 new systematic analyses and investigations delivered to customers,
- 4 new formal workshops and training provided to customers, and
- 2 new real-time ground-water sites reporting in NWISWeb.

Performance for Key Increases

Healthy Lands – Green River Wyoming +$3.5 million									
	2004 Actual	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Pres. Budget	2010 Estimate	2011 Estimate	2012 Estimate
Resource Protection: # of systematic analyses and investigations. Initiative accelerates completion of systematic analyses and investigations to evaluate treatments and develop adaptive management options for sage habitats for the benefit of sage grouse on Department of the Interior managed lands. Initiative starts a total of 20 new systematic analyses and investigations in 2008. Of the 20, 6 will be delivered in 2008, 7 in 2009, and 7 in 2010. As funds are incorporated into the base, cycle repeats each year. Performance shown is incremental and not cumulative.									
Performance at Proposed Budget Level	1	1	1	1	3	3	3	14	14
Performance w/o Initiative	1	1	1	1	3	3	3	3	3
Performance Change	0	0	0	0	+2	0	0	+11	0
Total actual/projected cost at Budget Level ($000)	$200	$200	$200	$200	$600	$2,800	$2,800	$2,800	$2,800
Total actual/projected cost without initiative ($000)	$200	$200	$200	$200	$600	$600	$600	$600	$600
Actual/projected cost per scientific report or other product (whole dollars)	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000
Comments	Systematic analyses, the product of research, require 1 to 5 years for completion. Some studies already underway in these areas will be completed in 2007 and 2008. The influx of new funding will accelerate completion of some research projects in progress as well as initiate other research projects that will conclude in the outyears. The USGS used an annual snapshot of the Resource Protection ABC research work activity cost data averaged over time as a surrogate cost per unit. To this the USGS added a proportional share of the cost derived for the Resource Protection science management activity. For 2004 through third quarter 2006, the average unit cost for systematic analyses is approximately $200,000 for the Resource Protection mission area, which correlates to the average cost that the program had historically used before implementation of ABC.								
Resource Protection: # of formal workshops and training provided to customers									
Performance at Proposed Budget Level	1	2	2	2	3	5	5	5	5
Performance w/o Initiative	1	2	2	2	3	3	3	3	3
Performance Change	0	+1	0	0	+1	+2	0	0	0
Total actual/projected cost at Budget Level ($000)	80	160	160	160	240	400	400	400	400
Total actual/projected cost without initiative ($000)	80	160	160	160	240	240	240	240	240
Actual/projected cost per per workshop (whole dollars)	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000

Key Increases

Healthy Lands – Green River Wyoming +$3.5 million									
	2004 Actual	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Pres. Budget	2010 Estimate	2011 Estimate	2012 Estimate
Comments	For workshops, which support land managers in applying the science, and are a shorter term product, the USGS used the average unit cost of $80,000 based on the technical assistance and proportional share of the science management work activity for 2005 for the Resource Protection mission. Other Interior goals will also accrue performance from systematic analyses produced, workshops conducted, and monitoring stations added to the network.								
Resource Protection: # of real-time ground-water sites reporting in NWIS-Web									
Performance at Proposed Budget Level	0	0	0	0	1	4	4	4	4
Performance w/o Initiative	0	0	0	0	1	1	1	1	1
Performance Change	0	0	0	0	+1	+3	+3	+3	+3
Total actual/projected cost at Budget Level ($000)	0	0	0	0	*	*	*	*	*
Total actual/projected cost without initiative ($000)	0	0	0	0	*	*	*	*	*
Actual/projected cost per ground-water site (whole dollars)	0	0	0	0	*	*	*	*	*
Comments	* In the first year of operation, the cost of a single well ranges from $4,000–$10,000 and includes the cost of getting permission to use a landowner's existing well, characterization of the site (depth of well, type of pump, establishment of measurement benchmark), and installation of scientific instruments. Wherever possible, the USGS retrofits existing wells with the needed equipment, but if a well is required in a location where none are available, drilling costs can range from $5,000–$25,000, depending on terrain, rock type, and the depth and diameter of the well. After the first year, annual operating costs range from $1,000–$7,000, depending on frequency of sampling, presence or absence of a recorder, real-time capability, distance of the well from the office, and other factors.								
Note: Because no decisions have been made on out-year funding levels, this table assumes funding will be provided at 2009 levels post-2009 and that costs will not increase due to inflation, and performance will not decrease due to inflation.									

Oceans and Coastal Frontiers Initiative — Healthy Coastal Lands and Oceans

The Department of the Interior's Ocean and Coastal Initiative builds on work begun in response to the U.S. Ocean Action Plan (OAP) issued on December 17, 2004 and the January, 2007 Ocean Research Priorities Plan (ORPP). Through Executive Order and the OAP, the President directed that Federal agencies enhance existing partnerships by expanding coordination and consultation on ocean-related matters and encouraged State collaborations with Federal agencies to address regional ocean and coastal issues. The Department of the Interior has developed, through a multi-bureau effort, an Ocean and Coastal Frontiers Initiative which addresses Department priorities in responding to the broad direction of the OAP and responds to national priorities that intersect the priorities and needs of developing regional ocean governance alliances. This request supports the USGS component of the broader departmental initiative.

To meet the requirements of the Secretarial Initiative and continuing the efforts begun in the OAP, the USGS is requesting +$7.0 million in 2009. The major components of the Ocean and Coastal Frontiers Initiative includes +$4.0 million for Extended Continental Shelf and +$2.0 million for Improving Ocean and Coastal Resources through Collaboration, +$1.0 million for OAP activities, as well as $0.9 million for the Fish and Wildlife Service component.

This Initiative also continues USGS efforts initiated in 2008 to implement the OAP and engage in interagency efforts to advance the implementation strategy of the ORPP. The OAP increases (+$0.5 million for Geologic Hazards, Resources, and Processes - Coastal and Marine Geology Program and +$0.5 million for Water Resources Investigations - Hydrologic Networks and Analysis) will enhance existing regional coastal ocean observing systems, apply USGS monitoring, mapping, and modeling capabilities, advance the near-term priorities of the ORPP, implement the National Water Quality Monitoring Network (NWQMN), build upon pilot study demonstration projects designed to reveal the feasibility of the NWQMN, refine observational parameters and temporal and geographic sampling frequencies and scales, and develop data sharing, summarization, and reporting methodologies.

Partnering programs will support integrated efforts to generate specialized scientific data and research analyses necessary to effectively manage and conserve the Nation's coastal and marine resources, and produce scientific products that the public and private sectors can use to respond to natural disasters and changing conditions in our living and non-living natural resources.

Activities supported through this initiative will advance the broad goals of the USGS Science Strategy Plan for Understanding Ecosystems and Predicting Ecosystem Change; Climate Variability and Change; and National Hazards, Risk, and Resilience Assessment; the goals of the USGS National Coastal Program Plan (NCPP); Administration priorities established in the OAP and ORPP; and the emerging priorities of Regional Ocean Governance Alliances. The USGS will build on existing partnerships with National Oceanic and Atmospheric Administration (NOAA), U.S. Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (USACE) and other Interior bureaus and draw on expertise from across USGS programs and science centers.

Performance Impact of the Initiative:

- +5 systematic analyses in 2009, and an additional +15 by 2012,
- +4 workshops in 2009 and an additional +5 by 2012.

Performance for Key Increases

Oceans and Coastal Frontiers Initiative – +$7.0 million									
	2004 Actual	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Pres. Budget	2010 Estimate	2011 Estimate	2012 Estimate
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments									
% of targeted science products that are used by partners for land or resource management decision making (SP)				93%	≥90%	≥90%	≥90%	≥90%	≥90%
# of systematic analyses and investigations delivered to customers. CMGP funding requested in 2009 results in 5 new systematic analyses in 2009, and 15 systematic analyses delivered in the outyears.									
Performance at Proposed Budget Level				218	200	205	205	210	220
Performance Change				+210	-18	+5	0	+5	+10
Total actual/projected cost at Budget Level ($000)				33,745	34,549	40,323	40,323	40,323	40,323
Total actual/projected cost without initiative ($000)				33,745	34,549	34,549	34,549	34,549	34,549
Actual/projected cost per systematic analysis (whole dollars)				155,000	173,000	197,000	197,000	192,000	183,000
Comments	Systematic analyses, the product of research, require one to five years for completion. Systematic analyses were rebaselined in 2007 to standardize bureau-wide counting. The 2009 President's Budget has requested +5 in 2009 for the Ocean and Coastal Frontiers Initiative; +5 in 2011 and +10 in 2012. Some studies already underway in these areas will be completed in 2008 and 2009. The influx of new funding will accelerate completion of some research projects currently in progress as well as initiate other research projects that will conclude in the out-years. The USGS used an annual snapshot of the Resource Protection ABC research work activity cost data averaged over time as a surrogate cost per unit. To this, the USGS added a proportional share of the cost derived for the Resource Protection science management activity. Prior to rebaselining in 2007, the average unit cost for systematic analyses was approximately $4,000,000 for the Resource Protection mission area which correlates to the average cost that the program had historically used before implementation of ABC. After rebaselining, the average unit cost for systematic analyses drops proportional to the revised number of studies.								
# of formal workshops and training provided to customers Funding requested in the related Ocean Action Plan for the CMGP in the 2008 Plan results 1 new workshop to be delivered in 2008. Funding requested in 2009 results in 4 new workshops to be delivered in 2009; +2 in 2010; +1 in 2011, and +2 in 2012.									
Performance at Proposed Budget Level				11	11	15	17	18	20
Performance Change				+1	+1	+4	+2	+1	+2
Total actual/projected cost at Budget Level ($000)				277	300	375	425	450	500
Total actual/projected cost without initiative ($000)				250	250	250	250	250	250
Actual/projected cost per workshop (whole dollars)				25,200	27,200	25,000	25,000	25,000	25,000

Oceans and Coastal Frontiers Initiative – +$7.0 million									
	2004 Actual	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Pres. Budget	2010 Estimate	2011 Estimate	2012 Estimate
Comments	For workshops 2004–07 Plan, which support land managers in applying the science, and are a shorter term product, the USGS used the average unit cost of $25,000 based annual snapshot of the Resource Protection ABC research work activity cost data averaged over time as a surrogate cost per unit; 2007 actual and 2008 Plans slightly exceed the average; 2009 and beyond should average $25,000 per workshop.								

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2009 President's Budget Request - BA in thousands
Crosswalk of DOI Goals to Budget Activities
(in thousands of dollars)

Account/Budget Activity	RESOURCE PROTECTION 1.4 Improve the Understanding of National Ecosystems and Resources Through Integrated Interdisciplinary Assessment	RESOURCE USE 2.4 Improve the Understanding of Energy and Mineral Resources to Promote Responsible Use and Sustain the Nation's Dynamic Economy	SERVING COMMUNITIES 4.2 Improve Understanding, Prediction, and Monitoring of Natural Hazards to Inform Decisions by Civil Authorities and the Public to Plan for, Manage, and Mitigate the Effects of Hazard Events on People and Property	TOTAL
Surveys, Investigations, and Research				
Geog Res., Investigations & Remote Sensing	73,118			73,118
Geologic Hazards., Resources, and Processes	74,838	52,920	80,257	208,015
Water Resources Investigations	203,027			203,027
Biological Research	180,329			180,329
Enterprise Information	103,493	4,075	4,553	112,121
Global Change	26,583			26,583
Science Support	53,492	6,497	7,211	67,200
Facilities	78,053	9,539	10,531	98,123
SIR Appropriation, Total	792,933	73,031	102,552	968,516

Please note that the following DOI goals were not applicable to USGS and therefore were not displayed in the table above: Resource Protection 1.1, 1.2, and 1.3; Resources Use 2.1, 2.2, and 2.3; Recreation 3.1and 3.2; Serving Communities 4.1, 4.3, 4.4, and 4.5; Management Excellence 5.1 and 5.2 and Other.

Bureau Goal Performance Table

Target Codes:	SP = Strategic Plan measures	PART = PART Measure	
		UNK = Prior year data unavailable	
	TBD = Targets have not yet been developed	BUR = Bureau specific measure	
		NA = Long-term targets are inappropriate to determine at this time	
Type Codes:	C = Cumulative Measure	A = Annual Measure	F = Future Measure

End Outcome Goal 1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through Integrated Interdisciplinary assessment.

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
End Outcome Measures										
% of targeted science products that are used by partners for land or resource management decision making **(SP)**	A	85%	90%	93%	≥90%	93%	≥90%	≥90%	0	≥90%
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure availability of long-term environmental and natural resource information, data and systematic analyses needed by land and resource managers for informed decision making**										
% of North American migratory birds for which scientific information on their status and trends are available **(SP) (PART) (BRM)**	A	UNK	26%	26%	26% (169/650)	26.6% (173/650)	26.6% (173/650)	27.13% (176/650)	+0.53%	27.1% (176/650)
% of targeted fish and aquatic populations for which information is available regarding limiting factors **(SP) (PART) (BRM)**	A	UNK	31%	31%	37% (44/119)	38.66% (46/119)	41% (49/119)	45% (54/119)	+4%	51% (61/119)
% of targeted invasive species for which scientific information and decision support models are available to improve early detection (including risk assessments) and invasive species management **(SP) (PART) (BRM)**	A	UNK	51.6%	51.6%	52.5% (3.15/6)	54% (3.25/6)	54% (3.25/6)	53.3% (3.2/6)	-0.7%	54% (3.25/6)

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
X% improvement in detectability limits for selected, high priority environmentally available chemical analytes **(PART) (BRM)**	A	UNK	UNK	6%	12%	12%	20%	37%	+17%	48%
Increase long-term trend precision (decrease bias) for existing species monitored through the Breeding Bird Survey to enable a detection of 50% population decline of relevant species within 20 years **(PART) (BRM)**	A	UNK	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0	0.0008
X% of CRU students that work on subsequent fish and wildlife science advance degrees or obtain employment in the fish and wildlife or other natural resources field, within targeted dates post-graduation **(CRU) (BUR)**	A	UNK	UNK	95%	95%	95%	95%	95%	0	95%
X% of focal migratory bird populations for which scientific information is available to support resource management decisionmaking (USGS in coordination with FWS) **(PART) (BRM)**	A	UNK	UNK	56.88%	57.02%	57.02%	57.16%	57.22%	+.06%	TBD
X% of US land with land characterization and species distribution information available for resource management decision-making updated in the last 5 years **(BIMD PART)**	C	18.3%	23.3%	42.3%	34%	36.4%	37%	40%	+3%	50%
X% of North American migratory birds for which scientific information on their status (species distribution and number) and trends are available in a standardized and exchangeable format, to improve conservation plans of federal and state agencies **(BIMD PART)**	C	15%	20%	25%	30%	30%	31%	31%	0	31%

Goal Performance Table

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
X% of North American amphibians and reptiles for which scientific information on their status (species distribution) are available in a standardized and exchangeable format, to improve conservation plans of federal and state agencies **(BIMD PART)**	C	88%	90%	91%	92%	92%	93%	93%	0	94%
X% of North American mammals for which scientific information on their status (species distribution) are available in a standardized and exchangeable format, to improve conservation plans of federal and state agencies **(BIMD PART)**	C	91%	93%	94%	94%	94%	95%	95%	0	95%
X% of US federally-listed threatened and endangered or indicator fish species for which scientific information on A species status is available in a standardized and exchangeable format to improve conservation plans of federal and state agencies **(BIMD PART)**	C	2.6%	7.5%	12.4%	17.5%	17.5%	20%	20%	0	21%
X% of river basins that have streamflow stations **(SP) (WRD PART)**	C	77%	82% (1825/ 2223)	81% 1800/ 2223)	84% (1870/ 2223)	81% (1800/ 2223)	84% (1870/ 2223)	86% (1920/ 2223)	+2% (+50)	92% (2038/ 2223)
X% of the Nation's 65 principal aquifers with monitoring wells used to measure responses of water levels to drought and climatic variations to provide information needed for water-supply decisionmaking **(SP) (WRD PART)**	C	60% (39/65)	61% (40/65)	61% (40/65)	60% (39/65)	60% (39/65)	60% (39/65)	60% (39/65)	0	66% (43/65)

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
X% of targeted contaminants for which methods are developed to assess potential environmental and human health significance **(SP) (WRD PART)**	C	10%	20%	85%	33% (55/188)	41% (78/188)	33% (76/232)	33% (76/232)	0	33% (74/232)
X% of streamflow stations with real-time measurement/ reporting of water quality **(WRD PART)**	C	6% (450/ 7451)	7% (520/ 7451)	9%	8% (600/ 7451)	11% (820/ 7451)	11% (826/ 7508)	12% (900/ 7508)	+1% (+74)	15% (1125/ 7508)
X% of ground-water stations that have real-time reporting capability in the ground water climate response network **(WRD PART)**	C	57%	67% (233/347)	47%	63% (220/347)	52% (181/347)	53% (290/544)	53% (290/544)	0	53% (305/574)
X% of U.S. with ground water quality status and trends information to support resource management decisions **(WRD PART)**	C	0	39%	58%	51%	68%	70%	70%	0	70%
X% of States with web based Sreamflow statistics tools to support water management decisions **(WRD PART)**	C	4%	10% (5/50)	14%	20% (10/50)	18% (9/50)	26% (13/50)	26% (13/50)	0	30% (15/50)
X% of U.S. with ground water availability status and trends information to support resource management decisions **(WRD PART)**	C	5% (3.5/65)	7% (4.5/65)	8% (5.5/65)	9% (6/65)	9% (6/65)	11% (7/65)	12% (8/65)	+1% (+1)	12% (8/65)
% of proposed streamflow sites currently in operation that meet one or more federal needs **(WRD PART)**	C	64%	61% (2700/ 4425)	62% (2742/ 4425)	62% (2742/ 4425)	62% (2742/ 4425)	64% (2845/ 4425)	65% (2895/ 4425)	+1% (+50)	55% (2450/ 4425)
X% improvement in accuracy of watershed (SPARROW) model prediction for total nitrogen and total phosphorus (measured as reduced error) **(WRD PART)**	C	40%	31%	24%	32%	20%	20%	20%	0	20%

Goal Performance Table

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
% of surface area of the coterminous U.S. for which high-resolution geospatial datasets are cataloged, managed, and available through *The National Map* **(SP) (NGP)**	F	UNK	UNK	UNK	83% (581/700)	99.71% (698/700)	100% (700/700)	100% (700/700)	0	100% (700/700)
% of the area of 11 Western States for which orthoimagery have been acquired through a FSA/USGS partnership with other entities to achieve a 5-year cycle for 1-meter NAIP imagery **(BUR) (NGP)**	A	UNK	43%	23%	62%	100%	100%	100%	0	100%
% of total cost FSA and USGS saved through partnering with other entities for imagery acquisition of 1-meter NAIP orthoimagery **(BUR) (NGP)**	A	UNK	44%	41%	36%	32%	36%	36%	0	36%
% of data acquisition costs for *The National Map* funded by partners **(RePART Eff. Measure) (NGP)**	F	45%	47%	74%	60%	59.3%	60%	60%	0	75%
% of customers that identify or indicate (via a survey) that USGS NGP Outreach materials and activities (information and publications, conferences, training and workshops) met their needs/requirements **(BUR) (NGP)**	F	UNK	UNK	UNK	UNK	UNK	Baseline	TBD	TBD	TBD
% of time that USGS managed geospatial data and information dissemination systems (i.e., Geospatial One-Stop Portal, *The National Map*, NSDI Clearinghouses) are accessible online to customers **(BUR) (NGP)**	F	UNK	UNK	UNK	UNK	UNK	Baseline	TBD	TBD	TBD
% of GIO partners reporting satisfaction with partnership agreements **(BUR) (NGP)**	F	UNK	UNK	UNK	UNK	UNK	Baseline	TBD	TBD	TBD

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
% of total cost of geospatial data and geospatial services saved through Geospatial Line of Business Joint Business Case **(BUR) (NGP)**	F	UNK	UNK	UNK	UNK	UNK	Baseline	TBD	TBD	TBD
% of nation's surface for which hydrology, elevation, and orthoimagery are available through the NSDI clearinghouse and funded through partnerships **(BUR NGP)**	C	62%	71%	99%	89%	100%	100%	100%	0	100%
% of US surface area with contemporary land cover data needed for major environmental monitoring and assessment programs **(SP) (Geography) (PART)**	C	45%	65%	75%	95% (286/300)	95% (286/300)	100% (300/300)	15% (45/300)	See comment below	60% (180/300)
Comment	In 2009, USGS will begin the next generation land cover dataset.									
% of surface area with temporal and spatial monitoring, research, and assessment/data coverage to meet land use planning and monitoring requirements **(PART)** (Number of completed eco-region assessments out of a total of 84 eco-regions) **(Global Change)**	C	31%	37%	48%	60% (50/84)	61% (51/84)	69% (58/84)	87% (73/84)	+18% (+15)	Plan Completion in 2010
X% of data accessible: X% of satellite data available from archive within 24 hours of capture **(PART Geography)**	A	90%	97.2%	98.7%	95%	95%	95%	95%	0	95%
X% of US with regional geologic map coverage that is available to customers through the NGMDB **(PART)**	C	50.25%	53%	55%	57.5%	60.4%	63%	65%	+2%	71%
X% of geologic investigations in National Park Service (NPS) units that are cited for use by the 94%NPS within three years of delivery **(NCGM PART)**	A	UNK	80%	80%	80%	100%	80%	80%	0	80%

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
X% of EDMAP students that work on subsequent geoscience degrees or obtain a job in a geoscience field **(NCGM PART)**	A	95%	94%	95%	95%	94%	95%	95%	0	95%
X% of U.S. with geologic maps that are being integrated into ground-water availability status and trends to support resource management decisions **(NCGM PART)**	A	3%	5%	6%	8%	8%	10%	13%	+3%	14%
# of counties or comparable jurisdictions that have adopted hazard mitigation measures based in part on geologic mapping and research **(NCGM PART)**	C	UNK	10	12	14	14	14	15	+1	16
% of NPS units for which environmental characterization based on airborne remote sensing is provided as digital GIS products and for which products are cited or use by NPS within 2 years **(C&M PART)**	C	UNK	50%	50%	60%	60%	75%	75%	0	75%
% of regional and major topical studies for which interpretive and synthesis products are cited by identified partners and users within 3 years of study completion **(C&M PART)**	C	60%	80%	80%	80%	80%	80%	80%	0	80%
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure the quality and relevance of science information and data to support decision making**										
% of studies validated through appropriate peer review or independent review **(SP)**	A	100% (1526/ 1526)	100% (2127 /2127)	100% (2157/ 2157)	100% 1732/ 1732)	100% (2879/ 2879)	100% (2530 2530)	100% (2412/ 2412)	0	100% (2345/ 2345)
% satisfaction with scientific and technical products and assistance for environment and natural resource decision making **(SP)**	A	90%	96%	91%	≥90%	90%	≥90%	≥90%	0	≥90%
PART Efficiency and Other Output Measures										

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
Average cost per sample for selected, high priority environmentally available chemical analytes **(BRM PART Eff Measure)**	A	UNK	$700	$680	$680	$680	$650	$643	-$7	$567
# of cumulative gigabytes managed **(PART) (BIMD)**	C	360	791.25	1,134.22	820	931	1,000	1,000	0	1,210
# of annual gigabytes of geospatial data collected **(BUR) (NGP)**	A	34,815	6,023	76,550	25,428	94,802	24,344	24,344	0	35,000
# of cumulative gigabytes of geospatial data managed **(BUR) (NGP)**	C	85,857	108,035	187,842	200,635	278,646	249,679	249,679	0	400,000
# of annual terabytes collected (**BUR) (Geography)**	A	527.2	438.8	537.9	534.0	96	Rebaseline			
# of cumulative terabytes managed **(Geography)**	C	2,448.3	2,887.4	3,425.3	4,043.8	4,255.9	Rebaseline			
# of annual terabytes collected **(BUR) (Geography)**	A	UNK	UNK	UNK	UNK	UNK	278	278	0	300
# of cumulative terabytes managed **(Geography)**	C	UNK	UNK	UNK	UNK	UNK	3,556.6	2,547.3	-1,009.3	3,400
Comment	Data managed reflects aggregated total of terabytes of data in the archive at the end of a period, including recent collections, reprocessing datasets, compression and disposal of data. The change from 2008 reflects the reprocessing of MODIS and ASTER data based on the development of new scientific algorithms thus reducing the size of datasets.									
# of annual gigabytes collected **(Geology)**	A	407.2	117.8	218.8	210.8	1,570	210.8	225	+	225
# of cumulative gigabytes managed **(Geology)**	C	898.2	1016.0	1235.0	1445	2,824.6	2981.4	3187	+107.6	3981
# of annual gigabytes collected **(Global Change)**		NA	NA	NA	NA	NA	2.8	2.8	0	2.8
# of cumulative gigabytes managed **(Global Change)**		NA	NA	NA	NA	NA	19.4	22.2	+2.8	30.6
# of systematic analyses & investigations delivered to customers **(Total)**	A	1,526	2,127	2,157	1,732	2,879	2,530	2,412	-118	2,361

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
# of formal workshops or training provided to customers (instances/issues/events) **(Total)**	A	179	403	313	194	392	195	193	-2	192
# of data standards used in implementing *The National Map* **(NGP PART)**	C	17	22	22	22	22	22	22	0	22
# of students complete degree requirements for MS, PhD, and post doctoral program under the direction and mentorship of Unit Scientists **(CRU) (BUR)**	A	106	100	103	95	95	90	90	0	90
Amount of fire-related data and information available online via the NBII, to assist land managers in fire management decision making **(BIMD PART)**	C	.5gb	1.5gb	15.42gb	2.5gb	23.3gb	3.0gb	3.0gb	0	3.0gb
# of Natural History Museum specimen data records available online via the NBII, to assist researchers in identifying and addressing threats to human and animal health **(BIMD PART)**	C	UNK	20 million	57.6 million	35 million	59.3 million	60 million	60 million	0	60 million
Amount of invasive species data and information available online via the NBII, to assist in modeling and forecasting the spread of invasives **(BIMD PART)**	C	750 mb	800 mb	1,137 mb	920 mb	1,441 mb	1,441 mb	1,441mb	0	1,500mb
# of NBII Clearinghouse metadata records **(BIMD PART)**	C	UNK	UNK	UNK	UNK	29,170	41,000	41,500	+500	43,000
Average cost per gigabyte of data available through servers under Program control **(BIMD PART Eff Measure)**	A	$66,000	$63,000	$17,155	$55,000	$3,794.4	$3,794	$3,794	0	$3,794
Average cost per analytical result, adjusted for inflation, is stable or declining over a 5-year period **(WRD PART Eff. Measure)**	A	$8.64	$8.63	$8.34	$8.64	$8.08	$8.64	$9.15	+0.51	$9.15
# real-time streamgages reporting in NWIS-Web **(WRD PART)**	A	5,978	6,246	6,496	6,195	6,728	6,830	6,880	+50	6,125

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
# real-time ground-water sites reporting in NWIS-Web **(WRD)**	A	799	796	917	685	983	984	987	+3	900
# real-time water-quality sites reporting in NWIS-Web **(WRD)**	A	1,062	1,125	1,102	887	1,249	1,249	1,249	0	1,141
X% of WRD streamflow stations with 30 or more years of record **(WRD PART)**	C	60% baseline	58% (3622/ 6246)	59%	63% (3902/ 6195)	59% (3970/ 6728)	58% (2970/ 6830)	62% (4620/ 6880)	+4%	65% (3976/ 6125)
X% of daily streamflow measurement sites with data that are converted from provisional to final status within 4 months of day of collection **(WRD PART Eff)**	C	0% baseline	10%	20%	25%	24%	29%	33%	+4%	45%
LDCM: X% of ground system designed, built, and tested **(Geography)**	C	UNK	UNK	8% (reflects planning stage only)	44% (reflects planning stage only)	44% (reflects planning stage only)	Replace with EVM-based measure below			
LDCM: Cost variance and Scheduled variance for the LDCM project remain with +/-10% tolerance **(Geography)**	C	UNK	UNK	UNK	UNK	UNK	+8%/0% CV/SV	+10%/0%	+2%/0%	TBD
# of hours for fieldwork, compilation, and publication of a typical geologic map **(NCGM PART Eff. Measure)**	A	3,160	3,070	2,980	2,890	2,890	2,810	2,810	0	2,700
# of State Geological Surveys that add geologic map information to the NGMDB **(NCGM PART)**	C	47	48	49	50	50	51	0	-51	Measure will end in 2008
# of EDMAP students trained each year **(NCGM PART)**	A	60	62	66	60	58	60	60	0	60
# of conceptual or numerical models developed **(Puget Sound GD)**	F	2	0	0	0	0	1	1	0	1
# of digital geographic information products for priority National Park Service units that provide environmental characterization based on airborne remote sensing **(C&M PART)**	C	3	10	8	9	10	10	10	0	10

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
Fraction of significant landfalling hurricanes (coterminous US) for which post-storm assessments of impact are developed **(C&M PART)**	A	4/5	3/3	>=3/4	>=3/4	0/1	>=3/4	>=3/4	0	>=3/4
% of open Ocean and Great-Lakes shoreline of coterminous US for which up-to-date characterization of the shoreline is provided **(C&M PART)**	C	62%	62%	80%	90%	80%	90%	90%	0	90%
Cost of collection and processing of airborne remote sensing data for coastal characterization and impact assessments **(C&M PART Eff Measure)**	A	.58	.56	.55	.47	.57	.35	.35	0	.35
# of environmental products in marine protected and managed areas provided for resource management and restoration planning **(C&M PART)**	C	40	54	63	72	76	75	81	+6	87

End Outcome Goal 2.4 Resource Use: Improve the understanding of Energy and Mineral Resources to Promote Responsible Use and Sustain the Nation's Dynamic Economy.

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
End Outcome Measures										
% of targeted science products that are used by partners and customers for land or resource management decision making **(SP)**	A	80%	86.5%	87.5%	≥80%	99%	≥90%	≥90%	0	≥90%
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure availability of energy and mineral resource information and systematic analyses needed by land and resource mangers for informed decision making**										
# of targeted basins/areas with energy resource assessments available to support management decisions **(SP) (ERP PART)**	A	5	7	6	5	5	5	5	0	2

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
% of targeted non-fuel mineral commodities for which up-to-date deposit models are available to support decision making **(MRP) (SP)**	C	0%	0%	0%	Baseline	0%	7%	7%	0	67%
Baseline Information: Average square miles of the United States with non-energy mineral information available to support management decisions **(MRP PART)**	C	2,401,329	3,097,647	3,318,208	3,346,737	3,346,000	3,346,000	3,346,000	0	3,346,000
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure the quality and relevance of science information and data to support decision making**										
% of studies validated through appropriate peer review or independent review **(SP)**	A	100% (10/10)	100% (10/10)	100% (11/11)	100% (11/11)	100% (11/11)	100% (8/8)	100% (6/6)	0	100% (7/7)
% satisfaction with scientific and technical products and assistance for natural resource decision making **(SP)**	A	88.5%	97.5%	97.5%	≥80%	97%	≥80%	≥80%	0	≥80%
PART Efficiency and Other Output Measures										
# of annual gigabytes collected **(ERP)**	A	.745	97.793	158.048	20.038	37.409	20.038	20.038	0	20.038
# of cumulative gigabytes managed **(ERP)**	C	211.458	351.289	509.338	524.826	546.747	544.864	564.902	+20.038	625.016
# of cumulative gigabytes managed **(MRP)**	C	15.420	16.131	16.221	16.3	16.3	16.3	16.3	0	16.3
# of systematic analyses & investigations delivered to customers (assessments) **(Total)**	A	10	10	11	11	11	8	6	-2	7
# of formal workshops or training provided to customers (instances/issues/events) **(Total)**	A	16	16	15	15	15	14	10	-4	10
X% of targeted analyses/investigations delivered which are cited by identified partners within 3 years of delivery **(ERP PART)**	A	80%	86%	82%	≥80%	82%	≥80%	≥80%	0	≥80%

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
Average cost of a systematic analysis or investigation **(ERP PART Eff. Measure)**	A	$2.2M	$2.73M	$1.98M	$2.75M	$1.3M	$2.75M	$2.75M	0	$2.75M
# of mineral commodity reports available for decisions **(BUR)**	A	733	746	690	720	717	700	650	-50	600
X% of expected responses for which canvass forms have been converted to electronic format **(MRP) (BUR)**	C	58%	81%	88%	100%	100%	100%	100%	0	100%
X% of targeted analyses delivered which are cited by identified partners within 3 years after analysis delivered **(MRP PART)**	A	80%	87%	93%	≥80%	93%	≥80%	≥80%	0	≥80%
Average cost of a systematic analysis or investigation **(MRP PART Eff. Measure)**	A	$4.31M	$4.18M	$4.3M	$3.8M	$3.7M	$4.9M	$17M	+13.1M	$7M

End Outcome Goal 4.2 Serving Communities: Improve understanding, prediction, and monitoring of natural hazards to inform decisions by civil authorities and the public to plan for, manage, and mitigate the effects of hazard events on people and property.

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
End Outcome Measures										
% of communities/Tribes using DOI science on hazard mitigation, preparedness and avoidance for each hazard management activity **(SP)**	C	43.2% (129.7/3)	44.6% (133.7/3)	47.5% (142.5/3)	50.4% (151.3/3)	50% (148.5/3)	52.8% (158.3/3)	53% (158.9/3)	+0.2%	53.4% (160.3/3)
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Provide information to assist communities in managing risks from natural hazards**										
# of areas for which detailed hazard assessments are completed **(SP)**	C	UNK	UNK	49	51	51	53	54	+1	63

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
# of urban areas for which detailed hazard maps are completed **(PART) (EHP)**	A	2	3	3	3	3	4	4	0	6
# of metropolitan regions where Shakemap is incorporated into emergency procedures **(SP) (PART)**	C	5	5	5	5	5	5	5	0	5
% of potentially hazardous volcanoes with published hazard assessments **(SP) (PART)**	C	61.4%	62.8% (44/70)	64.3% (45/70)	65.7% (46/70)	65.7% (46/70)	67.1% (47/70)	68.6% (48/70)	+1.5% (+1)	71.4% (50/70)
Use Rate: Earthquakes: X% of communities/tribes using DOI science on hazard mitigation, preparedness and avoidance for each hazard management activity (07 Plan baseline is 885 at risk counties) **(BUR)**	C	62.7% (559/891)	63.4% (565/891)	63.9% (569/891)	62.8% (556/885) Rebaslined in FY 2007	67% (593/885)	67% (593/885)	67% (593/885)	0	67% (593/885)
Use Rate: Landslides: X% of communities/tribes using DOI science on hazard mitigation, preparedness, and avoidance for each hazard management activity **(BUR)**	C	3.7% (68/1800)	3.9% 71/1800)	4.4% (80/1800)	4.9% (89/1800)	4.9% (89/1800)	5.4% (98/1800)	6.0% (107/1800)	+0.6% (+9)	7.4% (134/1800)
Use Rate: Volcanoes: X% of communities/tribes using DOI science on hazard mitigation, preparedness, and avoidance for each hazard management activity (Baseline is 256 at risk counties) **(BUR)**	C	63.3%	66.4% (170/256)	74.2% (190/256)	83.6% (214/256)	76.6% (196/256)	85.9% (220/256)	85.9% (220/256)	0	85.9% (220/256)
Use Rate: Landslide Hazards: # of responses to inquiries from the public, educators, and public officials to the National Landslide Information Center on hazard mitigation, preparedness and avoidance strategies for landslide hazards **(BUR)**	A	1,600	5,200	1,600	1,600	1,600	1,600	1,200	-400	1,200
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure the quality and relevance of science information and data to support decision making**										

Goal Performance Table

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
% of studies validated through peer review or independent review, as appropriate **(SP)**	A	100%	100%	100%	100% (252/252)	100% (248/248)	100% (239/239)	100% (227/227)	0	100% (182/182)
% satisfaction with scientific and technical products and assistance for natural hazard planning, mitigation, and emergency response **(SP)**	A	UNK	UNK	UNK	≥80%	87%	≥80%	≥80%	0	≥80%
PART Efficiency and Other Output Measures										
# of systematic analyses & investigations delivered to customers **(Total)**	A	3	6	4	252	248	239	227	-12	182
# of real-time ANSS earthquake sensors (reported yearly and cumulative at the end of the year **(PART) (EHP)**	C	95 (cum.523)	40 (cum.563)	27 (cum.723)	40 (cum.763)	60 (cum 786)	17 (cum.803)	0 (cum. 803)	0	0 (cum 803)
% of earthquake monitoring global seismic network stations that have telemetry (increase reporting speed from one hour to 20 minutes)	A	80%	86%	89%	93%	96%	93%	93%	0	95%
# of formal workshops or training provided to customers (instances/issues/events) **(Total)**	A	14	19	15	12	14	12	13	+1	12
# of sites (mobile or fixed) monitored for ground deformation to identify volcanic activity **(VHP)**	C	85	88	94	125	159	170	180	+10	210
# of areas or locations for which geophysical models exist that are used to interpret monitoring data **(PART) (LHP)**	C	4	4 1/3	4 2/3	5	5	5 1/3	5 2/3	+1/3	6 2/3
# of volcanoes for which information supports public safety decisions **(PART) (VHP)**	C	49	+2 (cum 51)	0 (cum 51)	+1 (cum 52)	+1 (cum 52)	0 (cum 52)	0 (cum 52)	0	1 (cum 53)
X% of potentially active volcanoes monitored (x number of 70) **(PART) (VHP)**	C	67%	72.9% (51/70)	72.9% (51/70)	74.3% (52/70)	74.3% (52/70)	74.3% (52/70)	74.3% (52/70)	0	75.7% (53/70)

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
# of communities/tribes using DOI science on hazard mitigation, preparedness, and avoidance for **Earthquake** hazard management activity **(PART)** (07 Baseline is 885 at risk counties)	C	559	565	569	556	593	593	593	0	593
# of communities/tribes using DOI science on hazard mitigation, preparedness and avoidance of each **Landslide** management activity (PART) (Baseline is 1,800 counties and parks with moderate to high landslide susceptibility in the U.S. (99-03, 60 adopted measure)	C	68	71	80	89	89	98	107	+9	134
# of communities/tribes using DOI science on hazard mitigation, preparedness, and avoidance for **Volcano** hazard management activity **(PART)** (Baseline is 256 at risk counties)	C	162	170	190	214	196	220	220	0	220
X% data availability for real-time data from the GSN **(PART)**	A	90.5	89%	88%	87%	88%	86%	84%	-2%	84%
Data processing and notification costs per unit volume of input data from sensors in monitoring networks (in cost per gigabyte) **(PART Eff. Measure)**	A	0.90 $k/GB (-1%)	0.79 $k/GB	1.30 $k/GB	1.33 $k/GB	1.19 $k/GB	1.33 $k/GB	1.33 $k/GB	0	1.33 $k/GB

End Outcome Goal 5.1 Management Excellence: Increase Accountability.

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
End Outcome Measures										
Obtain unqualified audit **(SP)**	A	Unqualified Opinion	Unqualified Opinion	Unqualified Opinion	Unqualified Opinion	Unqualified Opinion	Unqualified Opinion	Unqualified Opinion	0	Unqualified Opinion

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
Establish and maintain an effective, risk-based internal control environment as defined by the Federal Manager's Financial Integrity Act (FMFIA) and revised OMB Circular A-123 **(SP)**	A	UNK	UNK	100%	100%	100%	100%	100%	0	100%
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Improved Financial Management**										
Corrective actions: Percent of material weaknesses, and material non-compliance issues that are corrected on schedule **(SP)**	A	UNK	UNK	100%	100%	100%	100%	100%	0	100%
Corrective Actions: Percent of established targets in Financial Performance Metrics met as defined in FAM No. 2003-015. **(SP)**	A	UNK	UNK	UNK	100%	100%	100%	100%	0	100%

End Outcome Goal 5.2 Management Excellence: Advance Modernization/Integration

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
End Outcome Measures										
Percent of systems and lines of business/functional areas associated with an approved blueprint that are managed consistent with that blueprint **(SP)**	F	UNK	UNK	UNK	UNK	UNK	Baseline	TBD	-	TBD
Percent of IT systems that have Certification and Accreditation (C&A) and are maintaining C&A status **(SP) (EIS&T)**	A	UNK	UNK	100%	100%	100%	100%	100%	0	100%
Intermediate Outcome Measures and Bureau and PART Outcome Measures **E-Government and Information Technology Management**										
Efficient IT Management: Score achieved on the OMB Enterprise Architecture Framework **(SP) (EIS&T)**	A	UNK	UNK	Level 3	Level 4	Level 4 – complete Level 3 – Use and Results	Level 4	Level 4	0	Level 5

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
Efficient IT Management: Stage achieved on the GAO IT Investment Management Framework **(SP) (EIS&T)**	F	UNK	UNK	63% stage 3	70% stage 3	74% stage 3	100% stage 3	100% stage 3	0	State 4 & 5 targets to be set by DOI
Efficient IT Management: Score achieved on the NIST Federal IT Security Assessment Framework **(SP) (EIS&T)**	F	UNK	UNK	3.37	3.5	3.82	4.5	4.5	0	4.5
Implement Records Management Strategy: % of all bureaus and offices developing consistent records management policy **(SP) (EIR)**	A	UNK	UNK	UNK	100%	100%	100%	100%	0	100%
IT Investment Management Annual % of USGS IT investments reviewed, approved, and monitored through the CPIC process. **(BUR) (EIS&T)**	F	UNK	UNK	100%	100%	100%	100%	100%	0	100%
% of earth science instructors in the U.S., K-16, using USGS educational materials **(BUR) (EIR)**	F	UNK	UNK	UNK	UNK	UNK	Baseline	TBD	TBD	TBD
% of customers satisfied with service from USGS IT Service Desk **(BUR) (EIS&T)**	F	UNK	UNK	94%	94%	95.9%	94%	94%	0	97%
% of identified USGS security incidents that receive corrective action within timeframes required by the DOI Incident Response Policy **(BUR) (EIS&T)**	F	25%	50%	75%	100%	95%	100%	100%	0	100%
Total USGS public web content managed by the enterprise web infrastructure **(BUR) (EIR)**	F	UNK	UNK	UNK	UNK	UNK	Baseline	TBD	TBD	TBD
Total # of internships and fellowships supported and/or facilitated by the USGS educational program **(BUR) (EIR)**	F	18	22	55	65	70	55	55	0	55
PART Efficiency and Other Output Measures										

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
# of new and legacy information products added to the USGS publications database **(BUR) (EIR)**	F	UNK	UNK	70,351	71,000	71,717	67,500	67,500	0	All legacy completed, and all new added annually.
# of online bibliographic records **(BUR) (EIR)**	F	4,196	3,872	6,381	6,381	4,992	6,381	6,381	0	80,000
Intermediate Outcome Measures and Bureau and PART Outcome Measures Human Capital Management										
Worker Competency: % of employees who have resolved competency gaps in specified occupational groups identified as critical occupations in the Department **(SP)**	A	65%	65%	77%	77%	77%	79%	79%	0	83%
Safe Workplace: % reduction in lost production days **(SP)**	C	UNK	6.4 lost production days per 100 employees	5.9 lost production days per 100 employees	6.28 lost production days per 100 employees	NA	6.21 lost production days per 100 employees	6.02 lost production days per 100 employees	0.19	5.97 lost production days per 100 employees
Safe Workplace: % reduction in the number of employees on workers compensation rolls **(SP)** (rounded to the nearest whole number)	C	UNK	UNK	81%	79%	NA	76%	73%	3%	67%
Safe Workplace: % annual reduction in the injury incidence rate **(SP)**	C	UNK	UNK	2.786 injuries per 100 employees	2.70 injuries per 100 employees	2.53 injuries per 100 employees	2.62 injuries per 100 employees	2.54 injuries per 100 employees	0.08	2.319 injuries per 100 employees
Diversity: The % of managers who have completed the 4-hour required minimum annual diversity/EEO training **(BUR)**	A	UNK	UNK	UNK	20%	39.2%	30%	60%	+30%	100%
Diversity: The # of MD-715 identified deficiencies that have been corrected **(BUR)**	A	UNK	UNK	UNK	2	3	3	5	+2	TBD
Collaboration Capacity: # of volunteer hours per year supporting DOI mission activities **(SP)**	A	UNK	UNK	UNK	200,000	138,761	200,000	200,000	0	200,000

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
Cooperative Conservation Internal Capacity: # of employees trained in collaboration and partnering competencies **(BUR)**	C	UNK	UNK	UNK	150 FTE	150 FTE	4,339 FTE	5,207 FTE	+868 FTE	7,810 FTE
Cooperative Conservation Internal Capacity: % of organizations that have trained and developed employees in collaboration and partnering competencies **(SP)**	C	UNK	UNK	UNK	Establish Baseline	41%	50%	60%	+10%	90%
Cooperative Conservation External Capacity: # of conservation projects that actively involve the use of knowledge and skills of people in the area, and local resources in priority setting, planning, and implementation processes **(SP)**	C	UNK	UNK	UNK	Establish Baseline	90	92	98	+6	104
Intermediate Outcome Measures and Bureau and PART Outcome Measures Organizational Reviews and Acquisitions										
Competition: Number of full time equivalent (FTE) in competitive sourcing studies completed during the fiscal year **(SP)**	F	0 FTE	0 FTE	70FTE	512 FTE	112 FTE	TBD (Unknown until Business Strategy Reviews complete.)	TBD (Unknown until 2008 Business Strategy Reviews complete.)	TBD	TBD (Unknown until Business Strategy Reviews complete.)
Increase Competition: Percentage of eligible service contract actions over $25,000 awarded as performance-based acquisitions **(SP)**	A	37%	48%	25%	40%	50%	50%	50%	0	50%
Intermediate Outcome Measures and Bureau and PART Outcome Measures Performance-Budget Information										
% of programs with demonstrated use of performance measures in budget justifications and decisions **(SP)**	C	UNK	UNK	UNK	100%	100%	100%	100%	0	100%
% of programs that can estimate marginal cost of changing of performance **(SP)**	C	UNK	UNK	UNK	Establish Baseline	100%	100%	100%	0	100%

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
Intermediate Outcome Measures and Bureau and PART Outcome Measures Facilities Improvement										
Overall condition of buildings and of structures (as measured by the FCI) that are mission critical and mission dependent (as measured by the API), with emphasis on improving the condition of assets with critical health and safety needs **(SP)**	A	UNK	UNK	UNK	UNK	0.124	0.115	0.133	-0.18	0.095
Percent change in the Operating Costs (operations and maintenance costs) per square foot of buildings that are "Not-Mission Dependent" as reported in the Federal Real Property Profile (FRPP) in the current fiscal year compared to the previous fiscal year. **(SP)**	A	UNK	UNK	UNK	UNK	-1.6%	-3%	-3%	0	-5%
Percent change in the total number of buildings (office, warehouse, laboratory, and housing) reported as “Under Utilized” or “Not Utilized” in the Federal Real Property Profile (FRPP) in the current fiscal year compared to the previous fiscal year **(SP)**	A	UNK	UNK	UNK	UNK	83%	-5%	-5%	0	-5%
Comment	In 2007 eleven additional warehouse buildings were identified as “Under Utilized” or “Not Utilized” resulting in the percentage change of 83% when comparing to 2006 data.									
Percent of assets targeted for disposal that were disposed **(SP)**	A	UNK	UNK	UNK	UNK	26%	100%	100%	0	100%
PART Efficiency and Other Output Measures										
# of bureau condition assessments in progress or completed (within a 5-year cycle **(Facilities)**	C	41	9	14	+10 (cum 24)	+9 (cum 23)	+9 (cum 32)	+12 (cum 44)	+12	NA (new 5-year cycle)
# of deferred maintenance and capital improvements (cumulative) **(Facilities)**	C	36	53	63	74	70	80	87	+7	98

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
New Capital Improvement Project **(Facilities)**	C	UNK	UNK	UNK	NA	NA	1	0	-1	1

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Budget at a Glance
(Dollars in Thousands)

	2007 Actual	2008 Enacted	Fixed Costs Changes	Internal Transfers a/	Travel Reduction	Program Changes	2009 Budget Request
Appropriation: Surveys, Investigations and Research							
Geographic Research, Investigations, & Remote Sensing							
Land Remote Sensing	**63,264**	**61,457**	**245**	**0**	**-156**	**1,016**	**62,562**
Establish National Land Imaging Program	NA	NA				2,000	[2,000]
Eliminate AmericaView	[1,645]	[984]				-984	[0]
Geographic Analysis and Monitoring	**16,926**	**16,266**	**171**	**-2,886**	**-42**	**-2,953**	**10,556**
Realign Global Change	[2,932]	[2,886]		-2,886			[0]
Eliminate Priority Ecosystem Science	[1,971]	[1,940]				-1,940	[0]
Reduce Geographic Research	[1,029]	[1,013]				-1,013	[0]
Total, GRIRS	**80,190**	**77,723**	**416**	**-2,886**	**-198**	**-1,937**	**73,118**
Geologic Hazards, Resources, & Processes							
Geologic Hazard Assessments	**81,890**	**85,651**	**887**	**0**	**-328**	**-5,953**	**80,257**
Eliminate Earthquake Hazards General Increase (EHP)	NA	[1,969]				-1,969	[0]
Reduce Earthquake Grants (EHP)	[13,000]	[13,000]				-3,000	[10,000]
Eliminate Volcano Hazards General Increase (VHP)	NA	[492]				-492	[0]
Eliminate Global Seismographic Network General Increase (GSN)	NA	[492]				-492	[0]
Geologic Landscape & Coastal Assessments	**78,327**	**80,614**	**827**	**-10,336**	**-277**	**4,010**	**74,838**
Realign Global Change (ESD)	[10,500]	[10,336]		-10,336			[0]
Establish Water for America - Water Census (NCGM)	NA	NA				1,500	[1,500]
Establish Ocean and Coastal Frontiers (CMG)							
Establish Extended Continental Shelf (CMG)	NA	NA				4,000	[4,000]
Improve Ocean & Coastal Resources Through Collaboration (CMG)	NA	NA				2,000	[2,000]
Enhance Funding for Ocean Action Plan (CMG)	NA	[984]				500	[1,484]
Eliminate Remaining Funding in Earth Surface Dynamics (ESD)	[3,054]	[3,006]				-3,006	[0]
Eliminate National Cooperative Geologic Mapping General Increase (NCGM)	NA	[984]				-984	[0]
Geologic Resource Assessments	**76,786**	**77,211**	**1,315**	**0**	**-196**	**-25,410**	**52,920**
Reduce Mineral Resources Assessments and Activities (MRP)	[51,636]	[50,830]	[947]		[-89]	-25,410	[26,278]
Total, GHRP	**237,003**	**243,476**	**3,029**	**-10,336**	**-801**	**-27,353**	**208,015**

Budget at a Glance (Continued)
(Dollars in Thousands)

	2007 Actual	2008 Enacted	Fixed Costs Changes	Internal Transfers a/	Travel Reduction	Program Changes	2009 Budget Request
Water Resources Investigations							
Hydrologic Monitoring, Assessments & Research	**145,147**	**151,367**	**2,401**	**-3,062**	**-691**	**-9,273**	**140,742**
Realign Global Change (HRD -2,202 & HNA -860)	[3,111]	[3,062]		-3,062			[0]
Establish Water for America - Water Census							
Initiate Ground-Water Research for Water Census (GWRP)	NA	NA				3,000	[3,000]
Improve Streamgages & Enhance Surface-Water Assessment (NSIP)	NA	NA				5,000	[5,000]
Ocean and Coastal Frontiers (HNA)							
Enhance Funding for Ocean Action Plan (HNA)	NA	[984]				500	[1,484]
Eliminate Memphis Aquifer (GWRP)	[493]	[345]				-345	[0]
Reduce Funding for National Water-Quality Assessment	[62,818]	[63,912]	[1,144]		[-298]	-10,645	[54,113]
Eliminate Priority Ecosysytems Science (TSH)	[2,292]	[2,257]				-2,257	[0]
Eliminate Amphibian Research & Monitoring & Related Activities (TSH)	[755]	[743]				-743	[0]
Eliminate Hood Canal Dissolved Oxygen Study (HRD)	[99]	[197]				-197	[0]
Eliminate San Pedro Partnership Monitoring & Reporting (HRD)	[296]	[295]				-295	[0]
Eliminate Long-Term Estuary Group (HRD)	[846]	[492]				-492	[0]
Eliminate US-Mexico Transboundary Aquifer (HRD)	NA	[492]				-492	[0]
Eliminate General Increase for Streamgages & Hazards (NSIP)	NA	[1,477]				-1,477	[0]
Reduce Lake Champlain Basin Toxic Materials (HNA)	[448]	[493]				-338	[155]
Eliminate Expanded Monitoring of Water Resources in Hawaii (HNA)	[444]	[492]				-492	[0]
Cooperative Water Program	**64,345**	**62,849**	**1,170**	**0**	**-293**	**-1,441**	**62,285**
Reduce Cooperative Water Program Funding	[64,345]	[62,849]	[1,170]		[-293]	-1,441	[62,285]
Water Resources Research Act Program	**5,404**	**6,304**	**0**	**0**	**0**	**-6,304**	**0**
Eliminate Water Resources Research Institutes	[5,404]	[6,304]				-6,304	[0]
Total, WRI	**214,896**	**220,520**	**3,571**	**-3,062**	**-984**	**-17,018**	**203,027**

Budget at a Glance (Continued)
(Dollars in Thousands)

	2007 Actual	2008 Enacted	Fixed Costs Changes	Internal Transfers a/	Travel Reduction	Program Changes	2009 Budget Request
Biological Research							
Biological Research and Monitoring	**143,342**	**141,275**	**2,016**	**-5,007**	**-517**	**7,573**	**145,340**
Realign Global Change	[5,086]	[5,007]		-5,007			[0]
Establish Birds Forever Initiative	NA	NA				1,000	[1,000]
Enhance Healthy Lands Initiative	NA	[1,477]				3,500	[4,977]
Increase Funding for Priority Ecosystems Studies	[1,369]	[1,348]				6,620	[7,968]
Provide Funds for Wildlife Research Studies	NA	NA				300	[300]
Eliminate Mammalian Ecology	[300]	[295]				-295	[0]
Reduce Contaminant/Endocrine Biology	[650]	[246]				-246	[0]
Reduce Pacific NW Forest Plan	[2,779]	[2,736]				-886	[1,850]
Reduce a Portion of Wildlfie, Terrestrial & Endangered Resources	[508]	[500]				-500	[0]
Eliminate Molecular Biology at LCS	[788]	[788]				-788	[0]
Eliminate Equipment at Anadromous Fish Research Center	NA	[148]				-148	[0]
Eliminate San Francisco Salt Pond Restoration	NA	[492]				-492	[0]
Eliminate Great Lakes Research Vessel Infrastructure	NA	[492]				-492	[0]
Biological Information Management & Delivery	**22,856**	**22,422**	**174**	**0**	**-85**	**-2,932**	**19,579**
Reduce National Biological Information Infrastructure	[6,220]	[5,631]				-2,932	[2,699]
Cooperative Research Units	**14,764**	**16,174**	**275**	**0**	**-55**	**-984**	**15,410**
Eliminate General Increase	NA	[984]				-984	[0]
Total, BR	**180,962**	**179,871**	**2,465**	**-5,007**	**-657**	**3,657**	**180,329**
Enterprise Information							
Enterprise Information Security and Technology	**26,061**	**24,514**	**-887**	**1,549**	**-145**	**0**	**25,031**
Realign Budget (DOI/WCF Funding Between EI & SS)	NA	NA		1,549			[1,549]
Enterprise Information Resources	**17,030**	**16,775**	**416**	**287**	**-50**	**0**	**17,428**
Realign Budget (DOI/WCF Funding Between EI & SS)	NA	NA		287			[287]
National Geospatial Program	**68,691**	**69,082**	**734**	**0**	**-154**	**0**	**69,662**
Total, EI	**111,782**	**110,371**	**263**	**1,836**	**-349**	**0**	**112,121**

Budget at a Glance (Continued)
(Dollars in Thousands)

	2007 Actual	2008 Enacted	Fixed Costs Changes	Internal Transfers a/	Travel Reduction	Program Changes	2009 Budget Request
Global Change							
		7,383	**373**	**21,291**	**-81**	**-2,383**	**26,583**
Realign Global Change				21,291			[21,291]
Eliminate General Increase for Global Change						-7,383	[-7,383]
Increase for Climate Change						5,000	[5,000]
Total, GC	**0**	**7,383**	**373**	**21,291**	**-81**	**-2,383**	**26,583**
Science Support							
	67,782	**67,167**	**2,099**	**-1,836**	**-230**	**0**	**67,200**
Realign Budget (DOI/WCF Funding Between EI & SS)	[1,836]	[1,836]		-1,836			[0]
Total, SS	**67,782**	**67,167**	**2,099**	**-1,836**	**-230**	**0**	**67,200**
Facilities							
Rental Payments and Operations & Maintenance			**2,741**	**92,071**	**-10**	**0**	**94,802**
Realign Facilities Subactivity Funding				92,071			[92,071]
Rental Payments	**72,428**	**72,479**	**0**	**-72,479**	**0**	**0**	**0**
Realign Facilities Subactivity Funding				-72,479			[-72,479]
Operations & Maintenance	**19,634**	**19,592**	**0**	**-19,592**	**0**	**0**	**0**
Realign Facilities Subactivity Funding				-19,592			[-19,592]
Deferred Maintenance & Capital Improvement	**3,373**	**7,898**	**0**	**0**	**0**	**-4,577**	**3,321**
Eliminate One-time Patuxent Facilities Repair Funding	NA	[4,577]				-4,577	[0]
Total, Fac	**95,435**	**99,969**	**2,741**	**0**	**-10**	**-4,577**	**98,123**
TOTAL. SIR	**988,050**	**1,006,480**	**14,957**	**0**	**-3,310**	**-49,611**	**968,516**

a/ Details of Internal Transfers are in the following table.

Details on Internal Transfers
(Dollars in Thousands)

	Global Change	DOI WCF	Facilities	Total Internal Transfers
Appropriation: Surveys, Investigations and Research				
Geographic Research, Investigations, & Remote Sensing				
Land Remote Sensing				
Geographic Analysis and Monitoring				
Realign Global Change	-2,886			-2,886
Geologic Hazards, Resources, & Processes				
Geologic Hazard Assessments				
Geologic Landscape & Coastal Assessments				
Realign Global Change (ESD)	-10,336			-10,336
Geologic Resource Assessments				
Water Resources Investigations				
Hydrologic Monitoring, Assessments & Research				
Realign Global Change	-2,202			
Realign Global Change	-860			
Total				-3,062
Cooperative Water Program				
Water Resources Research Act Program				
Biological Research				
Biological Research and Monitoring				
Realign Global Change	-5,007			-5,007
Biological Information Management & Delivery				
Cooperative Research Units				
Enterprise Information				
Enterprise Information Security and Technology				
Realign Budget (DOI/WCF Funding Between EI & SS) from SS		2,017		
Realign Budget (DOI/WCF Funding Between EI & SS) to SS		-468		
Total				1,549
Enterprise Information Resources				
Realign Budget (DOI/WCF Funding Between EI & SS) from SS		297		
Realign Budget (DOI/WCF Funding Between EI & SS) to SS		-10		
Total				287
National Geospatial Program				
Global Change				
Realign Global Change	21,291			21,291
Science Support				
Realign Budget (DOI/WCF Funding Between EI & SS) - from EI		478		
Realign Budget (DOI/WCF Funding Between EI & SS) - to EI		-2,314		
Total				-1,836
Facilities				
Rental Payments and Operations & Maintenance				
Realign Facilities Subactivity Funding			92,071	92,071
Rental Payments				
Realign Facilities Subactivity Funding			-72,479	-72,479
Operations & Maintenance				
Realign Facilities Subactivity Funding			-19,592	-19,592
Deferred Maintenance & Capital Improvement				
Total, Fac				
TOTAL. SIR	**0**	**0**	**0**	**0**

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Program Increases

Component	2009 Program Change ($000)	Page Reference
Water for America – Water Census	+9,500	F-2,H-59,I-7,I-52
Birds Forever	+1,000	F-14
Healthy Lands	+3,500	F-20
Ocean and Coastal Frontiers	+7,000	F-25
Climate Change	+5,000	F-33
National Land Imaging Program	+2,000	F-41
Priority Ecosystems Science	+6,620	F-53
Wildlife Research Studies	+300	J-6
Total	**+$34,920**	

Water for America **+$9,500,000**

Water is vital to the U.S. economy in general, and to agricultural production, energy independence, the viability of cities, and environmental quality in particular. If the Nation is to manage this vital resource well, good information and predictive tools are needed to guide decisions made by the private sector, localities, Tribes, States, and the Federal Government. A net increase of $8.2 million along with an internal redirection will provide $9.5 million to conduct a water census and upgrade the Nation's stream gage network. The internal redirection is shown as a decrease on page D-17.

National Cooperative Geologic Mapping (+$1,500,000) — In cooperation with the Water Resources Discipline, the National Cooperative Geologic Mapping Program FEDMAP and STATEMAP components will work to provide better characterization of the Nation's aquifers, including geologic description and identification of zones of high-quality and poor-quality water. STATEMAP will receive approximately half of the funding.

Ground-Water Resources Program (+$3,000,000) — To continue managing vital water resources well, good information and predictive tools are needed to guide decisions made by the private sector, localities, Tribes, States, and the Federal government. The Nation needs a Census of Water that tracks changing flow, use, and storage of water, as well as models and predictive tools that will provide information necessary to inform decisions. Under this initiative, the GWRP will —

- Perform the first nationwide assessment of water availability, water quality, and human and environmental water use by 2019 describing the change in water flows, ground-water storage, and water use in all,
- Proceed with regional-scale studies by performing statistical analyses of the history and status of storage (in aquifers and reservoirs) and flows (in rivers and aquifers) for each

of the Nation's 21 Water Resource Regions (to achieve the first cycle of a national water census by 2019, 6 regions will be studied for 3 years until the first cycle is complete — see *http://water.usgs.gov/GIS/regions.html*),

- Use statistical methods to significantly enhance the quality and timeliness of the Nation's water use information, in accordance with recommendations from the National Research Council, and
- Cooperate with State and local government in selected watersheds or aquifer systems to increase use of new technologies in water planning and management, such as regional ground-water / surface-water models that enable planners to assess the true limits of sustainability of the total water resource of a region and conjunctive (ground-water / surface-water) modeling and aquifer storage and recovery.

National Streamflow Information Program (+$5,000,000) — Environmental flows are of increasing interest and importance, including from a legal standpoint (the Endangered Species Act). Healthy ecosystems require a full range of streamflows – not just minimum flow, but also flow to establish or recondition habitats. Water quality issues have changed, largely due to the impact of the Clean Water Act. Point sources of water pollution are now well-managed, but the Nation now must tackle nonpoint sources of pollution, or water-quality degradation associated with land use and land cover. Scientists and managers alike now recognize that surface water and ground water are a single resource and need to be managed as such. And, since 1978, data collection and delivery have undergone a technical revolution.

None of these issues can be addressed without reliable, long-term data on streamflows and a solid understanding of the relationship between surface water and ground water. The USGS is uniquely positioned to provide this information and analysis through the NSIP and the GWRP, which will work together under the 2009 initiative. Under this initiative, the USGS NSIP will —

- Proceed with regional-scale studies by performing statistical analyses of the history and status of storage (in aquifers and reservoirs) and flows (in rivers and aquifers) for each of the Nation's 21 Water Resource Regions (to achieve the first cycle of a national water census by 2019, 6 regions will be studied for 3 years until the first cycle is complete — see *http://water.usgs.gov/GIS/regions.html),*
- Cooperate with State and local government in selected watersheds or aquifer systems to increase use of new technologies in water planning and management, such as regional ground-water / surface-water models that enable planners to assess the true limits of sustainability of the total water resource of a region and conjunctive (ground-water / surface-water) modeling and aquifer storage and recovery,
- Modernize the Nation's 7,000 streamgages by replacing obsolete telemetry systems that will permit continued real-time operations and provide more timely information needed for better water management during floods and droughts, and stabilize the long-term network by reestablishing critical streamgages discontinued in past decade.

Birds Forever **+$1,000,000**

The USGS proposes an increase of $1.0 million and 3 FTE to support bird monitoring through the Breeding Bird Survey. The U.S. Fish and Wildlife Service (FWS) is also requesting new funds ($8.1 million) through the Birds Forever Initiative in 2009 to address threats that have lead to rapid decline in the populations of many migratory bird species. The USGS request within the Biological Research and Monitoring (BRM) subactivity complements the FWS request by

providing new/increased research and monitoring capacity to better understand large scale drivers of migratory bird population and habitat change such as global warming, deforestation, and urban development. The USGS initiative supports activities that are critical to the FWS' (and other partners) achievement of its migratory bird trust resource goals and objectives. Program Changes associated with the Birds Forever Initiative are described in the Science on the Landscape section on page F-14.

Healthy Lands Initiative **+$3,500,000**

The 2009 USGS Healthy Lands Initiative (HLI) includes $5 million, a $3.5 million increase over the 2008 enacted level to continue and expand efforts in southwest Wyoming. The USGS will build on 2008 accomplishments, such as inventorying species and habitats, monitoring and assessing water resources, integrating energy resources and habitat data, and providing a robust data inventory and models to inform land-use decisions in the region and that cam be transferred to other Healthy Lands focus areas. Adaptive approaches to land and resource management will be initiated to ensure the long-term viability of wildlife habitat. Results from this effort will provide the information and knowledge for decisionmakers to build and implement adaptive management solutions as energy resources are developed, to ensure the long-term viability of wildlife and habitats. The partnership among USGS, BLM, FWS, and others is a long-term science-based effort to assess and enhance aquatic and terrestrial habitats at a landscape scale while facilitating responsible energy development. Tools and technologies developed in this effort will be transferable to other areas in the Nation where there are similar issues of energy development and impacts to wildlife habitat. Program Changes associated with the Healthy Lands Initiative are described in the Science on the Landscape section on page F-20.

Ocean and Coastal Frontiers Initiative **+$7,000,000**

The Ocean and Coastal Frontiers Initiative builds on work begun in response to the U.S. Ocean Action Plan (OAP) and the January, 2007 Ocean Research Priorities Plan (ORPP). It addresses Department, OAP, and national priorities as well as needs of developing regional ocean governance alliances, supports the USGS component of the broader departmental Ocean and Coastal Initiative and builds upon base-funded activities and enhances efforts supporting the near-term priorities of the ORPP initiated in the 2008 budget. Proposed activities will be substantially leveraged with external resources and expertise to provide services and products in the most efficient and cost-effective manner. Program Changes associated with this Initiative are described in the Science on the Landscape section on page F-25.

The Department's Ocean and Coastal Frontiers Initiative includes $7.0 million for the USGS and $0.9 million for FWS. The USGS is the lead bureau for the following initiative elements:

Extended Continental Shelf: Expanding the Frontiers of Scientific Information (+$4,000,000) — USGS will provide the geologic base for development of a successful claim to the U.S. Extended Continental Shelf (ECS) that will vastly increase the area of public lands for which the Department has management and regulatory responsibility.

Improving Ocean and Coastal Resources through Collaboration (+$2,000,000) — USGS will develop, in collaboration with other Federal agencies, the tools, information, and management frameworks required to address pressing national issues where they are deemed critical to regional priorities.

Program Changes

Ocean Action Plan (+$1,000,000) —The OAP effort includes $1.0 million for the USGS to continue activities initiated in 2008:

> **Coastal and Marine Geology Program (+$500,000) —** This increase will engage and enhance existing regional coastal ocean observing systems (RCOOS) and, in partnership with other federal agencies, apply USGS monitoring, mapping, and modeling capabilities to the development of science-based decision-support tools for coastal managers. Activities supported will advance the near-term priorities of the ORPP.
>
> **Hydrologic Networks and Analysis (+$500,000) —** This increase will implement the National Water Quality Monitoring Network (NWQMN) called for in the OAP and defined through the efforts of some 40 Federal, State, and local agencies, monitoring associations, or professional organizations including the USGS, EPA, and NOAA. The "National Water Quality Monitoring Network for U.S. Coastal Waters and their Tributaries" plan provided interagency pilot studies in 2007 to inventory existing monitoring assets, identify gaps between network design specifications and current data collection, refine the NWQMN's observational and data sharing requirements, and identify next steps for network implementation. The proposed increase will build upon pilot study results leading to demonstration projects designed to reveal the feasibility of the NWQMN, refine observational parameters and temporal and geographic sampling frequencies and scales, and develop data sharing, summarization, and reporting methodologies.

Climate Change Initiative **+$5,000,000**

In 2009, the USGS is sustaining $5.0 million of the $7.4 million unrequested congressional action in 2008. Work will continue to develop the framework for a comprehensive, national climate effects research and monitoring network and to adapt scientific findings of the network into several real life applications. Concurrent with this initiative, USGS proposes a budget restructure to align global change work under a single budget activity. In addition to the climate change initiative, the 2009 proposed activity will include $26.6 million in funding as part of the USGS contribution to the Climate Change Science Program (CCSP) of $31.4 million. An additional $3.7 million for the National Satellite Land Remote Sensing Data Archive in the Land Remote Sensing sub-activity in Geography and $1.1 million in the Biological Research and Monitoring activity contributes to CCSP and are not included in the proposed new activity (see page F-33).

The climate change funding will allow the initial steps in the development of a comprehensive monitoring of the Nation's Federal lands. The initiative will include two components:

> **Climate Change Science Strategy** will provide critical science, monitoring, and predictive modeling of information related to our changing climate and its effects on the landscape and the Nation's resources.
>
> **Climate Change Science Adaptation** will provide understanding of the effects of climate change on Department lands and how these projected changes are likely to interact with other important factors affecting physical and biological systems at local to regional scales; such factors include soil type, land use, and biotic interactions.

National Land Imaging **+$2,000,000**

The request for 2009 will enable the USGS to begin working with the Department to develop a National Land Imaging Program. During 2008, the USGS will initiate planning for startup of this national program by establishing the Federal Land Imaging Council and a FACA Committee. The increase in 2009 will allow the USGS, through a collaborative process, to define priorities for land imaging. Program Changes associated with this Initiative are described in the Science on the Landscape section on page F-41.

The program will:

- Establish policy and program management capabilities,
- Develop charters for a Federal Land Imaging Council and a Federal Advisory Committee focused on the future needs for moderate-resolution land imaging,
- Define the core operational capability for U.S. moderate-resolution land imaging,
- Develop a strategic plan for U.S. civil operational moderate-resolution land imaging,
- Formalize a governance model to coordinate land-imaging affairs,
- Reach agreement on interagency agreements and protocols to be used to acquire future land imaging data, and
- Initiate a comprehensive index of technical requirements and capabilities, based on a national inventory of needs and applications.

Priority Ecosystems **+$6,620,000**

In 2009, the USGS proposes an increase to support interdisciplinary studies of ecosystems, including studies of the Everglades, San Francisco Bay Delta, Chesapeake Bay, Platte River, and the Mojave Desert to evaluate land-use changes, ecosystem histories, indexes of ecosystem sensitivity to change, and vulnerability to potential stressors in order to devise restoration and adaptive management strategies for land use managers. Program Changes associated with the Priority Ecosystems are described in the Science on the Landscape section on page F-53.

Wildlife Research Studies unrequested congressional action **+$300,000**

The USGS proposes an increase of $300,000 to restore scientific capabilities related to wildlife studies that were reduced in 2008.

2009 Priority Goals and Resources by DOI Goal Increases ($34,920,000)

Resource Protection

End Outcome Goal: PEO.1.4. – Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment			
Subactivity or Program	**Project or Item**	**Program Change ($000)**	**Performance Impact**
National Cooperative Geologic Mapping Program	Water for America – Water Census	9,500	+1% of U.S. with geologic maps that are being integrated into ground-water availability status and trends to support resource management decisions
Ground-Water Resources Program			+1% of U.S. with ground-water availability status and trends info to support resource management decisions +1 systematic analyses and investigations delivered to customers

Program Changes

End Outcome Goal: PEO.1.4. – Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment			
Subactivity or Program	**Project or Item**	**Program Change ($000)**	**Performance Impact**
National Streamflow Information Program			+1% of proposed streamflow sites currently in operation that meet one or more Federal needs +50 real-time streamgages reporting in NWISWeb +2% of Nation's river basins that have streamflow stations
Biological Research and Monitoring	Birds Forever	1,000	+0.53% of North American migratory birds for which scientific information on their status and trends are available +0.06% of focal migratory bird populations for which scientific information is available to support resource management decisionmaking +4 real-time ground-water sites reporting in NWISWeb +2 systematic analyses and investigations delivered to customers in 2011 +2 formal workshops and training
Biological Research and Monitoring	Healthy Lands	3,500	+11 systematic analyses and investigations delivered to customers in 2011 +2 formal workshops and training +4 real-time ground-water sites reporting in NWISWeb
Coastal and Marine Geology Program	Ocean and Coastal Frontiers	7,000	+17 annual gigabytes collected +17 (=112) cumulative gigabytes managed +5 systematic analyses and investigations delivered to customers +4 formal workshops or training +6 environmental products in marine protected and managed areas provided for resource mgt and restoration planning
Global Change	Climate Change	5,000	+5 systematic analyses and investigations delivered to customers +2 workshops or training +9% of surface area with temporal and spatial monitoring, research, and assessment/data coverage to meet land use planning and monitoring requirements
Land Remote Sensing Program	National Land Imaging Program	2,000	+1 workshops or training
Biological Research and Monitoring Program	Priority Ecosystem Science	6,620	+11 systematic analyses and investigations delivered to customers in 2011
Biological Research and Monitoring Program	Wildlife Research Studies	300	NA

Program Decreases

Component	2009 Program Change ($000)	Page Reference
AmericaView – Educational support for remote sensing science	-984	G-10
Geographic Analysis and Monitoring	-2,953	G-25
Earthquake Hazards	-1,969	H-7
Earthquake Grants	-3,000	H-7
Volcano Hazards	-492	H-23
Global Seismographic Network	-492	H-39
Earth Surface Dynamics	-3,006	H-54
National Cooperative Geologic Mapping	-984	H-59
Mineral Resources	-25,410	H-83
Ground-Water Resources Program – Memphis Aquifer study	-345	I-8
National Water-Quality Assessment Program	-10,645	I-19
Toxic Substances Hydrology	-3,000	I-33 & 34
Hydrologic Research and Development – Hood Canal	-197	I-41
Hydrologic Research and Development – San Pedro Partnership	-295	I-41
Hydrologic Research and Development – Long-Term Estuary Assessment Group	-492	I-41
Hydrologic Research and Development – U.S.-Mexico Transboundary Aquifer	-492	I-41
National Streamflow Information Program	-1,477	I-53
Hydrologic Networks and Analysis – Lake Champlain	-338	I-62
Hydrologic Networks and Analysis – Water Monitoring in Hawaii	-492	I-62
Cooperative Water Program	-1,441	I-71
Water Resources Research Act Program	-6,304	I-81
Wildlife/Mammalian Ecology	-295	J-6
Contaminant/Endocrine Biology	-246	J-6
Pacific NW Forest Plan	-886	J-6
Wildlife, Terrestrial & Endangered	-500	J-20
Molecular Biology at LCS	-788	J-6
Equipment for the Anadromous Fish Research Center	-148	J-6
San Francisco Salt Pond Restoration	-492	J-6
Great Lakes Research Vessel Infrastructure	-492	J-6
NBII	-2,932	J-6
Cooperative Research Units	-984	J-57
Global Change	-7,383	L-2
One-time Patuxent Facilities Repair	-4,577	N-13
Travel	-3,310	A-4
Total	**-$87,841**	

Geographic Research, Investigations, and Remote Sensing

AmericaView – Educational support for remote sensing science **-$984,000**
The proposed decrease discontinues Federal funding to support State-level networks. The reduction allows USGS to utilize resources for higher priority science needs.

Geographic Analysis and Monitoring **-$2,953,000**
The 2009 budget proposes a reduction, which includes funding for Priority Ecosystem Science (PES) activities within GAM (-$1,940,000) and other geographic research (-$1,013,000). Funding for PES is included in an increase in Biological Research and Monitoring.

Geologic Hazards, Resources, and Processes

Earthquake Hazards General Program **-$1,969,000**
The reduction eliminates funds for an unrequested congressional action related to a general program increase for earthquake hazards and the multi-hazards initiative. In 2008, these funds are being used to improve delivery of USGS information to support emergency management in Southern California and to expand the initiative to include activities in high-hazard areas of the Pacific Northwest and central United States. In 2009, the core program and multi-hazards initiative will remain intact.

Earthquake Grants **-$3,000,000**
The reduction allows USGS to defer lower priority efforts while continuing to support the highest priority work with external grant-supported researchers. The proposed reduction will result in an overall decrease in the number of awards.

Volcano Hazards General Program **-$492,000**
The reduction eliminates an unrequested congressional action related to a general program increase for volcano hazards. In 2008, funding is being used to enhance the Mount Rainier mudflow warning system and develop a volcanic ash hazard assessment for the Pacific Northwest. In 2009, work on these projects will be slowed with the core program intact.

Global Seismographic Network General Program **-$492,000**
The reduction eliminates an unrequested congressional action related to a general program increase for the global seismographic network. In 2008, funding is being used to on station maintenance by refreshing of station equipment. In 2009, the core program will remain intact.

Eliminate Remaining Funding in Earth Surface Dynamics **-$3,006,000**
The request eliminates the Earth Surface Dynamics Program (ESDP). All performance metrics and 78 FTE were moved from the ESDP into the new USGS Global Change activity. The remaining 4 FTE are being moved from the ESDP to Biological Research and Monitoring to support the Priority Ecosystems.

National Cooperative Geologic Mapping General Program **-$984,000**
This request eliminates an unrequested congressional action related to a general program increase for the national cooperative mapping. The 2008 funding is being used to match funds in STATEMAP and to support landslide hazard efforts related to wild fires in southern California, reduce geologic mapping efforts in National Park Service units, and end a geologic mapping

project along the U.S.-Mexico border. In 2009, the core program will remain intact and projects initiated in 2008 will be slowed or deferred.

Mineral Resources **-$25,410,000**

The request for the Mineral Resources Program (MRP) will result in a scaled-back 2009 program. MRP will continue to publish up to 650 mineral commodity reports on a limited group of commodities for which data are most essential to other Federal agencies, industry, and the public; conduct workshops and training events, and manage MRP's digital databases, although at a reduced level. While lower priority research projects will be discontinued, high priority research efforts will continue, some at a slower pace.

Lower priority research includes environmental consequences of mined and unmined mineral deposits; mineral resource studies in support of economic development and land management in rural Alaska; rare and scarce metals required for emerging technologies; and specialized studies of materials flows and recycling of nonfuel minerals throughout the economy.

The 1995 National Mineral Resource Assessment will be delayed 2-3 years. Support for most MRP-funded geochemical, geophysical, and geographic information laboratories will be discontinued; as will the Mineral Resources External Research Program, which makes grants to States and other non-Federal entities. The reduction will also reduce by 210 the number of scientific and technical positions from ten locations across the United States (Anchorage, AK; Denver, CO; Flagstaff, AZ; Menlo Park, CA; Mounds View, MN; Reno, NV; Reston, VA; Spokane, WA; Seattle, WA; and Tucson, AZ),

Water Resources Investigations

Ground-Water Resources Program – Memphis Aquifer study **-$345,000**

The reduction eliminates congressional action related to hydrologic monitoring, geologic mapping, and modeling of the Memphis Aquifer. This project is not an Administration or USGS priority and does not address the highest priority science needs in ground-water research and monitoring. This reduction will keep the core GWRP intact while allowing the USGS to make the best use of resources.

National Water-Quality Assessment Program **-$10,645,000**

- Stop monitoring of ground-water quality to determine current conditions and trends, as well as data collection for topical studies, until data analysis and reporting on prior year work is completed.
- In Regional Study Unit Assessments of Status and Trends, stop all source-water and ground-water monitoring activities, resulting in a loss of approximately 65,000 physical and chemical measurements from more than 200 wells and about 22 large surface and ground-water supply intakes. Stop assessment of trends in ground-water quality and the quality of drinking water in domestic and public supply wells, and stop broad-scale assessments that integrate modeling with monitoring.
- Reduce monitoring and assessments associated with five national priority topics. Stop existing field studies and cancel the start of new field studies in CA, NY, NC, and SC.
- Reduce supporting research and methods development, as well as services provided by the Hydrologic Instrumentation Facility, the National Water Information System, National

Water Quality Laboratory (NWQL), and USGS support for the Advisory Committee on Water Information's National Water Quality Monitoring Council.

- Reduce technical support of USGS water-quality activities, including quality assurance oversight activities across the USGS. Eliminate Office of Water Quality reviews of WSC activities.
- Reduce the number of physical and chemical analyses produced by the NWQL by tens of thousands of analytical results. The reduced workload in the NWQL would increase costs of analysis for other USGS programs.
- Reduce scientific report production by about 20 percent and stop support for regional and national scale reporting efforts of other agencies such as the Heinz Center's State of the Nation's Ecosystems Report and various EPA reports.
- Reduce the overall USGS water resources staff by 72 FTE (hydrologists, biologists, and hydrologic technicians). Options for implementing this reduction would be targeted VSIP/VERA offerings, consolidation of current and future vacancies, and targeted reductions in force.

Toxics Substances Hydrology **-$3,000,000**

- **Priority Ecosystems Science (-$2,257,000) —** The Toxics program contributes approximately half of the funds that the Water Resources Investigations activity allocates to PES projects. These resources support water quality characterizations of aquatic ecosystems with emphasis on the effects of human stresses on the water-quality conditions of natural ecosystems. Increased funds in the Biological Research and Monitoring (BRM) subactivity will support the projects currently underway and planned—such as research on mercury methylation in the Everglades, intersex fish in the Chesapeake Bay, and water-quality effects on aquatic organisms in San Francisco Bay—which will result in 11 systematic analyses and investigations in BRM.
- **Amphibian Research and Monitoring Initiative and Other Activities (-$743,000) —** Most of this remaining decrease supports the interagency Amphibian Research and Monitoring Initiative (ARMI). These resources provide water-quality information that supports investigations into the causes of declining amphibian populations and the causes of the increasing occurrence of populations with excessive limb deformities. Evidence indicates that stress from human influences is either a direct or a contributing factor. Toxics program contributions to the ARMI have included efforts with USGS biologists and scientists from other Interior bureaus to collect hydrologic and water quality data in the habitat of various amphibian species across the Nation. The portion of the decrease not associated with ARMI will reduce Toxics program research on contamination from hard-rock mining, pesticides, and emerging contaminants.

Hydrologic Research and Development **-$1,476,000**

The reduction eliminates unrequested congressional action related to four projects that are not Administration or USGS priorities and do not address the highest priority science needs in water research and monitoring. This will keep the core program intact while allowing the USGS to make the best use of resources. The specific projects are —

- Fish mortality research at Hood Canal, WA (-$197,000),
- USGS participation in the Upper San Pedro Partnership in Arizona (-$295,000),

- Participation in lower Mississippi monitoring and research with the Long-Term Estuary Assessment Group (-$492,000), and
- Initiation of work authorized by the U.S.-Mexico Transboundary Aquifer Assessment Act (-$492,000).

National Streamflow Information Program unrequested congressional action **-$1,477,000**

This decrease eliminates funds for unrequested congressional action related to a general program increase for streamgaging operations and the Hazards Assessment and Mitigation initiative. Most of the decrease would be taken from the operational funding for streamgages in the national streamgaging network that are currently supported by USGS. These operational costs include such items as vehicle costs (acquisition, operation, and maintenance), equipment, supplies, and travel. The decrease will not result in deactivation of streamgages in the short term, but in 2008 these funds are being used to stabilize the network by support streamgages that previously received a disproportionate share of funding from partner agencies. In 2009, the higher costs will revert to partner agencies, who may not be able to continue paying a larger share of the costs indefinitely; as a result, some streamgages (an amount that cannot be quantified at this time) may need to be discontinued in 2010 or beyond. It will also result in a decrease in USGS monitoring activity and analysis of flood and debris flow hazards in Southern California.

Hydrologic Networks and Analysis **-$830,000**

The reduction will end two unrequested congressional actions related to water-quality monitoring in the Lake Champlain basin and expanded monitoring of water resources in Hawaii. These projects are not Administration or USGS priorities and do not address the highest priority science needs in water research and monitoring. This will keep the core program intact while allowing the USGS to make the best use of resources. In these particular projects, the USGS would —

- **Lake Champlain (-$338,000) —** End expanded water-quality monitoring for mercury and other toxic substances in Lake Champlain (this leaves $154,000 in the program for basic data collection in the Lake) and
- **Water monitoring in Hawaii (-$492,000) —** End expanded monitoring of water resources in Hawaii, in cooperation with the State Department of Natural Resources.

Cooperative Water Program — interpretive studies unrequested congressional action **-$1,441,000**

This decrease was originally proposed in the 2008 President's budget to offset the $1,400,000 increase proposed for the National Streamflow Information Program and other higher priority USGS programs. In 2009, the decrease would result in about 20 fewer interpretive studies of water resources issues that are conducted through the Cooperative Water Program, starting with studies that were scheduled to conclude at the end of 2008.

Since the cooperators provide about two-thirds of the funding for the program, the content of projects is determined in consultation with those cooperators, and specific focus areas are often not known until workplans and joint funding agreements are established during the fiscal year. Thus, the USGS cannot say which specific studies would be stopped in 2009. However, likely topical areas to be reduced include —

- Water quality issues such as determining the effects of land use practices on water quality,

- Water availability and use,
- Wetlands, lakes, reservoirs, and estuaries,
- Water resources issues in the coastal zone, and
- Environmental effects on human health.

Water Resources Research Act Program -$6,304,000
The proposed reduction eliminates USGS funding, which was restored through 2008 congressional action, for each of the 54 State Water Resources Research Institutes. The reduction also eliminates USGS support for research projects under the national competitive grant program authorized by section 104(g) of the Water Resources Research Act. This USGS support amounts to less than 6 percent of their total funding. Most of the Institutes have been very successful in generating funding from non-USGS sources and no longer need USGS funding to continue operating.

Biological Research

Mammalian population ecology and habitat -$295,000
The USGS proposes a $300,000 reduction in 2009 to the Wildlife: Terrestrial and Endangered Resources program in mammalian population ecology and habitat to provide resources for higher priority research activities within the USGS.

Contaminant Biology research efforts -$246,000
The USGS proposes a decrease in 2009 within the Contaminant Biology program for endocrine reproductive studies to provide resources for higher priority research activities within the USGS.

Pacific Northwest forest program -$886,000
The USGS proposes to eliminate or reduce the scope of lower priority studies of habitat requirements of select species in old-growth forest and riparian ecosystems, and reduce research support for long-term effectiveness monitoring of select management options designed to sustain biodiversity and ecosystem function.

Wildlife: Terrestrial and Endangered Species studies -$500,000
The USGS proposes to reduce funding for lower priority research activities such as those related to migratory birds, marine mammals, and wildlife species.

Molecular Biology at Leetown – unrequested congressional action -$788,000
The USGS proposes to eliminate research on molecular biology at Leetown, WV, terminating fishery genetics research projects along the Northeast and Mid-Atlantic coast, in the Great Lakes and Finger Lakes, and in northern Appalachia.

Anadromous Fish Laboratory Equipment – unrequested congressional action -$148,000
The USGS requests to eliminate funding for a one-time purchase of equipment for the lab.

San Francisco Salt Ponds Studies – unrequested congressional action -$492,000
The USGS proposes to eliminate lower priority studies that focus on managing and evaluating wetland restoration.

Great Lakes Research Vessel – unrequested congressional action -$492,000
The proposed decrease reflects funding that was used in 2008 to maintain Great Lakes deepwater fisheries surveys with large research vessels.

National Biological Information Infrastructure (NBII) -$2,932,000
In 2009, the USGS proposes a reduction of $2.9 million to the National Biological Information Infrastructure (NBII). The infrastructure would be downsized to perform only basic information dissemination functions, for data and information currently available.

Cooperative Research Units – unrequested congressional action -$984,000
The USGS received a general increase of $1.0 million in the 2008 enacted budget for the Cooperative Research Units. The USGS requests a decrease of $1.0 million in 2009 for this unrequested congressional action to maintain higher priority funding elsewhere in the USGS.

Global Change

Global Change – unrequested congressional action -$7,383,000
The USGS eliminating the unrequested congressional action and sustaining $5.0 million of work started in 2008 to develop the framework for a comprehensive, national climate effects research and monitoring network and to adapt scientific findings of the network into several real life applications.

Facilities

Patuxent Wildlife Research Center -$4,577,000
The USGS 2008 President's Budget includes $4.6 million for the Patuxent Wildlife Research Center (PWRC). The increase in 2008 was the result of a directive included in the 2006 House Appropriations Committee Report, USGS and Fish and Wildlife Service (FWS) to develop options to address the facilities and infrastructure issues at the PWRC and the Patuxent Research Refuge (PRR). In FY 2008, USGS and the FWS jointly proposed to fund, on a roughly equal basis, critical utility infrastructure replacement for their collocated facilities on the Patuxent Research Refuge, Laurel, MD. This work will be completed in 2008. Funding for continued improvements needed at the refuge is included in the FWS budget request.

Other

Travel Reduction -$3,310,000
The Department is undertaking a $20.0 million effort to reduce travel and relocation expenses across the board. The allocation of shares of this travel reduction is based on each bureau's and office's percentage of the Department's total 2007 budget object class 21 expenses. USGS's share of this reduction is $3.3 million. USGS will create a strategy to manage and control travel and relocation costs that promotes improved efficiency in allocating available travel funds to highest priority uses, locations, and functions. The bureau will review policies and business practices for managing travel and relocations to ensure that these policies and business practices emphasize travel priorities, reduce costs through improved management and efficiencies, and increase accountability for managing travel priorities and cost. Options that the bureau will consider in reducing 2009 travel expenses include:

Program Changes

- Reduce number of travelers to meetings, conferences, seminars, etc. to only essential personnel, i.e., primary decisionmaker, presenter, representative.
- Increase use of teleconferences, video-conferencing technologies, on-line meeting capabilities, etc. in lieu of traveling to events.
- Combine meetings, conferences, seminars, and other events to reduce the number of individual travel events.
- Increase use of on-line booking and travel management services.

The individual program reductions are included in the 2009 program changes category of the introductory table of each activity and subactivity and are identified in a footnote to that table.

2009 Priority Goals and Resources by DOI Goal
Decreases ($87,841,000)

Resource Protection

End Outcome Goal: PEO.1.4. – Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment			
Subactivity or Program	**Project or Item**	**Program Change ($000)**	**Performance Impact**
Land Remote Sensing Program	America View	-984	NA
Geographic Analysis and Monitoring	Geographic Analysis and Monitoring	-2,953	NA
Earth Surface Dynamics Program	Earth Surface Dynamics	-3,006	NA
National Cooperative Geologic Mapping Program	National Cooperative Geologic Mapping	-984	NA
Ground-Water Resources Program	Memphis Aquifer study	-345	NA
National Water-Quality Assessment Program	Water-quality assessment activities	-10,645	-61 systematic analyses and investigations delivered to customers +$0.51 Average cost per analytical result [at National Water Quality Lab]
Toxic Substances Hydrology	Priority Ecosystems Science and Amphibian Research and Monitoring Initiative	-3,000	-14 systematic analyses and investigations delivered to customers
Hydrologic Research and Development	Hood Canal fish mortality research	-197	NA
Hydrologic Research and Development	San Pedro Partnership	-295	-1 systematic analyses and investigations delivered to customers
Hydrologic Research and Development	Long-Term Estuary Assessment Group	-492	NA
Hydrologic Research and Development	U.S.-Mexico Transboundary Aquifer Study	-492	NA
National Streamflow Information Program	National stream-gaging network and Hazard Assessment and Mitigation Initiative	-1,477	NA
Hydrologic Network and Analysis	Lake Champlain	-338	-1 systematic analyses and investigations delivered to customers
Hydrologic Network and Analysis	Water monitoring in Hawaii	-492	NA
Cooperative Water Program	Interpretive studies	-1,441	-20 Systematic analyses and investigations delivered to customers
Water Resource Research Act Program	Grants to State Water Resources Research Institutes	-6,304	NA
Biological Research and Monitoring Program	Wildlife/Mammalian Ecology	-295	-1 systematic analyses and investigations delivered to customers
Biological Research and Monitoring Program	Contaminant/ Endocrine Biology	-246	-3 systematic analyses and investigations delivered to customers
Biological Research and Monitoring Program	Pacific NW Forest Plan	-886	-5 systematic analyses and investigations delivered to customers

Program Changes

End Outcome Goal: PEO.1.4. – Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment			
Subactivity or Program	**Project or Item**	**Program Change ($000)**	**Performance Impact**
Biological Research and Monitoring Program	Wildlife, Terrestrial & Endangered	-500	-2 systematic analyses and investigations delivered to customers
Biological Research and Monitoring Program	Molecular Biology at LSC	-788	-4 systematic analyses and investigations delivered to customers
Biological Research and Monitoring Program	Equipment for the Anadromous Fish Research Center	-148	NA
Biological Research and Monitoring Program	San Francisco Salt Pond Restoration	-492	-2 systematic analyses and investigations delivered to customers
Biological Research and Monitoring Program	Great Lakes Research Vessel Infrastructure	-492	NA
Biological Information Management and Delivery	NBII	-2,932	-11 formal workshops and training -5% of North American migratory birds for which scientific information on their status (species distribution and number) and trends are available in a standardized and exchangeable format, to improve conservation plans of federal and state agencies -0.5% of North American amphibians and reptiles for which scientific information on their status (species distribution) are available in a standardized and exchangeable format, to improve conservation plans of federal and state agencies -1% of North American mammals for which scientific information on their status (species distribution) are available in a standardized and exchangeable format, to improve conservation plans of federal and state agencies -0.5% of U.S. federally-listed threatened and endangered or indicator fish species for which scientific information on a species status is available in a standardized and exchangeable format to improve conservation plans of federal and state agencies
Cooperative Research Units	Cooperative Research Units	-984	-10 systematic analyses and investigations -3 formal workshops and training provided to customers
Global Change	Global Change	-7,383	-7 systematic analyses and investigations -3 workshops and training provided to customers
All Programs	Travel	-2,711	NA

Resource Use

End Outcome Goal: PEO.2.4. – Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment			
Subactivity or Program	**Project or Item**	**Program Change ($000)**	**Performance Impact**
Mineral Resources Program	Mineral Resources	-25,410	-3 systematic analyses & investigations delivered to customers -4 formal workshops or training provided to customers -50 mineral commodity reports available for decisions -20% of nonfuel mineral commodities for which up-to-date deposit models are available to support decision making
All Programs	Travel	-226	NA

Serving Communities

End Outcome Goal: SEO4.2. – Improve the understanding, prediction, and monitoring of natural hazards to inform decisions by civil authorities and the public to plan for, manage, and mitigate the effects of hazard events on people and property			
Subactivity or Program	**Project or Item**	**Program Change ($000)**	**Performance Impact**
Earthquake Hazards Program	Earthquake Grants	-3,000	-20 systematic analyses/ investigations delivered to customers
Earthquake Hazards Program	Earthquake Hazards	-1,969	NA
Volcano Hazards Program	Volcano Hazards	-492	NA
Global Seismographic Network Program	Global Seismographic Network	-492	NA
All Programs	Travel	-373	NA

Management Excellence

End Outcome Goal: 5.2. – Management Excellence: Advance Modernization/Integration			
Subactivity or Program	**Project or Item**	**Program Change ($000)**	**Performance Impact**
Facilities	One-time Patuxent Facilities Repair	-4,577	-1 New Capital Improvements Plan

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Analysis by Activity

(Dollars in Thousands)

Activity	2008 Enacted		Fixed Costs b/ (+/-)		Related Changes c/ (+/-)		Program Changes d/ (+/-)		2009 Budget Request		Inc.(+) Dec.(-) from 2008	
	FTE a/	Amount	*FTE*	Amount	*FTE*	Amount	*FTE*	Amount	*FTE a/*	Amount	*FTE*	Amount
Geographic Research, Investigations, & Remote Sensing	*224*	77,723	*0*	416	*-25*	-2,886	*-24*	-2,135	*175*	73,118	*-49*	-4,605
Geologic Hazards., Resources, and Processes	*1,316*	243,476	*0*	3,029	*-78*	-10,336	*-204*	-28,154	*1,034*	208,015	*-282*	-35,461
Water Resources Investigations	*1,729*	220,520	*0*	3,571	*-48*	-3,062	*-72*	-18,002	*1,609*	203,027	*-120*	-17,493
Biological Research	*1,242*	179,871	*0*	2,465	*-13*	-5,007	*9*	3,000	*1,238*	180,329	*-4*	458
Enterprise Information	*465*	110,371	*0*	263	*0*	1,836	*0*	-349	*465*	112,121	*0*	1,750
Global Change	*29*	7,383	*0*	373	*164*	21,291	*-9*	-2,464	*184*	26,583	*155*	19,200
Science Support	*405*	67,167	*0*	2,099	*0*	-1,836	*0*	-230	*405*	67,200	*0*	33
Facilities	*52*	99,969	*0*	2,741	*0*	0	*0*	-4,587	*52*	98,123	*0*	-1,846
Total, SIR Appropriation	***5,462***	**1,006,480**	***0***	**14,957**	***0***	**0**	***-300***	**-52,921**	***5,162***	**968,516**	***-300***	**-37,964**

a/ The FTE's depicted in the 2008 and 2009 columns are only the staff-years associated with appropriated funding. Reimbursable FTE's are 2,694 and 2,694 and Working Capital Fund FTE's are 152 and 152 for 2008 and 2009 respectively. USGS total FTE's for 2008 and 2009 are 8,308 and 8,008 respectively. FTE may not add to totals and subtotals, due to rounding. After the development of the account level FTEs for the 2009 in the President's Budget Appendix, further refinements to the estimates were made. As a result, the 2009 direct FTE levels in this presentation do not match and are lower than those direct FTE levels presented in the Budget Appendix.

b/ Fixed cost changes for this account total $18,155, of which $14,957 is budgeted and $3,198 is absorbed.

c/ Includes technical adjustments (-$2,886 from Geographic Research, Investigations, & Remote Sensing; -$10,336 from Geologic Hazards, Resources, & Processes; -$3,062 from Water Resources Investigations; and -$5,007 from Biological Research), which is proposed as part of a budget restructure that moves funding (+$21,291) for global change activities into a new integrated budget activity titled Global Change. Also, includes a net -$1,836 technical adjustment from the Science Support budget activity to the Enterprise Information budget activity to realign costs in the Department's Working Capital Fund Centralized Bill to the correct activity.

d/ Changes for this activity include a reduction of -$3,310 for travel. The impact of this change is described in the General Statement that begins on page A-1.

United States Geological Survey

Federal Funds

General and special funds:

SURVEYS, INVESTIGATIONS, AND RESEARCH

For expenses necessary for the United States Geological Survey to perform surveys, investigations, and research covering topography, geology, hydrology, biology, and the mineral and water resources of the United States, its territories and possessions, and other areas as authorized by 43 U.S.C. 31, 1332, and 1340; classify lands as to their mineral and water resources; give engineering supervision to power permittees and Federal Energy Regulatory Commission licensees; administer the minerals exploration program (30 U.S.C. 641); conduct inquiries into the economic conditions affecting mining and materials processing industries (30 U.S.C. 3, 21a, and 1603; 50 U.S.C. 98g(1)) and related purposes as authorized by law; and to publish and disseminate data relative to the foregoing activities; **[**$1,022,430,000, to remain available until September 30, 2009**]***$968,516,000*, of which **[**$63,845,000**]***$62,285,000* shall be available only for cooperation with States or municipalities for water resources investigations; of which **[**$40,150,000**]***$8,000,000* shall remain available until expended for satellite operations; **[**and **]**of which **[**$8,023,000**]***$20,989,000 shall be available until September 30, 2010, for operation and maintenance of facilities and deferred maintenance; of which $2,000,000* shall be available until expended for deferred maintenance and capital improvement projects *that exceed $100,000 in cost; and of which $180,329,000 shall be available until September 30, 2010, for the biological research activity and the operation of the Cooperative Research Units*: *Provided*, That none of the funds provided for the biological research activity shall be used to conduct new surveys on private property, unless specifically authorized in writing by the property owner: *Provided further*, That no part of this appropriation shall be used to pay more than one-half the cost of topographic mapping or water resources data collection and investigations carried on in cooperation with States and municipalities. *(Department of the Interior, Environment, and Related Agencies Appropriations Act, 2008.)*

Justification of Proposed Language Change

The language changes in the 2009 President's Budget request return of the funding availability of appropriations in the Surveys, Investigations, and Research (SIR) language of USGS from the FY 2008 Congressionally-enacted two year availability to the FY 2007 construct of annual, multi- and no-year timeframes. As part of the 2008 Enacted budget, the SIR language had been changed to appropriate most of USGS funding as two-year availability with funding for satellite operations and deferred maintenance and capital improvement designated as no-year funding. The proposed language changes would make the SIR predominately one-year funding. However, two-year funding would be proposed for the biological research activity and the portion of the facilities activity associated with operation and maintenance. No-year funding would be proposed for some of the satellite operations funding and a portion of facilities' deferred maintenance and capital improvement projects.

Appropriation Language and Citations

1. For expenses necessary for the United States Geological Survey to perform surveys, investigations, and research covering topography, geology, hydrology, biology, and the mineral and water resources of the United States,

   - **43 U.S.C. 31(a)** provides for establishment of the Office of the Director of the Geological Survey, under the Interior Department, and that this officer shall have direction of the Geological Survey, and the classification of the public lands and examination of the geological structure, mineral resources, and products of the national domain.

2. its territories and possessions, and other areas as authorized by law.

   - **43 U.S.C 31(b)** provides that, "The authority of the Secretary of the Interior, exercised through the Geological Survey of the Department of the Interior, to examine the geological structure, mineral resources, and products of the national domain, is expanded to authorize such examinations outside the national domain where determined by the Secretary to be in the national interest."

   - **43 U.S.C. 1332(a)** provides that, "It is the declared policy of the United States, that the subsoil and seabed of the Outer Continental Shelf appertain to the United States and are subject to its jurisdiction, control, and power of disposition as provided in this subchapter."

   - **43 U.S.C. 1340** provides that, "Any agency of the United States and any person authorized by the Secretary may conduct geological and geophysical exploration in the Outer Continental Shelf. ..."

3. classify lands as to their mineral and water resources;

   - **43 U.S.C. 31(a)** provides that, "The Director of the Geological Survey, ... shall have the direction of the Geological Survey, and the classification of public lands and examination of the geological structure, mineral resources, and products in the National domain. ..."

4. give engineering supervision to power permittees

   - **43 U.S.C. 959** provides that, "The Secretary of the Interior is authorized and empowered, ... to permit the use of right of way through the public lands, forest, and other reservations of the United States ... for electrical plants, poles, and lines for the generation and distribution of electrical power, ...**Provided**, that such permits shall be allowed within or through any of said parks or any forest, military, Indian, or other reservation only upon approval of the Chief Officer of the Department under whose supervision such park or reservation falls and upon a finding by him that the same is not incompatible with the public interest ..."

   - **43 U.S.C. 961** provides that, "The head of the department having jurisdiction over the lands be, and he is, authorized and empowered, ... to grant an easement for right of way, ... over, across and upon the public lands and reservations of the United States for

electrical poles and lines for the transmission and distribution of electrical power ... upon a finding by him that the same is not incompatible with the public interest ..."

5. and Federal Energy Regulatory Commission licensees;

   - **16 U.S.C. 797(c)** states that, "To cooperate with the executive departments and other agencies of States or National Governments in such investigations; and for such purposes the several departments and agencies of the National Government are authorized and directed upon the request of the commission, to furnish such records, papers and information in their possession as may be requested by the commission, and temporarily to detail to the commission such officers or experts as may be necessary in such investigations."

6. administer the minerals exploration program;

   - **30 U.S.C. 641** provides that, "The Secretary of the Interior is hereby authorized and directed, in order to provide for discovery of additional domestic mineral reserves, to establish and maintain a program for exploration by private industry within the United States, its territories and possessions for such minerals, excluding organic fuels, as he shall from time to time designate, and to provide Federal financial assistance on a participating basis for that purpose."

7. publish and disseminate data relative to the foregoing activities;

   - **43 U.S.C. 41** provides for the publication of geological and economic maps, illustrating the resources and classification of the lands, and reports upon general and economic geology and paleontology. This section also provides for the scientific exchange and sale of such published material.

   - **44 U.S.C. 1318** provides for publication, by the Geological Survey, of various reports, including a report of mineral resources of the United States, bulletins and professional papers, and monographs. This section also specifies, in some instances, numbers of copies to be printed and the distribution thereof.

   - **44 U.S.C. 1320** provides for the distribution by the Director of the Geological Survey of copies of sale publications to public libraries.

8. and to conduct inquiries into the economic conditions affecting mining and materials processing industries...and related purposes as authorized by law and to publish and disseminate data;

   - **30 U.S.C. 3** provides for inquiry into the economic conditions affecting the mining, quarrying, metallurgical, and other minerals industries. This section also provides for the dissemination of information concerning these industries.

   - **30 U.S.C. 21(a)** provides for an annual report on the state of the domestic mining minerals, and mineral reclamation industries, including a statement of the trend in utilization and depletion of resources.

- **30 U.S.C. 1603** provides for ...improved collection, analysis, and dissemination of scientific, technical and economic materials information and data from Federal, state, and local governments, and other sources as appropriate.

- **50 U.S.C. 98g(1)** provides for scientific, technologic, and economic investigations concerning the development, mining, preparation, treatment, and utilization of ore and other mineral substances.

9. of which ( ) shall be available only for cooperation with States or municipalities for water resources investigations;

- **43 U.S.C. 48** provides that, "...amounts received by the Geological Survey from any State, Territory or political subdivision thereof in carrying on work involving cooperation to be used in reimbursing the appropriation from which the expense of such work was paid, was from the act making appropriations for the Department of the Interior for the fiscal year ending June 30, 1928, and for other purposes, act January 12, 1927, ch. 277, 1, 44 Stat. 963, and has not been repeated in subsequent appropriation acts."

- Similar provisions were contained in the following act: 1926 - May 10, 1926, ch. 277, 1, 44 Stat. 487.

10. of which ( ) shall remain available until expended for satellite operations;

- **P.L. 107–43, Department of the Interior and Related Agencies Appropriation Act, 2002**

11. of which ( ) shall be available until September 30, ( ), for the operation and maintenance of facilities and deferred maintenance;

- **P.L. 106–291, Department of the Interior and Related Agencies Appropriations Act, 2001**

12. of which $1,600,000 shall be available until expended for deferred maintenance and capital improvement projects that exceed $100,000 in cost;

- **P.L. 108–447, Consolidated Appropriations Act, 2005 (Interior and Related Agencies portion)**

13. and of which ( ) shall be available until September 30, ( ), for the biological research activity and the operation of the Cooperative Research Units;

- **P.L. 104–208, Omnibus Appropriations Act, 1997 (Interior and Related Agencies portion)**

14. *Provided*, That none of these funds provided for the biological research activity shall be used to conduct new surveys on private property, unless specifically authorized in writing by the property owner:

- **P.L. 104–208, Omnibus Appropriations Act. 1997 (Interior and Related Agencies portion)**

15. Provided further, That no part of this appropriation shall be used to pay more than one-half the cost of topographic mapping or water resources data collections and investigations carried on in cooperation with States and municipalities.

    - **43 U.S.C. 50** provides that, "The share of the Geological Survey in any topographic mapping or water resources investigations carried on in cooperation with any State or municipality shall not exceed 50 per centum of the cost thereof. ..."

Permanent authority:

16. Provided further, that in fiscal year 1984 and thereafter, all receipts from the sale of maps sold or stored by the Geological Survey shall be available for map printing and distribution to supplement funds otherwise available, to remain available until expended.

    - **43 U.S.C. 42a** Provided further, That in fiscal year 1986 and thereafter, all amortization fees resulting from the Geological Survey providing telecommunications services shall be deposited in a special fund to be established on the books of the Treasury and be immediately available for payment of replacement or expansion of telecommunications services, to remain available until expended.

    - **43 U.S.C. 50a** with the establishment of the Working Capital Fund (WCF) in FY 1991, the Telecommunications Amortization Fund account and its end of year FY 1990 balances were included in the WCF.

17. Provided further, that, heretofore and hereafter, in carrying out work involving cooperation with any State, Territory, possession, or political subdivision thereof, the Geological Survey may, notwithstanding any other provisions of law, record obligations against accounts receivable from any such entities and shall credit amounts received from such entities to this appropriation.

    - **43 U.S.C. 50b**

18. Provided further, That in Fiscal Year 1987 and thereafter the Geological Survey is authorized to accept lands, buildings, equipment, and other contributions from public and private sources and to prosecute projects in cooperation with other agencies, Federal, State, or private.

    - **43 U.S.C. 36c** This authority for contributions was in the appropriation language annually from FY 1983 through FY 1986 and was made permanent in FY 1987.

19. Provided, That upon enactment of this Act and hereafter, final costs related to the National Petroleum Reserve in Alaska may be paid from available prior year balances in this account.

    - **P.L. 100–446, Department of the Interior and Related Agencies Appropriations Act, 1989**

20. Established a Working Capital Fund which is detailed in the Working Capital Fund section of this book.

    - **P.L. 101–512, Department of the Interior and Related Agencies Appropriations Act, 1991**

21. Provided further, That beginning October 1, 1990, and thereafter, funds received from any State, territory, possession, country, international organization, or political subdivision thereof, for topographic, geologic, or water resources mapping or investigations involving cooperation with such an entity shall be considered as intragovernmental funds as defined in the publication titled "A Glossary of Terms Used in the Federal Budget Process."

    - **P.L. 101–512, Department of the Interior and Related Agencies Appropriations Act, 1991**

    This authority exempts non-Federal cooperative funds from sequester as defined in 1985 amendments (P.L. 99–177) to the Budget Impoundment and Control Act of 1974.

22. Provided further, That beginning in fiscal year 1998 and once every five years thereafter, the National Academy of Sciences shall review and report on the biological research activity of the Survey:

    - **P.L. 104–208, Omnibus Appropriations Act, 1997 (Interior and Related Agencies portion)**

Administrative Provisions

From within the amount appropriated for activities of the United States Geological Survey such sums as are necessary shall be available for reimbursement to the General Services Administration for security guard services; contracting for the furnishing of topographic maps and for the making of geophysical or other specialized surveys when it is administratively determined that such procedures are in the public interest; construction and maintenance of necessary buildings and appurtenant facilities; acquisition of lands for gauging stations and observation wells; expenses of the United States National Committee on Geology; and payment of compensation and expenses of persons on the rolls of the Survey duly appointed to represent the United States in the negotiation and administration of interstate compacts: *Provided*, That activities funded by appropriations herein made may be accomplished through the use of contracts, grants, or cooperative agreements as defined in 31 U.S.C. 6302 et seq.: *Provided further*, That the United States Geological Survey may enter into contracts or cooperative agreements directly with individuals or indirectly with institutions or nonprofit organizations, without regard to 41 U.S.C. 5, for the temporary or intermittent services of students or recent graduates, who shall be considered employees for the purpose of chapters 57 and 81 of title 5, United States Code, relating to compensation for travel and work injuries, and chapter 171 of title 28, United States Code, relating to tort claims, but shall not be considered to be Federal employees for any other purposes. *(Department of the Interior, Environment, and Related Agencies Appropriations Act, 2008.)*

Justification of Proposed Administrative Provisions Language Change

The USGS does not propose any administrative provisions language changes to the 2009 President's Budget request.

Administrative Provisions Language and Citations

1. From within the amount appropriated for activities of the United States Geological Survey such sums as are necessary shall be available for reimbursement to the General Services Administration for security guard services; contracting for the furnishing of topographic maps and for the making of geophysical or other specialized surveys when it is administratively determined that such procedures are in the public interest;

   - **No specific authority**. These provisions are required by reason of rulings of the Comptroller General that specific authority is required for reimbursing the General Services Administration for guard services (B–87255); and for contracting with private persons for the performance of duties with which the agency is specifically charged (15 Comp. Gen. 951).

2. construction and maintenance of necessary buildings and appurtenant facilities;

   - **No specific authority.** The Organic Act of 1879, establishing the Geological Survey and providing for "... examination of the geological structure, mineral resources, and products of the national domain" (43 U.S.C. 31) is general authorization for construction of special-purpose laboratory buildings. Specific authorization by the Congressional committees on public works is not needed because of the highly specialized purposes of the building. 40 U.S.C. 612: "The term 'public building' means any building ... which is generally suitable for office or storage space ... but shall not include any such buildings and construction projects: ... (E) on or used in connection with ... or for nuclear production, research, or development projects." 41 U.S.C. 12: "No contract shall be entered into for the erection, repair, or furnishing of any public building ... which shall bind the government to pay a larger sum of money than the amount in the Treasury appropriated for the specific purpose."

3. acquisition of lands for gauging stations and observation wells;

   - **43 U.S.C. 36(b)** provides that, "The Secretary of the Interior may, on behalf of the United States and for the use by the Geological Survey in gaging streams and underground water resources, acquire lands by donation or when funds have been appropriated by Congress by purchase or condemnation ...."

4. expenses of the U.S. National Committee on Geology;

   - **43 U.S.C. 31** participation in and payment of expenses of the U.S. National Committee on Geology is a proper and necessary function of the Geological Survey, and so is authorized by the Survey's Organic Act of March 3, 1879, 43 U.S.C. 31. This Act provides that, "...The Director of the Geological Survey, which office is established, under the Interior Department, shall be appointed by the President by and with the advice and consent of the Senate. This officer shall have the direction of the Geological Survey, and the classification of the public lands and examination of the geological structure, mineral resources, and products of the national domain ...."

5. and payment of compensation and expenses of persons on the rolls of the Survey duly appointed to represent the United States in the negotiation and administration of interstate compacts:

   - **66 Stat. 453.** The above language first appeared in the Appropriation Act for FY 1953, P.L. 82–470 (66 Stat. 453), and has been repeated in each Act since that date. Article I, Section 10, paragraph 3, of the United States Constitution provides that, No State shall, without the consent of Congress, lay any duty on tonnage, keep troops, or ships of war in time of peace, enter into any agreement or compact with another State, or with a foreign power, or engage in war, unless actually invaded, or in such imminent danger as will not admit or delay." (emphasis supplied)

   Thus each interstate compact must be approved by the Congress and signed by the President. The Public Law approving each interstate compact represents the authorizing legislation.

6. *Provided*, That activities funded by appropriations herein may be accomplished through the use of contracts, grants, or cooperative agreements as defined in 31 U.S.C. 6302, et seq.

   - The above language appears in the Department of the Interior and Related Agencies Appropriations Act, 1988, as included in Public Law 100–202.

7. *Provided further,* That the United States Geological Survey may enter into contracts or cooperative agreements directly with individuals or indirectly with institutions or nonprofit organizations, without regard to 41 U.S.C. 5, for the temporary or intermittent services of students or recent graduates, who shall be considered employees for the purpose of chapters 57 and 81 of title 5, United States Code, relating to compensation for travel and work injuries, and chapter 171 of title 28, United States Code, relating to tort claims, but shall not be considered to be Federal employees for any other purposes.

   - The above language appears in the Consolidated Appropriations Act, 2005 (Interior and Related Agencies portion), as included in Public Law 108–447.

Permanent Authority:

1. *Provided*, That appropriations herein and hereafter made shall be available for paying costs incidental to the utilization of services contributed by individuals who serve without compensation as volunteers in aid of work of the Geological Survey, and that within appropriations herein and hereafter provided, Geological Survey officials may authorize either direct procurement of or reimbursement for expenses incidental to the effective use of volunteers such as, but not limited to, training, transportation, lodging, subsistence, equipment, and supplies.

   - **43 U.S.C. 50c**

2. *Provided further*, That provision for such expenses or services is in accord with volunteer or cooperative agreements made with such individuals, private organizations, educational institutions, or State or local government.

   - **43 U.S.C 31(a)**

3. *Provided further*, That the Geological Survey (43 U.S.C. 31(a)) shall hereafter be designated the United States Geological Survey.

   - **Department of the Interior and Related Agencies Appropriations Act, 1992, as included in Public Law 102–154.**

4. *Provided further*, That the United States Geological Survey may hereafter contract directly with individuals or indirectly with institutions or nonprofit organizations, without regard to 41 U.S.C. 5, for the temporary or intermittent services of students or recent graduates, who shall be considered employees for the purposes of chapters 57 and 81 of title 5, United States Code, relating to compensation for travel and work injuries, and Chapter 171 of Title 28, United States Code, relating to tort claims, but shall not be considered to be a Federal employees for any other purposes.

   - **Department of the Interior and Related Agencies Appropriations Act, 2000, as included in Public Law 106–113.**

5. *Provided further,* That notwithstanding the provisions of the Federal Grant and Cooperative. Agreement Act of 1977 (31 U.S.C. 6301–6308), the may be United States Geological Survey is authorized to continue existing, and hereafter, to enter into new cooperative agreements directed towards a particular cooperator, in support of joint research and data collection activities with Federal, State, and academic partners funded by appropriations herein, including those that provide for space in cooperator facilities.

   - **Department of the Interior and Related Agencies Appropriations Act, 2004, as included in Public Law 108–108.**

Justification of Fixed Costs and Related Changes: USGS

(Dollars in Thousands)

	2008 Budget	2008 Revised	2009 Fixed Costs Change
Additional Operational Costs from 2008 and 2009 Jan Pay Raises			
1. 2008 Pay Raise, 3 Quarters in 2008 Budget	+$13,357	+$13,149	NA
Amount of pay raise absorbed	*[$0]*	*[$2,435]*	*NA*
2. 2008 Pay Raise, 1 Quarter (Enacted 3.5%)	NA	NA	+$4,024
Amount of pay raise absorbed			*[$671]*
3. 2009 Pay Raise (Proposed 2.9%)	NA	NA	+$9,334
Amount of pay raise absorbed			*[$2,335]*

These adjustments are for an additional amount needed to fund estimated pay raises for Federal employees.

Line 1, 2008 Revised column is an update of 2008 budget estimates based upon an enacted 3.5% pay raise and the 1.56% across the board reduction.

Line 2 is the amount needed in 2009 to fund the estimated 3.5% January 2008 pay raise from October through December 2008.

Line 3 is the amount needed in 2009 to fund the estimated 2.9% January 2009 pay raise from January through September 2009.

	2008 Budget	2008 Revised	2009 Fixed Costs Change
Other Fixed Cost Changes			
One Less Pay Day	NA	NA	-$2,048

This adjustment reflects the decreased costs resulting from the fact that there is one less pay day in 2009 than in 2008.

Employer Share of Federal Health Benefit Plans	+$2,082	+$2,050	+$770
Amount of health benefits absorbed	*[$0]*	*[$32]*	*[$193]*

This adjustment is for changes in the Federal government's share of the cost of health insurance coverage for Federal employees. For 2009, the increase is estimated at 3.0%, the average increase for the past few years..

Worker's Compensation Payments	$2,892	$2,892	+$103

The adjustment is for actual charges through June 2006, in the costs of compensating injured employees and dependents of employees who suffered accidental deaths while on duty. Costs for 2008 will reimburse the Department of Labor, Federal Employees Compensation Fund, pursuant to 5 U.S.C. 8147(b) as amended by Public Law 94–273.

Unemployment Compensation Payments	$732	$732	-$107

The adjustment is for estimated changes in the costs of unemployment compensation claims to be paid to the Department of Labor, Federal Employees Compensation Account, in the Unemployment Trust Fund, pursuant to Public Law 96–499

	2008 Budget	2008 Revised	2009 Fixed Costs Change
Other Fixed Cost Changes (continued)			
Rental Payments	$61,647	$61,647	+$2,665
Amount of rental payments absorbed	*[$0]*	*[$19]*	
The adjustment is for changes in the costs payable to General Service Administration (GSA) and others resulting from changes in rates for office and non-office space as estimated by GSA, as well as the rental costs of other currently occupied space. These costs include building security; in the case of GSA space, these are paid to DHS. Costs of mandatory office relocations, i.e., relocations in cases where due to external events there is no alternative but to vacate the currently occupied space, are also included.			
Department Working Capital Fund	$16,134	$16,134	+$216
The change reflects expected changes in the charges for services funded through the Working Capital Fund (WCF). These charges are displayed in the Budget Justification for Department Management.			

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Summary of Requirements
(Dollars in Thousands)

Appropriation: Surveys, Investigations, and Research

	FTE	Amount	FTE	Amount
Budget estimate, 2008 Enacted			5,462	1,006,480
Fixed and Related Cost Changes:				
Additional Cost in 2009 of January 2008 Pay Raise		+4,024		
Additional Cost in 2009 of January 2009 Pay Raise		+9,334		
One Less Pay Day		-2,048		
Employer Share of Federal Health Benefit Plans		+770		
Worker's Compensation Payments		+103		
Unemployment Compensation Payments		-107		
Rental Payments		+2,665		
Department Working Capital Fund Charges		+216		
Subtotal, Fixed Cost Adjustments				+14,957
Technical Adjustment			0	0
Subtotal, Fixed Costs and Related Changes			0	+14,957
Program Change			-300	-52,921
TOTAL REQUIREMENTS			5,162	968,516

Summary of Requirements
(Dollars in Thousands)

Activity/Subactivity/Prog Element	2007 Actual FTE a/	2007 Actual Amount	2008 Enacted FTE a/	2008 Enacted Amount	Fixed Costs b/ (+/-) FTE	Fixed Costs b/ (+/-) Amount	Related Changes c/ (+/-) FTE	Related Changes c/ (+/-) Amount	Program Changes d/ (+/-) FTE	Program Changes d/ (+/-) Amount	2009 Budget Request FTE a/	2009 Budget Request Amount	Inc.(+) Dec.(-) from 2008 FTE	Inc.(+) Dec.(-) from 2008 Amount
GEOG RES., INVESTIGATIONS & REMOTE SENSING														
Land Remote Sensing	118	63,264	118	61,457		245			3	860	121	62,562	3	1,105
Geographic Analysis and Monitoring c/	113	16,926	106	16,266		171	-25	-2,886	-27	-2,995	54	10,556	-52	-5,710
TOTAL	231	80,190	224	77,723	0	416	-25	-2,886	-24	-2,135	175	73,118	-49	-4,605
GEOLOGIC HAZ., RESOURCES, & PROC.														
Geologic Hazard Assessments														
Earthquake Hazards	226	51,152	226	53,653		576				-5,173	226	49,056	0	-4,597
Volcano Hazards	134	21,544	134	22,190		203				-568	134	21,825	0	-365
Landslide Hazards	20	3,259	20	3,308		42				-22	20	3,328	0	20
Global Seismographic Network	9	3,927	9	4,441		33				-502	9	3,972	0	-469
Geomagnetism	15	2,008	15	2,059		33				-16	15	2,076	0	17
Subtotal	404	81,890	404	85,651	0	887	0	0	0	-6,281	404	80,257	0	-5,394
Geologic Landscape & Coastal Assessments														
Earth Surface Dynamics c/	82	13,414	82	13,342		0	-78	-10,336	-4	-3,006	0	0	-82	-13,342
National Cooperative Geologic Mapping	131	25,239	131	26,626		332			3	441	134	27,399	3	773
Coastal and Marine Geology	213	39,674	214	40,646		495			7	6,298	221	47,439	7	6,793
Subtotal	426	78,327	427	80,614	0	827	-78	-10,336	6	3,733	355	74,838	-72	-5,776
Geologic Resource Assessments														
Mineral Resources	354	51,636	334	50,830		947			-210	-25,499	124	26,278	-210	-24,552
Energy Resources	151	25,150	151	26,381		368				-107	151	26,642	0	261
Subtotal	505	76,786	485	77,211	0	1,315	0	0	-210	-25,606	275	52,920	-210	-24,291
TOTAL	1,335	237,003	1,316	243,476	0	3,029	-78	-10,336	-204	-28,154	1,034	208,015	-282	-35,461
WATER RESOURCES INVESTIGATIONS														
Hydrologic Monitoring, Assessments & Research														
Ground-Water Resources Program	61	8,098	61	7,853		100			12	2,618	73	10,571	12	2,718
National Water-Quality Assessment	400	62,818	400	63,912		1,144			-72	-10,943	328	54,113	-72	-9,799
Toxic Substances Hydrology	52	13,293	52	13,516		251			-14	-3,063	38	10,704	-14	-2,812
Hydrologic Research & Development c/	253	14,754	255	15,423		211	-42	-2,202	-2	-1,537	211	11,895	-44	-3,528
National Streamflow Information Program	45	16,612	45	20,126		257			12	3,429	57	23,812	12	3,686
Hydrologic Networks and Analysis c/	196	29,572	199	30,537		438	-6	-860		-468	193	29,647	-6	-890
Subtotal	1,007	145,147	1,012	151,367	0	2,401	-48	-3,062	-64	-9,964	900	140,742	-112	-10,625
Cooperative Water Program	725	64,345	715	62,849		1,170			-6	-1,734	709	62,285	-6	-564
Water Resources Research Act Program	2	5,404	2	6,304		0			-2	-6,304	0	0	-2	-6,304
TOTAL	1,734	214,896	1,729	220,520	0	3,571	-48	-3,062	-72	-18,002	1,609	203,027	-120	-17,493

Summary of Requirements
(Dollars in Thousands)

Activity/Subactivity/Prog Element	2007 Actual FTE a/	2007 Actual Amount	2008 Enacted FTE a/	2008 Enacted Amount	Fixed Costs b/ (+/-) FTE	Fixed Costs b/ (+/-) Amount	Related Changes c/ (+/-) FTE	Related Changes c/ (+/-) Amount	Program Changes d/ (+/-) FTE	Program Changes d/ (+/-) Amount	2009 Budget Request FTE a/	2009 Budget Request Amount	Inc.(+) Dec.(-) from 2008 FTE	Inc.(+) Dec.(-) from 2008 Amount
BIOLOGICAL RESEARCH														
Biological Research and Monitoring c/	1,025	143,342	1,029	141,275		2,016	-13	-5,007	35	7,056	1,051	145,340	22	4,065
Biological Information Management & Delivery	72	22,856	72	22,422		174			-18	-3,017	54	19,579	-18	-2,843
Cooperative Research Units	133	14,764	141	16,174		275			-8	-1,039	133	15,410	-8	-764
TOTAL	1,230	180,962	1,242	179,871	0	2,465	-13	-5,007	9	3,000	1,238	180,329	-4	458
ENTERPRISE INFORMATION														
Enterprise Information Security and Technology c/	100	26,061	90	24,514		-887		1,549		-145	90	25,031	0	517
Enterprise Information Resources c/	127	17,030	124	16,775		416		287		-50	124	17,428	0	653
National Geospatial Program	296	68,691	251	69,082		734				-154	251	69,662	0	580
TOTAL	523	111,782	465	110,371	0	263	0	1,836	0	-349	465	112,121	0	1,750
GLOBAL CHANGE c/			29	7,383		373	164	21,291	-9	-2,464	184	26,583	155	19,200
SCIENCE SUPPORT c/	405	67,782	405	67,167		2,099		-1,836		-230	405	67,200	0	33
FACILITIES														
Rental Payments and Operations & Maintenance c/						2,741	52	92,071		-10	52	94,802	52	94,802
Rental Payments c/		72,428		72,479		0		-72,479		0	0	0	0	-72,479
Operations & Maintenance c/	52	19,634	52	19,592		0	-52	-19,592		0	0	0	-52	-19,592
Deferred Maintenance & Capital Improvement		3,373		7,898		0				-4,577	0	3,321	0	-4,577
TOTAL	52	95,435	52	99,969	0	2,741	0	0	0	-4,587	52	98,123	0	-1,846
SIR, TOTAL	**5,510**	**988,050**	**5,462**	**1,006,480**	**0**	**14,957**	**0**	**0**	**-300**	**-52,921**	**5,162**	**968,516**	**-300**	**-37,964**
Spectrum Relocation Costs Transfer		6,159												
Revised SIR, TOTAL	**5,510**	**994,209**	**5,462**	**1,006,480**	**0**	**14,957**	**0**	**0**	**-300**	**-52,921**	**5,162**	**968,516**	**-300**	**-37,964**

a/ The FTE's depicted in the 2007, 2008, and 2009 columns are only the staff-years associated with appropriated funding. Reimbursable FTE's are 2,704, 2,694 and 2,694 and Working Capital Fund FTE's are 154, 152 and 152 for 2007, 2008 and 2009 respectively. USGS total FTE's for 2007, 2008, and 2009 are 8,368, 8,308 and 8,008 respectively. FTE may not add to totals and subtotals, due to rounding. For 2007, FTE above Geologic Hazards, Resources, and Processes; Water Resources Investigations; and Biological Research include FTEs associated with Contributed Funds 2, 3, and 18 respectively. After the development of the account level FTEs for the 2009 in the President's Budget Appendix, further refinements to the estimates were made. As a result, the 2009 direct FTE levels in this presentation do not match and are lower than those direct FTE levels presented in the Budget Appendix.

b/ Fixed cost changes for this account total $18,155, of which $14,957 is budgeted and $3,198 is absorbed.

c/ Includes technical adjustments (-$2,886 from Geographic Research, Investigations, & Remote Sensing; -$10,336 from Geologic Hazards, Resources, & Processes; -$3,062 from Water Resources Investigations; and -$5,007 from Biological Research), which is proposed as part of a budget restructure that moves funding (+$21,291) for global change activities into a new integrated budget activity titled Global Change. Also, includes a net -$1,836 technical adjustment from the Science Support budget activity to the Enterprise Information budget activity to realign costs in the Department's Working Capital Fund Centralized Bill to the correct activity. Also, includes an internal Facilities budget activity realignment, which creates a new subactivity titled Rental Payments and Operations & Maintenance from the two former subactivities.

d/ Changes for this activity include a reduction of -$3,310 for travel. The impact of this change is described in the General Statement that begins on page A-1.

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Global Change Activity – Restructure

Global Change Budget Changes under Current Bureau Budget Structure

(Dollars in Thousands)

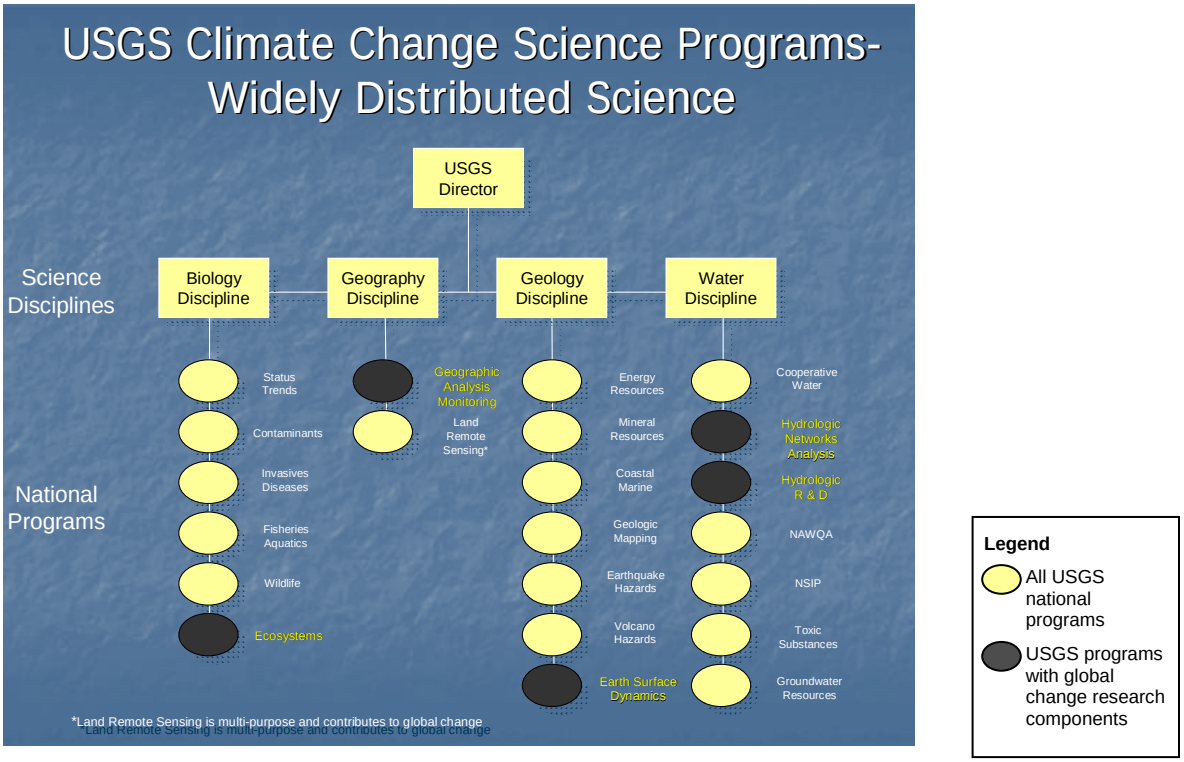
Global Change	2007 Actual	2008 Actual	2009 Fixed Costs & Related Changes (+/-)[a/]	2009 Program Changes (+/-)[b/]	2009 Budget Request	Change From 2008 (+/-)
Geographic Research, Investigations, & Remote Sensing						
Geographic Analysis and Monitoring	2,932	2,886	-2,886		0	-2,886
FTE	*25*	*25*	*-25*		*0*	*-25*
Geologic Hazards, Resources, & Processes						
Geologic Landscapes & Coastal Assessments						
Earth Surface Dynamics	10,500	10,336	-10,336		0	-10,336
FTE	*78*	*78*	*-78*			*-78*
Water Resources Investigations						
Hydrologic Monitoring, Assessments, and Research						
Hydrologic Research and Development	2,294	2,202	-2,202		0	-2,202
FTE	*42*	*42*	*-42*			*-42*
Hydrologic Networks and Analysis	896	860	-860		0	-860
FTE	*6*	*6*	*-6*			*-6*
Biological Research						
Biological Research and Monitoring	5,086	5,007	-5,007		0	-5,007
FTE	*13*	*13*	*-13*			*-13*
Overall Total Requirements ($000)	21,708	21,291	-21,291			-21,291
Global Change	0	7,383	+21,664	-2,464	26,583	+19,200
Global Change over time	[21,708]	[28,674]			[26,583]	
Overall Total FTE	*0*	*29*	*+164*	*-9*	*184*	*+155*
CCSP (USGS's contribution)	4,900	4,824			4,824	0
Total GC (including CCSP)	26,608	33,498			31,407	-2,091

[a/] Fixed cost increases for this activity total $473, of which $373 is budgeted and $100 is absorbed. A technical adjustment of $21,291 is proposed as part of a budget restructure that moves funding for global change activity into a new integrated budget activity titled Global Change.

[b/] Changes for this activity include a reduction of -81 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Science Framework

The current USGS climate change science framework, and the majority of the proposed construct for the Global Change Activity, is distributed among several USGS programs, across all four disciplines. The proposed 2009 Global Change activity will encompass $26.6 million of the USGS contribution to the Department Climate Change Science Program (CCSP) of $31.4 million. An additional $3.7 million for the National Satellite Land Remote Sensing Data Archive (NSLRSDA) in the Land Remote Sensing subactivity and $1.1 million in the Biological Research and Monitoring subactivity contributes to the CCSP and are not included in the proposed new activity.



Global Change under the current USGS Budget Structure

Under the current organizational structure, each scientific discipline invests in global change activities and the CCSP, and therefore engages in the development and execution of scientific priorities for federally funded climate change science. Each participating bureau program has specific scientists that engage in global change activities, CCSP and other climate change science research and planning activities. Each of the four science Associate Directors has authority over other bureau programs currently or potentially aligned with global change and CCSP climate program activities and priority-setting.

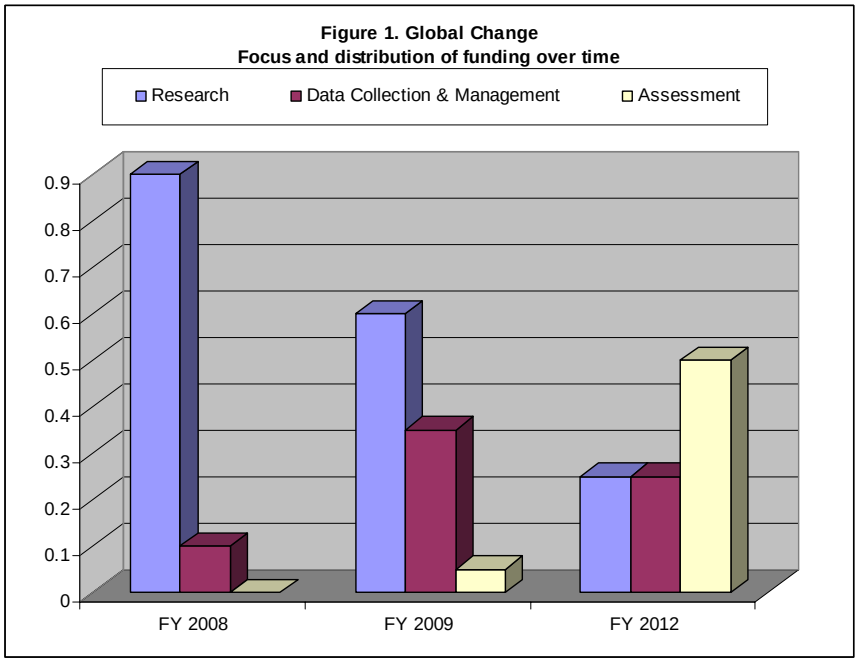
Currently, global change research is funded and managed under several management units who must accommodate many research priorities in addition to climate change. Further, not all pertinent components of global change research have been so identified, generating an incomplete and inconsistent classification of global change work. Although five of the 28 USGS programs are currently identified as having global change research components, many other programs also do relevant work. Because the global change work is so widely dispersed, the

development of a single set of climate change science priorities and associated global change-specific performance measures has not been accomplished.

Global change impacts and assessments have been identified by the bureau as key science areas through the bureau's recently released Science Strategy. Congress and the Administration have focused on global change activities in the bureau, and their importance to land and resource managers. By drawing on our scientific strengths in a focused and integrated way, the USGS can develop a national monitoring framework and conduct research which expands the understanding of current climate variability, climate change, and their effects on the Nation's resources.

Recommendation: A new budget activity for USGS Global Change activities
A new budget activity would bring together the funding and facilitate the development of a single set of strategic science and management goals and their implementation, a cogent set of global change-specific performance measures that can be reliably measured, and related budgetary and communication strategies focused on the goals and objectives of USGS' work within global change.

This activity will evolve from a research-focused effort to one that is focused primarily on data collection and assessment, although still supported and guided by research (Figure 1). In 2008, research activities account for 90 percent of the work, by 2012, 75 percent of the work will be focused on data collection and assessments.



USGS is proposing a new budget activity within its 2009 budget structure. This proposal is outlined below, along with cross-walk tables for funding, FTE, and performance from our current structure to the new structure.

New Budget Structure

Budget Activity: Global Change

Base Budget Restructure

Current base funding in the programs listed below would be moved to the new Global Change Activity through a technical adjustment.

	Global Change Activity
2009 Base Budget Change ($000's)	
Current Act/Subact/Programs	
Geog Res., Investigations and Remote Sensing	
Geograhic Analysis and Monitoring	2,886
FTE	*25*
Geologic Haz, Resources, and Proc	
Geologic Landscape & Coastal Assess.	
Earth Surface Dynamics	10,336
FTE	*78*
Water Resources Investigations	
Hydrologic Monitoring, Assess. & Res.	
Hydrologic Research & Development	2,202
FTE	*42*
Hydrologic Networks and Analysis	860
FTE	*6*
Biological Research	
Biological Research and Monitoring-Climate	4,022
Biological Research and Monitoring-Carbon	985
FTE	*13*
Total	21,291
FTE	*164*

2008 Performance Restructure—Base program

2008 crosswalk of performance from current budget structure to proposed budget structure.

Activity	Global Change
Geographic Research, Investigations, & Remote Sensing Geographic Analysis & Monitoring Program	
# of systematic analysis and/or investigations delivered to customers	12
% of surface area with temporal and spatial monitoring, research, and assessment/data coverage to meet land use planning and monitoring requirements (Geography) (PART) (Number of completed eco-region assessments out of a total of 84 eco-regions). Note: The metric ownership will change from Geography to Global Change.	69% (58/84)
Geologic Hazards, Resources, and Processes Geologic Landscape & Coastal Assessment Earth Surface Dynamic Program	
# of systematic analysis and/or investigations delivered to customers	6
# of workshops and/or training provided to customers	6
# of annual gigabytes	2.8
# of cumulative gigabytes managed	19.4
Water Resources Investigations Hydrologic Monitoring, Assess. & Research – Hydrologic Research & Development	
# of systematic analysis and/or investigations delivered to customers	6
Water Resources Investigations Hydrologic Monitoring, Assess. & Research Hydrologic Networks & Analysis	
# of systematic analysis and/or investigations delivered to customers	2
Biological Research Biological Research & Monitoring	
# of systematic analysis and/or investigations delivered to customers	28
# of workshops and/or training provided to customers	3

2009 Performance Restructure – Base program

Annual performance metrics for 2009 will remain the same as in the 2008 crosswalk of Performance from Current Budget Structure to Proposed Budget Structure.

New USGS Budget at the Activity level for the 2009 Request (Dollars in thousands)

Activity	2006 Actual	2007 Actual	2008 Enacted	2009 Request
Geographic Research, Investigations, & Remote Sensing	$129,273	$80,190	$77,723	$73,118
Geologic Hazards, Resources, & Processes	$235,286	$237,003	$243,476	$208,015
Water Resources Investigations	$211,764	$214,896	$220,520	$203,027
Biological Research	$178,544	$180,962	$179,871	$180,329
Enterprise Information	$46,394	$111,782	$110,371	$112,121
Global Change			**7,383**	**$26,583**
Science Support	$69,302	$67,782	$67,167	$67,200
Facilities	$94,782	$95,435	$99,969	$98,123
Total	**$965,345**	**$988,050**	**$1,006,480**	**$968,516**

Climate Change Initiative

The 2009 budget proposal includes a $5.0 million Climate Change initiative. This initiative will result in science and adaptive management strategies for climate impacts and development of the methodology to assess geologic carbon storage. Results from this initiative will provide resource managers crucial information and tools to develop land and water management strategies and determine adaptive management activities in a dynamic environment affected by climate change. USGS funding for the science components will reside in the Global Change Activity.

Below is the cross-walk table for funding, FTE, and performance of the initiative on Climate Change.

	2007 Actual	2008 Actual	2009			Change From 2008 (+/-)
			Fixed Costs & Related Changes (+/-)[a/]	Program Changes (+/-)[b/]	Budget Request	
Global Change	0	0				
Climate Change Initiative	0	0		[+5,000]	[5,000]	[+5,000]
FTE				*[+20]*	*[20]*	*[+20]*
Total Requirements ($000)	**0**	**7,383**	**21,664**	**-2,464**	**26,583**	**+19,200**
Global Change over time	[21,708]	[28,674]			[26,583]	
Total FTE		*29*	*+164*	*-9*	*184*	*+155*

a/ Fixed cost increases for this activity total $473, of which $373 is budgeted and $100 is absorbed. A technical adjustment of $21,291 is proposed as part of a budget restructure that moves funding for global change activity into a new integrated budget activity titled Global Change.

b/ Changes for this activity include a reduction of -81 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Summary of 2009 Program Changes for the Climate Change Initiative

Request Component	**($000)**	**FTE**
• Climate Change Science Strategy (see Section F)	+3,000	+10
• Climate Change Adaptation	+1,000	+7
• Carbon Sequestration	+1,000	+3
TOTAL Program Changes	**+5,000**	**+20**

Performance Measures

(Climate Change Initiative)

(Climate Change Science Strategy and Adaptation)

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 PB + Fixed Costs)	2009 President's Budget	Program Change Accruing in 2009
					A	B=A+C	C
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments							
# of systematic analyses and investigations				7	54	59	+5
Total actual/ projected cost ($000)				1,750	13,500	14,750	+1,250

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 PB + Fixed Costs)	2009 President's Budget	Program Change Accruing in 2009
					A	B=A+C	C
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments							
Actual/projected cost per scientific report or other product (whole dollars)				250,000	250,000	250,000	250,000
Comments	This measure includes decision support tools delivered to stakeholders. Costs of decision support tool development include baseline research, field testing and customer workshops to determine user needs and delivery requirements. Out-year costs per tool may decrease as knowledge base on customer requirements increases. Cost per unit is an average from the program contributing to the Global Change Activity. This measure combines outputs from several USGS programs into a new budget activity.						
# of workshops or training provided to customers *(annual)*				1	9	11	+2
Total Projected Cost ($000)				25	225	325	+100
Projected Cost per Workshop (whole dollars)				25,000	25,000	25,000	+25,000
Comments	This measure combines outputs from several USGS programs into a new budget activity.						
# of annual gigabytes					2.8	2.8	0
# of cumulative gigabytes managed					22.2	22.2	0
Comments	This measure is from Geology-Earth Surface Dynamics.						
% of surface area with temporal and spatial monitoring, research, and assessment/data coverage to meet land use planning and monitoring requirements (Geography) (PART) (Number of completed eco-region assessments out of a total of 84 eco-regions).					78% (66/84)	87% (73/84)	+9%
Comments	The metric ownership is in Geography.						

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Out-year performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent out-year.

(Carbon Sequestration)

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 PB + Fixed Costs)	2009 President's Budget	Program Change Accruing in 2009
					A	B=A+C	C
2.4 Resource Use: Improve the understanding of energy and mineral resources to promote responsible use and sustain the Nation's dynamic economy.							
# systematic analyses or investigations							0
Comments	Systematic analysis and investigation in 2010 = published methodology; does not include "assessment" noted above.						
# of formal workshops or training provided to customers				2	2	2	0
Total Actual/Projected Cost ($000)				30	30	30	0
Actual/Projected Cost Per Workshop (whole dollars)				15,000	15,000	15,000	0
Comments	2 workshops in 2010: one to explain the methodology and one to work with partners to start assessment effort.						
X% of targeted analyses/investigations delivered which are cited by identified partners within 3 years of delivery (PART)	≥80%	≥80%	≥80%	≥80%	≥80%	≥80%	0

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Out-year performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent out-year.

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Technical Adjustment for Enterprise Information and Science Support

A technical adjustment is proposed to move $2,313,800 for Enterprise Information related costs, from Science Support to Enterprise Information and to move $478.100 from Enterprise Information to Science Support. This adjustment is being made to realign cost in the DOI WCF Centralized Bill to the correct activity. The table shown below details the activities identified which are included in this adjustment and realigns the funding accordingly:

(Dollars in Thousands)

Current Activity	Transfer to	Project	2007 Actual	2008 Enacted	Amount to be transferred
Enterprise Information	Science Support	Enterprise Information	324.5	467.6	467.6
Enterprise Information	Science Support	FOIA Appeals	10.5	10.5	10.5
Total			**335.0**	**478.1**	**478.1**
Science Support	Enterprise Information	Fixed Costs for ESN (centrally billed)	1,098.0	1,098.0	1,098.0
Science Support	Enterprise Information	Information Technology Architecture	477.2	503.1	503.1
Science Support	Enterprise Information	Capital Planning	160.5	195.4	195.4
Science Support	Enterprise Information	Enterprise Resource Management	33.8	50.0	50.0
Science Support	Enterprise Information	Data Resource Management	22.1	22.1	22.1
Science Support	Enterprise Information	IT Security	262.9	266.6	266.6
Science Support	Enterprise Information	Frequency Management Support	103.1	99.1	99.1
Science Support	Enterprise Information	Web and Internal/External Communications	74.1	72.5	72.5
Science Support	Enterprise Information	GPEA	7.0	7.0	7.0
Total			**2,238.7**	**2,313.8**	**2,313.8**

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Technical Adjustment
Facilities Rent and Operations and Maintenance Restructure

	2007 Actual	2008 Enacted	2009			Change From 2008 (+/-)
			Fixed Costs & Related Changes (+/-) a/	Program Changes (+/-) b/	Budget Request	
Rental Payments and Operations and Maintenance ($000)	0	0	+94,812	-10	94,802	94,802
FTE	*0*	*0*	*+52*	*0*	*52*	*+52*
Rental Payments ($000)	72,428	72,479	-75,144	0	0	-72,479
FTE	*0*	*0*	*0*	*0*	*0*	*0*
Operations and Maintenance ($000)	19,634	19,592	-19,668	0	0	-19,592
FTE	*52*	*52*	*-52*	*0*	*0*	*-52*
Total Requirements ($000)	**92,062**	**92,071**	**0**	**-10**	**94,802**	**-1,846**
Total FTE	***52***	***52***	***0***	***0***	***52***	***0***

The technical adjustment is proposed as part of a budget restructure that combines the Rental Payments and Operations and Maintenance subactivities.

Justification of 2009 Technical Adjustment

Combining the Rent and Operations and Maintenance subactivities will provide the USGS with funding flexibility that is needed to meet asset management goals and carry out Executive Order 13327. Among our key asset management goals is improving the condition of owned facilities. Routine operations and maintenance of owned USGS facilities is currently under-funded which results in continued growth to the deferred maintenance backlog and continued degradation of facility condition. Given current budget constraints, USGS proposes to address this issue internally by downsizing rented space and using the savings to fund operations and maintenance at a sustainable level. Combining the two subactivities provides the structural capability to carry out this strategy.

USGS spends approximately $121.0 million annually on Facilities. Only 83 percent of those costs are funded through the Facilities Activity. The remaining comes from reimbursable partners (19 percent) and science funding (3 percent). For Facilities, the biggest expenditure is rent, 91.1 million in 2006. Rented space provides the greatest opportunity for savings. This point was emphasized by Booz Allen Hamilton in a Strategic Facilities Master Plan they prepared for USGS in late 2005.

Although only 25 percent of Facilities funds are spent on owned properties, these assets are the most unique and mission-critical in the USGS portfolio. As part of the Strategic Facilities Master Plan, USGS facilities were ranked in terms of their mission dependency using a tool called the

Asset Priority Index. Despite the fact that the largest concentrations of employees are in GSA space at national and regional headquarters in Reston, VA, Denver, CO, and Menlo Park, CA, 15 of the top 20 mission critical assets are owned assets. These owned assets have unique capabilities or are uniquely located on the landscape for the science conducted.

The Facility Condition Index for USGS-owned assets is 0.153, which is poor and the deferred maintenance backlog is $42.0 million. USGS has just started to conduct modeling exercises to project the appropriate sustainable level of operations and maintenance funding that will allow completion of critical cyclical and preventive maintenance that is currently not being done. To eliminate the deferred maintenance backlog, this routine maintenance must be completed first.

Annually, the USGS receives a fixed cost increases for the Rent subactivity. This has allowed the Rent subactivity to keep pace with inflation and uncontrollable escalations in rent costs. However, the opposite has occurred with the O&M sub-activity. Each year rising costs related to energy, fossil fuel, equipment and maintenance, coupled with across-the-board reductions in appropriated funding have significantly reduced the purchasing power of our O&M dollars. This means science program dollars are being used to fund maintenance, or the maintenance is being deferred and added to our backlog.

Combining the subactivities would also provide flexibility in the fiscal management of the funding. Uncertainty of reimbursable funding income adds to the complexity USGS cost centers face in managing rent and operations and maintenance (O&M). Currently, the USGS cost centers charge an overhead rate on all reimbursable funding for their share of facilities costs. At the beginning of each fiscal year, facilities overhead rates are set based on estimates of rent and O&M costs versus projected appropriated and reimbursable income. Based on these estimates, funds are allocated on a “fair share” basis for the Federal portion of the facilities costs and a projection is made on the reimbursable income assessments. Once the reimbursable facilities assessment income is earned then it is split in proportion to estimated rent and O&M costs. Facilities assessments are not earned until expenses have been incurred. Therefore, facilities cost are incrementally funded throughout the year for the reimbursable portion.

The uncertainty of funding makes estimating difficult and creates problems for the Cost Centers where too much rent funding or too little O&M funding can be collected. When this occurs and the cost center does not have adequate rent or O&M funding, the cost center must use science dollars to cover the shortfall. Each fiscal year regional management works with each cost center to re-allocate and adjust facilities funding to cover the facilities lines.

Removing the distinction between rent and operations and maintenance funding would allow the cost centers to balance the reimbursable income with the appropriated funding and reduce the use of program funding to resolve some of the complexities in determining facilities funding. This flexibility will allow USGS to better manage facilities funding to meet the asset management goal of Executive Order 13327.

Science on the Landscape — Regional and Crosscutting Activities

The Science on the Landscape section showcases USGS multidisciplinary science that addresses issues important to regional partners and customers. Presented in this section are the 2009 USGS Integrated Science Initiatives (page F-1) and Regional and Crosscutting Activities (F-46), including Regional Realignment (F-47), Regional Planning, Performance, and Partnerships (F-48), Workforce Planning (F-49), Science on the DOI Landscape (F-51), Priority Ecosystems Science (F-53), and Departmental Crosscuts (F-59).

USGS Integrated Science Initiatives

Several complementary priorities influenced the development of the 2009 USGS budget request. In August 2007, the Office of Science and Technology Policy and the Office of Management and Budget issued the Administration's 2009 Research and Development Budget Priorities, which include investments in climate change science, ocean science, water availability and quality, global earth observations, decision support tools that integrate information across natural hazard scenarios, such as landslides and disease, and understanding complex biological systems. The report specifically recommends aligning program with Subcommittee on Water Availability and Quality and National Land Imaging Program reports. For 2009 budget development, the Secretary emphasized water availability, ecosystem change, and oceans and coastal areas. The USGS science strategy provides direction in areas that include climate change, ecosystems, water availability, hazards, and integrating data. In the following initiatives, USGS proposes to address specifically the science priorities of the Administration.

Water for America

	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-)	2009 Program Changes (+/-)	2009 Budget Request	Change From 2008 (+/-)
National Cooperative Geologic Mapping Program ($000)	0	0	0	+1,500	1,500	+1,500
FTE	*0*	*0*	*0*	*+3*	*3*	*+3*
Ground-Water Resources Program ($000)	1,567	1,543	0	+3,000	4,543	+3,000
FTE	*0*	*0*	*0*	*+12*	*12*	*+12*
National Streamflow Information Program ($000)	16,612	20,126	+257	+5,000 [a/]	23,812 [a/]	+3,686 [a/]
National Streamflow Information Program ($000) – internal transfer				[-1,477[a/]]		
National Streamflow Information Program ($000) – travel reduction				[-94[a/]]		
FTE	*45*	*45*	*0*	*+12*	*57*	*+12*
Total Requirements ($000)	**18,197**	**21,669**	**+257**	**+9,500**	**29,855**	**+8,186 [a/]**
Total FTE	***45***	***45***	***0***	***+27***	***72***	***+27***
Other Major Resources:						
National Cooperative Geologic Mapping Program non-Federal match				+750		+750
Cooperative Water Program non-Federal match [a/]	[b/]	[b/]	[b/]	[b/]	[b/]	[b/]

[a/] This 2009 request of $23,812 for the National Streamflow Information Program (NSIP) includes an additional change (-$1,571; -$1,477 of a Congressional action and -$94 for the travel reduction) not associated with the Water for America initiative that is portrayed in the NSIP section of the budget (see page I - 53).

[b/] The Cooperative Water Program (CWP) requests no funds for this initiative but remains supportive of initiative goals and will assist in information transfer to State, local, and tribal agencies. Currently, the matching funds that these non-Federal agencies provide to the CWP support the operation of over 4,000 streamgages, 10,000 ground-water observation wells, a total of 700 hydrologic investigations, and the national water use database. Dollars in the CWP are matched at least 1 for 1 by State, local, municipal, and tribal cooperating agencies. In the past years the matching ratio has been about 2 non-Federal dollars contributed for every dollar appropriated to the USGS.

"Agencies are also encouraged to align programs with A Strategy for Federal Science and Technology to Support U.S. Water Availability and Quality because of the importance of fresh water supplies to human health, environmental quality, and economic prosperity."

– National Science and Technology Council, 2007

Summary of 2009 Program Changes for Water for America

Request Component	($000)	FTE
• National Cooperative Geologic Mapping Program	+1,500	+3
• Ground-Water Resources Program	+3,000	+12
• National Streamflow Information Program	+5,000	+12
• National Streamflow Information Program – internal transfer	[-1,477]	
• National Streamflow Information Program – travel reduction	[-94]	
TOTAL Program Changes (includes internal transfer and a travel reduction for a net change of +$8,186)	**+9,500**	**+27**

Justification of 2009 Program Changes

The 2009 budget request for Securing Water for 21st Century America is $29,855,000 and 72 FTE, a program change of +$9,500,000 and +27 FTE from 2008 Enacted. This includes an internal redirection of -$1,477,000, a travel reduction of -$94,000, and a fixed cost adjustment of +$257,000, for a net change of +$8,186,000 from 2008 Enacted.

Water for America **(+$9,500,000 / +27 FTE)**

Water is essential to maintain human and environmental health, agriculture, energy, and industry – in short, water is essential for the economic vitality of communities and the Nation. In its early history, U.S. water management focused on alleviating or controlling the impacts of floods and droughts. Investments in water infrastructure such as dams and canals provided safe, abundant, and inexpensive sources of water, aided flood management, and dramatically improved health and economic prosperity. The U.S. water resources, infrastructure, and technologies became the envy of the world.

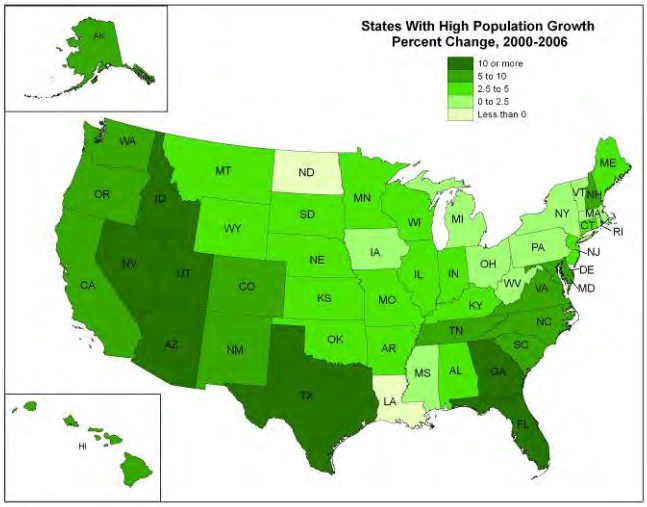
The dawning of the 21st Century brings a new set of water resource challenges. Aging infrastructure and rapid population growth, mining of finite ground-water resources, reduced water quality associated with particular land uses and land covers, water needed for human and environmental uses, and climate variability and change determine the amount of fresh water available at any time (fig. 1). Water shortage and water-use conflict have become more commonplace in many areas of the United States – even in normal water years – for irrigation of crops, for growing cities and communities, for energy production, and for the environment and species protected under the law.

Over the past few years, the Western Governor's Association, the National Science and Technology Council (NSTC), and the National Research Council have each published reports that cite the need for gathering basic hydrologic information to identify, monitor, expand, conserve, and predict water availability and use in the coming years. In 2005 the U.S. Congress provided funding for the USGS to begin to apply the Water Census concept through a pilot project in the Great Lakes region. The USGS is making excellent progress and has now undertaken a new pilot effort related to the changes in ground water storage in the Lower Colorado River Basin.

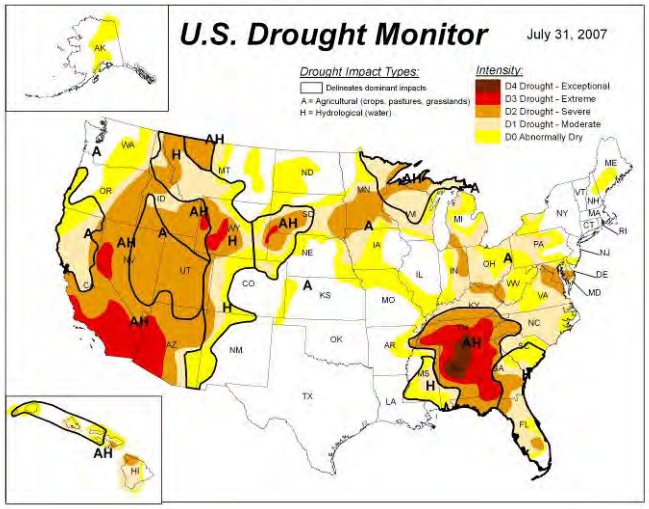
Under the auspices of the NSTC, the Subcommittee on Water Availability and Quality was established to consider the issue of anticipated water shortages that are anticipated in the next decade across the Nation. The report resulting from the Subcommittee's interagency

collaboration was released in September 2007 and lays out research priorities and recommendations for a Federal science strategy to address this issue. This initiative addresses many of those priorities and recommendations. A water census is a priority in the USGS science strategy (*http://www.usgs.gov/science_strategy/*) issued in 2007 as well and is foundational to this 2009 initiative.

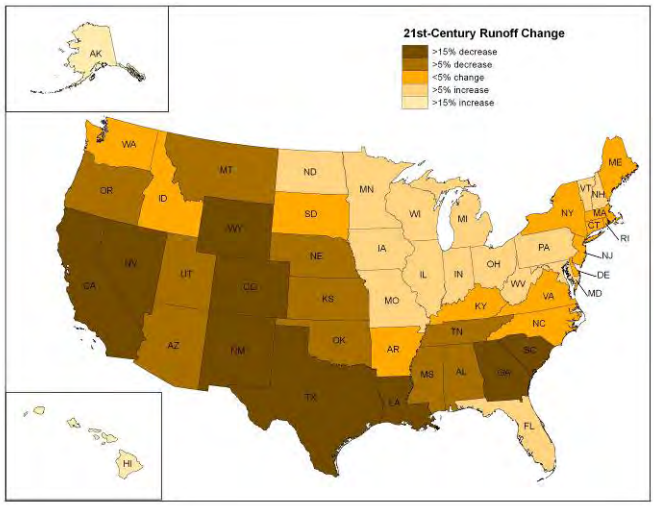
Authority to manage water resources is largely delegated to States, Tribes, and municipalities. To effectively address water-supply challenges, Federal, State, local, and tribal governments must collaborate to find out how much water we have, expand, conserve, and protect supplies to meet increasing demands, and plan for the Nation's water future. Existing partnerships include 1,400 State and local water agencies, State geological surveys, State Water Resources Research Institutes, the USACE, the NOAA, and the NSF.



States with the most rapid population growth…



…are some of the same States facing extreme drought



…and some of the same States predicted to face reductions in water supplies due to climate change.

Figure 1. — Population growth, drought, and predicted effects of climate change on the hydrologic cycle (shown here as reductions in runoff) may influence the future availability of water.

Joint Initiative Between U.S. Bureau of Reclamation (BOR) and the USGS — Interior Bureaus that have Federal responsibility for science and technology related to water availability and use work closely on water-resource issues. The Department is proposing this joint initiative by its two primary water resources agencies. In 2009, funding for this effort includes $31.4 million for the BOR and $29.8 million for the USGS.

The BOR is the Nation's largest wholesale water supplier and the second largest producer of hydroelectric power in the 17 western States. Because the BOR manages such a large water infrastructure in the West, their research and development efforts focus on ensuring reliable water supply and delivery under the increasing demands placed on water managers. The BOR's role in the joint initiative is directed toward the 17 Reclamation States and focuses on expansion of existing resources (through improved technologies), partnering with water users for purposes of conservation and protecting endangered species, and assisting States and river basins with water planning. The USGS collaborates with the BOR and other agencies to characterize changing water availability.

The USGS role is to improve knowledge of the resource nationwide for improved planning and management. The interdisciplinary science capabilities of USGS scientists ensure that all aspects of USGS earth science — water, geology, biology, and geography — will be brought to bear on this critical issue.

The USGS provides reliable, impartial information about the Nation's water resources. The information is used by the BOR and other decisionmakers to —

- Minimize loss of life and property resulting from floods, droughts, and land movement,
- Effectively manage water resources for domestic, agricultural, commercial, industrial, recreational, and ecological uses,
- Protect and enhance water resources for human health, aquatic health, and environmental quality, and
- Contribute to wise physical and economic development of water resources for the benefit of present and future generations.

Use of Cost and Performance Information
Evaluation by National Hydrologic Warning Council

The National Hydrologic Warning Council (NHWC) completed an evaluation of the USGS streamgaging program in 2006, seeking to answer two questions:

- Does the benefit derived from the streamgage network exceed the cost of building, operating, and maintaining this network, thereby justifying the investment?
- Does the incremental benefit of an expanded network equal or exceed the incremental cost of the expansion?

The evaluation included case studies involving use of streamgage data for flood prediction and warning (including emergency response), for reservoir operation, for floodplain mapping, and for the design of flood management projects.

The study concluded —

> "… even though we cannot assign with certainty a total benefit to the network, the benefit clearly exceeds the estimated cost. Each of the uses that we consider herein, in fact, yields benefits that exceed much of the cost, even when considered in individual cases. In the aggregate, nationwide, the benefits of gages in the context of reducing flood damages greatly exceed the costs of collecting the data used for decision making."

Based on this and other recent analyses, the USGS continues to seek additional support for the network, bearing in mind that annual funding adjustments will be needed to keep program performance level in the face of rising costs, which historically have increased about 3.8 percent per year.

The USGS collects and disseminates basic hydrologic data, conducts interpretive hydrologic studies, and performs fundamental hydrologic research. For example, the USGS operates and maintains national networks of streamgages and wells, collects and maintains the Nation's water use database, measures and assesses the status and trends of the Nation's water quality, and performs reconnaissance of emerging contaminants. Interior, through the BOR and the USGS, will leverage its talent, facilities, equipment, and extensive partnerships to make major contributions that will ensure the future water supplies needed for a growing Nation. Geographic focus areas for the initiative will be determined in consultation with stakeholders and allocated in proportion to the funding available.

Key Outcomes and Benefits of Water for America

- Better characterization of the Nation's aquifers, including geologic description and identification of zones of high-quality and poor-quality water.
- Better knowledge of water use and how it is changing over time. Landsat and other remote sensing techniques will be crucial to this effort.
- Better characterizations of the changes in the amounts of fresh ground water stored in the major aquifers, through enhanced data networks, better systems for data sharing with the States, and retrospective assessment and modeling studies.
- Better understanding of the needs of aquatic species for streamflow.
- Reestablishment of long-term streamgages crucial for monitoring long-term impacts of climate, land use, and water use, and modernization and stabilization of the national streamgaging network to make it more flood-resilient and more compliant with new technologies for rapid reporting of data.
- Better models and management tools to help the BOR, Corps of Engineers, and State and local agencies to manage large watersheds and aquifers in the face of climate change, demographic change, and water use change.

Program Performance Change

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Outyears
					A	B=A+C	C	D
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments								
Proposed streamflow sites currently in operation that meet one or more Federal needs (denominator = 4,425)	61% (2,700)	61% (2,700)	62% (2,742)	64% (2,845)	64% (2,845)	65% (2,895)	+1% (+50)	0
Total projected cost ($000)	35,100	36,450	37,017	39,830	41,253	41,978	+725	--
# real-time stream-gages reporting in NWISWeb	6,246	6,496	6,728	6,830	6,830	6,880	+50	0
Total projected cost ($000)	84,321	87,696	90,828	88,158	99,035	99,760	+725	--

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Outyears
					A	B=A+C	C	D
X% of river basins that have streamflow stations (denominator = 2,333 river basins) **(SP) (WRD PART)**	82% (1,825)	81% (1,800)	81% (1,800)	84% (1,870)	84% (1,870)	86% (1,920)	+2% (+50)	0
Total projected cost ($000)	23,725	24,300	24,300	26,180	27,115	27,840	+725	--
Actual/projected cost per streamgage (nat'l. avg.) (whole dollars)	13,500	13,500	13,500	14,000	14,500	14,500	+14,500	--
Comments	The increase in 2009 results from the addition of 50 new or reactivated (existing) streamgages. The proposed upgrade of 350 additional streamgages gives more frequent reporting capability to existing streamgages but does not increase the number of streamgages in operation, so the upgrades do not affect this performance measure. However, if streamgages are **not** upgraded, they will cease to deliver information when NOAA changes the data-delivery satellite technology in 2013. Cost is a national average that includes operation and maintenance, salary and transportation for technicians who perform site visits, salary for records management and validation, and a small amount for replacement of equipment when a gage is disabled by lightning strike or other event. This replacement of equipment does not include replacement of gages that are lost in large numbers during floods or hurricanes. In practice, the cost of an individual streamgage varies depending on the size of the stream, type of terrain, need for cableways or other specialized equipment at the site, and distance of each site from the nearest USGS office. The measure for "% of river basins" assumes at least one streamgage in each basin, where 2,223 basins are defined nationwide by 8-digit hydrologic unit codes. This metric may never attain 100% because not all basins may require streamflow data (e.g., a basin with no population may not require any assessment of flood risk or land use changes).							
% of U.S. with geologic maps that are being integrated into ground-water availability status and trends to support resource manage-ment decisions	5%	6%	8%	10%	12%	13%	+1%	0
Total projected cost ($000)	11,000	11,000	12,000	12,000	12,000	13,500	+1,500	--
Comments	Approximately 47% of total NCGMP budget is devoted to ground-water related studies.							
Comments	The increase in 2009 results from the addition of 50 new or reactivated (existing) streamgages. The proposed upgrade of 350 additional streamgages gives more frequent reporting capability to existing streamgages but does not increase the number of streamgages in operation, so the upgrades do not affect this performance measure. However, if streamgages are **not** upgraded, they will cease to deliver information when NOAA changes the data-delivery satellite technology in 2013. This measure assumes a single streamgage in each basin, where 2,223 basins are defined nationwide by 8-digit hydrologic unit codes; however, many basins require more than one streamgage to accurately assess conditions. This metric may never attain 100% because not all basins may require streamflow data (e.g., a basin with no population may not require any assessment of flood risk or land use changes).							
Quality: X% of studies validated through appropriate peer review or independent review **(SP)**	100%	100%	100%	100%	100%	100%	0	0

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Outyears
					A	B=A+C	C	D
Systematic analyses and investigations delivered to customers	--	--	229	223	223	224	+1	+16
Actual/projected cost per scientific report or other product (whole dollars)	--	--	300,000	300,000	310,000	310,000	310,000	340,000
Comments	Measure rebaselined in 2007: Definition of systematic analyses was changed to improve consistency of application across the bureau. Average cost across contributing programs based on 2007 activity based costing data. 3% inflation added per year Cost per scientific product is an average that includes the cost of writing, editing, peer review, and publication of each product, as well as the cost of the studies from which the products are derived. Reimbursements from other Federal agencies are included in the calculation, but the portion of funding housed in the Enterprise Information Activity (associated with the Enterprise Publishing Network) is not included. Outyear products are +4 in 2010, +6 in 2011, and +6 in 2012.							

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 President's budget level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent outyear.

Program Overview

The USGS request for 2009 is +$9,500,000, building upon a base of $1,543,000 in the Ground-Water Resources Program and $20,126,000 in NSIP, and including an internal redirection in NSIP for a net program change of +$8,186,000:

National Cooperative Geologic Mapping Program	$1.5 million
Ground-Water Resources Program (GWRP)	$3.0 million
National Streamflow Information Program (NSIP)	$3.0 million
NSIP Streamgage Network Upgrade	$2.0 million

To continue managing vital water resources well, good information and predictive tools are needed to guide decisions made by the private sector, localities, Tribes, States, and the Federal government. The Nation needs a Census of Water that tracks changing flow, use, and storage of water, as well as models and predictive tools that will help to inform decisions. The last overall assessment of water resources for the Nation was published by the Water Resources Council in 1978. Much has changed since that time. These changes have been driven by economics, demographics, technology, law, and climate.

Since the last national water assessment, the Nation has experienced large population growth and demographic shifts. From 1980 to 2006, for example, Nevada's population grew by over 2 million (a 410 percent increase), California grew by over 12 million (a 54 percent increase),

and Georgia grew by nearly 4 million (a 71 percent increase) (fig. 1). Use of ground water has increased, to the extent that ground-water levels have declined 100 feet or more in many areas. Scientists have recognized that climate change is affecting the hydrologic cycle, and efforts are underway to reduce uncertainties in predicted runoff and to resolve global estimates to finer regional and State scales.

Environmental flows are of increasing interest and importance, including from a legal standpoint (the Endangered Species Act). Healthy ecosystems require a full range of streamflows – not just minimum flow, but also flow to establish or recondition habitats. Water quality issues have changed, largely due to the impact of the Clean Water Act. Point sources of water pollution are now well-managed, but the Nation now must tackle nonpoint sources of pollution, or water-quality degradation associated with land use and land cover. The American public now considers desalination of brackish water and reusing treated wastewater as means for expanding the fresh water supply. Scientists and managers alike now recognize that surface water and ground water are a single resource and need to be managed as such. And, since 1978, data collection and delivery technologies have undergone a revolution.

Modernization of the USGS National Streamgaging Network

The Internet delivery of USGS near-real-time streamflow and water-level data has led to expanded uses and new demands for hydrologic data. Local, tribal, State, and Federal agencies, companies with a day-to-day interest in water resources, and private citizens have come to rely upon USGS real-time streamflow Web pages for information to fulfill a wide variety of purposes.

Currently, the USGS fulfills an average of about 800,000 requests for real-time data per day.

Increased use of the NOAA GOES satellite and advances in computer technology have made the original satellite radio systems in USGS streamgages obsolete. The phased modernization of the NOAA GOES system requires that all of the USGS streamgages have newer, high-transmission-rate radios installed by 2013. Those streamgages that do not have the newer radios will cease providing real-time data at that time. The new radios will support more frequent data reporting (1-hour intervals versus 4-hour) and will provide increased capacity to convey other useful information such as water temperatures and chemistry.

A portion of the 2009 Water for America Initiative ($2 million) will support the first phase of upgrading the streamgage network to high-data-rate radios, so that information on streamflow conditions can continue to flow to those who need it.

Under this initiative, over the next decade the USGS will —

- Perform the first nationwide assessment of water availability, water quality, and human and environmental water use by 2019 describing the change in water flows, ground-water storage, and water use in all sectors,
- Proceed with regional-scale studies by performing statistical analyses of the history and status of storage (in aquifers and reservoirs) and flows (in rivers and aquifers) for each of the Nation's 21 Water Resource Regions (to achieve the first cycle of a national water census by 2019, 6 regions will be studied for 3 years until the first cycle is complete — see *http://water.usgs.gov/GIS/regions.html*),
- Use statistical methods to significantly enhance the quality and timeliness of the Nation's water use information, in accordance with recommendations from the National Research Council,
- Cooperate with State and local government in selected watersheds or aquifer systems to increase use of new technologies in water planning and management, such as regional ground-water / surface-water models that enable planners to assess the true limits of sustainability of the total water resource of a region and conjunctive (ground-water / surface-water) modeling and aquifer storage and recovery,

- Work with States to map the geologic framework of the United States to improve characterization of the Nation's aquifers, using newly developed geophysical methods,
- Create new cyber infrastructure for providing hydrologic data to the public and scientists, facilitating the sharing of data from multiple sources through new web services approaches to data delivery, and
- Modernize the Nation's 7,000 streamgages by replacing obsolete telemetry systems to continue real-time operations and provide more timely information needed for better water management during floods and droughts, and stabilize the long-term network by reestablishing critical streamgages discontinued in past decade.

Great Lakes Basin Water Availability and Use Pilot Study

As part of the pilot Water Availability and Use pilot study begun in 2005, the USGS has been evaluating ways to make the program as effective as possible. The Water for America Initiative proposed for 2009 will build upon the pilot and increase the long-term efficiency of a national water availability and use assessment.

Parts of Minnesota, Wisconsin, Illinois, Indiana, Michigan, Ohio, Pennsylvania, and New York constitute the U.S. portion of the Great Lakes Basin and are at the forefront of most of the issues dealing with water in the Lakes and flowing to the Lakes. As a result, the most important partner for this project is the Council of Great Lakes Governors, which has coordinated work among the water-resources managers in the eight States to develop uniform policies for diversion and use of Great Lakes water. Information about the amount of water used and available is at the heart of these policies.

Federal natural resource agencies also are important partners for the Water Availability and Use assessment. For example, the EPA uses streamflow data to estimate chemical loading to the Lakes, and the NOAA in conjunction with the U.S. Army Corps of Engineers uses USGS data and analyses to forecast lake and river levels. In addition, other Department of Interior Bureaus use information on water availability for ecosystem evaluations in National Parks and National Refuges. Finally, the information is also important to binational partners such as the International Joint Commission, the Great Lakes Commission, and Environment Canada's National Water Research Institute.

2009 Program Performance

All programs contributing to this initiative have scored moderately effective or better in the Administration's PART evaluation, and program metrics, some of which were developed during the PART process, will be used to measure performance. Increases in performance are shown in the previous table. In the long term, these incremental changes in performance will lead to —

- Knowledge of the history and current status of the storage (in aquifers and reservoirs), flows (in rivers and aquifers), and use of water. This is not unlike economic and population statistics provided by agencies such as the Census Bureau.
- Analyses of the limits of sustainable water development at regional scales. This would provide a framework for the water-allocation and water-development responsibilities exercised by the States.

Specific Activities for 2009

- Conduct studies to determine the 3-dimensional geologic framework of important aquifer systems, better defining the architecture and extent of the vessels that hold the Nation's ground water. Better understanding of the chemistry of the rocks and sediments will also contribute to an understanding of water quality. Under the provisions of the National Cooperative Geologic Mapping Act, this component of the initiative will leverage $750,000 in State funds to increase the amount of geologic mapping and subsurface characterization possible.

- Continue to modernize the Nation's 7,000 streamgages with real-time telemetry to permit better management during floods and droughts, stabilize the long-term network by reestablishing critical streamgages discontinued in past 2 decades, and improve a variety of data collection and processing activities. In particular, funding to NSIP will be used to —
  - Upgrade 350 streamgages to hourly real-time data transmission,
  - Reestablish 50 long-term streamgages that had been discontinued in the past 2 decades,
  - Increase network cost-efficiency by improving data collection and processing software and by using new data-collection instruments that are more reliable and improve safety for field technicians during flood conditions, and
  - Enhance real-time data delivery through development of Web services.

> *"Abundant supplies of clean, fresh water can no longer be taken for granted."*
>
> – National Science and Technology Council, 2007

- Develop, test, and apply new statistical tools for estimating water use and improving the water-use data base in accordance with the recommendations of the National Research Council.
- Develop better characterization of aquifers that provide important water supplies or have the potential to augment existing water supplies, including assessment of the amount of fresh water stored in major aquifers, through improved data networks, better systems for data sharing, and retrospective assessment and modeling studies.
- Provide regional-scale analysis of water availability and use as a part of an overall national assessment. These studies will be focused initially on 6 of the 21 water resources regions of the United States (these water resources regions represent the largest grain of the hydrologic unit divisions). The studies will provide standard products summarizing the status and trends in streamflow, floods, droughts, ground-water storage, recharge, and water use. Within three of these six regions, large watersheds will be analyzed to develop regional simulation models that can be used for evaluating sustainability of water resources at a regional scale.
- Through the Cooperative Water Program (CWP), the USGS will transfer improved models and management tools developed through this initiative to help Federal, State, local, and tribal agencies manage large watersheds and aquifers in a sustainable manner in the face of climate change,

Flint River Water Resources Modeling

USGS scientists working on the Flint River Science Thrust Study are developing prototype modeling tools to predict how river ecosystems change as a result of increasing water demands and land use alteration.

In 2007, project scientists developed two hydrologic models for the upper Flint River basin in Georgia, obtained 20 years of satellite imagery to support an analysis of linkages between land cover dynamics and flow regimes, developed geologic maps to support stream channel classification, used historical streamgaging data to analyze evidence of geomorphic channel adjustment, and developed models of fish population dynamics in relation to flow regimes.

In 2008, geographic and geomorphic analyses will be completed and linked with the finalized hydrologic and biological models to provide the prototype tool for estimating changes in viability and range of aquatic biota under alternative water-use and land-use scenarios. Sensitivity analyses will be conducted to show areas of greatest scientific uncertainty in predicting ecosystem responses to flow alteration, and peer-reviewed manuscripts will be prepared for all components of the study.

Work planned for 2009 in the Water for America Initiative will build upon knowledge resulting from this study.

demographic change, and water use change. Currently, non-Federal matching funds provided to the CWP support the operation of over 4,000 streamgages, 10,000 ground-water observation wells, a total of 700 hydrologic investigations, and the national water use database. Dollars and FTE in the Cooperative Water Program are matched at least 1 for 1 by State, local, municipal, and tribal cooperating agencies, effectively doubling the resources in this line item. In the past years the matching ratio has been about 2 non-Federal dollars contributed for every dollar appropriated to the USGS.

Birds Forever

	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-)[a/]	2009 Program Changes (+/-) [b/]	2009 Budget Request	Change From 2008 (+/-)
Biological Research and Monitoring ($000)	143,342	141,275	-2,991	+7,056	145,340	+4,065
Birds Forever	250	250	0	+1,000	1,250	+1,000
Total FTE	*0*	*0*	*0*	*+3*	*3*	*+3*

[a/] Fixed cost increases for this subactivity total $2,551, of which $2,016 is budgeted and $535 is absorbed. A technical adjustment is proposed as part of a budget restructure that moves funding for global change activities into a new integrated budget activity titled Global Change.

[b/] Changes for this subactivity include a reduction of -$517 for travel for Biological Research and Monitoring. The impact of this change is described in the General Statement that begins on page A - 1.

Summary of 2009 Program Changes for Birds Forever

Request Component	($000)	FTE
• Birds Forever	+1,000	+3
TOTAL Program Change	**+1,000**	**+3**

Justification of 2009 Program Changes

The 2009 budget request for the Birds Forever Initiative is $1,250,000 and 3 FTE, a program change of +$1,000,000 and +3 FTE from the 2008 enacted level.

Birds Forever **(+$1,000,000 / +3 FTE)**

The USGS proposes an increase of $1.0 million and 3 FTE to support bird monitoring through the Breeding Bird Survey (BBS). The U.S. Fish and Wildlife Service (FWS) is also requesting new funds ($8.1 million) through the Birds Forever Initiative in 2009 to address threats that have lead to rapid decline in the populations of many migratory bird species. The USGS request within the Biological Research and Monitoring (BRM) subactivity complements the FWS request by providing new/increased research and monitoring capacity to better understand large scale drivers of migratory bird population and habitat change such as global warming, deforestation, and urban development. The USGS initiative supports activities that are critical to the FWS' (and other partners) achievement of migratory bird trust resource goals and objectives.

The requested increase for the Birds Forever Initiative would result in 2 new systematic analyses and investigations delivered to customers, 2 new formal workshops and training provided to customers. The FTE needed to support the BBS include a Programmer/Database Manager to maintain operational and technical currency with dynamic web delivery/applications, a GIS specialist for working with route distributional issues and for working with habitat scientists on remotely sensed habitat data, and an Operations Biologist to coordinate with BBS volunteers, State coordinators, FWS, Canadian Wildlife Service, Partners in Flight, and others.

This USGS initiative includes the following component:

Monitoring: *Understanding Changing Bird Populations Nationwide*

The USGS BBS provides the most geographically extensive and scientifically based estimation of bird population status and trends in North America. Today, BBS resources, adjusted for inflation, are below the amount allocated in the 1970s, yet the number of routes, volunteer participants, data, and data requests has quadrupled. Furthermore, requests by the migratory bird management and research communities to address BBS operational concerns (e.g., expand the number of routes surveyed, expand the geographic scope, provide training for volunteer observers) and scientific issues (e.g., evaluate and refine methodologies such as estimation of detection probabilities and sampling location bias) presents challenges beyond the scope of activities able to be accomplished with existing funding. To address these increasing demands and the monitoring goals of the North American Bird Conservation Initiative (NABCI) (The NABCI Committee is a forum of government agencies, private organizations, and bird initiatives helping partners across the continent meet their common bird conservation objectives.), additional funding will be used to —

- Expand the number of BBS routes surveyed annually
- Expand the geographic scope of BBS into Mexico
- Evaluate and refine methodologies (estimation of detection probabilities, etc.)
- Enhance both database management and online data reporting.

The proposed increase for the Birds Forever Initiative provides major advances in knowledge through research support for numerous major management areas that include several species.

The initiative supports the Resource Protection end outcome goal of improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment.

Program Performance Change

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments								
Quality: % of studies validated through appropriate peer review or inde-pendent review	UNK	UNK	UNK	118/118* 100%	118/118* 100%	118/118* 100%	0	2/2 100%
Increase long-term trend precision (decrease bias) for existing species monitored through the Breeding Bird Survey to enable a detection of 50% population decline of relevant species within 20 years **(PART) (BRM)**	UNK	0.0008	0.0008	0.0008	0.0008	0.0008	0	0
% of North American migratory birds for which scientific information on their status and trends are available **(SP) (PART) (BRM)**	26%	26%	26.6% (173/650)	26.6% (173/650)	26.6% (173/650)	27.13% (176/650)	+0.53%	+0.11%
% of focal migratory bird populations for which scientific information is available to support resource management decisionmaking (USGS in coordination with FWS) **(PART) (BRM)**	UNK	56.88%	57.02%	57.16%	57.16%	57.22%	+0.06%	+0.04%
# of systematic analyses and investigations	UNK	UNK	UNK	118*	118*	118*	0	+2
Total Projected Cost ($000)	--	--	--	23,600	23,600	24,000	+400	0
Projected Cost per systematic analy-sis (whole dollars)	--	--	--	200,000	200,000	200,000	--	--

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
Comments	The 2009 proposed increase for the Birds Forever Initiative would result in 2 new systematic analysis or investigation delivered to customers in 2011. The USGS used an annual snapshot of the Resource Protection ABC research work activity cost data averaged over time as a surrogate cost per unit. To this the USGS added a proportional share of the cost derived for the Resource Protection science management activity. The average unit cost for systematic analyses is approximately $200,000 for the Resource Protection mission area which correlates to the average cost that the program had historically used before implementation of ABC.							
# of formal workshops and training provided to customers	UNK	UNK	UNK	6**	6**	8**	+2	0
Total Projected Cost ($000)	UNK	UNK	UNK	480	480	640	+160	--
Projected Cost per workshop (whole dollars)	80,000	80,000	80,000	80,000	80,000	80,000	--	--
Comments	The 2009 proposed increase for the Birds Forever Initiative would result in 2 new workshops and training provided to customers in 2009. For workshops, which support land managers in applying the science, and are a shorter term product, the USGS used the average unit cost of $80,000 based on the technical assistance and proportional share of the science management work activity for the Resource Protection mission. Other Interior goals will also accrue performance from workshops.							

* Total systematic analyses and investigations for the Status and Trends program.
** Total formal workshops and training for the Status and Trends program.

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent out-year.

Program Overview

The North American Breeding Bird Survey (BBS) was launched in 1966, utilizing 600 roadside routes to obtain range-wide population data on breeding birds in the United States and Canada east of the Mississippi River. Today, the BBS provides the foundation for non-game, land bird conservation in North America with over 3,200 skilled volunteer participants sampling 3,000 routes annually across the continental United States and southern Canada. Each year long-term population trends are calculated for over 420 of the 650 bird species recorded on BBS routes. These trends inform researchers and wildlife managers of significant changes in bird population levels and are utilized, along with other indicators, by the FWS, Canadian Wildlife Service (CWS), state wildlife agencies and Partners in Flight to establish national and regional avian conservation priorities. Trends with both raw and summarized data are available on the internet http://www.pwrc.usgs.gov/bbs/. The USGS and the CWS jointly coordinate the BBS.

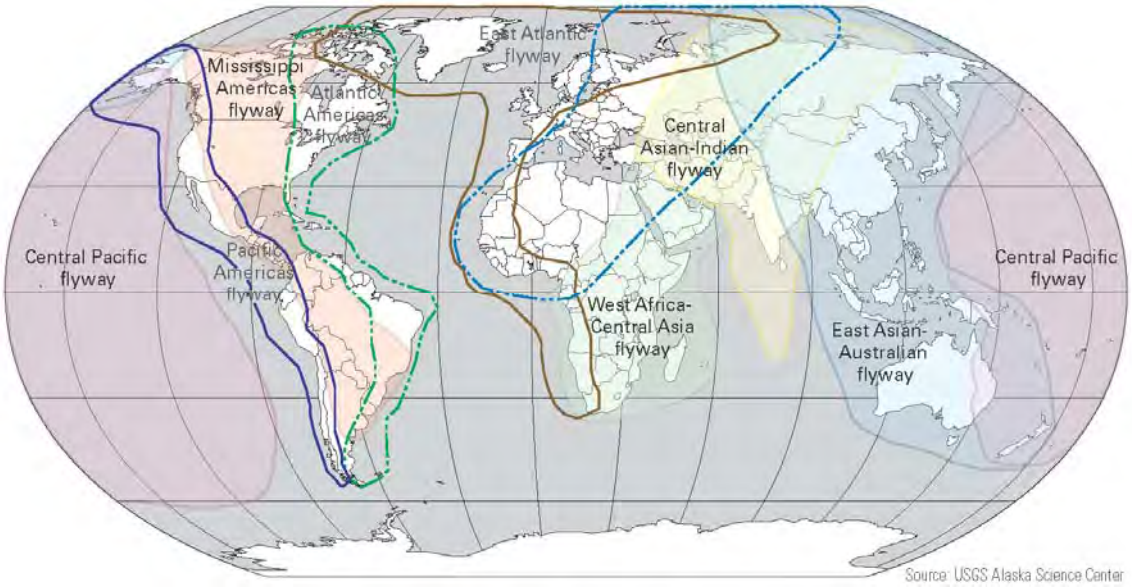
North American Breeding Bird Survey

The USGS North American Breeding Bird Survey (BBS), the continent's barometer of bird population change, has been providing data crucial for migratory bird conservation planning since 1966. Although the BBS is most effective when it surveys the entire breeding ranges of species, until now its geographic scope has been limited to the U.S. and Canada. In fact, the breeding ranges of over 150 species extend far into Mexico.

Because of this, management decisions for species of the southwestern U.S. in particular have been based on insufficient information. Now, thanks to a strengthening Mexican conservation infrastructure and a start-up grant from the Neotropical Migratory Bird Conservation Fund, a Mexican component of the BBS is imminent.

Following a 3-year feasibility study, the three North American nations met at a workshop and agreed to begin pilot implementation of the USGS' survey in Mexico as soon as possible. This development represents achievement realizing a long-standing objective of the BBS and improving management of our shared migratory bird species. The target is for full implementation by 2010.

WORLD FLYWAYS



The BBS helps to provide the scientific support to achieve the objectives of the NABCI, including increasing the value of monitoring information by improving survey statistical design and protocol development. The NABCI focuses on managing the populations and habitats of birds that are protected, restored, or enhanced through coordinated efforts at the national, regional, State, and local level, guided by sound science and effective management.

The BBS addresses the Department's Resource Protection strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment and by providing the science information that resource managers need.

The USGS national-level approach to managing biological and natural resource data and scientific information ensures the application of standards that foster opportunities for collaboration and cooperation. The USGS places a premium on partnerships at all levels of government and with nongovernmental entities, including the private sector. These partners use USGS-generated scientific data and information that contribute to the knowledge base available to Interior land and resource managers, and others.

The USGS works closely with partners and customers in defining priorities, developing science plans, and carrying out biological research to support the needs of research management organizations. Key partners in many of these endeavors include Interior bureaus, other Federal agencies, States, Tribes, and private organizations with regional and ecosystem-specific interests.

2009 Program Performance

The USGS tracks several performance measures. Some of these are included in the Department of the Interior’s Strategic Plan under the Resource Protection mission goal to protect the Nation's natural, cultural, and heritage resources. The end outcome goal is to improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment. The performance measure of this goal is to identify the percent of targeted science products that are used by partners for land or resource management decision-making.

Products include 1 peer-reviewed publication and 1 technical report for the FWS.

In 2009, BRM Status and Trends program will conduct workshops for training/validation of BBS volunteers and improving survey design and protocol development.

Healthy Lands — Building Blocks of Cooperative Conservation

	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-)[a/]	2009 Program Changes (+/-)[b/]	2009 Budget Request	Change From 2008 (+/-)
Biological Research						
Biological Research & Monitoring ($000)	143,342	141,275	-2,991	+7,056	145,340	+4,065
Healthy Lands ($000)	140	1,477	0	+3,500	4,977	+3,500
Total FTE [c/]	***1***	***3***	***0***	***+7***	10	+7

[a/] Fixed cost increases for this subactivity total $2,551, of which $2,016 is budgeted and $535 is absorbed. A technical adjustment is proposed as part of a budget restructure that moves funding for global change activities into a new integrated budget activity titled Global Change.

[b/] Changes for this subactivity include a reduction of -$517 for travel. The impact of this change is described in the General Statement that begins on page A-1.

[c/] FTE above for 2007 include 18 FTE associated with contributed funds.

Summary of 2008 Program Changes for Healthy Lands Initiative

Request Component	($000)	FTE
• Healthy Lands	+3,500	+7
TOTAL Program Changes	**+3,500**	**+7**

Justification of 2009 Program Changes

Healthy Lands **(+$3,500,000 / +7 FTE)**

The Healthy Lands Initiative (HLI), a central component of the President's fiscal year 2008 budget, laid the foundation for addressing the challenge of conserving the Nation's most at-risk natural resources in light of explosive population growth and significant increases in energy development on public land in the West. In 2009 the USGS, a significant partner in this multi-bureau initiative, will build on 2008 accomplishments such as inventorying species and habitats, monitoring and assessing water resources, integrating energy resources and habitat data, and providing a robust data inventory and models to inform land-use decisions for southwest Wyoming, which can be transferred to other HLI areas.

> The Healthy Lands Initiative was developed to get out in front of and respond to a multitude of pressures on the public lands. These pressures include increased urban-suburban development, outdoor recreational activity, rising energy demands, after effects of large-scale wildfires and the effect of an ongoing weed invasion. This initiative takes a landscape-level approach to land management that will facilitate necessary energy development while protecting resources on public lands including a world-class wildlife habitat.

The USGS brings its portfolio of science expertise to address the real-time land management issues identified by Department resources managers to help decisionmakers build and implement adaptive management solutions in the region. The requested funding will accelerate the landscape-scale assessment, planning and habitat restoration and enhancement activities in

southwest Wyoming and extend them to include additional high priority landscapes. Adaptive management approaches to land and resource management will be initiated to ensure the long-term viability of wildlife habitat. Implementing existing land management plans with consultation will minimize impacts on wildlife and the listing of species.

Outputs from this effort will provide the information and knowledge for decisionmakers to build and implement adaptive management solutions as energy resources are developed to ensure the long-term viability of wildlife and habitats in these areas.

Program Performance Change

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Outyears
					A	B=A+C	C	D
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments								
Percent of targeted science products that are used by partners for land or resource management decisionmaking	90%	93%	93%	≥90%	≥90%	≥90%	--	≥90%
Quality: X% of studies validated through appropriate peer review or independent review	1/1 100%	1/1 100%	1/1 100%	3/3 100%	3/3 100%	3/3 100%	0 --	11/11 100%
# of systematic analyses and investigations	1	1	1	3	3	3	0	+11
Total actual/projected cost ($000)	200	200	200	600	600	2,800	+2,200	0
Actual/projected cost per scientific report or other product (whole dollars)	200,000	200,000	200,000	200,000	200,000	200,000	--	--
Comments	New funds received in 2008 accelerates completion of 2 new systematic analyses and investigations to evaluate treatments and develop adaptive management options for sage habitats for the benefit of sage grouse on Interior managed lands. New funds requested in 2009 would result in 11 new systematic analyses and investigations delivered in the outyears. Systematic analyses, the product of research, require 1 to 5 years for completion. The new funding will accelerate completion of some research projects currently in progress as well as initiate other research projects that will conclude in the outyears. The USGS used an annual snapshot of the Resource Protection ABC research work activity cost data averaged over time as a surrogate cost per unit. To this the USGS added a proportional share of the cost derived for the Resource Protection science management activity. For 2005 through third quarter 2007, the average unit cost for systematic analyses is approximately $200,000 for the Resource Protection mission area which correlates to the average cost that the program had historically used before implementation of ABC.							
# of formal workshops and training provided to customers	2	2	2	3	3	5	+2	0
Total actual/projected cost ($000)	160	160	160	240	240	400	160	0
Actual/projected cost per workshop (whole dollars)	80,000	80,000	80,000	80,000	80,000	80,000	--	--

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Outyears
					A	B=A+C	C	D
Comments	For workshops, which support land managers in applying the science, and are a shorter term product, the USGS used the average unit cost of $80,000 based on the technical assistance and proportional share of the science management work activity for 2006 for the Resource Protection mission. Other Interior goals will also accrue performance from systematic analyses produced, workshops conducted, and monitoring stations added to the network.							
# of real-time ground-water sites reporting in NWIS-Web	0	0	0	1	1	4	3	0
Total actual/projected cost ($000)	0	0	0	0	0	*	*	0
Actual/projected cost per ground-water site (whole dollars)	--	--	--	*	*	*	*	--
Comments	* In the first year of operation, the cost of a single well ranges from $4,000–$10,000 and includes the cost of getting permission to use a landowner's existing well, characterization of the site (depth of well, type of pump, establishment of measurement benchmark), and installation of scientific instruments. Wherever possible, the USGS retrofits existing wells with the needed equipment, but if a well is required in a location where none are available, drilling costs can range from $5,000–$25,000, depending on terrain, rock type, and the depth and diameter of the well. After the first year, annual operating costs range from $1,000–$7,000, depending on frequency of sampling, presence or absence of a recorder, real-time capability, distance of the well from the office, and other factors.							

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 President's budget level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent outyear.

Program Overview

The USGS, BLM, and FWS are working together to develop a science-driven approach to implementing the Healthy Lands Initiative. This process will provide a science-based landscape-level approach that combines biological planning, conservation design and delivery, development of best management practices, establishment of a data clearinghouse and information management framework, while utilizing an integrated inventory, monitoring, and research strategy to guide the adaptive management cycle.

In southwest Wyoming, USGS will monitor changes as energy resources are developed and inform conservation and restoration efforts, contributing to the long-term viability of wildlife and habitats in these areas.

This work builds on past and present scientific studies and assessments in Wyoming, such as the recently completed energy assessment of the basin, land use and land cover studies, vegetative mapping studies, and long-term baseline water monitoring. The USGS will work with Federal and State land management agencies to identify their highest priority issues that will guide the scientific priorities. Specific partners include BLM, FWS, National Park Service, Bureau of Reclamation, U.S. Forest Service, Wyoming State agencies, universities, industry, non-governmental organizations, and conservation groups.

In 2007, the Department made available $3.0 million to States for HLI through BLM. USGS contributed approximately $500,000 into science activities and technical assistance in southwest Wyoming. The USGS led the science workshop that focused on the HLI issues in southwest Wyoming such as habitat fragmentation, inventorying and monitoring, and database development.

In 2008, BLM will initiate on-the-ground work in several States (NM, WY, UT, CO, ID, OR-NV-ID), and USGS will work with partners to implement the highest priority integrated science identified through workshops and meetings with stakeholders. To strengthen the collaboration, a coalition of Interior bureaus along with the U.S. Forest Service, the Wyoming Game and Fish Department, and the Wyoming Department of Agriculture formed a partnership called the Wyoming Landscape Conservation Initiative (WLCI). The partners are extending the existing Memorandum of Understanding to include additional local stakeholders such as county commissioners and conservation district managers.

Also in 2008, USGS is providing the expertise to help land managers extend landscape management principles to new geographic areas. USGS will hold additional science workshops in partnership with the other members of the WLCI community to maintain emphasis on their highest priority needs, report accomplishments, and identify new priorities. Additionally, USGS will establish and implement a monitoring strategy and protocols to provide information needed to assess adaptive management decision, develop a data warehousing and information management strategy to make study results and decision management tools readily available to all partners, and develop habitat restoration strategies and models.

2009 Program Performance

This initiative directly contributes to the Department's Resource Protection strategic goal of improving the understanding of natural ecosystems by assessing the current health of the Green River Basin in southwest Wyoming and other priority ecosystems, monitoring the changes as energy resources are developed, and informing conservation and restoration efforts, all to ensure the long-term viability of wildlife and habitats in these areas. The "percent of targeted science products that are used by partners for land or resource management decisionmaking" under Resource Protection will increase as a result of this initiative.

Critical products under development include spatial tools and models that accurately map sagebrush habitats over large areas. The first phase focuses on Southwest Wyoming and models have been developed that predict multiple rangeland components with a high degree of accuracy. These methods have been specifically developed to be both operationally and cost effective over large areas to enable their application across entire ecosystems. Subsequent models now in progress will provide users with information to meet specific habitat requirements, assess multiple wildlife habitat relationships over large landscapes, and provide a rangeland monitoring database that discriminates significant change over time.

In 2009, the USGS will conduct a landscape-level ecological assessment to build on the baseline of scientific information related to wildlife habitat and development activities occurring or planned for these areas. Benefiting from the 2008 work in southwest Wyoming, the initial focus of USGS in the HLI initiative, the scientific tools, models, and protocols that were developed will be transferred to other HLI areas and applied to assist land management agencies to determine best management practices in other areas and to meet the needs of multiple stakeholders.

Additionally, strategic integrated monitoring protocols will be identified and applied to provide more scientifically based information to support management decisions and implementation of an adaptive management process. All data and information collected will be organized into an integrated geospatial database and made available to all partners within these areas. The USGS will organize and conduct additional science workshops to identify partner needs and the appropriate science to apply to meet short- and long-term needs and goals.

The partnership among USGS, BLM, FWS, and others will be a long-term science-based effort to assess and enhance aquatic and terrestrial habitats at a landscape scale while facilitating responsible energy development. Tools and technologies developed in this effort will be transferable to other areas in the Nation where there are similar issues of energy development and impacts to wildlife habitat.

Results of these efforts and completion of ecological assessment in future years will provide the information and knowledge for decisionmakers to build and implement adaptive management solutions to ensure the long-term viability of wildlife and habitats in these areas. The partnership among USGS, BLM, FWS, and State and local agencies and organizations will continue to expand as a long-term science-based effort to assess and enhance aquatic and terrestrial habitats at a landscape scale across the Nation.

All programs contributing to this initiative have scored “moderately effective” or “effective” in the Administration’s PART evaluation. Program metrics, some of which were developed during the PART process, will be used to measure performance.

Ocean and Coastal Frontiers Initiative — Healthy Coastal Lands and Oceans

	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-)	2009 Program Changes (+/-)	2009 Budget Request	Change From 2008 (+/-)
Extended Continental Shelf						
Coastal and Marine Geology Program ($000)			0	+4,000	4,000	+4,000
Improving Ocean and Coastal Resources through Collaboration						
Coastal and Marine Geology Program ($000)			*0*	+2,000	2,000	+2,000
*FTE Increase to be Spread**			*0*	*+7*	*7*	
Ocean Action Plan						
Coastal and Marine Geology Program ($000)	5,000	8,121	0	+500	8,621	+500
FTE	*19*	*24*	*0*	*0*	*24*	*0*
Water Resources Investigations Hydrologic Networks and Analysis ($000)-	0	984	0	+500	1,484	+500
FTE	*0*	*3*	*0*	*0*	*3*	*0*
Subtotal ($000)	5,000	9,105	0	+1,000	10,105	+1,000
Subtotal FTE	*19*	*27*	*0*	*0*	*27*	*0*
Total Requirements ($000)	**5,000**	**9,105**	**0**	**+7,000**	**16,105**	**+7,000**
Total FTE	***19***	***27***	***0***	***+7***	***34***	***+7***

*The USGS will draw on expertise from across USGS programs and science centers to implement the major components of the Department's Coastal and Ocean initiative. As FTE provisions are developed across USGS programs and science centers engaged in multiple elements of this program, allocation of Coastal and Marine Geology Program (+7 FTE) to specific program components will be determined.

Summary of 2009 Program Changes for Ocean Science

Request Component	**($000)**	**FTE**
Ocean and Coastal Frontiers		+7
• Extended Continental Shelf		
Coastal and Marine Geology Program	[+4,000]	
• Improving Ocean and Coastal Resources through Collaboration		
Coastal and Marine Geology Program	[+2,000]	
• Ocean Action Plan		
Coastal and Marine Geology Program	[+500]	
Water Resources Investigations- Hydrologic Networks and Analysis	[+500]	
TOTAL Program Changes	**+7,000**	**+7**

Justification of 2009 Program Changes

The 2009 request for the USGS Ocean and Coastal Frontier Initiative is $16,105,000 and 34 FTE, a net program change of +$7,000,000 and +7 FTE from the 2008 Enacted level.

Ocean and Coastal Frontiers Initiative (+$7,000,000 / +7 FTE)

The Department of the Interior's Ocean and Coastal Initiative builds on work begun in response to the U.S. Ocean Action Plan (OAP) issued on December 17, 2004 and the January, 2007 Ocean Research Priorities Plan (ORPP) (*http://ocean.ceq.gov/about/docs/orppfinal.pdf*). Through Executive Order and the OAP, the President directed that Federal agencies enhance existing partnerships by expanding coordination and consultation on ocean-related matters and encouraged State collaborations with Federal agencies to address regional ocean and coastal issues. The Department of the Interior has developed an Ocean and Coastal Frontiers Initiative that addresses Department, OAP, and national priorities as well as needs of developing regional ocean governance alliances. This request supports the USGS component of the broader departmental Ocean and Coastal Initiative.

Partnerships are crucial to this Initiative's success and include National Oceanic and Atmospheric Administration (NOAA), U.S. Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (USACE), the Office of the Secretary of the Interior, Minerals Management Service (MMS), Fish and Wildlife Service (FWS), National Park Service (NPS), and Office of Insular Affairs (OIA).

The USGS implementing program for the Ocean and Coastal Initiative is the Coastal and Marine Geology Program (CMGP) which draws upon expertise across the USGS. This initiative builds upon base-funded activities and enhances efforts supporting the near-term priorities of the ORPP initiated in the 2008 budget.

Proposed activities will be substantially leveraged with external resources and expertise to provide services and products in the most efficient and cost-effective manner.

The Department's Ocean and Coastal Frontiers Initiative includes $7.0 million for the USGS and $0.9 million for FWS. The USGS is the lead bureau for the following initiative elements:

- **Extended Continental Shelf: Expanding the Frontiers of Scientific Information (+$4,000,000) —** USGS will provide the geologic base for development of a successful claim to the U.S. Extended Continental Shelf (ECS) that will vastly increase the area of public lands for which the Department has management and regulatory responsibility.

- **Improving Ocean and Coastal Resources through Collaboration (+$2,000,000) —** USGS will develop, in collaboration with other Federal agencies, the tools, information, and management frameworks required to address pressing national issues where they are deemed critical to regional priorities.

- **Ocean Action Plan (+$1,000,000) —**The OAP effort includes $1.0 million for the USGS to continue activities initiated in 2008:

    - **Coastal and Marine Geology Program (+$500,000) —** This increase will engage and enhance existing regional coastal ocean observing systems (RCOOS) and, in

partnership with other federal agencies, apply USGS monitoring, mapping, and modeling capabilities to the development of science-based decision-support tools for coastal managers. Activities supported will advance the near-term priorities of the ORPP.

- **Water Resources Investigations - Hydrologic Networks and Analysis (+$500,000) —** This increase will implement the National Water Quality Monitoring Network (NWQMN) called for in the OAP and defined through the efforts of some 40 Federal, State, and local agencies, monitoring associations, or professional organizations including the USGS, EPA, and NOAA. The "National Water Quality Monitoring Network for U.S. Coastal Waters and their Tributaries" plan provided interagency pilot studies in 2007 to inventory existing monitoring assets, identify gaps between network design specifications and current data collection, refine the NWQMN's observational and data sharing requirements, and identify next steps for network implementation. The proposed increase will build upon pilot study results leading to demonstration projects designed to reveal the feasibility of the NWQMN, refine observational parameters and temporal and geographic sampling frequencies and scales, and develop data sharing, summarization, and reporting methodologies. Expanded information can be found in the Hydrologic Networks and Analysis (HNA) section, beginning on page I-1.

Partnering programs will support integrated efforts to generate specialized scientific data and research analyses necessary to effectively manage and conserve the Nation's coastal and marine resources, and produce scientific products that the public and private sectors can use to respond to natural disasters and changing conditions in our living and non-living natural resources. This initiative supports the Department's Strategic Plan Resource Protection goal to improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment. All programs contributing to this initiative have scored moderately effective or better in the Administration's Program Assessment Rating Tool (PART) evaluation, and program metrics, some of which were developed during the PART process, will be used to measure performance.

Activities supported through this initiative will advance the broad goals of the USGS Science Strategy (*Facing Tomorrow's Challenges – U.S. Geological Survey Science in the Decade 2007-2017*, USGS Circular 1309, 2007) with respect to Understanding Ecosystems and Predicting Ecosystem Change; Climate Variability and Change; and National Hazards, Risk, and Resilience Assessment; the goals of the USGS National Coastal Program Plan (NCPP); Administration priorities established in the OAP and ORPP; and the emerging priorities of Regional Ocean Governance Alliances.

The USGS will build on existing partnerships with NOAA, EPA, USACE and Interior bureaus.

- Partnerships will (1) provide and integrate monitoring and mapping data from existing and enhanced programs and (2) establish the observational basis for regional forecasting and assessment.

- USGS leadership in water quality and hydrologic monitoring, ecosystem monitoring, and geologic and landscape mapping of coastal and submerged resources will be integrated (e.g., NOAA bathymetric mapping, tide and water level monitoring, and physical modeling, and USACE coastal mapping and monitoring to provide an observational

framework for decision-support, models and assessments). Observational programs established by RCOOS will be important contributors.

- Existing interagency collaborative efforts will (1) enhance developing integrated ocean observing systems and (2) through the National Water Quality Monitoring Council-led implementation of the NWQMN, facilitate inventory and fill gaps in regional upland, estuarine and coastal monitoring, including physical, biological, and ecological responses. NOAA support for Integrated Ocean and Coastal Observing System Regional Associations will contribute to stakeholder engagement and outreach efforts to prioritize observing needs and integrate observing networks into decision support tools.

- Supported activities, including external community efforts, will result in physical and ecosystem modeling tools that provide critical information for anticipating hazard vulnerability, contaminant and pathogen movement, and ecological and human impacts.

Program Performance Change

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan+ Fixed Costs)	2009 President's Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments.								
# annual gigabytes collected **(CMGP)**			8	8	8	25	+17	25/year
# cumulative gigabytes managed **(CMGP)**			79	87	95	112	+17	187
Comments	Increased gigabytes beginning in 2009 are associated with gigabytes of data managed by the CMGP for seafloor mapping of the ECS, within Ocean and Coastal Frontiers Initiative.							
# systematic analyses and investigations delivered to customers			218	200	200	205	+5	+15
Total Actual/Projected Cost ($000)			33,745	34,549	34,549	40,323	+5,774	+197,000/ year
Actual/Projected Cost Per scientific report or other product (whole dollars)			155,000	173,000	173,000	197,000	+24,000	+40,323/ year
Comments	Rebaselined in 2007 to standardize bureau-wide counting. 2009 Budget has proposed +5 for the Ocean and Coastal Frontiers Initiative beginning in 2009 and +15 additional systematic analyses delivered in the outyears.							
# formal workshops or training provided customers (instances/issues/ events)			11	11	11	15	+4	+5

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan+ Fixed Costs)	2009 President's Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
Total Actual/Projected Cost ($000)			277	300	275	375	+75	25/year
Actual/Projected Cost Per Workshop (whole dollars)			25,200	27,200	25,000	25,000	0	25,000
Comments	Funding requested in 2009 results in 4 new workshops to be delivered in 2009; +2 in 2010; +1 in 2011 and +2 in 2012. Variation in location of workshops results in the differences in average costs.							
# environmental products in marine protected and managed areas provided for resource mgt and restoration planning **(CMGP PART)**			72	75	75	81	+6	+6

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent outyear.

Program Overview

The 2009 Oceans and Coastal Frontiers Initiative involves the participation of several USGS programs, with current funding as follows**:**

$8,621,000 – Geologic Hazards, Resources and Processes, Coastal and Marine Geology Program (CMGP)
$1,484,000 – Water Resources Investigations - Hydrologic Networks and Analysis (HNA)

Under this initiative, the USGS will address the following major elements of the Department's Ocean and Coastal Frontiers Initiative:

Extended Continental Shelf (ECS) — In 2007, the USGS CMGP, working within the Interagency Task Force on the Extended Continental Shelf, supports ongoing activities that provide technical evaluation of other Nation's submissions to the United Nation's Commission on the Limits of the Continental Shelf; assess current data availability for development of U.S. ECS limits; and contribute to coordinated interagency data collection, management and analyses strategic plans to define the U.S. ECS limits. This work will expand in 2008 through the interagency process, led by the Department of State, and funded in the 2008 budget request for the NOAA. The USGS CMGP funds will provide for geophysical data collection and interpretation consistent with development of a successful delineation of the U.S. ECS.

Improving Ocean and Coastal Resources through Collaboration — The USGS has a long history of developing successful partnership in coastal areas to address national issues through regional scale studies. In 2007, activities included integrated multi-disciplinary efforts in Puget Sound, the Gulf of Mexico, and San Francisco Bay. The 2008 budget provides for continuation of these efforts and multi-agency implementation of the ORPP Plan enhancing existing USGS and other agency programs in the Great Lakes and Gulf of Mexico. The objective of these regional efforts is, in collaboration with other Federal, state and local agencies, to develop the tools, information, and management frameworks required to address pressing national issues where they are deemed critical to regional priorities. The USGS CMGP will enhance those regional partnership efforts in the Great Lakes and Gulf of Mexico, and one or more additional efforts identified through a merit-based selection process.

Ocean Action Plan — USGS CMGP and HNA are continuing efforts to advance the OAP, implement the NWQMN called for therein, and engaging in interagency efforts to advance the implementation strategy of the ORPP in support of the Near-term Priorities identified therein.

2009 Program Performance

Through this initiative, the USGS will support activities including:

- **Extended Continental Shelf ($4,000,000) —** Supporting departmental priorities for Expanding the Frontiers of Scientific Information**,** substantial and targeted mapping activities will provide the technical basis for developing a successful delineation of the ECS. Establishment of U.S. ECS limits will vastly increase public land areas and resources over which the Department will have management and regulatory responsibility. The technical requirements for delineation require substantial geological and geophysical data collection and interpretation. USGS Federal leadership in geological characterization will marshal interagency resources and engage external technical expertise to establish and document ECS limits. As identified by the Interagency Task Force on the ECS, initial data collection priorities will focus on the Arctic.

  Specific activities will:

  - Support full engagement of the USGS and other Department bureaus in the development of information, analyses, and submission preparation to delimit the U.S. limits of the ECS, and

  - Provide information relevant to the management of resources (estimated to exceed $1.0 trillion in value) in the ECS expanded national domain.

- **Improving Ocean and Coastal Resources through Collaboration ($2,000,000) —** The departmental initiative includes substantial activities that respond to needs identified by regional alliances and enhance provision of scientific information and research products to inform decisionmaking on issues including hazard resilience, resource conservation and restoration, water quality, and public health. Through targeted implementation of the USGS NCPP and enhancement of its leadership role in provision of mapping, monitoring, and research products, the USGS is a lead bureau in much of the regional implementation proposed.

Proposed regional activities will: (1) address national issues through implementation of near-term priorities identified in the ORPP, (2) respond to the OAP, and (3) respond to targeted development of coordinated multi-agency mapping and monitoring activities, including the NWQMN. Regional study selections will be merit based and will reflect, (a) stakeholder input in development of priorities, study goals, and strategies; (b) responsiveness to consensus objectives of established and enhanced multi-sector partnerships; (c) leveraging opportunities effectively utilizing available partner and USGS expertise and resources; and (d) impact of study products to address priority decision-making needs of coastal managers consistent with the near-term priorities of the ORPP. ORPP implementation in the Great Lakes and Gulf of Mexico began in 2008. In 2009, studies will be evaluated for merit-based selection, expanding to include the New England and Pacific Coast regions. Decisions on funding allocations will be made in Summer 2008.

The scope of merit-based activities will:

- Enhance the provision of mapping and monitoring information required for ecosystem-based management of coastal resources,
- Support integrated collaborative studies which provide (1) forecast models and assessments to anticipate future coastal change and (2) tools to effectively evaluate policy and management strategies to preserve the environmental and economic health of coastal systems, and
- Support the Department and USGS strategic goals and plans, Administration priorities established in the OAP and ORPP, and the emerging priorities of the Regional Ocean Governance Alliances.

- **Ocean Action Plan ($1,000,000) —** The CMGP and HNA program increases, originally proposed as part of the 2008 President's budget and partially funded in 2008, continue USGS efforts to advance the OAP, implement the NWQMN called for therein, and to engage in interagency efforts to advance the implementation strategy of the ORPP in support of the Near-term Priorities identified therein.

The following proposed studies address national issues through response to regional priorities and will contribute to the coordinated Federal implementation of the ORPP near-term priority “Forecasting the Response of Coastal Ecosystems to Persistent Forcing and Extreme Events”. USGS studies proposed include:

- Rebuild for a Disaster Resilient Gulf Coast — CMGP led efforts will enhance initial implementation begun in 2008 and will support data integration and modeling of barrier island and coastal response to severe storms and regional assessments of sand resources to inform restoration and management of coastal barrier islands; providing tools to assess the feasibility and effectiveness of alternative strategies to enhance ecosystem health and hazard resilience.

- Forecast Water Quality and Beach Health in the Great Lakes — CMGP led efforts will enhance initial implementation begun in 2008 and will support monitoring, consistent with the NWQMN, and integrate observations and models to improve forecasts of pathogens on recreational beaches and water quality; providing tools to reduce human health risks and economic impacts associated with impaired water quality and beach closures.

Topics for merit-based evaluation may include the following customer priorities with funding levels to be based upon scope and impact of proposals:

- Manage Coastal Change Impacts on Ecosystems and Coastal Communities on Long Island — Assess system-wide distribution, transport, and accumulation of sediment and associated contaminants to determine response of coastal resources, including coastal ground water, to sea-level rise and storms; providing resource managers tools to anticipate the impacts of future change and the effectiveness of management strategies.

- Map and Monitor San Francisco Bay/Delta and Coastal Ocean — Conduct mapping and monitoring in support of model development to understand regional sedimentary systems and forecast the evolution of natural, human-altered, and restored coastal landscapes; providing tools to assess the vulnerability of coastal resources, including restored habitat, to natural processes and human activities.

- Science for the Puget Sound Partnership — Evaluate alternatives for restoration of critical habitat; evaluate the effects of urbanization on habitat, water quality, and restoration success; and develop tools for adaptive management by State and tribal agencies; providing tools to evaluate and prioritize strategies to maintain and restore critical ecosystem elements.

Climate Change Initiative

	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-)[a/]	2009 Program Changes (+/-)[b/]	2009 Budget Request	Change From 2008 (+/-)
Global Change						
Realignment	[21,708]	[21,291]	21,664	-81	21,583	+292
FTE	*[164]*	*[164]*	*164*		*164*	*[0]*
Congressional Action		+7,383		-7,383	0	-7,383
FTE		*+29*		*-29*	*0*	*[-29]*
Climate Change Initiative	0	0		+5,000	5,000	+5,000
FTE				*+20*	*20*	*+20*
Total Requirements ($000)	**0**	**7,383**	**21,664**	**-2,464**	**26,583**	**-2,091**
Global Change over time	[21,708]	[28,674]			[26,583]	
Total FTE		*29*	*+164*	*-9*	*184*	*+20*

[a/]Fixed cost increases for this activity total $473, of which $373 is budgeted and $100 is absorbed. A technical adjustment of $21,291 is proposed as part of a budget restructure that moves funding for global change activity into a new integrated budget activity titled Global Change.
[b/]Changes for this activity include a reduction of -$81 for travel. The impact of this change is described in the General Statement that begins on page A-1.

The technical adjustment is proposed as part of a budget restructure that consolidates funding for global change activities from throughout the bureau into this new integrated budget activity titled Global Change. For the cross-walk from current programs to this structure, see section E.

Note: The 2009 proposed activity will encompass $26.6 million of the USGS contribution to the Department of the Interior Climate Change Science Program (CCSP) of $31.4 million. An additional $3.7 million for the National Satellite Land Remote Sensing Data Archive (NSLRSDA) in the Land Remote Sensing sub-activity in Geography and $1.1 million in the Biological Research and Monitoring activity contributes to CCSP and are not included in the proposed new activity.

Summary of 2009 Program Changes for the Climate Change Initiative

Request Component	**($000)**	**FTE**
• Climate Change Science Strategy	+4,000	+13
• Climate Change Adaptation	+1,000	+7
TOTAL Program Changes	**+5,000**	**+20**

Justification of 2009 Program Changes

The 2009 budget request for the Climate Change Initiative is $5,000,000 and 20 FTEs, a net program change of -$2,464,000 and -9 FTEs, and a net increase of +$19,200,000 and +155 FTEs from the 2008 Enacted Budget.

Climate Change Initiative (+$5,000,000 / +20 FTEs)

The Department of the Interior holds a natural leadership role in providing critical science, monitoring, and predictive modeling of information related to changes in climate. As steward of 507 million acres of Federal lands, a primary strategic goal of the Department is to improve the understanding of natural ecosystems and resources through interdisciplinary assessment.

The 2009 budget proposal includes a $5.0 million Climate Change initiative. Building on previous work in climate change, this initiative will result in science and adaptive management strategies for climate impacts. Results from this initiative will provide resource managers crucial information and tools to develop land and water management strategies and determine adaptive management activities in a dynamic environment affected by climate change.

It is generally thought that global warming trends over the last 100 years that have accelerated in the last 40 years will produce significant global changes affecting water supplies, plant and animal life, human infrastructure, and ecosystems on diverse landscapes. Changes may include differences in the amount and timing of precipitation, altered water temperatures and sea levels, and fluctuations in vegetation patterns and distribution of wildlife.

Changes in climate can lead to long- and short-term resource management challenges such as loss of storm water buffers for low-lying areas, reduced water flow, lower storage and underground water levels, disruptions of biological patterns and interactions between species and their habitat, and altered patterns for natural hazards such as storms, drought, fires, insect outbreaks.

The Department proposes a two-prong approach to address the potential impacts of climate change. Primarily, the Climate Change initiative would establish an integrated approach to scientific understanding of the impact of changing climate on lands across the United States. The USGS will also develop adaptation and mitigation strategies that anticipate the effects of a changing climate.

Although the science strategy is a long-term solution to the issues climate change presages, the initiative also includes components with more immediate solutions. Multiple Interior agencies will apply proven remedies to reduce green house gasses on Federal land and employ cost-effective use of alternative energy, energy conservation design and practices, and water conservation.

Program Performance Change
(Climate Change Science Strategy and Adaptation)

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 PB + Fixed Costs)	2009 President's Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments								
# of systematic analyses and investigations				7	81	86	+5	+16
Total actual/ projected cost ($000)				$1,750	$13,500	$14,750	+$1,250	+$4,000
Actual/projected cost per scientific report or other product (whole dollars)				$250,000	$250,000	$250,000	$250,000	$250,000
Comments	This measure includes decision support tools delivered to stakeholders. Costs of decision support tool development include baseline research, field testing and customer workshops to determine user needs and delivery requirements. Out-year costs per tool may decrease as knowledge base on customer requirements increases. Cost per unit is an average from the program contributing to the Global Change Activity. This measure combines outputs from several USGS programs into a new budget activity.							
# of workshops or training provided to customers *(annual)*				3	11	13	+2	+6
Total Projected Cost ($000)				$75	$275	$325	+$50	$150
Projected Cost per Workshop (whole dollars)				$25,000	$25,000	$25,000	+$25,000	+$25,000
# of annual gigabytes					2.8	2.8	0	+8.4
# of cumulative gigabytes managed					22.2	22.2	0	30.6
% of surface area with temporal and spatial monitoring, research, and assessment/data coverage to meet land use planning and monitoring requirements (Global Change) (PART) (Number of completed eco-region assess-ments out of a total of 84 eco-regions).					78% (66/84)	87% (73/84)	+9%	Plan completion 2010

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 PB + Fixed Costs)	2009 President's Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Out-year performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent out-year.

Program Overview

Climate Change Science Strategy

This Climate Change initiative provides critical science, monitoring, and predictive modeling of information related to our changing climate and its effects on the landscape and the Nation's resources. The knowledge and information that results from this program will help policymakers, resource managers, and citizens make informed decisions about the management of the landscapes for which they have responsibility and on which they live.

Current climate models and scenarios do not provide information that most stakeholders require for effective resource or hazard management, and they do not provide information in ways that are accessible to the managers that need that information. While local and regional studies are essential for understanding the processes and responses of physical and biological systems to climate change, it is cost-prohibitive to conduct rigorous, detailed studies of this type for every square mile of the Nation. A better approach is to monitor and measure changes across the landscape at a broader scale, and then relate those observations to the results of detailed and regional-scale studies in a rigorous, reproducible way.

Most current climate models provide insufficient information to stakeholders for effective resource or hazard management. Furthermore, information that is available is not always accessible to the managers that require it. While local and regional studies are helpful in understanding the processes and responses of physical and biological systems to climate change, it is not feasible to conduct detailed studies of this type for every square mile of the Nation. A more cost effective approach is to monitor and measure changes across the landscape at a broader scale and relate these observations to the results of more detailed studies using rigorous and reproducible methods.

Existing research elements from 2007 include ongoing work on current and past climate and climate variability using both direct evidence and proxies in the geologic, cryospheric and biotic records – ice cores, tree rings, fossils, sediments, phenology and other data – in order to constrain the natural variability of climate. Other ongoing research includes analysis of monitoring systems and archives of remotely-sensed data to research the magnitudes, rates and effects of natural and human-induced changes to the Earth's surface and systems, and to separate and quantify anthropogenic versus natural change in Earth surface processes.

Additional USGS activities planned for 2008 include studies aimed at assessing the processes and cycles among the hydrosphere, cryosphere, biosphere and geosphere across a wide range of spatial and temporal scales, and in measuring and reducing uncertainty in the rates of change in the Earth's past climate and past climate variability.

Current USGS studies of polar bears are designed to explain their movements and activities by investigating interactions between bears, their principal prey, ringed seals, and the sea ice that supports both of them. In 2008, additional studies will develop a better understanding of how polar bears adapt to changing conditions. The results will have implications for the health and survival of the bears and the Arctic ecosystem in which they live.

Existing elements of a national monitoring network from 2007 include nationally based monitoring efforts and analysis of trends and change. Ongoing studies for 2008 are aimed at understanding ecological and biogeochemical processes in the context of the hydrologic cycle and of process responses to system perturbations. Results will enable discrimination between natural and human-induced changes to ensure effective water availability, water quality, and ecosystem management by supporting managers in making effective and informed water management decisions. Also in 2008, the USGS will develop improved computer models of the global climate system, and will use regional models to enhance understanding of conditions leading to climatological extremes and resultant hydrologic hazards, and regional and global climatic precursors of hydrologic events and hazards.

Land cover is both a driver and a consequence of climate change, and is heavily influenced by human activities as well as climate. Understanding the overall spatial distribution of various types of land cover through time (e.g. forest, agriculture, rangeland, urban) provides a unique look at the human footprint on the land surface. National-scale work in 2007 and 2008 includes a systematic effort to characterize and quantify land surface status and trends in changes to provide a framework for understanding patterns and processes of change from local to global scales. This element includes the continued development of a national assessment of changes in land cover for the lower 48 States over the past 30 years, using Landsat satellite imagery as the basis for assessing rates, trends, causes and consequences of change, and to define future scenarios of change.

Climate Change Science Adaptation

Recent atmosphere-ocean climate models predict pronounced warming of most continental areas, a poleward expansion of the subtropical highs, and a poleward expansion and strengthening of the mid-latitude westerly flow and associated storm tracks in this century. In North America, the warming is projected to be greatest at high latitudes, and except for the southwestern US, greatest during the winter season. In conjunction with the projected circulation changes, precipitation is likely to increase in the northeastern US and decrease in the southwest. The frequency and magnitude of extreme events is expected to change through an intensified hydrologic cycle.

However, these models have a number of limitations for land and resource managers who need to adapt their management plans for anticipated environmental changes. The global models are unable to depict the spatial structure of temperature, precipitation, wind, and clouds in regions with complex topography, complex coastlines, small irregular land masses, or heterogeneous land use and are unable to adequately represent important regional- and local-scale atmospheric circulations. Processes at high temporal scales such as precipitation frequency

and intensity, and wind speed variability are not well represented. As a result of these deficiencies, climatic changes at fine spatial scales may be significantly different from the large-area changes. In some cases, local changes may even be in the opposite direction. In short, the models, while robust in many ways, are not adequate to inform Interior resource managers in their efforts to adapt to change.

Much of the land that Interior manages occurs in complex terrain where climatic parameters (temperature, precipitation, wind, radiation) vary rapidly over short distances. Examples of issues likely to be sensitive to climate change include: coastal erosion, inundation of coastal areas by storm surges, severity and frequency of floods, fluvial erosion, severity and frequency of droughts, insect outbreaks, severity and extent of fires, eolian erosion and frequency of dust storms, air quality, depth and duration of snow pack in mountain areas, stream flow and lake levels, ground-water dynamics, permafrost degradation, melting of glaciers, mass wasting, shifting vegetation patterns, and wildlife migration patterns and range shifts.

To understand the effects of climate change on Interior lands, we not only need a better understanding of the potential changes for various climate parameters at local to regional scales, but also how these projected changes are likely to interact with other important factors affecting physical and biological systems at these scales; such factors include soil type, land use, and biotic interactions.

2009 Program Performance

All programs contributing to this initiative have scored moderately effective or better in the Administration's PART evaluation, and program metrics, some of which were developed during the PART process, will be used to measure performance.

Climate Change Science Strategy

In 2009, the USGS will initiate an integrated study of the impacts of climate change on some of the Nation’s most sensitive lands, to integrate geologic, biologic, hydrologic, and geographic information. Our approach is to combine data collection and analysis at local, regional and national scales and to integrate across different temporal and spatial scales. This approach will provide a framework for scientific research, for climate-scenario testing, for the development, validation, and cost-effective modification of mitigation and adaptation strategies, and for the assessment of risk to communities.

In 2009, improvement of the Alaskan permafrost monitoring network in the Yukon River Basin site and on Alaska’s North Slope will provide new information at better spatial resolution regarding the areas covered by both continuous and discontinuous permafrost. Part of the global network of permafrost monitoring stations, temperature profiles collected at existing and new monitoring stations will provide information on active-layer thickness (the surface layer that freezes and thaws annually) that in turn reflects changes in surface climate through time. In addition, deeper permafrost is monitored through periodic down-hole temperature measurements in boreholes. This new information will provide valuable input for modeling changes to permafrost under varying climate-change scenarios in the future.

Additionally, this study will produce regional surveys and gradient studies focused on specific issues such as the status and trends in habitat condition and population dynamics of migratory birds, amphibians, fish and other aquatic organisms, water chemistry and quantity in and on the

landscape, habitat changes and migration disturbance across multiple refuges, and monitoring of fire extent, frequency, and severity.

In 2009, work will continue to improve our understanding of earth system processes and ecological and physical thresholds, in relating those thresholds to climate drivers and climate variability, and to model and anticipate the effects of climate change and variability on natural and human systems. These studies will provide integrated long-term perspectives on the effects of climate change and variability, and will provide a baseline against which to develop plans for ecosystem restoration and for adapting to and mitigating climate change effects.

In 2009, our regional integrated monitoring studies will focus on the preparation and delivery of an integrated set of habitat-sea ice models for the South Beaufort Sea, an important area of polar bear population. These numeric models will provide valuable information on the amount, distribution and quality of polar bear habitat and forage area. These data will be linked to climate simulations and models to forecast impacts of likely climate change scenarios on polar bear habitat extent and quality, and the viability of populations, and potential for interactions with human communities under changing climate conditions. These results will be useful both to scientists and to land managers in Arctic and sub-Arctic regions.

A National Integrated Network will provide the broad-scale setting for the regional and local studies defined above. Studies at the national scale focus on broad-scale monitoring and analysis and include such approaches as satellite remote sensing, aerial photography, and national-scale networks. The primary objectives of the national-scale studies are the development of spatially and temporally continuous information, such as land use and land-cover change, broad phenologic trends, forest species distributions, forest fragmentation, fire history, normalized difference vegetation index (NDVI), albedo (reflective power), snow cover, lake appearance/disappearance, characterization of long-term trends and seasonal interannual variations in regional streamflow, snowpack accumulation and melt, glacier mass balance along with hydrologic flow across broad areas, and the response of ground water to climate change. Comparisons of data collected on different dates can be used to evaluate trends and rates of change over timescales from days to decades, thus providing a robust context for companion studies at the regional and core tiers.

In 2009, work will continue the initial development of these continental-scale sources of information and analysis, both as a way to understand the changes that are occurring to the landscape at the national scale, and as a way to generalize observations obtained from local and regional perspectives. Specifically, work will continue to bring the national assessment of land cover changes for the lower 48 states nearer to completion, with an estimate of 88 percent completion by the end of 2009. This level of completion will allow syntheses of the rates, trends, causes and consequences of land cover change in across the Nation and a better understanding of the impacts to ecosystems and human communities. Additional studies in 2009 will lead to a better understanding of hydrologic events and hazards in the context of changing climate and climatological extremes.

This initiative will contribute directly to the Department's Mission Goal of Resource Protection. Specific measures affected by this work in 2009 are:

- 5 systematic analyses,
- 2 workshops,
- 2.8 gigabytes of data added annually, and

- 9 percent increase in the percent of surface area (eco-regions) to meet land use planning and monitoring.

Climate Change Science Adaptation

To successfully manage Interior lands over the next few decades, land managers will need information on the range of climate conditions that are likely to occur on these lands at much higher resolution than can be supplied by Atmosphere-Ocean General Circulation Models. In addition, there is a critical need to understand how the projected climate changes for these particular lands will interact with physical and biological systems at micro- through regional-scales.

To this end, Interior will:

- Identify high-priority Interior lands that would benefit from downscaling.
- Assemble a suite of landscape change, ecosystem change, and hydrologic models to be coupled to regional climate models.
- Participate in the development and refinement of community land surface models (LSMs) that are directly coupled with Regional Climate Models (RCM)s for impact assessments.
- Coordinate downscaling and related earth system modeling efforts within Interior, both among the scientists involved and between Interior scientists and land managers. Outside organizations with whom Interior might partner on these efforts include the National Center for Atmospheric Research, the National Centers for Environmental Prediction, and the Geophysical Fluid Dynamics Laboratory.

The initiative includes $1.0 million to adapt scientific findings of the network into several real life applications. Aided by information from the climate change monitoring network in a pilot study in the Yukon Basin and North Slope regions of Alaska, USGS will develop guidance on infrastructure and operational changes that may be needed as a result of climate change. Guidance will include, for example, water models to facilitate water delivery decisions where climate change has affected the timing of peak flows of water resources.

The information can also be used to develop response plans for disruptive events possibly induced by climate change. For example, resource managers along the Gulf coast responsible for infrastructure, recreation, and energy production, among other things, could benefit from response plans related to storm surges, sea-level rise, and coastal erosion resulting from hurricanes.

National Land Imaging Program

	2007 Actual	2008 Enacted	2009			Change From 2008 (+/-)
			Fixed Costs & Related Changes (+/-)	Program Changes (+/-)	Budget Request	
National Land Imaging Program	0	0	0	+2,000	2,000	+2,000
FTE	*0*	*0*	*0*	*+3*	*3*	*+3*

Summary of 2009 Program Changes for the National Land Imaging Program

Request Component	($000)	FTE
• National Land Imaging Program	+2,000	+3
TOTAL Program Change	**+2,000**	**+3**

Justification of 2009 Program Changes

The 2009 request for the USGS National Land Imaging Program Initiative is +$2,000,000 and +3 FTE, a net program change of +$2,000,000 and +3 FTE from the 2008 President's Budget.

National Land Imaging Program (+$2,000,000 / +3 FTE)

On August 14, 2007, the Administration, through the Office of Science and Technology Policy, issued a plan for the United States National Land Imaging Program (NLIP). Recommendations in “A Plan for a U.S. National Land Imaging Program,” call for NLIP to be established in the Department and to provide focused leadership and management for the Nation’s operational land imaging efforts that would ensure the availability of land imaging data far into the future, with an uninterrupted history back to 1972.

The Administration’s call for NLIP to address the Nation’s needs in civil-operational land imaging is the result of several decades of policy change. Following development and launch of Landsats 1 through 5, from 1972 to 1984, the United States chose to commercialize United States land remote sensing. By 1992, the Congress resolved that commercialization was not successful and authorized the development of Landsat 7 (Landsat 6 was lost at launch in 1994). After Landsat 7 was launched in 1999, the United States attempted again to establish a private-public partnership for continued development of the Landsat program. After four years, in 2003, NASA withdrew its solicitation for proposals for a partnership due to the lack of commercial interest.

Reflecting on the circumstances of a failed partnership and facing a potential data gap, in 2004 the Administration declared Landsat to be a *National Asset* whose data would be acquired using concurrent and developing United States weather satellite missions in the future; this approach was later found to be overly expensive and technically infeasible. In 2005, with the approaching gap in the 35-year continuous record of Landsat data, the Administration provided

funding to NASA and the USGS to produce a new Landsat satellite and mission, the LDCM. Landsats 5 and 7 had reached the end of their design lives, were in degraded status, and could fail at any time; because of spent fuel, neither satellite would operate beyond 2012. LDCM is scheduled for launch in 2011.

The Administration also called upon all Federal agencies that either used or produced satellite land data to form an interagency working group to explore the future of land imaging. After nearly 2 years of policy evaluation and user assessment, the Administration released its report recommending that the Department of the Interior assume management of the NLIP in order to provide stable program management and advance civil-operational land imaging technologies and imagery applications related to economic, environmental, and security interests.

The report called on NLIP to enable the widest beneficial use of civil-operational land imaging by all levels of government, and by profit and non-profit institutions in the United States and abroad. Imagery at moderate resolution is necessary for the inventory and monitoring of global agriculture, tracking the status of Earth's ecosystems and natural resources — including impacts of climate variability — and assessing the condition of the Nation's urban and rural infrastructures. In addition, moderate-resolution imagery supports the military and intelligence missions and is used for disaster mitigation and response, and many other operational applications important to governments worldwide. Remote sensing data is essential for national and global agricultural assessments performed by the Department of Agriculture (USDA) and the United States Agency for International Development.

Estimates of the value of land imagery to the Nation are difficult to generate, since land imagery data and applications that are derived from it are ubiquitous throughout our culture and involve every level of government and many different industry and public service sectors. Refined studies of the value of land imaging are underway at the USGS and the USDA.

Additional NLIP implementation would require significant additions, upgrades, and changes to the staffing and facilities of the Department related to land remote sensing, satellite and data operations, and land science. The NLIP would —

- Evaluate the options and mechanisms to fund costs now dispersed among agencies;
- Assume management control of United States land imaging satellites used for civil-operational purposes;
- Demonstrate leadership in advancing United States satellite and instrument technologies to better address land and natural resource management;
- Acquire the capacity to manage land imaging data from multiple United States and foreign land imaging satellites to satisfy United States public and private needs;
- Enter into commercial and foreign partnerships to shape future scientific and technical initiatives in global land imaging and land science; and
- Assume national and global leadership in the application of civil-operational land imagery to address United States economic, environmental, and national security interests.

The 2009 budget includes $2.0 million for the USGS to initiate the planning and design and to develop the partnership efforts for an operational program of moderate-resolution satellite imagery data collection of the Earth's land surfaces. Although the USGS will lead this initiative, it will be with shared responsibility among the other land imaging users. This initiative will begin coordinated interagency planning within Departmental bureau activities that use and benefit

from moderate resolution land imaging data, including supporting current science and operational activities and developing new applications of moderate resolution land imaging data.

The increase will also enable the Land Remote Sensing Program to establish Federal interagency and Federal Advisory Committees for assessing the future need for civil-operational land imaging data. A formal assessment of the societal and economic benefit of satellite land imaging will also be performed. Moderate resolution land imaging satellite data would be acquired to supplement Landsat 5 and 7 data. Finally, this effort would require three additional FTE.

Program Performance Change

	2005 Actual	2006 Actual	2007 Actual	2008 President's Budget	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments								
# of formal work-shops or training provided to customers	0	0	0	0	0	1	+1	0
Total Actual/Pro-jected Cost ($000)	$0	$0	$0	$0	$0	$64	+$64	--
Actual/Projected Cost Per Work-shop (whole dollars)	$0	$0	$0	$0	$0	$64,000	0	--

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Out-year performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent out-year.

Program Overview

During 2008, the Department and USGS will take initial administrative steps to establish the Federal Land Imaging Council (FLIC) and begin initial outreach to domestic and international concerns with an interest in land imaging and land imaging applications. The FLIC will be composed of all Federal agencies of government that acquire, use, or rely upon the provision of civil land imagery and derived data to meet their Agencies' missions, and those Federal agencies that own or develop capabilities related to the development of civil operational land imaging systems. Outreach to domestic concerns includes State, local, and tribal governments, universities and scientists, and industry concerns involved in imagery data analysis and product development for United States public markets.

2009 Program Performance

In 2009, the proposed increase of $2.0 million will be used for 3 additional FTE to begin efforts to implement the NLIP.

The primary focus of development in 2009 will be the start-up of formal planning of the technical and policy aspects of NLIP. The 2009 budget includes funding for additional staff resources to address the increased workload. The USGS will also begin drafting a statement of work for technical support services needed to manage the NLIP responsibilities.

Land Remote Sensing has scored moderately effective or better in the Administration's PART evaluation, and program metrics, some of which were developed during the PART process, will be used to measure performance.

In 2009 emphasis will be in the following areas:

- Work with the land imaging user community (Federal Land Imaging Council, Federal Advisory Committee, universities, State, local, and tribal governments, and industry) to define future user and technical requirements,
- Conduct an assessment of the societal and economic value of moderate-resolution satellite data,
- Implement agreements to acquire new sources of moderate-resolution data to augment Landsat data,

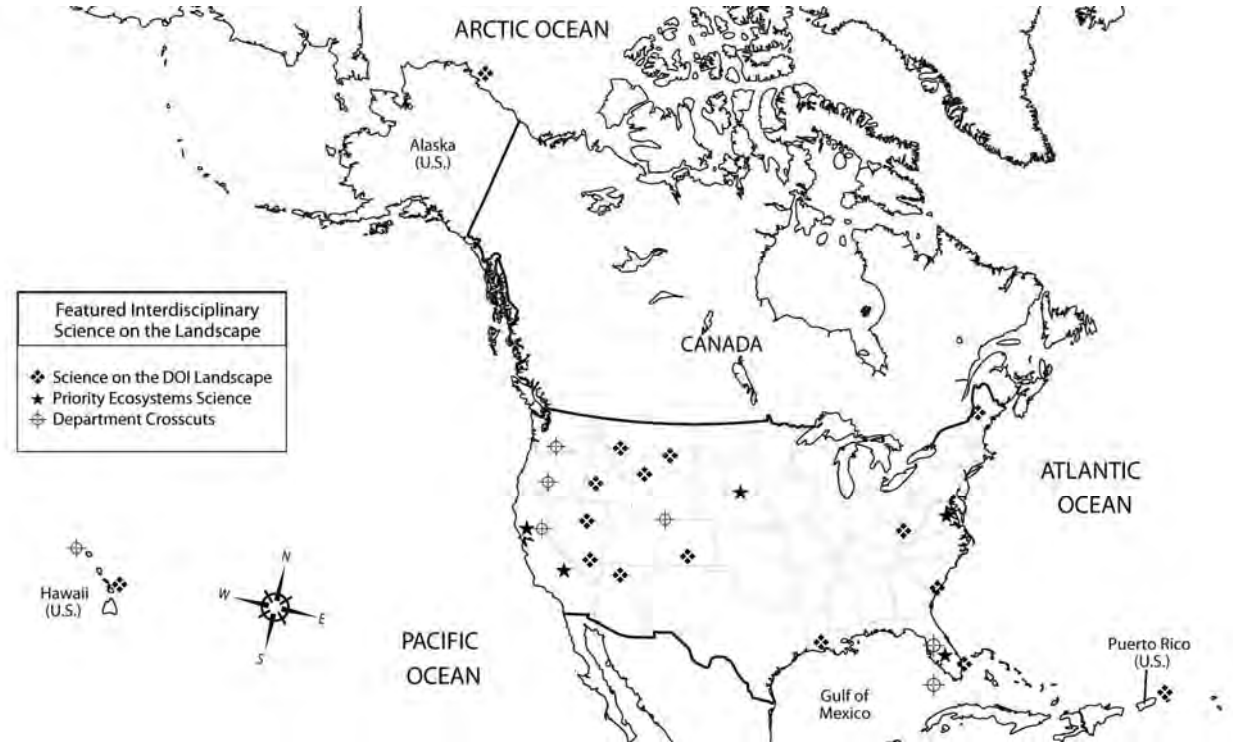
A plan for the NLIP was completed on December 22, 2006, by the Future of Land Imaging Interagency Working Group and submitted to the Office of Science and Technology Policy. On August 14, 2007, the OSTP released the plan for the NLIP that would serve as the framework for continuing the collection of moderate resolution multispectral remote sensing data for the globe. The report designated the Department of the Interior as the Federal agency responsible for establishing the new national program to provide focused leadership and management for the Nation’s civil-operational land imaging efforts. LRS addresses the Department of the Interior’s strategic goal of Resource Protection (Improve the Understanding of National Ecosystems and Resources through Integrated Interdisciplinary Assessment).

Activities would include —

- Coordinating and promoting the uses of land imaging data within the Department’s bureaus,
- Conducting a comprehensive evaluation of the societal and economic benefits of moderate resolution land imaging data,
- Establishing a Federal Land Imaging Council to advise the Department on how DOI land management and moderate resolution land imaging data relates to the purposes of the Federal Government and to define future requirements for these data, and
- Establishing a Land Imaging Advisory Committee, composed of representatives of State, local, and tribal government, science and non-profit institutions, and United States commercial industry to advise the Department on their needs for civil-operational land imaging capabilities, data, and applications.

These funds would also be used to acquire moderate resolution land imaging data to supplement Landsat data as Landsat 5 and 7 approach the end of their performance lives.

NLIP will conduct work in collaboration with other programs within the USGS (Earthquakes, Volcanoes, GAM and others), in support of the other Interior Bureaus and other Federal agencies, and State, local, and tribal governments. The NLIP will maintain strong and effective working relationships with the Executive Office of the President and its policy offices, and the Committees of the Congress that oversee United States space programs and policies. The NLIP will also maintain strong and effective working relationships with commercial data operators and distributors in the United States; with universities, scientists, and other United States and international non-profit institutions; with foreign governments, space agencies, institutions of land science and applications research, and foreign commercial suppliers and users of civil land imagery; and with suppliers of aerospace equipment and services.



Regional and Crosscutting Activities

The USGS regional construct was developed to focus on issue-based, multidisciplinary science; align USGS work more closely with partners at the local and regional level; and enhance partnerships with Department of the Interior bureaus and other Federal, State, and local agencies. Closer proximity of the three USGS regions to Interior bureaus and other partners allows USGS scientists and managers to understand and address land and resource management issues at the local and regional levels, increases the opportunity for partnerships, and leverages resources. Regional efforts enhance the connection of the world-renowned capabilities of USGS with the high-priority, real-time land management, urban planning, and heightened security needs of local, Federal, State, tribal, and community managers.

Eastern Region — The Eastern Region (ER) has the longest urbanized coastline extending from the Gulf Coast of Mississippi to the Atlantic coastline of Maine, and along the Great Lakes from New York to Wisconsin; coastal issues represent an important focus for USGS science in response to coastal storms, erosion, and other hazards. The ER includes 60 percent of the U.S. population, or approximately 180 million people. Nearly 50 percent of the growth in U.S. population since 1990 has occurred in the East, which contributes to the longest record of human-induced change in the Nation. The Eastern Region is characterized by numerous, high-density, urban population centers located along or in close proximity to shorelines, hardwood forests, and the Appalachian Mountains. Continued expansion of coastal and riverine urban centers into rural areas of the region will impact the Nation's ability to use and enjoy natural resources while increasing the number and difficulty of the challenges to protect the welfare of citizens from natural disasters and other health risks.

Central Region — Though largely rural, the USGS Central Region (CR) has some of the fastest growing population centers in the United States. Priority science issues of CR resource managers are agricultural practices, fire science, invasive species, water availability, and landscape management. Response to natural disasters is in the forefront of CR scientific activities. The USGS plays a key role in providing near-real-time data to NOAA tsunami warning centers and supports tsunami monitoring in the Pacific Rim. Seismic data from the Global Seismographic Network, supported jointly by the USGS and NSF, are used daily to determine the locations, depths, magnitudes, and other parameters of earthquakes worldwide. An integrated science approach addresses agricultural practices issues through work with partners to interpret the impacts and evaluate alternative management strategies. Landscape change due to energy development is occurring in southwestern Wyoming, and USGS scientists have evaluated various mapping technologies to larger geographic areas and provided BLM managers with landscape-scale tools to assess wildlife habitat across large areas of Wyoming. Issues along the Mississippi River and into the Gulf of Mexico related to sea level rise, salt water intrusion, and sediment flows into the gulf represent a critical study into the effects of climate change. Drought impacts have resulted in large expanses of dead trees due to pine beetle infestation in the upper elevations of the Rocky Mountains and Southwest. Fire, sediment flows, and other results are being studied by an integrated science team in the Central Region.

Western Region — The Western Region is made up of nine states and the Pacific Trust Territories. It is a land of superlatives, from the highest peaks to the lowest point in the United States; the hottest and coldest recorded temperatures, the driest desert and wettest rainforest. It is home to the most remote and pristine wilderness landscapes and eight of the ten fastest-growing urban areas. The Western Region has the most miles of coastline, and underlying the greater part of the coastline are huge and potentially catastrophic earthquake-producing subduction zones. It is one of the most volcanically-active regions in the world. The Western Region contains 75 percent of U.S. Federal lands, more than two-thirds of the Nation's listed threatened and endangered species, and abundant supplies of both renewable and non-renewable natural resources, including minerals, geothermal energy, wind energy, oil and gas.

Regional Realignment

The USGS Science Strategy Circular 1309, *U.S. Geological Survey Science in the Decade 2007-2017,* is based on input from diverse stakeholders regarding their science needs and on the results of a bureau-level National Research Council review of USGS roles and responsibilities. This science strategy identifies needs for structural change in implementation strategies — an examination of the best organizational structure both to continue to meet our science responsibilities and to more effectively conduct the ecosystem-based science required to meet the challenges of the 21st Century.

A long-term evaluation had been underway to assess our traditional organizational structure, which is primarily discipline-based. After careful evaluation, in 2008 the USGS regional structure consisting of regional directors and discipline-specific regional executives was modified, and functions and responsibilities reallocated in order to facilitate cross-discipline science, allow closer collaboration with our customers, and provide a simplified coordination process via a single USGS point of contact for all science disciplines. The three existing regions — Central, Eastern, and Western — were maintained and geographic areas within each region were created to enhance the multi-discipline science.

A key aspect of implementing our Science Strategy will be creating and sustaining a work environment and culture that is more conducive to collaborative, interdisciplinary scientific research. The realignment of the Regional Executives was one step toward building our capacity for interdisciplinary science. Another part of our commitment toward achieving the goals of our Science Strategy is to implement a common bureau science planning process. The Regional Executives and the discipline Chief Scientists have been charged with developing and refining a bureau science planning model that takes advantage of our new regional management structure and enhances our ability to achieve the Science Strategy goals.

Geographic boundaries and main offices of USGS organizational realignment.

The regions and associated geographic areas are led by members of the senior executive service who have responsibility for all the science centers in their region and areas and for implementing multi-disciplinary work and delivering high-quality integrated science as well as being the primary USGS representative to all customers. These executives are also responsible for providing technical quality control and quality assurance for all science activities.

Regional Planning, Performance, and Partnerships

Regional science planning is a collaborative effort between regional and programmatic managers to plan and implement the bureau's science goals, with an emphasis on work important to our many regional partners. Regional science outputs and outcomes directly address questions relating to the Department's strategic goals of Resource Protection, Resource Use, and Serving Communities and are reported in the programs' performance tables.

Planning and assessment of performance are conducted at various management levels in the Regions. Reviews are in-depth evaluations on the full range of activities under their purview; including scientific programs, products, management, and support services. Regional strategic reviews assess longer term strategic planning goals, their alignment with regional and bureau goals, and the impact of the scientific work on societal issues. Feedback is sought from partners who use and benefit from the products to identify their high priority science issues and specific science questions. Regional representatives meet with partners and USGS scientists to propose science projects to address these issues such as hazards, water use and availability, wildfire, landscape change, coastal and river processes, invasive species, human health and others. The USGS partners with all the Interior bureaus, other Federal agencies such as EPA, FEMA, NASA, NOAA, USACE, DOE, and USDA, and other organizations such as State, local and tribal governments, universities, non-governmental and international organizations, and the private sector to conduct science and inform decisions for the future.

Workforce Planning

Workforce Plans are reviewed and amended routinely to better align with bureau science directions. Annual reviews of program activities include analyses of current workforce capabilities, costs, and fit with current and future program directions. Periodic review of staffing needs and workforce plan changes are a fundamental management practice. Several early retirement and voluntary separation (VSIP/VERA) requests have been approved by the Department of the Interior, OPM, and OMB and were used to strategically align cost centers workforce with changing scientific directions and to better position them to respond to flat or reduced budgets. The USGS also employs VSIP/VERA authority for developing the USGS Enterprise Publishing Network, in the broader Survey attempt to more effectively utilize its editing and publishing assets and to better control the cost structure for publications.

Regional Realignment (see details below) provides a more holistic perspective of applying the knowledge and skills of our workforce to mission and societal issues and across the bureau's regions and disciplines. Following are highlights of selected regional workforce planning efforts.

- The Eastern Region (ER) manages programs in 26 States, the District of Columbia, the Commonwealth of Puerto Rico, and the U.S. Virgin Islands. Approximately 2,700 employees are distributed across 130 duty stations east of the Mississippi River. In 2007, the Eastern Region conducted a comprehensive assessment of the status of current workforce plans; developed specific actions taken in 2007; incorporated workforce planning into annual and strategic reviews in order to modify the science direction based on customer need and budgetary restrictions; and worked with the Eastern Region Science Committee to develop linkages between the Eastern Region's Science Plan and Workforce Plan.

  Workforce planning results in 2007 included the successful implementation of the Eastern Region Minerals Information Team as a USGS Most Efficient Organization (MEO) in response to Competitive Sourcing goals established by the bureau, which resulted in both reduced workforce and cost of the activity. The workforce plan of the Caribbean Water Science Center was instrumental in detecting a need to realign the workforce with changing scientific directions and to better respond to a reduced budget. The Eastern Region developed and implemented a VSIP/VERA which allowed restructuring in this cost center to implement future staffing decisions with minimal adverse impact to the Federal workforce. Workforce planning is also a critical component of the regional restructuring which began in 2008 and will be implemented throughout the year.

- The USGS Central Region (CR) manages programs in 15 States between the Mississippi River and the western slope of the Rocky Mountains. Approximately 2,700 employees and 975 on site contractors are distributed in 88 cities and 21 field offices across the Region. All Cost Centers in the CR have received workforce management training and nearly all have a workforce plan. During 2007, 11 CR Cost Centers used their workforce plans to support VSIP/VERA that resulted in the departure of 39 employees. These workforce adjustment efforts were prompted by evolving changes in the skills needed from our employees based on the recognition that issues facing land and resource managers are complex and require new technologies and integrated systems approaches to researching solutions and evaluating alternatives. In some cases, pressures on the Cost Centers from shrinking or stagnant budgets also necessitated staffing adjustments. Already in 2008 three additional Cost Centers have employed VSIP/VERA and three more are seeking approval for the use of VSIP/VERA.

- The Western Region (WR) manages programs in Alaska, Arizona, California, Hawaii, Idaho, Nevada, Oregon, Utah, Washington, Guam, and the Pacific Trust Territories. There are more than 2,400 employees distributed in 80 field offices across the Region. Beginning in 2007 as part of a long-term effort to gain control over escalating costs of facilities and salary and to reduce excessive turnover in the San Francisco Bay area (Menlo Park office), the WR utilized workforce planning for a long term transition to a lower cost area. As a result, the WR's Office of Western Regional Services (OWRS) reshaped the number and types of positions in the workforce through attrition and voluntary moves to Sacramento. This relocation plan also facilitated the implementation of the Long-term Integrated Science and Facility plan, relocating non-science functions currently performed at Menlo Park to lower cost areas. OWRS is currently implementing this VSIP/VERA, for which authority was provided during 2006-07, in order to accelerate the transition and now has over sixty percent of the regional support workforce located in Sacramento. In 2008, the program has been extended for one year.

  In WR, each Water Science Center manages workforce change based on the program opportunities they develop with partners and the science skills they have available or will need in the future—a necessary feature of a strongly reimbursable-dependent workforce. Water Science Centers annually examine the direction of likely future science program activities and fill vacancies vacated by retirements and transfers with younger scientists whose expertise matches future science activities and needs. This gradual transition process is evaluated as scientist positions become available.

  WR took a leadership role with respect to analyzing and implementing the new USGS regional executive leadership structure. Throughout 2007, WR ran planning sessions to evaluate organizational models and cost estimates that would permit it to evaluate multiple models and develop a realistic cost basis for the reorganization.

Results of documented Workforce Plans have provided leadership with information to manage resources (both personnel and financial) and to set and modify, as appropriate, science direction based upon customer need. Regions continue to use workforce planning tools in annual, strategic and administrative reviews. The regions continue refinement of existing workforce plans in response to evolving Department goals as well as the continuing development of USGS future science directions. As several bureau competitive sourcing scoping activities and possible follow-on studies proceed in 2008 and 2009, related planning and implementation efforts will be guided by regional workforce plans.

Science on the DOI Landscape

In 2007, USGS scientists completed the development and calibration of an integrated surface and ground-water model of Biscayne National Park and surrounding areas. This model is being used to provide insight into the causes of ecosystem degradation and to predict the effects of Everglades Restoration on future freshwater inflows to the bay. Technical presentations of this modeling effort were given at the National Conference for Ecosystem Restoration (April 2007) and the Geological Society of America's National Meeting (October 2007). A science support strategy for BNP and surrounding areas was also published as part of this project. This report provides background on many of the unresolved scientific issues facing BNP and proposes a USGS comprehensive research plan for addressing many of the problems. The 2008 focus will be to merge the Biscayne Model with the USGS model of Everglades National Park. The resulting model, which will encompass both of the national parks in South Florida, will then be used to quantify the effects of Everglades Restoration on the entire southern Florida peninsula. Documentation of this modeling effort and related scientific findings will also continue through 2008.

In 2007, Central Region scientists completed the DOI on the Landscape projects on Mancos Shale landscapes and coalbed methane development in the Powder River basin of Wyoming. Technical assistance to partners through our rapid response process will continue in 2008 and beyond.

BLM, FWS, and other partners are contending with management issues related to energy development in sagebrush ecosystems. The goal of the sagebrush project is to build and conduct a long-term, interdisciplinary research program focused on sagebrush ecosystems with immediate objectives addressing the highest research priorities of the BLM in Wyoming. The 2008 Healthy Lands Initiative will begin to address their needs in a comprehensive way using an integrated science approach. To initiate this effort, in 2007, scientists in the Central Region began a project to model at a landscape scale the relationships among sagebrush habitats and the obligate wildlife species located in this habitat. This project will provide the foundation to begin understanding the cumulative effects of intensive energy extraction activities and habitat loss on the viability of species such as sage-grouse. In 2008 and 2009, data and information from this project will be incorporated into an information management system that will be available to managers and provide them with tools to evaluate management options.

The USGS co-sponsored a meeting with the FWS and NPS to identify Ozarks resource issues and to commit to a cooperative interdisciplinary Ozarks research partnership. A key result of this partnership will be the start of a new project in 2008 to understand the karst features in the Ozarks. Working with partners, the objective of this project is to develop a probabilistic model for identifying the major factors that determine the occurrence of karst features in the Ozarks that can be used to better inform resource management decisionmaking in karst-dominated landscapes. Partners will use this information in evaluating management decisions and make the information available to other land use managers in the region to provide them with tools for a region-wide assessment of issues and management actions. In 2009, USGS will identify data gaps and develop the initial model by analyzing data that were collected or derived in 2008 and beginning to compile maps of existing features.

In 2009, WR will initiate new projects now in the planning stage and develop workshops with Interior partners. These projects include the River Ecosystem Modeling and Science (REMS) now under development for a pilot project in the Klamath Basin, OR; the results of this study can be used by the FWS, BOR, USDA, FERC, Tribes, Department of Commerce and others.

The Mojave project (2004-07), now completing the reports, has developed an integrated multidisciplinary understanding for critical aspects of Mojave Desert ecosystem leading to a predictive model for potential Desert Tortoise Habitat. The habitat model completes three widely used modeling algorithms to determine the best model and applies a number of model evaluation techniques. Preliminary output is proving highly valuable for Federal resource managers' (FWS and BLM) efforts to evaluate critical habitat boundaries, identify new areas to conduct population surveys, aid in the design of conservation and monitoring programs, and identify suitability of areas for translocation projects for land valuation in relation to tortoise habitat and is incorporated in the FWS Draft Recovery Plan for the Mojave Desert Tortoise.

The CRUISE (Columbia River USGS Integrated Science Explorer) Project, completed in 2007, produced an experimental Web-based access point to provide map-based information on USGS projects in the upper Columbia River of Washington and Idaho. Information is drawn from a variety of integrated and single discipline projects that have proven useful for Federal partners.

The Hawaii Ridge-to-Reef project (2004-10) is linking impacts on watersheds from invasive species, land-use transformations, and climate change to declines in reef ecosystems. Mapping and other field measurements are being used to understand processes on the landscape, and models are being developed to show how changes in watersheds affect nearby coral reefs. To estimate the sediment flux onto endangered reefs, USGS has installed stream gages with suspended sediment collectors in Kauai, Moloka'i, and Kahoolawe to provide ground-truthing of actual fluxes onto the reef, and form the beginning of long-term data sets on sediment flux to reef communities from steep volcanic highlands. USGS has also begun to measure rates of erosion in different settings using a network of erosion pins, first installed during 2007—the data collection and modeling effort will continue through 2008 and 2009.

The Lower Colorado River Project focuses on geospatial analysis of change in river channel position, riparian vegetation and the potential for restoration of riparian areas of lower Colorado River resources. The project is to be completed during 2008 and a final report will be issued. A planning effort in 2008 for a new project is being evaluated through consultations with BOR and other partner agencies and is anticipated for launch during 2009.

The vast majority of the Nation's arctic tundra ecosystems exist in a sensitive state on the Arctic Coastal Plain (ACP) of Alaska, where Interior is the predominant landholder overseeing management, development, and preservation of the land and resources. The USGS is in its fourth and final year of studying the terrestrial, lake, and coastal habitats of the central portion of the ACP, examining how changes in these habitats correlate to the spatial and temporal changes in goose populations, an Interior trust species. Current results indicate (1) up to 45 feet per year of coastal shoreline erosion in the study area, (2) goose population changes in size and distribution over the past 30 years, and (3) coastline erosion of the Beaufort Sea altering tundra habitats by saltwater intrusion, resulted in forage plant species shifts. In 2008, USGS scientists plan to complete lake water quality work; obtain additional shoreline erosion information; model coastal shoreline erosion to predict future shoreline edges, finalize a Web-based decision support system; produce an updated vegetation map showing areas of saltwater influence; and conduct final analyzes of the multi-year data and produce a series of summary reports and a final interdisciplinary report.

Priority Ecosystems Science

	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-)	2009 Program Changes (+/-)	2009 Budget Request	Change From 2008 (+/-)
Geograph. Research, Invest., Remote Sens.						
Geographic Analysis & Monitoring ($000)	2,000	1,940	0	-1,940	0	-1,940
FTE	*20*	*20*	*0*	*-20*	*0*	*-20*
Geologic Hazards, Resources, & Proc.						
Geologic Landscape & Coastal Assessments						
Earth Surface Dynamics ($000)	2,500	2,423	0	-2,423	0	-2,423
FTE	*4*	*4*	*0*	*-4*	*0*	*-4*
Water Resources Investigations						
Hydrologic Monitoring, Assess. & Research						
Toxic Substances Hydrology ($000)	2,299	2,257	0	-2,257	0	-2,257
FTE	*10*	*10*	*0*	*-10*	*0*	*-10*
Hydrologic Networks & Analysis ($000)	2,430	2,393	0	0	2,393	0
FTE	*15*	*15*	*0*	*0*	*15*	*0*
Biological Research						
Biological Research & Monitoring						
Ter., Freshwater, Marine Ecosystems.($000)	1,369	1,348	0	+6,620	7,968	+6,620
FTE	*10*	*10*	*0*	*+34*	*44*	*0*
Total Funding	**10,598**	**9,701**	**0**	**0**	**10,361**	**0**
Total FTE	***59***	***59***	***0***	***0***	***59***	***0***

Summary of 2008 Program Changes for Priority Ecosystems Science in Biological Research and Monitoring

Request Component	($000)	FTE
• Priority Ecosystems Science	+6,620	+34
TOTAL Program Changes	**+6,620**	**+34**

Justification of 2009 Program Changes

The 2009 budget request for Priority Ecosystems Science (PES) is $10,361,000 and 59 FTE, a program change of +$6,620,000 and +34 FTE from the 2008 enacted.

Priority Ecosystems Science in Biological Research & Monitoring (+$6,620,000 / +34 FTE)

In 2009, the USGS proposes an increase to support interdisciplinary studies of ecosystems, including studies of the Everglades, San Francisco Bay Delta, Chesapeake Bay, Platte River, and the Mojave Desert to evaluate land-use changes, ecosystem histories, indexes of ecosystem sensitivity to change, and vulnerability to potential stressors in order to devise restoration and adaptive management strategies for land use managers.

Research in support of PES is aimed at improving the understanding of the rates, causes, and consequences of natural and human-induced processes that shape and change the landscape over time and to provide comprehensive information needed to understand the environmental, resource, and economic consequences of landscape change. The 2009 request for PES would support maps of urban growth trends throughout the Chesapeake Bay watershed that are being used by State resource agencies and land conservation organizations to target land preservation efforts and develop urban growth forecasts that consider the potential impacts on stream and estuary water quality. Additionally, funds would be used for work in the Greater Everglades to develop and apply technologically advanced elevation measurement systems that provide the foundation for research, management, and restoration of critical ecosystems.

In 2009, the USGS requests an increase to support water quality characterizations of aquatic ecosystems with emphasis on the effects of human stresses on the water-quality conditions of natural ecosystems. Work would also include research on the mercury methylation in the Everglades, intersex fish in the Chesapeake Bay, and water-quality effects on aquatic organisms in San Francisco Bay.

Program Performance Change

Toxic Substances Program (PES only)

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Outyears
					A	B=A+C	C	D
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments								
Systematic analyses and investigations delivered to customers	--	--	11	11	11	0	-11	--
Total actual/projected cost ($000)	--	--	2,200	2,200	2,200	0	-2,200	--
Actual/projected cost per scientific report or other product (whole dollars)	--	--	200,000	200,000	200,000	--	200,000	--
Comments	Measure rebaselined in 2007: Definition of systematic analyses was changed to improve consistency of application across the bureau. Average cost across contributing programs based on 2007 activity based costing data. 3% inflation added per year Change in 2009 is due to elimination of Toxics funding for integrated Priority Ecosystems Science projects. In 2009, 11 are transferred to the Biological Research and Monitoring subactivity. Actuals for 2007 are higher than the target due to transition from the old WRD Reports Tracking System to the new enterprise-wide IPDS, which tracks status of scientific products for the entire USGS. More authors are complying with requirements to enter all scientific publications and other products into the system. Since the transition to IPDS was made in the middle of the year, the increased compliance rate results in exceeding the target for the water programs. Targets for 2008 have been revised based on increased compliance in reporting completion of publications and other products, and unit projected costs have been adjusted accordingly. Cost per scientific product is an average that includes the cost of writing, editing, peer review, and publication of each product, as well as the cost of the studies from which the products are derived. Reimbursements from other Federal agencies are included in the calculation, but the portion of funding housed in the Enterprise Information Activity (associated with the Enterprise Publishing Network) is not included.							

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Outyears
					A	B=A+C	C	D

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 President's budget level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent outyear.

Terrestrial, Freshwater, and Marine Ecosystems (PES only)

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Outyears
					A	B=A+C	C	D
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments								
Systematic analyses and investigations delivered to customers	31	26	30	26	26	26	0	+11
Total actual/projected cost ($000)	6,200	5,200	6,000	5,200	5,200	7,400	+2,200	--
Actual/projected cost per scientific report or other product (whole dollars)	200,000	200,000	200,000	200,000	200,000	200,000	200,000	--
Comments	Change is due to elimination of Toxics funding for integrated Priority Ecosystems Science projects. In 2009, 11 are transferred to the Biological Research and Monitoring subactivity.							

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 President's budget level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent outyear.

Program Overview

Through PES, the USGS provides integrated science support to better understand the interactive nature of resources and the environment. Land- and resource-management agencies require integrated scientific information and understanding to circumvent potential problems and implement needed improvements. USGS scientific information is provided within the adaptive management framework as improved scientific understanding can be incorporated into the planning and management of each area. Scientific information is used to ensure that future plans have realistic expectations for restoration, structures under construction are optimally managed, monitoring will yield the information desired, and managers have the tools to predict outcomes of possible restoration scenarios.

PES supports ongoing studies in the Greater Everglades, Chesapeake Bay, San Francisco Bay, the Mojave Desert, the Platte River, and the Greater Yellowstone area. PES addresses the Department's Resource Protection strategic goal of improving the understanding of natural ecosystems and resources through interdisciplinary assessment. Planned outputs include systematic analyses and investigations delivered to customers, formal workshops, and training that facilitate exchange and use of knowledge and long-term monitoring.

2009 Program Performance

Restoring the Greater Everglades and Coastal Ecosystems — The Everglades and adjacent coastal ecosystems in South Florida comprise the largest environmental restoration project ever attempted in the United States. USGS science is an important part of the restoration effort. Beginning in 2007, data from the entire network of streamgages in the Greater Everglades, whether operated by NPS, South Florida Water Management District, or USGS, are being served through the Everglades Depth Estimation Network (EDEN), a central network designed and operated by the USGS. Once fully implemented in 2008, EDEN will provide a real-world validation tool for hydrologic model output. Another important area of study links temperature to hydrologic and manatee models to determine manatee movement. USGS will validate and refine the coupled hydrologic-manatee models and provide a decision support tool for planning and evaluating additional southwest Florida restoration alternatives as they come on-line in 2008 and beyond. USGS is continuing studies on water-quality-related changes (shifts in conductivity and contaminants) at Loxahatchee National Wildlife Refuge and expanding mercury and sulfate studies into Everglades National Park. Studying the interaction of sulfur and carbon on bioavailability of mercury allows managers to evaluate restoration alternatives that minimize biological impacts. In April 2007, an invasive species, the Burmese python, consumed two Key Largo wood rats — an FWS listed endangered species. The FWS, NPS, USGS, and University of Florida worked together to immediately initiate, by mid-2007, a jointly funded effort to help address this significant challenge. USGS's paleoecological research has been used to help set restoration targets and evaluate restoration alternatives for Everglades National Park, Florida Bay, and Biscayne National Park. Since paleoecological data also include a record of sea-level fluctuations, USGS will be reevaluating sea-level rise data within the context of projected future freshwater flows and accelerated sea-level rise. This information could help to refine target(s) for freshwater flows to coastal systems and explain the dynamics of the interaction of restoration with coastal change. A preliminary study on the paleoecology of freshwater marshes is providing the FWS with information useful in their re-evaluation of the current distribution of species versus the historical and the projected future Everglades distribution.

Science Supports Restoration Efforts in San Francisco Bay — The USGS continues to be a key participant in the San Francisco Bay and Delta (SFBD) in support of the Bay-Delta Program CALFED, a 30-year plan to restore ecosystem function, improve water supply reliability, and sustain water quality and watershed habitat in the Bay. USGS provides leadership for CALFED's scientific program and contributes research to improve program decisions and expand the body of knowledge relevant to CALFED's proposed actions. USGS studies focus on the relation between sea level rise and hydrologic responses to climate change and the proposed changes in the physical habitat of the watershed, estuary, and rehabilitated wetlands. These habitat and hydrologic changes affect water flow, pesticide and metals concentrations, sediment concentrations and transport, and salinity distributions and thus concurrent studies examine the response of biological resources to changes. Finally, studies continue on fish and avian populations in the system due to their response to all physical and ecosystem alterations. USGS scientists began work on two 3-year jointly funded SFBD PES/CALFED studies. The first study is forecasting future ecological and hydrologic states of the Delta and estuarine

ecosystem under prescribed scenarios of change using a series of linked climate, hydrologic, geomorphic and ecologic models. Findings will aid restoration, water quality goals, and decisions on infrastructure changes in the Delta. The second study is examining whether foodweb changes are responsible for the recent decline of fish (including the endangered Delta Smelt) in the system. PES activities continue to support the South Bay Salt Pond Restoration Project, which covers 15,000 acres of former commercial salt ponds in South San Francisco Bay, which were purchased by State, and Federal agencies in March 2003. Although the FWS and conservation organizations have supported conversion of salt ponds and other bay lands to tidal wetlands to benefit species of concern, no guidelines, models, or management strategies for such conversions exist. This study provides the research to develop guidelines and is critical in the adaptive management process in the restoration.

USGS Focuses Science on More Effective Restoration of the Chesapeake Bay Ecosystem — The restoration of the Chesapeake Bay, the Nation's largest estuary, is continually challenged by the population increase in its 64,000 square mile watershed. Since the mid-1980s, the Chesapeake Bay Program (CBP), a multi-agency partnership has worked to improve water quality, increase habitat, and restore living resources in the Bay. However, the lack of significant improvement in the Bay ecosystem and the discovery of “intersex” characteristics in fish within the Bay watershed illustrates that more effective implementation and assessment of ecosystem management actions are needed. The USGS has implemented a new science plan in consultation with the CBP, Interior, and academic partners to provide integrated science for effective ecosystem conservation and restoration during 2007-12. In 2007, the USGS developed a decision-support tool that provided modeling and monitoring results to help resource managers better target and assess water-quality management actions. US EPA and other CBP partners want USGS to expand the application into the Chesapeake Online Assessment Tool (COAST) to include other partner’s information. This effort was supported by PES and the Geographic Analysis and Monitoring Program (GAM). The USGS also lead a more comprehensive approach by the EPA, FWS, NPS, NOAA, and NRCS to identify geographic areas to focus implementation of management actions to improve water quality, habitat and living resources. A scientific approach for the effort will be summarized in 2008. The USGS, working with FWS and four states, conducted sampling of fish populations and emerging contaminants to begin to assess the factors affecting health of populations in the watershed including problems related to intersex characteristics. The initial results are expected in 2008. Finally, the USGS completed a synthesis report of Chesapeake Bay science and its implications for ecosystem management that will be released in early 2008. In 2008-10, the USGS is planning to conduct field investigations that are needed to better define the factors affecting the transport and change of nutrients and sediment in the watershed, and the factors affecting fish health, to improve the approaches to more effectively implement and assess ecosystem management actions.

> "The science provided by USGS will help the Chesapeake Bay Program partners more effectively implement management actions"
>
> **Richard Batiuk, USEPA**
> **Associate Director, Chesapeake Bay Program**
> **December, 2007**

The Mojave Desert Ecosystem — The Mojave Desert Ecosystem is a landscape of contrasts and challenges spread across southern Nevada, western Arizona, southwestern Utah, and southeastern California. Encompassing six military bases, four national park units, and considerable Bureau of Land Management and other Federal lands, the Mojave Desert is home to a rapidly growing population of well over a million people. Human activities, such as animal grazing, off-road vehicle use, construction, mining, urban expansion, waste disposal, recreational uses, water withdrawal, and natural processes influenced by man, such as fire and invasive species, have increased the vulnerability of the desert environment to soil erosion and

ultimately habitat degradation. USGS continues to work closely with land management entities in the Mojave Desert, mainly through the Desert Managers Group which includes NPS, BLM, FWS, DOD, State and many other groups creating a decision support system to (1) describe the vulnerability of the land to erosion, invasion by noxious weeds, climatic variability and other disturbances, (2) identify the mechanisms that determine resistance and resilience to disturbance, (3) determine the potential for recovery of degraded land so that managers can better target management activities, and (4) develop monitoring techniques. In 2008 and 2009, USGS will continue (1) detailed studies of how plants and fauna interact and respond to interactions between geomorphic surfaces and water availability, (2) development of tools for analyzing these processes at a landscape and regional scale, and (3) assist managers in developing monitoring programs.

Platte River Ecosystem Resources and Management — The Central Platte River Valley provides habitat for the annual migration of over one-half million sandhill cranes, several million waterfowl, and for endangered species, including the whooping crane, piping plover, and least tern. Changes in water and land use have transformed the river channel, altered the structure of riparian habitats, and allowed for the introduction and spread of invasive species. In 2006, the Department of the Interior and the States of Colorado, Nebraska, and Wyoming all signed off on a proposed Platte River Recovery Implementation Program to improve habitat for the endangered species. The USGS has worked with State, Federal, and local partners to develop successful adaptive management strategies and USGS research is being used to guide the development of a new 5-year management plan for the crane population. In 2008 and 2009, the USGS will continue to operate hydrologic monitoring stations along the river, monitor cranes and migratory waterfowl, expand technological studies to better link surface and ground water levels, and investigate the effects of invasive species. Other related studies are examining the effect of sediment movement on hydrologic flows, vegetation and channel morphology. In particular, the South Platte River Aggregate study is examining the effects of gravel mining on groundwater flows, wetlands and wildlife.

Greater Yellowstone Ecosystem: Snake River Project — The Snake River PES project is part of the Greater Yellowstone area, which includes multiple States and mixed jurisdictions of Federal, State, and private lands. The area is home to relatively intact species assemblages that represent world class wildlife, botanical, and geologic resources. The potential for controversy in this area is high as there are competing uses that include urbanization, mineral development, recreational use, and traditional land use such as grazing and timber harvest. The initiation of USGS research and the formation of the science advisory panel have prompted the BOR to examine modification of river flows to more closely mimic natural seasonal water flows thereby providing an opportunity to adaptively manage the system. Currently, 3 years of riparian vegetation research and 3 years of geomorphological research have been completed (2005–07). In 2007, radio tags and passive integrator transponder tags were implanted in Snake River cutthroat trout in 2007 to track seasonal movements of cutthroat trout throughout the study area; a riparian study was completed; geomorphic studies were continued; and a LIDAR study component and trout habitat studies were initiated. The geomorphic and trout studies will continue in 2008 and 2009. Knowledge gained through ongoing studies enabled the production of maps of the distribution of floodplains and terraces of the Holocene valley to help with geomorphic analysis, the development of maps and figures detailing the flow inundation frequencies, reports on occurrence and spatial data on invasive and sensitive plant species, and spatially geo-referenced study plots for future monitoring as part of our riparian work. In 2009 plans include building the larger Yellowstone Ecosystem initiative with Yellowstone National Park and other partners in the ecosystem directing the effort with a climate change focus.

Department Crosscuts

As the Department's science bureau, USGS conducts research that is foundational to numerous intradepartmental and interagency crosscutting activities. These crosscutting activities range from environmental issues such as the Everglades restoration and coral reef protection in the Pacific Islands to resource management issues such as salmon recovery in the Pacific Northwest. The following are crosscutting activities in which the USGS plays a prominent role.

(Dollars in Millions)

	2007 Enacted	2008 Enacted	2009 President's Request
California Bay-Delta	$4.1	$4.2	$3.7
Columbia River Basin Salmon Recovery	3.0	2.7	2.5
Coral Reef Protection	4.3	4.3	5.9
Global Change	26.6	26.6	26.6
Greater Everglades Ecosystem Restoration	6.9	6.8	6.8
Invasive Species	10.9	11.1	10.6
Klamath River Basin	2.6	2.5	2.5
Middle Rio Grande	2.1	2.2	2.2

California Bay-Delta — Activities in the San Francisco Bay and Delta focus on providing status and trend information on water quality in the San Joaquin River and Sacramento River watersheds, and unbiased and reliable scientific information and tools that explain the occurrence and effects of toxic substances in the Bay-Delta hydrologic environment. These activities are in support of, or have related and overlapping objectives with, the CALFED Bay-Delta Program. In 2008 and 2009, USGS will continue work on identifying the effects of the changing hydrology, infrastructure, and climate on the physical, chemical, and biological processes of the system; the interaction between and important processes of the marshes and adjacent bays, with a focus on the current decline of pelagic fish species and the restoration of salt ponds to ecosystems compatible with the needs of the San Francisco Bay and freshwater Delta. The 2008 funding increase is a result of a congressional add to enable USGS to manage and evaluate wetland restoration in Bay Delta. USGS will analyze the quality of aquatic and mudflat habitats as indicated by factors such as primary productivity and nutrient flow, evaluate the effect of restoration on habitat use by species groups (e.g., macroinvertebrates, fish, and birds).

Columbia River Basin Salmon Recovery — The USGS collaborates with many partners on efforts to restore salmon populations in the Columbia River Basin. The USGS works with FWS, BOR, and BLM to address research needs on Interior lands and projects. Partners external to the Department of Interior include the Bonneville Power Administration, U.S. Army Corps of Engineers, and NOAA Fisheries, U.S. Forest Service, Washington and Oregon state government agencies, the Grand Ronde Tribe, the Yakama Nation, and several citizen advisory groups. In 2007, the USGS determined that survival of juvenile salmon passing through modified spillways at McNary Dam was equal to or better than passage over unmodified spillways, which means that structural modifications at other dams may provide a means to maintain or improve passage of fish while reducing the volume of water needed to safely allow passage. On the Toutle River, a sediment retention structure built after the eruption of Mount St. Helens, was determined to be a total barrier to upstream migrating salmon. In the Wind River, studies showed that introduced Chinook salmon do not have a negative impact on native

steelhead and that summer flows influence the upstream extent of spawning by Chinook salmon, which in turn influences the distribution of juvenile Chinook salmon the following year. The USGS monitored fish migrations in the Big White Salmon and Methow rivers as part of ongoing investigations of barrier removals. In the Yakima River basin, a decision support tool was developed to assist with managing river flows to maximize benefits to fish, agriculture, and municipalities.

In 2008 and 2009, the USGS will continue working with managers to restore Columbia Basin salmon. Studies will focus on long-term effects of barrier removal as a means of rebuilding salmon populations, including removal of Condit Dam on the Big White Salmon River and irrigation dam removals on the Methow River. The USGS will continue to assess the survival of juvenile salmon passing dams to identify the impacts of water management and determine the efficacy of modifications to fish passage structures at dams on the Lower Snake and Columbia Rivers. The USGS will also investigate the impact of American shad, a fish not native to the Columbia River, on salmon restoration efforts.

Coral Reef Protection — Coral reefs worldwide are in decline. The Department of the Interior alone has responsibility for more than 3.5 million acres of submerged habitat. In addition to shallow reef habitat, DOI also has responsibility for ocean areas where deep reef habitat exists. USGS is providing information to MMS on the value, diversity and extent of deep reefs under Department responsibility. Local Action Strategies have been developed in response to Coral Reef Task Force resolutions to address coral reef degradation in State and Federal waters (e.g., Hawaii, Florida, and the Caribbean). USGS research will provide information on reef health and status to resource managers and the scientific community to enable them to better manage the resource. Resource managers with the NPS, FWS, MMS, NOAA, and coastal States have called upon USGS to help them understand the processes involved in reef decline so that local-scale stressors can be mitigated or removed, and reef recovery encouraged. USGS products are being and will continue to be used by members of the Coral Reef Task Force as they implement the various Local Action Strategies.

In 2008 and 2009, USGS research on shallow and deep reefs will include understanding conditions needed for productive and healthy reef communities, understanding terrestrial impacts to reef health in support of U.S. Coral Reef Task Force resolutions, assessing impacts of disease on corals and the recovery trajectory to a healthy state, and evaluating how nature and human activities in marine parks and refuges and on the Outer Continental Shelf influence reef integrity and biodiversity.

Global Change — The USGS supports multidisciplinary studies of past environmental and climatic changes (climate history); process studies that explore the sensitivity of the Earth's surface, the hydrologic cycle, and ecosystems to climate variability and change; and forecasting of potential future changes and their effects on landscapes and ecosystems (particularly on public lands). USGS Global Change Research activities strive to achieve a whole-system understanding of the interrelationships among Earth surface processes, ecological systems, and human activities. Activities of this cross-discipline science program focus on documenting, analyzing, and modeling the character of past and present environments and the geological, biological, hydrological, and geochemical processes involved in environmental change so that future environmental changes and impacts can be anticipated. To accomplish these goals, the USGS draws on its extensive land, water, and ecological monitoring networks, its remote sensing and mapping capabilities, and its basic process-oriented research. The integrated combination of these studies provides long-term perspectives needed by natural resource

managers, communities, and policymakers to anticipate and adapt to climate change and variability within a science-based framework.

In 2009, following the recommendations articulated by the Department of the Interior Climate Change Task Force, the USGS will provide leadership for more effective coordination of climate effects monitoring across the Department and develop new intensive research regarding processes related to climate change impacts in climate-sensitive parts of the Nation, including the Yukon Basin and North Slope of Alaska. USGS will develop a new strategy for development of locally and regionally relevant science applications for resource management decisionmaking, and the architecture for a global change information management system in order to provide better and more efficient access to science information by managers and policymakers throughout Interior. A new organizational structure is proposed to consolidate primary climate change efforts. The funding changes in 2009 are a result of congressional action. In 2009, the Climate Change Initiative will be implemented.

Greater Everglades Ecosystem Restoration — The Everglades and adjacent coastal ecosystems in South Florida is the largest environmental restoration project ever attempted in the United States. USGS science is an important part of the restoration effort. The Everglades crosscut is also a project within the PES and is discussed in more detail on page F-56.

Invasive Species — The USGS plays a significant role in implementing the national Invasive Species Management Plan, developed by the National Invasive Species Council, as called for in the Presidential Executive Order on invasive species. To meet the goals of the plan, the USGS Invasive Species program provides management-oriented research and delivers information needed to prevent, detect, control, and eradicate invasive species and to restore impaired ecosystems. USGS researchers are leading or cooperating in efforts to integrate the capabilities of the USGS and partners, including Federal and State resource agencies, universities, and the National Biological Information Infrastructure Invasive Species Information Node, to help provide the information, methods, technologies, tools, and technical assistance needed for effective responses to terrestrial and aquatic invaders threatening the U.S. ecosystems and native species. Facilitating these efforts is the National Institute for Invasive Species Science (NIISS), a growing consortium of government and non-governmental organizations that is administratively housed in the USGS Fort Collins Science Center in Colorado. An important focus of NIISS is on developing models for predicting the probable spread and impacts of invaders, in cooperation with NASA Goddard Space Flight Center, the USGS EROS Data Center, and others. In 2009, the Invasive Species program will continue its efforts to address invasive species issues by conducting research to document and monitor the introduction and spread of invasive species, study the ecology of invaders and factors in the resistance of habitats to invasion, forecast probabilities and locations of future invasions, provide methods and information to assess and manage risks, and develop methods to prevent and control invasive species and minimize their environmental impacts. USGS researchers will also continue their efforts to develop an early detection/rapid assessment framework and incorporate pilot studies into a coordinated national early detection system.

Klamath River Basin — The Departments of the Interior, Commerce, and Agriculture are conducting a variety of projects in support of natural resource management in the Klamath River Basin. USGS scientists collaborate with many federal, state, tribal, and local partners to address priority environmental, economic, and statutory needs in the basin. In 2007, USGS science was primarily focused on the key information needs of BOR and FWS on issues related to Endangered Species Act consultation, tribal trust, and water availability. As an example, USGS studies provided valuable information on endangered sucker population status and adult

survival in Upper Klamath Lake. In the lower river, scientists developed critically-needed, new information about juvenile Coho salmon migration and survival rates during their emigration to the ocean. USGS ground-water investigations continued in the upper basin as did studies of water quality and hydrodynamics in Upper Klamath Lake. In addition to providing key information for managers and stakeholders and future resource allocations in the basin, the data also was used in integrated studies to understand and predict endangered fish behaviors in response to changing environmental conditions.

In 2007, several USGS publications provided significant new information relevant to partners. A detailed analysis of key environmental influences on water-quality conditions in Upper Klamath Lake was performed and related to probable population consequences to endangered suckers. Federal managers are currently using this information in the reconsultation of Biological Opinions for shortnose and Lost River suckers. Two journal articles are providing a more detailed understanding of the physical processes controlling internal loading of phosphorus in the lake. These products are instrumental in assisting managers in the development of strategies to effectively cope with lake nutrient dynamics, algal blooms, water-quality conditions, and related biological effects. Another article describes the near-shore habitats of juvenile suckers using patch-occupancy theory. This information is significant with respect to lake-level management and habitat restoration projects. Finally, in response to water managers' needs, the USGS produced a detailed report on the hydrology of the Klamath Basin. This report serves as the linchpin for ongoing ground-water modeling and efforts to develop a reliable quantitative tool for optimally managing seasonal use of water in the upper basin and stream flows in the lower Klamath River.

In 2008 and 2009, the USGS will continue its research and monitoring of fish-habitat interactions and hydrological relationships to better understand and adaptively manage ongoing wetland restoration activities and other resource management actions. In particular, the USGS will investigate habitat usage by juvenile suckers in the newly restored Williamson River Delta. Other biological efforts will continue to emphasize status and trends of endangered suckers in Upper Klamath Lake. Information needs associated with the possible reintroduction and recovery of salmon in the Klamath Basin will include the conduct of coordinated studies addressing the physiology and condition of key species, migrations and habitat characteristics within the context of a new landscape initiative to improve watershed ecosystem modeling and decision support technologies.

Middle Rio Grande — Basins of the Rio Grande in the southwestern United States encompass the main city areas of northern New Mexico (e.g., Santa Fe and Albuquerque) and are home of half the population of New Mexico and a similar part of the economy. The vitality of Middle Rio Grande basin communities and economies depends on satisfying the growing demands for water, including drinking water, extracted from complex aquifers, yet knowledge of the aquifer systems and sustainability of the resource are poorly known. To address this need in the Albuquerque area, the USGS, in cooperation with the City of Albuquerque, New Mexico, Office of the State Engineer, and Bernalillo County, is monitoring ground-water quality at multiple depths, researching the interaction between surface- and ground-water resources to help local water managers determine the impact of withdrawals both from the aquifer system and from the Rio Grande, and researching the rate at which the aquifer can recharge itself after water is withdrawn. Related USGS investigations include (1) studies of the geologic framework of the basin region, which will provide critical information on ground-water aquifers, hazards (seismic, subsidence, landslide), and resources, (2) studies in the San Luis Basin, which will improve ground water models used for management of the Rio Grande, (3) work supporting development and validation of water resource management modeling tools, and (4) studies of

the concentration and transportation of sediments and selected chemicals and their affects on water quality. In 2009, geologic and geophysical mapping and supporting investigations will continue in the Rio Grande rift basins with emphasis on new work in the San Luis basin of northern New Mexico. Reports on various geologic, geophysical, and hydrogeologic aspects of the Albuquerque, Espanola, and San Luis basins will be published as part of a USGS-organized Geological Society of America Special Paper on the Rio Grande rift.

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Geographic Research, Investigations, and Remote Sensing

Subactivity	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-)[a/]	2009 Program Changes (+/-) [b/]	2009 Budget Request	Change From 2008 (+/-)
Land Remote Sensing ($000)	63,264	61,457	+245	+860	62,562	+1,105
FTE	*118*	*118*	*0*	*+3*	*121*	*+3*
Geographic Analysis and Monitoring ($000)	16,929	16,266	-2,715	-2,995	10,556	-5,710
FTE	*113*	*106*	-25	-27	54	-52
Total Requirements ($000)	**80,190**	**77,723**	**-2,470**	**-2,135**	**73,118**	**-4,605**
Total FTE	***231***	***224***	***-25***	***-24***	***175***	***-49***

a/ Fixed cost increases for this activity total $527, of which $416 will be budgeted and $111 will be absorbed. A technical adjustment of -$2,886 is proposed as part of a budget restructure that moves funding for global change activities into a new integrated budget activity titled Global Change.

b/ Changes for this activity include a reduction of -$198 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Activity Summary

The 2009 budget request for the Geographic Research, Investigations, and Remote Sensing Activity (Geography) is $73,118,000 and 175 FTE, which is a net program change of -$2,135,000 and -24 FTE from the 2008 Enacted level.

> Through geography we learn to appreciate the diversity of landscapes, peoples and cultures. Geography is therefore a vital subject resource for 21st century global citizens, enabling us to face questions of what it means to live sustainably in an interdependent world. Geography helps us investigate and to think critically and creatively about the complexities of places, and different views and feelings relating to places.
>
> *http://www.geography.org.uk/*

Geography is a multidisciplinary science that emphasizes space and place. It offers great potential to integrate important environmental and societal processes to facilitate our understanding of how human well-being and environmental quality can be improved and maintained. Moreover, it has the potential to identify spatial variation in these characteristics and qualities and to facilitate a more "place-specific" solution to environmental problems, including reduction of risk and options for greater adaptation to an uncertain future, including those related to global climate change.

USGS Geography research confronts some of the most pressing natural resource and environmental issues of our Nation. Observing the Earth with remote sensing satellites, USGS geographers monitor and analyze changes on the land, study connections between people and the land, and provide society with relevant science information to inform public decisions. The surface of the Earth is changing rapidly, at local, regional, national, even global scales, with significant repercussions for people, the economy, and the environment. Some changes have natural causes, such as volcanic eruptions or drought, while other changes on the land, such as resource extraction, agricultural practices, and urban growth, are human-induced processes. There are other types of changes that are a combination of natural and human-induced factors for example, landslides and floods are fundamentally natural processes that are often intensified or accelerated by human land use practices. Land cover on the Earth's surface—the pattern of

natural vegetation, agriculture, and urban areas—is the product of both natural processes and human influences. Land cover represents an unbiased signature of environmental conditions. Improved understanding about the consequences of landscape change assists decisionmakers in the fields of land use planning, land management, and natural resource conservation. The need for better information about land surface change is especially evident for changes brought about by wildfire, agricultural production, urbanization, forest logging, climate change and other factors operating at broad regional scales. USGS Geography research also includes linking satellite-based results to those observed from field-based monitoring programs, such as those generated by other USGS programs (stream gauge monitoring network, Breeding Bird Survey, National Water-Quality Assessment Program) and other agency programs (EPA's Environmental Monitoring and Assessment Program). Creating these linkages provides for a powerful way to monitor important changes on the landscape that relate to a wide range of environmental characteristics valued by society.

The goal of the USGS Geography Discipline is to improve people's ability to prosper by either affecting how the land will change (positive) or by becoming more adaptive to change (forecasting). This will provide decisionmakers and the public a combination of data and readily available tools (e.g., Web based) to improve and sustain environmental quality and public safety in an ever-changing world. These data and tools will result in an unprecedented ability to design landscapes that are resilient and adaptive. Geography will work toward becoming a global leader in the science of —

- Integrated vulnerability and risk assessment that incorporate the natural, social, and economic sciences,
- Scenario-based, alternative futures tools to reduce environmental and hazard risks and to facilitate adaptation to an every-changing world at landscape scales, and
- Land observations and monitoring via remote sensing.

USGS Geography Discipline supports two subactivities: Land Remote Sensing (LRS) that observes and analyzes changes on the Earth's landscape and Geographic Analysis and Monitoring (GAM) that conducts geographic research and modeling. The LRS subactivity provides information in the form of satellite imagery of the land surface and conducts research into the uses of these types of data to help land managers carry out their missions. This includes the acquisition of imagery, archiving and distribution, and research to better utilize these data to inform land and resources managers on how the landscape is changing. It also provides the Nation's portal to the largest archive of remotely sensed land data in the world; operates the Landsat satellites; and conducts research related to sensor technology and the scientific applications of remotely sensed data.

GAM focuses on the entirety of Landscape change processes by developing the framework to study the changes taking place, researching the impacts of these changes, and developing tools and models for decisionmakers. They also use the data from LRS to provide expert scientific reasoning as to the why change is happening, the rates by which the change is occurring, and the probable or potential effects or outcome of those changes. These two programs, together, provide essential temporal (time series), geographical (area covered), and analytical (why it is important) information to decisionmakers regarding changes on the landscape and the causes, rates, and implications of those changes.

On August 14, 2007, the Administration announced the release of a plan for a United States National Land Imaging Program (NLIP). The plan will serve as the framework for continuing the collection of moderate resolution multispectral remote sensing data for the globe. NLIP would be established at the Department of the Interior and would provide focused leadership and management for the Nation's operational land imaging efforts. The 2009 budget is requesting an increase of $2.0 million to begin efforts for establishing a NLIP. Additional information regarding this increase is included in the LRS section on page G-14 and the Science on the Landscape section on page F-41.

A Plan for a United States National Land Imaging Program

This plan reflects President Bush's commitment to play a leadership role in understanding the changes in the land surface we observe across the world….

The land surface, polar regions, and coastal zones are undergoing significant changes under the pressures of population growth, development, and climate change, and we must carefully monitor these changes in order to manage them. The importance of this imagery to the Nation requires a more sustainable effort to ensure that land imaging data are available far into the future.

John H. Marburger
Science Advisor to the President
Director of the Office of Science and Technology Policy
August 14, 2007

FY 2007 Performance Assessment Rating Tool (PART)

In 2007, the 2001 National Land Cover Database was completed for the conterminous United States and the 1992 to 2001 change product showing how the landscape has changed. These products are available through the internet at *http://www.mrlc.gov*. This project is a demonstration of an effective multi-agency collaborative effort. On June 4, 2007, USGS began providing a web-enabled product of selected Landsat data over the United States. This pilot project for the next Landsat Data Continuity Mission (LDCM), demonstrated the value and popularity that Landsat data has to the user community. In only seventeen weeks, 757 unique users downloaded almost 6,000 products (approximately 1.3 terabytes).

Use of Cost and Performance Information

Landsat data and land cover products are being made available through the Internet providing users easy access to data important in decision making for land use planning and resource management. This method of product delivery save tax dollars.

USGS Geography received an “effective” rating when assessed in 2004 by the Administration’s PART tool. USGS Geography has successfully achieved its milestones for 2007:

- Conducted a program review of the landscape status & trends project. An external panel report recognized the value of land cover trends research and its potential in supporting broad policy/planning activities. Recommendations from the review include completion of trends analysis, promotion of product, and identify potential users and develop applications of data in consequences of landscape change.
- Completed the 2001 NLCD for conterminous United States and the products are web enabled for download from the Multi Resolution Land Consortium (MLRC) website at *http://www.mrlc.gov/*.
- A preliminary cost-benefit analysis of introducing seismic-resistant building codes in Memphis was completed and a paper describing this work was presented at the International Congress on Modelling and Simulation.

- The 16th Landsat Technical Working Group (LTWG) meeting was held in May 14-18, 2007. USGS and NASA Landsat Program members met with International Cooperator representatives from 9 countries to discuss topics of technical interest.
- The Landsat Science Team held its first meeting in January 2007 to clarify leadership structure and define duties; and establish working groups for the LDCM.
- A Plan for a NLIP was completed on December 22, 2006, by the Future Land Imaging Interagency Working Group. A final report was released by the Administration in August 2007.
- USGS and NASA developed a joint LDCM requirements document. The USGS held the System Requirements Review for the LDCM ground system in late September, successfully completing a major project milestone.

Workforce Planning

The USGS is working hard to change skill sets, using VSIP/VERAs, to keep pace with changing customer needs. The bureau is using creative solutions for rapid changes in technology and workforce flexibility through the use of contractors and term appointments. In some cases, funding freed from salary load will be used to invest in partnerships through grants. However, in some cases the nature of the work requires the use of government employees. Thus, some of the positions vacated through the VSIP/VERA process will be filled with new employees who possess the requisite skills.

For example, the workload in Eastern Region Geography is increasing as a result of the new directions for geographic science and the expanding need to collaborate with multiple organizations (e.g., other Federal agencies, States, regional planning organizations, local governments, universities, NGOs) to better serve the USGS programs support. The VSIP/VERA process is one management tool that can help better align workforce skills to meet these objectives within level or declining budgets.

Subactivity Overview

The **LRS subactivity** acquires, archives, disseminates, and promotes the application of remotely sensed data of the Earth's land surface. LRS operates the Earth-observing satellites (Landsats 5 and 7) and acquires additional data through a multimission ground station, and procures commercial data from both aircraft and spacecraft operators and maintains a comprehensive archive of Earth observation data at the USGS EROS Center in Sioux Falls, SD. Data from this archive are distributed to Business Partner retailers and customers. The LRS program manages the National Civil Applications Program, including the Global Fiducials Library, rapid exploitation applications, and source management for classified and unclassified data. It also promotes the application of remotely sensed information and advances the state of remote sensing technology. Data acquired and managed by LRS are vital to applications such as support for national defense; global agricultural crop monitoring; monitoring and assessing the impacts of natural disasters; aiding in the management of water, biological, energy, and mineral resources; and analyzing the impacts of climatic and other global changes.

Antarctic Landsat Data Now Available

The public interest in the image mosaic of Antarctic has been overwhelming. The LIMA USGS website was released to the public on November 27, 2007. Compared to post Katrina where the number of viewing images went as high as 50,000 a day, the LIMA viewing totaled 4,371,218 on November 28. Since then the number has been about 1 million a day.

In support of the International Polar Year (2007-08), the new Landsat Image Mosaic of Antarctica (LIMA) brings the coldest place on Earth alive with a comprehensive view of Antarctica. The USGS, the British Antarctic Survey, and NASA, with funding from the National Science Foundation, developed the new mosaic along with an Antarctic web portal and online map viewer. From the Antarctic web portal (*http://lima.usgs.gov/*), scientists and the general public can download the entire mosaic and all of the original 1,065 hand-selected Landsat scenes used to create the mosaic. These scenes are part of over 8,000 scenes collected from 1999 through 2006 by the ETM+ sensor onboard Landsat 7. The seamless mosaic is available in four versions to meet different scientific and aesthetic needs.

This is a natural color mosaic over McMurdo Station, the largest research base in Antarctica. Ross Island is roughly 45 miles across at its widest point.

Landsat 5 Orbits the Earth 125,000 Times

On September 1, 2007, Landsat 5 made its 125,000th orbit of the Earth. Designed to complete only 16,000 orbits, the spacecraft continues to deliver daily images of our ever-changing planet. Through domestic and international ground stations, much of the Earth is imaged by the Thematic Mapper (TM) instrument, the operational imaging sensor aboard Landsat 5.

Landsat 5 was launched on March 1, 1984, from Vandenberg Air Force Base. Designed with space shuttle retrieval in mind, it was given an extra-large propellant tank to assist in such a maneuver. Shuttle flights out of Vandenberg were subsequently cancelled, so the additional propellants were channeled towards increasing the spacecraft lifetime by maintaining the spacecraft orbit. The satellite has experienced major failures with aging components. Innovative changes to daily operations have allowed the mission to survive and continue to downlink scenes around the world.

> Landsats have provided the longest, continuous global record of land cover and its historical changes in existence. Landsat is the premier technology supporting the new geographical field of land-cover science, part of Earth system science.
>
> Earth Observations from Space:
> The First 50 Years of Scientific Achievements
> The National Academies Press, 2008

The **GAM subactivity** provides the analysis and applications needed to address natural and human-induced changes on the landscape. Activities conducted in this program include land cover applications, global change research, ecosystems research, and producing a series of status and trends reports that document a national assessment of land surface change. The science Impact program**,** part of GAM, is a nascent, cross-discipline effort to increase the use and value of USGS science in making informed decisions at Interior, at other Federal, State, and local agencies, and by citizens. The effort encompasses developing, testing, evaluating, and applying improved methods and processes to enhance linkages between science and decisionmaking.

National Land Cover Database for the Conterminous United States Completed

In 2007, USGS completed the 2001 National Land Cover Database (NLCD 2001) for the conterminous United States. This was a huge undertaking by the Multi-Resolution Land Characteristics Consortium (MRLC), which is led by USGS and comprised of 9 other Federal agencies (EPA, NOAA, USFS, BLM, USDA/NRCS, NPS, NASA, USFWS, and OSM). The MRLC consortium is specifically designed to meet the current needs of Federal agencies for nationally consistent satellite remote sensing and land-cover data. However, the consortium also provides imagery and land cover data as public domain information, all of which can be accessed through this website at *http://www.mrlc.gov/*. These products include 21 classes of land cover, percent tree canopy, and percent urban imperviousness at 30-m resolution derived from Landsat imagery. The NLCD 2001 is and will continue to support a wide variety of users, institutional sectors, and local- to national-scale applications with this latest updated land-cover data. This baseline data set is essential in determining the effects of land-cover change on climate as well as the effects of climate change on land cover. Recently completed was the NLCD 1992 - 2001 change product, which was developed to offer users more accurate direct change analysis between the two products. These products provide an unprecedented ability to assess fundamental environmental changes across the entire US at scales ranging from entire regions and basins to communities. Examples of assessments that are now possible include —

- Impacts of urbanization on human health and the environment,
- Effects of landscape change on water quality and quantity,
- Effects of landscape change on the frequency and magnitude of natural hazards such as floods,

- Synergistic effects of landscape and climate change of human well-being and the environment, and
- Changes in a wide variety of ecological services that affect environmental quality and sustainability.

Helping Cities along the U.S.-Mexico Border Manage Urban Growth

Many of the people located along the US-Mexico border live in what are known as colonias, a rural settlement inhabited predominantly by Mexicans or Mexican Americans. These colonias have no access to sewer and (or) water infrastructure and share inadequate housing. The USGS in partnership with the US Department of Housing and Urban Development (HUD) worked with the Mexican Instituto Nacional de Estadística Geografía e Informática (INEGI) to create Internet-enabled geographic information systems to help cities along the U.S.-Mexico border manage issues related to urban growth and low-income housing developments. This has enabled the sister city of Douglas, AZ, to complete a housing survey using these data and unrequested Congressional funding for the Cochise County housing department to provide street lights to the Pirtleville colonia.

The sister cities of Nogales, AZ, and Nogales, Sonora, Mexico, known collectively as Ambos (both) Nogales, suffer from environmental problems attributed to decades of urban growth. USGS researchers have developed a method to estimate current, future, and hypothetical conditions in a virtual environment. The results will serve in the development of a new hands-off approach to borderland water quality investigations and also in the actual development patterns mitigated by the communities. The erosion potential maps have been accepted by the mayor of Nogales and will be used by the city's planning department.

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Activity: Geographic Research, Investigations, and Remote Sensing

Subactivity: Land Remote Sensing

Subactivity	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes[a/]	2009 Program Changes[b/] (+/-)	2009 Budget Request	Change from 2008 (+/-)
Land Remote Sensing ($000)	63,264	61,457	+245	+860	62,562	+1,105
Total FTE	*118*	*118*	*0*	*+3*	*121*	*+3*

a/ Fixed cost increases for this activity total $311, of which $245 will be budgeted and $66 will be absorbed.
b/ Changes for this activity include a reduction of -$156 for travel. The impact of this change is described in the General Statement that begins on page A-1

Summary 2009 Program Changes for Land Remote Sensing

Request Component	($000)	FTE
• National Land Imaging	+2,000	+3
• Educational support for remote sensing science	-984	0
• Travel reduction	-156	0
TOTAL Program Changes	**+860**	**+3**

Justification of 2009 Program Changes

The 2009 budget request for the Land Remote Sensing (LRS) subactivity is requesting $62,562,000 and 121 FTE, a net program change of +$860,000 and +3 FTE from the 2008 Enacted level. Below are the programmatic impacts of this change.

National Land Imaging **(+$2,000,000 / 0 FTE)**

This increase will enable the USGS to initiate the planning for an operational program to collect remote sensing imagery of the Earth's land surfaces. Details can be found in the Science on the Landscape Section beginning on page F-1. Although the USGS will lead this initiative, it will be with shared responsibility among the other land imaging users. As the lead agency, the USGS will establish a coordinated interagency working group to develop and plan for future requirements and applications for land imaging data to support current science and operational activities.

- The increase will also enable LRS to establish Federal interagency and Federal Advisory Committees for assessing the future need for civil-operational land imaging data.

- A formal assessment of the societal and economic benefit of satellite land imaging will also be performed.

- Moderate resolution land imaging satellite data would be acquired to supplement Landsat 5 and 7 data.

- Finally, three additional USGS personnel will be added to support these efforts.

Educational support for remote sensing science (-$984,400 / 0 FTE)
The proposed decrease eliminates all Federal funding to support State-level networks that provide affordable access to land remotely sensed data to consortia of university and state organizations for research, education, and other local applications, such as environmental monitoring, climate change research, natural resource management, and disaster analysis. This eliminates all support for a nationwide program that focuses on satellite remote sensing data and technologies in support of applied research, K-16 education, workforce development, and technology transfer.

Program Performance Change

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Outyears
					A	B=A+C	C	D
End Outcome Goal 1.4: Resource Protection: Improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment								
# of formal workshops or training provided to customers (instances/issues/events	17	10	28	8	8	11	+3	13
Total Projected Cost ($000)	**510**	**330**	**330**	**330**	**330**	**371**	**+123**	**--**
Projected Cost per unit (whole dollars)	**30**	**33**	**33**	**37**	**41**	**41**	**0**	**--**
Comments								

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 President's budget level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent outyear.

Program Overview

The Nation's economic and environmental vitality and security interests rely on continual Earth observations of the Earth's land surface to understand changes on the landscape at local, regional and global scales. Improving our ability to monitor, analyze and permanently record these changes promotes continued economic expansion, environmental awareness, and the advancement of scientific knowledge to support policy officials and decision-makers in fulfilling their public service responsibilities. Through the passage of the Land Remote Sensing Policy Act of 1992 (P.L. 102–555), Congress endorsed the need for continuous monitoring of the Earth

and maintaining a readily available record of information displaying the status of its resources and environment. LRS (*http://remotesensing.usgs.gov/*) is responsible for implementing the provisions of the Act and ensuring the continuous availability of moderate resolution and other remotely sensed imagery for the Nation.

The primary objectives of LRS are to:

- Collect, process, archive, and distribute scientifically relevant global land and near-land observations acquired from satellites;
- Ensure that these data are maintained and easily accessible and available to USGS partners, cooperators, stakeholders, and other customers;
- Conduct and sponsor research in land remote sensing data collection, accessibility, distribution, and application; and
- Investigate future remote sensing missions, sensors, and data relevant to the preceding objectives.

LRS objectives are aligned with the Department of the Interior's Strategic Plan goal of Resource Protection, to improve the understanding of natural ecosystems and resources through integrated interdisciplinary assessment. The program supports USGS strategic objectives by making high-quality remotely sensed data widely and inexpensively available without restrictions to a global community of international, Federal civil, defense, NGO, State, local, academic, commercial, and individual users.

The U.S. National Space Policy (NSPD 49), dated August 31, 2006, provides further guidance to LRS: "The Secretary of the Interior, through the Director of the U.S. Geological Survey, shall collect, archive, process, and distribute land surface data to the United States Government and other users and determine operational requirements for land surface data."

In addition, the Department of the Interior was required to establish a permanent Government archive, the National Satellite Land Remote Sensing Data Archive (NSLRSDA), containing satellite remote sensing data of the Earth's land surface—and to make these data easily accessible and readily available for study.

In accordance with these directives, LRS has the following components:

- Remote Sensing Missions and Data Acquisitions,
- Long-Term Data Preservation and Access,
- Remote Sensing Research and Applications, and
- National Civil Applications Program .

During 2007, the USGS chaired the Committee on Earth Observation Satellites (CEOS). CEOS is recognized as the major international forum for the coordination of civil Earth observation satellite programs, and for interaction of these programs with users of satellite data worldwide. CEOS member agencies operate most of the world's environmental satellites and CEOS is the world's leading international coordination group for environmental satellite programs and provides this capability to the Group on Earth Observations (GEO). The main goal of CEOS is to ensure that critical scientific questions relating to Earth observation and climate change are addressed and international satellite missions complement each other's

sensors, data, and capabilities. In 2008 and 2009, the USGS will continue a leadership role in CEOS as the U.S. develops future land remote sensing capabilities under the National Land Imaging Program. It is imperative that the USGS develop and nurture strong international relationships to augment U.S. capabilities and to meet the environmental information needs of the nation. Additional information can be found at: http://www.ceos.org/.

2009 Program Performance

The 2009 Budget Request for the Land Remote Sensing Program is $62,562,000 and 121 FTE. The LRS Program supports the Departments Resource Protection strategic goal in 2009.

Remote Sensing Missions and Data Acquisitions
(Estimates for 2007, $40.0 million; 2008, $40.1 million; 2009 $42.1 million)

The LRS Program acquires remotely sensed land data from government, commercial, and international assets, including data from National Technical Means sources in support of the Department of the Interior and the global Earth science community. This component also coordinates mission requirements with international cooperators, maintains ground receiving stations, and implements new technologies that support ground data reception and processing in preparation for long-term archiving.

Landsat

The Landsat Program is a series of Earth-observing satellite missions jointly managed by the USGS and the National Aeronautics and Space Administration (NASA). NASA has developed and launched the Landsat satellites. Once launched, the USGS assumes responsibility for operation of the spacecraft as well as the operations, maintenance, and management of ground data reception, processing, archiving, and product distribution.

Conserving Water with Landsat

The increased demand for scarce water supplies has shifted water management strategy from increasing water supply to innovatively managing water use at sustainable levels. To more effectively allocate limited water supplies, water resources managers must understand water consumption patterns over large geographic areas.

Detailed water consumption maps can be made quickly and easily with Landsat because of its 30 m spatial resolution and thermal imaging capability. Landsat data have been used successfully not only to quantify water consumed by irrigation, but also to establish water rights, to facilitate the transfer of water entitlements, and to estimate aquifer depletions and quantify net ground-water pumpage in areas where water extraction from underground is not measured.

Precious Resources: Water & Landsat's Thermal Band April 2007

Since 1972, Landsat satellites have collected information about Earth from space. This science, known as remote sensing, has matured with the Landsat Program. Landsat satellites have taken specialized digital data of Earth's continents and surrounding coastal regions for over three decades, enabling scientists to study many aspects of our planet and to evaluate the dynamic changes caused by both natural processes and human practices.

Landsat data are used by government, commercial, industrial, civilian, military, and educational communities throughout the United States and worldwide. These data support a wide range of applications in areas such as global change research, agriculture, forestry, geology, resource management, geography, mapping, water quality, and oceanography. No other current or planned remote sensing system, public or private, fills the role of Landsat in global change

research or in civil and commercial applications. The consistency of Landsat data over three decades of acquisition offers opportunities to compare changes in the Earth's surface over time. Landsat images are also invaluable for emergency response and disaster relief. Advances made in data reception and processing permit rapid access to imagery in times of natural or human-induced disaster. Within hours of data acquisition, the USGS Earth Resources Observation and Science (EROS) Center in Sioux Falls, South Dakota, provides relief organizations worldwide with satellite images for disaster response, as well as image-derived products that incorporate information on population density, elevation, and other relevant topics.

Investments on Borrowed Time

On March 1, 2007, Landsat 5 began its 24th year in orbit, marking an engineering feat. This is particularly impressive considering its operational lifespan was estimated to be no more than three years. On April 15, 2007, Landsat 7 completed its eighth year of operation. Data gathered by Landsat 5 and Landsat 7 continue to form the backbone of the 35-year-old global Landsat archive, containing millions of images of the Earth's terrestrial environment. Landsat 5 and 7 missions will end by 2012 when their fuel is depleted.

The USGS and NASA completed the Landsat Data Gap Study Team (LDGST), initiated by the Executive Office of the President, Office of Science and Technology Policy. The LDGST developed an approach to mitigate a potential gap in Landsat data continuity in the event of the loss of Landsat 7, by replacing a portion of the Landsat data stream with alternate sources. In March 2007, the USGS assumed responsibility for administering the LDGST. The LDGST developed an implementation plan that focused on the ResourceSat-1 Advanced Wide Field Sensor (AWiFS) as the primary alternate data source to Landsat 7. The recommendations were for the USGS to begin collecting AWiFS data over the continental United States and internationally, enhance procurement contracts, and establish data access and exchange agreements with international cooperators such as Brazil and India.

On June 4, 2007, the USGS began releasing selected Landsat 7 image data of the United States over the Internet (http://glovis.usgs.gov or http://earthexplorer.usgs.gov). These data are of high quality with limited cloud cover. A web-based distribution was established as a pilot project for the Landsat Data Continuity Mission (LDCM) to provide the user community easier access to Landsat data. In seventeen weeks, 757 unique users downloaded approximately 6,000 products (1.3 terabytes of data).

In 2008 and 2009 the USGS will continue operations and maintenance for Landsats 5 and 7. The mission for both satellites is expected to end in 2012 when their fuel is depleted. At that time a decommissioning process will be initiated, taking approximately one year to safely de-orbit both satellites.

Landsat Data Continuity Mission (LDCM)

The LDCM is the next Landsat mission to ensure the continued collection of valuable data and imagery of the Earth's land surface vital to the user community.

LDCM capitalizes on USGS and NASA investments made in remote sensing and data processing technology. USGS and NASA are working closely to ensure the integration of all ground system components with the spacecraft and instrument. The USGS will have responsibility for the operations of the mission, along with collecting, archiving, processing and distributing the data to U.S. Government and other users. NASA has responsibility for development of the flight systems including the spacecraft, instrument, launch, and final on-orbit checkout. LDCM is planned for a 5-year mission with 10-year expendable provisions and is scheduled for launch in 2011. Once on-orbit acceptance has been achieved after launch, NASA

will transfer ownership of the system to the USGS, which will operate the spacecraft and ground systems. Additional information on Landsat satellites can be found at: *http://ldcm.usgs.gov/*. During 2007, the USGS completed two essential reviews for the mission, the system concept review and ground system requirements review. These reviews assure that the operations concepts and requirements that define the ground system's functions will support the preliminary design activities commencing in 2008. In February 2007, the joint USGS and NASA team completed a successful System Concept Review (SCR) for the LDCM ground system. Satellite ground system experts formed the SCR peer review panel to assess USGS plans for the ground system development, initial operations concepts, and the requirements for the ground system development. The review identified areas requiring further investigation and clarification before proceeding with the first formal ground system development milestone—the System Requirements Review.

The SRR held late September 2007, received very high marks from an independent review panel. The SRR's purpose was to evaluate the maturity of the ground system operations concepts, requirements, development methodology, budget, schedule, risks, and an extensive set of supporting documentation. The review also evaluated the USGS and NASA ground system development team's progress towards supporting the overall LDCM mission schedule. The review resulted in only 17 action items, which is relatively few compared to ground system reviews for similar satellite missions. All action items are currently being addressed and many already completed.

In 2008, the USGS will commence ground system preliminary design activities for the two major segments that comprise the LDCM ground system: the Flight Operations Segment (FOS), which will operate the spacecraft and provide the communications network to support spacecraft operations and receive LDCM image data and the Data Processing and Archiving Segment (DPAS), which will capture, archive, process, and distribute LDCM data. The USGS will hold formal element level Preliminary Design Reviews to ensure the FOS and DPAS designs are maturing on schedule. Also, the USGS will be working closely with NASA in preparing and awarding contracts for the procurement of the LDCM spacecraft and the mission operations element used to control the spacecraft, Flight Operations Team (FOT) support, and development of the LDCM ground system. 2008 will close with the ground system level PDR where the USGS ground system development efforts will transition into detailed design activities.

In 2009, the USGS will complete detailed design activities and enter the system development phase for the ground system including software code development and integration of subsystems and elements to support ground system level integration and testing activities of the FOS. In addition, USGS and NASA will continue joint preparations for ground system and mission level formal testing slated to begin in early 2010. The USGS will complete facilities modifications to host the Mission Operations Center at the USGS EROS Center and will procure commercial off-the-shelf hardware and software to compliment mission specific software applications. Also, satellite communications systems and data networks will be augmented to support the LDCM data downlink specifications. The USGS FOT and ground operations teams will develop operations procedures and plans to support ground and on-orbit testing along with normal operations after LDCM system acceptance.

A National Land Imaging Program

On August 14, 2007, the Administration issued a plan for the U.S. National Land Imaging Program (NLIP). Based on the plan, NLIP would be established in the Department and would

provide focused leadership and management for the Nation's operational land imaging efforts that will ensure the availability of land imaging data far into the future, with an uninterrupted history back to 1972.

The Administration's call for NLIP to address the Nation's needs in civil-operational land imaging is the result of several decades of policy change. The Administration called upon all Federal agencies that either used or produced satellite land data to form an interagency working group to explore the future of land imaging. After nearly 2 years of policy evaluation and user assessment, the Administration released its report recommending that the Department assume management of the NLIP to provide stable program management and advance civil-operational land imaging technologies and imagery applications related to economic, environmental, and security interests. The report called on NLIP to enable the widest beneficial use of civil-operational land imaging by all levels of government, and by profit and non-profit institutions in the United States and abroad. More information about NLIP can be found in section F.

In 2009 emphasis will be in the following areas:

- Work with the land imaging user community (Federal Land Imaging Council, Federal Advisory Committee, universities, State, local, and tribal governments, and industry) to define future user and technical requirements,
- Conduct an economic assessment of the societal and economic value of moderate-resolution satellite data, and
- Implement foreign government and commercial agreements to acquire new sources of moderate-resolution data to augment Landsat data.

Long-Term Data Preservation and Access

(Estimates for 2007, $9.0 million; 2008, $9.2 million; 2009, $9.2 million)

The Earth is changing in ways that are not fully understood. It will never be possible to comprehend the meaning of these changes without a clear and consistent record of observable surface phenomena. LRS has the responsibility to preserve, provide access to, and distribute products from the long-term archive of aerial and satellite data sets. The archives at the EROS provide a comprehensive, permanent, and impartial record of the Earth's land surface acquired over several decades.

In the Land Remote Sensing Policy Act of 1992 the Congress directed the DOI to establish a permanent Government archive (NSLRSDA) containing satellite remote sensing data of the Earth's land surface, and to make them available for study. The USGS, as a world leader for archiving remotely sensed data, is responsible for making these data available and easily accessible to users at minimal costs. Today, the archive contains over 107,000 rolls of aerial and satellite imagery containing in excess of 13 million frames. It also contains additional aerial and satellite data sets, totaling over 4,000 terabytes stored in robotic mass storage systems.

The archive holdings provide a wealth of information used for environmental research, homeland security, land management, natural hazard analysis, and natural resource management and development, with applications that extend beyond America's borders. There is a worldwide community of users throughout Federal, State and local, and tribal governments, academic institutions, and private enterprise. The core satellite data holdings include: Multispectral Scanner (MSS) and Thematic Mapper (TM) image data (1972 to present) from Landsats 1-5 and Landsat 7; Advanced Very High Resolution Radiometer (AVHRR) data (1986

to present) over the Earth's land surface from NOAA weather satellites; and more than 880,000 declassified intelligence satellite photographs (1960-1972).
For two years, NASA and the USGS have been planning the production of the Mid-Decadal Global Land Survey. Based off the tri-decadal Landsat surveys of the past (1975, 1990, and 2000), this mid-decadal survey takes advantage of the two active satellite missions, Landsat 5 and Landsat 7. Before processing can begin, the older tri-decadal datasets are being reprocessed for higher accuracy, so that all dates can be geometrically matched. The Global Land Survey 2005 dataset will include the best cloud-free scene over a particular land area, with a target date of 2005-2006. The selected scenes will be available for distribution starting in calendar year 2008.

The USGS estimates an exponential growth in archival volume of satellite data to several petabytes by 2012. In 2008 and 2009 the project continues to maintain, preserve and provide ready access to historical remote sensing film and digital databases and archives. Planned activities include data organization, ingest, metadata generation, data set appraisals and assessments, dispositions including transfer to the National Archive and Records Administration (NARA) and preservation activities such as data set transcriptions and media migrations for collections.

Archiving activities include:

- Continue to operate and maintain systems that acquire, process, and ingest satellite imagery into the archive,
- Support archiving initiatives to partner with NARA in the future,
- Continue to manage, operate, and maintain photographic and digital archives and ensure long-term preservation of archival holdings,
- Appraise and dispose of the historical collections; add new collections in the archive that are aligned to program objectives and the USGS mission,
- Improve easier, faster public access to archive holdings through continued digitizing of USGS historical film collections; create and place browse images online and create single-frame coordinate metadata (to better assist customers in acquiring data and imagery tailored to their needs),
- Web enable historical data sets for no charge electronic distribution over the Internet,
- Advance Earth Explorer and GloVis capabilities to enhance public access to the historical archive,
- Provide for effective and efficient user and customer services for all the data sets currently in the archive, and
- Provide certified reproductions of archived film sources to the public.

These archival data form a baseline chronology of environmental change on the Earth, both natural and human-induced, and an invaluable tool for scientific assessment and prediction. Through access to archive holdings, stakeholders can learn from the past to benefit the future.

Remote Sensing Research and Applications
(Estimate for 2007, $12.6 million; 2008, $11.8 million; 2009, $10.8 million)

LRS provides national leadership to ensure that remotely sensed data are available and contribute to the understanding of how human-environmental systems respond to change. The LRS Program conducts research of remote sensing instruments and their application, which is important to the scientific community for identifying, analyzing, monitoring, and predicting land surface features and long (e.g., climate change) and short term (e.g., hurricane) events. Projects in 2008 include:

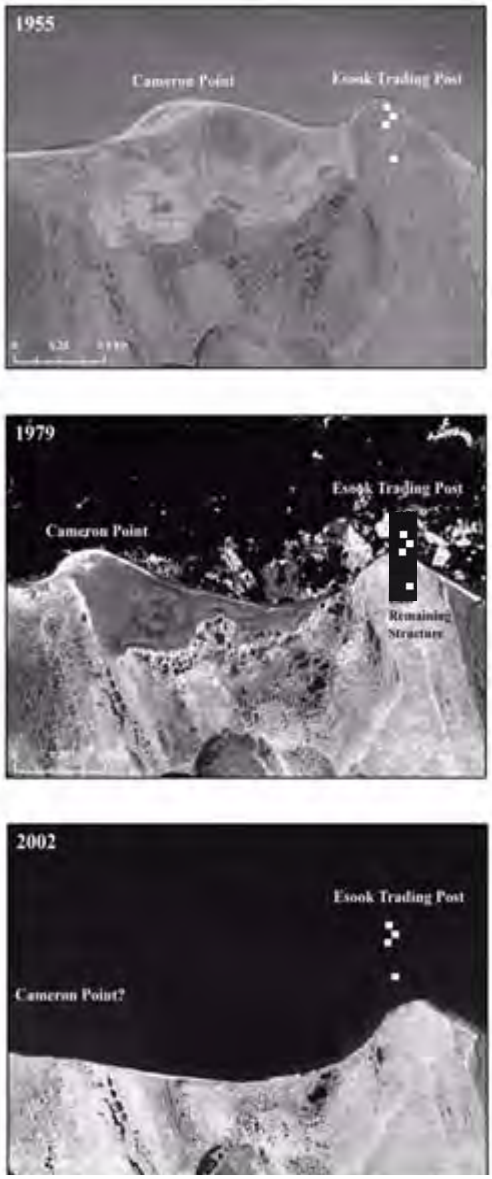
- Use of high resolution imagery and digital elevation models to better assess and potentially predict the effects of earthquakes, volcanism, and landslides;
- Effects of data resolution in support of national land surface change programs such as the National Land Cover Database and LANDFIRE;
- Application of light detection and ranging (LIDAR) and Synthetic Aperture Radar (SAR) remote sensing data for quantifying urban vegetation to a scale appropriate for land use managers to improve the health and resilience of eco-regions.

Additional information on LRS research can be found at:
http://remotesensing.usgs.gov/researchapps.html.

In 2009 remote sensing research activities include:

Using historical and recent aerial photography to assess the effects of coastline erosion on the Alaskan North Slope

Major landscape change has occurred along the coast of Alaska's North Slope. USGS scientists have found major erosion along areas of Alaska's arctic coastline resulting in the loss of both cultural and past exploration sites by using records from early explorers, historical aerial photos, and recent aerial photography. Since the 1830's 6 of 7 coastal features or geographic named-places have been lost by erosion. During the early 1900's another 2 of 4 coastal and historic sites were lost and since the late 1970's a petroleum test well in the National Petroleum Reserve of Alaska was lost due to continual coastal erosion. Work in 2007 shows that with current rates of erosion in some areas averaging as much as 15 meters-per-year, more sites will be lost, indicating the need for planning before new infrastructure is erected. These pictures are an example of the coastal erosion that has taken place between 1955, 1979, and 2002, showing the disappearance of the Esook Trading Post and Cameron Point.



Pictures show the coastal erosion along Alaska's North Slope.

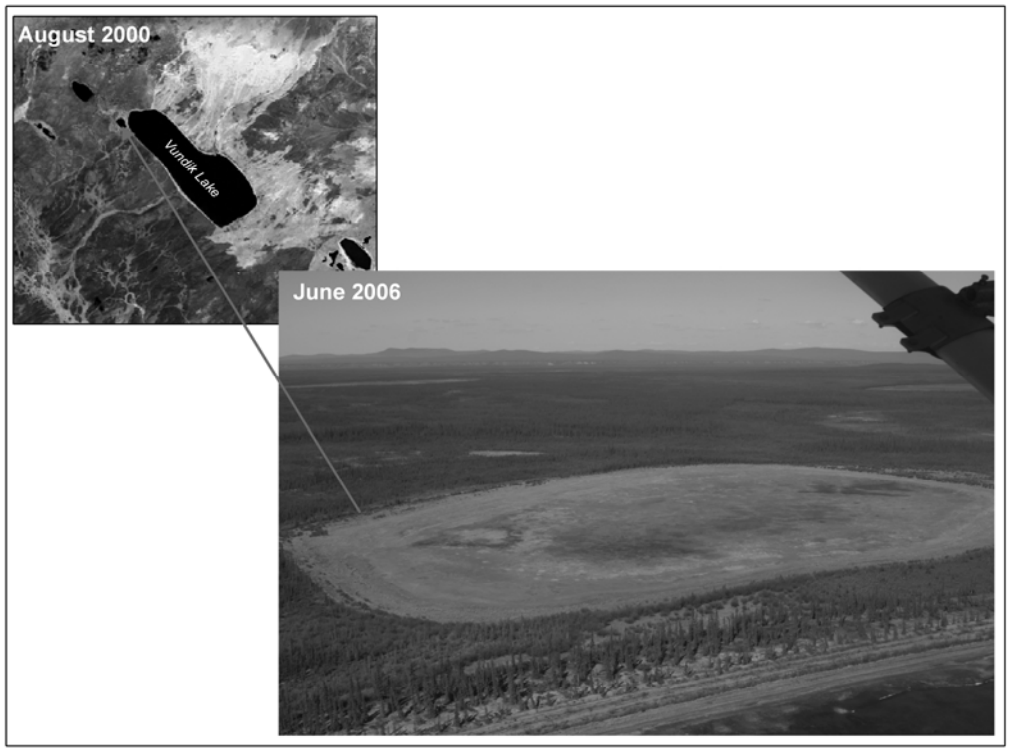
These studies are important to resource managers, such as the FWS who have management responsibility for international trust species of migratory waterfowl that utilize this area for breeding and molting. This research also supports the Department's conservation efforts in the preservation of cultural artifacts. In addition, land managers utilize this information in determining placement of roads and work pads for oil and gas development. This effort will continue into 2009.

Detection and Monitoring of Changes in Arctic and Sub-Arctic Lakes

Studies show that high-latitude lakes are undergoing very rapid changes. These changes are believed to be changing as a result of local, regional, or global fluctuations in climate. However, documented changes have not followed the same trajectory throughout the high latitude regions; some studies indicate lake expansion, whereas, others suggest lake shrinkage, drainage, and (or) drying. Current studies imply that part of this change may be due to local geophysical changes, as well as effects of long-term climate change. In 2008 and 2009, USGS will conduct studies to assess hydro-geomorphologic influences on local lake water level

dynamics and continuation of a statewide assessment of lake change using over 400 Landsat TM and ETM+ satellite images extending from 1985 to 2002. Information from these studies is essential to help prepare resource managers and communities for changes to the freshwater resources across the Alaskan landscape.

The Department plays a major stewardship role in Alaska for the management of national parks and national fish, wildlife refuges, BLM lands, along with other regulatory agencies such as U.S. Army Corps of Engineers. These lands support waterfowl populations of special concern under the Endangered Species Act and subsistence resources critical to native peoples. Understanding these environmental changes across the matrix of federally managed lands is essential to helping agencies carry out their missions in the face of climate and landscape changes.



The figure shows Landsat TM satellite image from August 2000 (upper left) of the Vundik Lake region and an oblique photograph (June 2006) of a recently dry lake basin within this region of the Yukon Flats National Wildlife Refuge. The lake is present in the 2000 image however aerial reconnaissance conducted within the refuge during 2006 has revealed a dry basin. As the impacts of climate change become more readily apparent it will be important for land and resource managers to monitor such changes as it could have serious ramifications for DOI trust species and resources.

Automated Feature Extraction of Disturbed Surfaces Associated with Energy Infrastructure

In 2007 the USGS developed a method for automating feature extraction from various map information to produce a database for BLM of well pads located in the San Juan Basin area in New Mexico and Colorado. This geographic information system (GIS) data layer also includes facilities, well points, and roads, that provide essential information in BLM's air emissions models used to detect potential contributory sources of air emissions from oil and gas development. Multiple sources of remotely sensed data (National Technical Means data sources and airborne photography) were used to identify various sources of air emissions. In 2008 and 2009, the techniques developed for the San Juan Basin area will also be used in the Green River Basin area of southwestern Wyoming as part of the Wyoming Landscape Conservation Initiative (WLCI) 2008 program to extract total disturbed surface, including roads, well pads, and other energy related infrastructure.

National Civil Applications Program (NCAP)

The NCAP serves USGS science programs and other Federal civil agencies by providing for the acquisition, dissemination, archive, and exploitation of classified remote sensing systems and data to address land and resource management, environmental, socioeconomic, hazards, disasters, and other geospatial scientific analysis and policy issues. In addition, the NCAP provides support for the Civil Applications Committee (CAC), a Presidential-chartered interagency committee that provides coordination and oversight of Federal civil use of classified collections.

LRS currently funds two secure facilities, in Reston and Denver, which support the complex infrastructure of security precautions and information technology (hardware, software, networks, etc.) necessary to enable the dual use of classified systems and capabilities. The NCAP activity serves as a key point of entry for the civil community to gain access to the significant resources the Intelligence Community has dedicated in areas such as: technology transfer and awareness of advanced image processing and analysis techniques, sensor research, and applications research.

In 2009, the NCAP will continue to play a proactive and relevant role in addressing geospatial requirements associated with Federal lands management and preparation for, mitigation of, response to and recovery from hazards and other emergencies. NCAP also supports the preservation of a long-term record of classified earth observations, which are useful for scientific evaluation of global dynamics, such as climate variability and change. Through NCAP, LRS provides decision-makers with the best available, scientifically sound information based on the awareness, utilization and synthesis of all classified, open source, and governmental remotely sensed data.

Program Performance Overview

The following table highlights important performance measures for the Land Remote Sensing Program.

End Outcome Goal 1.4: Resource Protection: Improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Measures Intermediate or PART Measures/PART Efficiency or Other Outcome Measures	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
GPRA End Outcome Measures									
% of targeted science products that are used by partners for land or resource management decision making **(SP)**	85%	90%	93%	≥90%	93%	≥90%	≥90%	0	≥90%
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure availability of long-term environmental and natural resource information, data and systematic analyses needed by land and resource managers for informed decision making**									
X% of data accessible: X% of satellite data available from archive within 24 hours of capture **(PART Geography)**	90%	97.2%	98.7%	95%	95%	95%	95%	0	95%
Total Actual/Projected Cost ($000)	**40,140**	**43,725**	**40,159**	**40,159**	**40,962**	**40,962**	**41,781**	**+819**	**--**
Actual/Projected Cost per scientific product (whole dollars)	**14.64**	**14.64**	**14.64**	**14.64**	**14.64**	**14.64**	**14.64**	**0**	**--**
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure the quality and relevance of science information and data to support decision making**									
% of studies validated through appropriate peer review or independent review **(SP)**	100% (98/98)	100% (83/83)	100% (79/79)	100% (75/75)	100% (66/66)	100% (71/71)	100% (60/60)	0	100% (70/70)
% satisfaction with scientific and technical products and assistance for environment and natural resource decision making **(SP)**	90%	96%	91%	≥90%	≥90%	≥90%	≥90%	0	≥90%
PART Efficiency and Other Output Measures									
# of annual terabytes collected (**BUR**) **(Geography)**	527.2	438.8	537.9	534.0	96	Rebaseline			

End Outcome Goal 1.4: Resource Protection: Improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Measures Intermediate or PART Measures/PART Efficiency or Other Outcome Measures	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
# of cumulative terabytes managed **(Geography)**	2,448.3	2,887.4	3,425.3	4,043.8	4,255.9	Rebaseline			
# of annual terabytes collected **(BUR) (Geography)**	UNK	UNK	UNK	UNK	UNK	278	278	0	300
# of cumulative terabytes managed **(Geography)**	UNK	UNK	UNK	UNK	UNK	3,556.6	2,547.3	-1,009.3	3,400
Comment:	Data managed reflects aggregated total of terabytes of data in the archive at the end of a period, including recent collections, reprocessing datasets, compression and disposal of data. The change from 2008 reflects the reprocessing of MODIS and ASTER data based on the development of new scientific algorithms thus reducing the size of datasets.								
# of systematic analyses and investigations delivered to customers	98	83	79	75	66	71	59	-12	70
Total Actual/Projected Cost for analysis' ($000)	**29,400**	**25,655**	**23,801**	**23,801**	**15,037**	**15,037**	**12,660**	**-2,488**	**--**
Actual/Projected Cost per analysis (whole dollars)	**300**	**309**	**301**	**301**	**200**	**211**	**211**	**0**	**--**
# of formal workshops or training provided to customers (instances/issues/events)	23	17	10	9	28	8	11	+3	13
Total Actual/Projected Cost for analysis' ($000)	**500**	**510**	**330**	**330**	**330**	**330**	**371**	**+123**	**--**
Actual/Projected Cost per analysis (whole dollars)	**22**	**30**	**33**	**33**	**37**	**41**	**41**	**0**	**--**
LDCM: X% of ground system designed, built, and tested **(Geography)**	UNK	UNK	8% (reflects planning stage only)	44% (reflects planning stage only)	44% (reflects planning stage only)	Replace with EVM-based measure below			

End Outcome Goal 1.4: Resource Protection: Improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Measures Intermediate or PART Measures/PART Efficiency or Other Outcome Measures	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
LDCM: Cost variance and scheduled variance for the LDCM project remain within +/- 10% tolerance **(Geography)**	UNK	UNK	UNK	UNK	UNK	+8%/0% CV/SV	+10%/0%	+2%/0%	TBD

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Activity: Geographic Research, Investigations, and Remote Sensing

Subactivity: Geographic Analysis and Monitoring

Subactivity	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-)	2009 Program Changes (+/-)[a/]	2009 Budget Request[b/]	Change From 2008 (+/-)
Geographic Analysis and Monitoring ($000)	16,926	16,266	-2,715	-2,995	10,556	-5,710
Total FTE	*113*	*106*	*-25*	*-27*	*54*	*-52*

a/ Fixed cost increases for this activity total $216, of which $171 will be budgeted and $45 will be absorbed. A technical adjustment is proposed as part of a budget restructure that moves funding for global change activities into a new integrated budget activity titled Global Change.

b/ Changes for this activity include a reduction of -$42 for travel. The impact of this change is described in the General Statement that begins on page A-1

Summary of 2009 Program Changes for the Geographic Analysis and Monitoring

Request Component	($000)	FTE
• Geographic Research	-1,013	-7
• Priority Ecosystems	-1,940	-20
• Travel Reduction	-42	0
TOTAL Program Changes	**-2,995**	**-27**

Justification of 2009 Program Changes

The 2009 budget request for the Geographic Analysis and Monitoring (GAM) subactivity is $10,556,000 and 54 FTE, a net program change of -$2,995,000 and -27 FTE from the 2008 Enacted level. This change includes a decrease of -$2,953,000 that was added by Congress above the 2008 President's request to restore ongoing geographic research. The reductions included:

USGS Priority Ecosystems Science (-$1,940,000 / -20 FTE)

The 2009 budget proposes a reduction in the Priority Ecosystem Science (PES) activities within GAM. This reduction in PES will facilitate the funding of higher priority activities within the GAM Program. PES activities will continue in the six study unit areas (Greater Everglades, San Francisco Bay, Chesapeake Bay, Mojave Desert, Platte River, and the Greater Yellowstone area) but at a reduced rate, potentially impacting ongoing modeling and monitoring activities. A portion of this reduction is being requested within the Biology Program, for more information on that request, see the Science on the Landscape section, beginning on page F-1.

Geographic Research **(-$1,013,000 / -7 FTE)**

The following geographic research projects will be discontinued or delayed so that funds may be directed toward higher priority research.

Carbon Cycling Research — This decrease will eliminate funds for continuing partnerships with other Department bureaus and the United States Department of Agriculture for identifying the amount of carbon currently stored in the ecosystems of the United States and select ecosystems around the world.

Causes and Consequences of Land Use and Land Cover Changes in the Chesapeake Bay Watershed — This decrease will eliminate Geography's research funds supporting landscape change studies in the Chesapeake Bay area including (1) analyzing land cover trends data for use by regional and local planners in resource decision-making, (2) analyzing the impact of development, particularly increased impervious surface amounts on stream geomorphology and water quality, and (3) modeling trends in agriculture, demographics, urban development, and forestry for the area's major tributary basins.

Program Performance Change

The following table represents the impact of the cut to the GAM program's research budget.

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Outyears
					A	B=A+C	C	D
End Outcome Goal 1.4: Resource Protection: Improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment								
Resource Protection: # of systematic analyses and investigations delivered to customers	83	79	66	71	71	59	-12	+10
Total Projected Cost ($000)	**25,655**	**23,801**	**23,801**	**15,037**	**15,037**	**12,660**	**-2,488**	**--**
Projected Cost per unit (whole dollars)	**309**	**301**	**301**	**211**	**211**	**211**	**0**	**--**

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2008 at the 2007 President's Budget level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2008 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2008. It does not include the impact of receiving the program change again in a subsequent outyear.

Program Overview

The Earth's surface is rapidly changing, at local, regional, national, and global scales, with significant repercussions for citizens, the economy, and the environment. Some of these changes are due to natural causes, such as volcanic eruptions, earthquakes, or drought, while other changes on the land, such as mining and forestry operations, agricultural practices, and urban growth, are human-induced processes. There are also changes that are a combination of natural and human-induced factors, for instance, landslides and floods are fundamentally natural processes that are often intensified and accelerated by human land use practices. GAM focuses on the entirety of Landscape Change processes by creating datasets of the changes taking place; researching the impacts of the identified changes and developing tools and models that allow resource managers adapt to changing conditions and make knowledgeable decisions on resource use and allocation. Results of GAM research are important components in reducing the detrimental impacts of human economic development and plans for avoiding, or alleviating the impacts of hazard events.

Approximately, one-half of GAM's resources are devoted to maintaining a land change monitoring system that characterizes and quantifies land surface characteristics and provides a framework for understanding change patterns and processes from local to global scales. The National Land Cover Database (NLCD) and the Ecosystems Mapping project form the core of this monitoring system. The remainder of GAM's resources are used to fund land change science projects that seek to:

- Understand the environmental consequences of land change and its impacts on the people, environment, economy, and resources of the nation.
- Improve the scientific basis for vulnerability and risk assessments, as well as disaster mitigation, response, and recovery activities.
- Develop credible and accessible geographic research, tools, and methods supporting resource allocation and decision-making.

Program researchers use earth observation data supplied by remote sensing platforms, environmental data gathered in the field, and socio-economic data to quantify the rates of landscape change, identify key driving forces, and forecast future trends of landscape change. Results of these studies are utilized by resource managers to plan future activities and responses to possible events that may result in loss of life, economic value, or degrade environmental resources. Studies are conducted within a geographic context at a range of spatial and temporal scales, in order to provide a comprehensive, interdisciplinary perspective. This perspective is necessary to understand the threats impacting our nation's quality of life, such as climate change, natural disasters, infectious diseases, and suburban sprawl.

The science conducted by GAM plays a vital role in several important USGS activities such as the Multi-Hazards Demonstration Project (MHDP) in southern California and the Integrated Landscape Monitoring (ILM) project, which is focused on four sites, the Great Basin, Puget Sound, Prairie Potholes, and Lower Mississippi Valley. The goal of GAM in these initiatives is to utilize the most relevant data and geographic techniques to assess some of the most pressing issues facing resource and disaster managers in our nation. In the MHDP, GAM is applying its expertise in assessing disaster response plans and identifying the possible economic damages and casualties resulting from a serious earthquake event. This work is being coordinated with local governments on how to limit these consequences through comprehensive land use zoning scenarios and building standards. The USGS ILM project has harnessed the talents of

scientists of from all the USGS disciplines to better understand and respond to ecosystem change. Monitoring change at the landscape level provides a window for viewing ecosystem responses that cannot be detected at the small site scale. In addition, understanding the processes that drive complex factors shaping landscapes requires sophisticated modeling and monitoring. For each pilot area a model of the landscape is developed to understand the key factors affecting the structure and condition of the landscape system and explore what conservation, restoration and remediation activities could be implemented to protect and improve the integrity and ecosystem functioning of the landscape. These models will be used to identify monitoring needs and the required science needed to support these efforts. GAM research in the ILM projects involves using remotely sensed images to identify vegetation types for habitat assessments, modeling hydrologic processes, and assessing the impacts of urbanization on water quality.

2009 Program Performance

The GAM program includes the following two program components: Land Change Monitoring and Land Change Science (which includes Environmental Consequences, Hazards and Risk Assessment, and Resource Decision-Making). In 2009, GAM will do the following:

Land Change Monitoring
(Estimate for 2007, $8.6 million; 2008, $8.6 million; 2009, $5.7 million)

The National Land Cover Database (NLCD) — Land cover information is increasingly required in a broad spectrum of scientific, economic and governmental applications including assessing ecosystem status and health, understanding spatial patterns of biodiversity and developing land management policies. The USGS has taken the lead in developing the NLCD which has been used in thousands of applications in the private, public, and academic sectors. This database is a critical component of many regional and environmental assessments, including the Heinz Center's *State of the Nation's Ecosystems* and EPA's *Report on the Environment*. These assessments were the first attempts to analyze environmental conditions for the entire country. All NLCD products are web enabled for download at the MRLC website at *http://www.mrlc.gov*. In 2008, NLCD 2001 data layers for Alaska, Hawaii, and Puerto Rico will be completed. In addition, land cover change information spanning the decade between the NLCD 2001 and the original NLCD from 1992 will be published to inform users on the amount and type of land cover change. Finally, prototyping research and development for a next generation NLCD based on a nominal year of 2006 Landsat imagery will be completed. For 2009, full scale production of NLCD 2006 will be underway with approximately 40 percent of the conterminous United States planned to be completed. This will encompass the completion of four thematic layers including land cover, percent imperviousness, percent tree canopy and change vector analysis.

National Geospatial Ecosystem Modeling — Ecosystems provide a framework for understanding the Earth's physical and biological processes that make life possible for all organisms, including humans. A comprehensive national ecosystem model will enable the economic and societal valuation of key ecosystem services like water production and quality, carbon sequestration, biodiversity, soil fertility, flood control. Quantifying the value of these services is increasingly becoming important to land management agencies, especially for the Bureau of Land Management and US Forest Service. The goal of this project is to provide both Federal and State land management agencies a standardized spatial framework for assessing and monitoring ecosystem services. In 2008, GAM will produce unique ecosystem footprints, which will subsequently be aggregated and labeled using an existing ecological systems

classification developed by NatureServe. Moreover, a collaboration between the EPA and the USGS will advance work on a National Atlas of Ecosystem Services, which will incorporate the ecosystem model, as well as other datasets. In 2009, the completed and validated National Ecosystems Model will be positioned for adoption by multiple agencies for use in resource management and conservation applications through workshops and the publication of a report describing the methodologies developed and possible applications.

The Road Indicator Project (TRIP)

Roads are an important indicator of human influences on the environment, contributing to the degradation of ecological and watershed conditions, while simultaneously providing access to natural resources. A metric of roadless space is needed for assessing both the ecological costs and societal benefits of roads. In 2008, TRIP is developing statistical descriptions of the loss of roadless space along the rapidly urbanizing Front Range of Colorado. These results will result in the publication of a model simulating the loss of roadless space due to urbanization and how various land use zoning decisions may influence the distribution of roads.

BLM Use of TRIP

BLM's Gunnison Field Office, working in conjunction with Gunnison County Dept. of Transportation, has gated and seasonally closed numerous roads on BLM land to protect sage grouse during their sensitve mating season. TRIP is being used to monitor vehicular traffic on these roads before and during closure to estimate the amount of human disturbance and effectiveness of closures.

Land Change Science Projects

(Estimate for 2007, $4.3 million; 2008, $4.9 million; 2009, $4.9 million)

Ozarks Studies — The Ozarks of southern Missouri and northern Arkansas are a rugged, mostly forested region that is characterized by exceptional water quality and remarkable biodiversity. Because the region is underlain by extensive networks of sinkholes, caves, and springs, it is particularly vulnerable to rapid and unpredictable changes in water quality. The region is currently experiencing an increase in population and is becoming a popular location for vacation homes, which will place enormous pressures on water resources. In 2008, research will be expanded to include a study of the hazards associated with the catastrophic collapse of sinkholes in the Ozarks. This will include co-hosting the National Cave and Karst Managers Symposium in St. Louis, and planning an Ozarks Summit that will be held later in the year. In 2009, they will continue to focus on the occurrence of sinkholes, the hazards associated with their catastrophic collapse, and the effects of land use change on water quality in the Ozarks. Reports will be published on the impacts of land cover change and the results of the hazard workshops.

Assessing Societal Vulnerability to Natural Hazards — The 2004 Indian Ocean disaster demonstrated how tsunamis are significant threats to the safety, economic well-being, and resources of coastal communities. Although tsunami-prone areas have been identified in many States, far less is known on the potential societal impacts of these tsunamis. Understanding societal vulnerability to tsunamis is critical if managers and policymakers are to increase the ability of threatened communities to respond to hazard events. Two USGS Scientific Investigation Reports detailing variations in community exposure and sensitivity to tsunamis in Oregon and Washington will be released in 2008. In addition, technical briefings of these reports will continue to be given to local, State, and Federal partners. In 2009, researchers will assess variations in community exposure and sensitivity to tsunamis in California and to determine the feasibility of doing a similar study in Alaska.

South Florida Ecosystem Portfolio Model — Resource managers and decision makers require tools that evaluate the impacts of land use decisions that attempt to maintain a balance between ecological health and the increasing pressures of urban development. The South Florida Ecosystem Portfolio Model, a geographic information system based decision support tool, will integrate natural science and economic information to support land use planning, land acquisition strategies, and regulatory decisions. It will contribute to improved public understanding and awareness of the importance of protecting South Florida's ecosystem functions and their support for the region's economy. In 2008, the team will continue implementation of the habitat and fragmentation criteria and begin implementation of the water quality buffer. The team will collaborate with Florida Atlantic University and Florida International University to identify quality-of-life indicators responsive to land use and land cover change. They will also continue its collaboration with the University of Pennsylvania to use the land price model as the basis of a probability of land use conversion (conversion pressure) model. In 2009, the team will refine the components and finish implementation in the web interface, deploy the tool for use by the NPS, get feedback from users and refine the models and interface based on this feedback, and publish several papers describing the tool, the components, and the approach.

Program Performance Overview

The following table highlights important performance measures for the Geographic Analysis and Monitoring Program. As shown in an earlier table, the decrease of PES funds potentially impacts metrics in the Biology Discipline as all PES performance is counted there.

End Outcome Goal 1.4: Resource Protection: Improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Measures Intermediate or PART Measures/PART Efficiency or Other Outcome Measures	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
GPRA End Outcome Measures									
% of targeted science products that are used by partners for land or resource management decision making **(SP)**	85%	90%	93%	≥90%	93%	≥90%	≥90%	0	≥90%
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure availability of long-term environmental and natural resource information, data and systematic analyses needed by land and resource managers for informed decision making**									
% of US surface area with contemporary land cover data needed for major environmental monitoring and assessment programs **(SP)**	45%	65%	75%	95% (286/3)	95% (286/3)	100% (300/3)	15% (45/3)	See comment below	60% (180/3)
Comment:	The current goal is to create a new land cover map (NLCD) of the US every 5 years. The USGS will complete the 2001 NLCD (using 2001 Landsat data) for the entire US and Puerto Rico in FY08. In FY09, USGS will begin the next generation NLCD using Landsat imagery acquired in 2006. Current land cover data is essential for conducting regional and national environmental assessments, including the impacts of climate change.								
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure the quality and relevance of science information and data to support decision making**									
% of studies validated through appropriate peer review or independent review **(SP)**	100% (98/98)	100% (83/83)	100% (79/79)	100% (75/75)	100% (66/66)	100% (71/71)	100% (60/60)	0	100% (70/70)
% satisfaction with scientific and technical products and assistance for environment and natural resource decision making **(SP)**	90%	96%	91%	≥90%	≥90%	≥90%	≥90%	0	≥90%
PART Efficiency and Other Output Measures									

End Outcome Goal 1.4: Resource Protection: Improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Measures Intermediate or PART Measures/PART Efficiency or Other Outcome Measures	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
# of annual terabytes collected (**BUR**) **(Geography)**	527.2	438.8	537.9	534.0	96	Rebaseline			
# of cumulative terabytes managed **(Geography)**	2,448.3	2,887.4	3,425.3	4,043.8	4,255.9	Rebaseline			
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# of systematic analyses and investigations delivered to customers	98	83	79	75	66	71	59	-12	70
Total Actual/Projected Cost for analysis' ($000)	**29,400**	**25,655**	**23,801**	**23,801**	**15,037**	**15,037**	**12,660**	**-2,488**	**--**
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# of formal workshops or training provided to customers (instances/issues/events)	23	17	10	9	28	8	11	+3	13
Total Actual/Projected Cost for analysis' ($000)	**500**	**510**	**330**	**330**	**330**	**330**	**371**	**+123**	**--**
Actual/Projected Cost per analysis (whole dollars)	**22**	**30**	**33**	**33**	**37**	**41**	**41**	**0**	**--**

Geologic Hazards, Resources, and Processes

Subactivity	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-) [a]	2009 Program Changes (+/-) [b]	2009 Budget Request	Change From 2008 (+/-)
Geologic Hazard Assessments ($000)	81,890	85,651	+887	-6,281	80,257	-5,394
FTE	*404*	*404*	*0*	*0*	*404*	*0*
Geologic Landscape and Coastal Assessments ($000)	78,327	80,614	-9,509	-3,733	74,838	-5,776
FTE	*426*	*427*	*-78*	*+6*	*355*	*-72*
Geologic Resource Assessments ($000)	76,786	77,211	+1,315	-25,606	52,920	-24,291
FTE	*505*	*485*	*0*	*-210*	*275*	*-210*
Total Requirements ($000)	**237,003**	**243,476**	**-7,307**	**-28,154**	**208,015**	**-35,461**
Total FTE [c]	***1,335***	***1,316***	***-78***	***-204***	***1,034***	***-282***

[a] Fixed cost increases for this activity total -$7,307 of which $3,830 is budgeted and $801 is absorbed. A technical adjustment is proposed as part of a budget restructure that moves funding for global change activities into a new integrated budget activity titled Global Change.

[b] Changes for this activity include a reduction of -$801 for travel. The impact of this change is described in the General Statement that begins on page A-1.

[c] FTE above for 2007 include 2 FTE associated with contributed funds.

Activity Summary

The 2009 budget request for the Geologic Hazards, Resources, and Processes Activity (Geology Discipline) is $208,015,000 and 1,034 FTE, which is a net program change of -$28,154,000 and -204 FTE from the 2008 Enacted level.

The budget request includes proposed increases of (1) +$6.0 million in support of the USGS development of an Ocean and Coastal Frontiers Initiative, (2) +$500,000 for the Ocean Action Plan Initiative begun in 2008, and (3) +$1.5 million in support of the Department's Water for America Initiative. These efforts would be collaborative across USGS disciplines, Department of the Interior bureaus and other Federal sectors. Additional information on program changes is provided in each program element section of this document and in the Science on the Landscape section, beginning on page F-1.

The budget request includes proposed decreases of (1) Mineral Resources Assessments and Activities reduction of -$25.4 million; (2) a program change of -$10.3 million from Earth Surface Dynamics Program (ESD) resulting from a budget restructure that moves funding for Global Change activities into a new integrated Global Change budget activity, and- $3.0 million for elimination of the remaining ESD program; (3) -$3.0 million in Earthquake Hazards Program (EHP) Earthquake Grants program, and (4) general program decreases of -$1.9 million for EHP; -$492,000 for Volcano Hazards Program (VHP); -$492,000 Global Seismic Network (GSN); and -$984,000 in National Cooperative Geologic Mapping Program (NCGMP).

The Geology Discipline provides Earth science information needs for a wide variety of partners and customers, including Federal, State, and local agencies, non-government organizations, industry, and academia. This information is used by USGS and its partners, cooperators, and customers in evaluating resource potential, defining and mitigating risks associated with natural hazards, and characterizing the potential impact of natural geologic processes on human activity, health, the economy, and the environment.

The mission of the Geology Discipline contributes to the achievement of the Department's 2007-2012 Strategic Plan goals of providing for responsible resource protection and use and serving communities by providing information to improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment; to improve the understanding of energy and mineral resources to promote responsible use and sustain the Nation's dynamic economy, and to improve understanding, prediction, warning and monitoring of natural hazards to inform decisions by civil authorities and the public to plan for, manage, and mitigate the effects of hazard events on people and property All Geology programs have a 5-Year Plan that supports the science strategy and are reviewed every 5 years.

Since 1996, the Geology Discipline has been a leader in conducting a discipline wide competitive project proposal process using a prototype of the BASIS+ system now in use across the bureau. Geology issues an annual call for project proposals called the Geology Annual Science Plan (also known as the Geology Prospectus) which contains scientific and funding guidance for all projects. The plan uses the Geology Science Strategy and Program 5-Year Plans for its organizing framework. Scientists are required to submit annual project work plans into the BASIS+ system for program review. The system is used to examine strengths and weaknesses in staff, scientific methodology, progress on goals, budgetary structure, use of funds and capital investments, and formulate final funding allocations. Reviews are conducted by scientific peers and include external scientific or stakeholder review.

Program Assessment Rating Tool (PART) Evaluation

The Administration has reviewed Geology Discipline programs within all three subactivity levels using the PART. The reviews concluded that all programs reviewed have a clear purpose, do a good job at leveraging resources, work with a wide array of partners, and were rated "moderately effective."

2007 recommendations for improvement included:

- Integrate performance reporting with Federal partners to ensure comprehensive representation of roles and responsibilities in outcomes
- Based on evaluation of initial efforts, expand coordination of hazards investments across landslide, earthquake and volcano activities
- Improve FEMA loss estimates by further integration of USGS seismic monitoring data.
- Increase availability of EDMAP project information on the Internet
- Complete standards for preservation of USGS paleontological specimens
- Establish USGS-wide performance measures for priority coastal activities along with program partners
- Establish and implement procedures for engagement of Federal resource management agencies in planning of program activities, design of products, and setting of joint priorities

- Increase coordination and provision of coastal and ocean mapping activities and information across Federal/non-Federal agencies
- Implement new Web templates throughout MRP-supported field centers
- Provide analyses required to meet Federal land and minerals management needs in Alaska
- Monitor actual Energy performance against performance measures and goals in the new 5-Year Plan
- Implement redesigned Energy resources Web site to ensure it meets user needs

Action Plans have been developed to carry out PART recommendations, with milestones being met on schedule.

- Geologic Hazard Assessment programs efficiently invest in technology that can be used across a variety of hazards. Specifically, investments in seismic monitoring, satellite data purchases and data archiving are all coordinated.
- The NCGMP has increased the availability and consistency of geologic maps through development of data collection and management standards and through training and information exchange tools.
- The Coastal and Marine Geology Program (CMGP) has provided leadership within USGS to coordinate bureauwide coastal activities and is developing targets on all bureau-level actions to ensure long-term progress is measured.
- Mineral Resources Program (MRP) use of standardized Web templates is improving user's ability to locate MRP data on the Web, increasing ease of use. MRP-funded cost centers across the United States have implemented these new templates to facilitate public access to MRP data and reports by decisionmakers, scientists, and the public.
- MRP scientists and managers in Alaska meet regularly with land management counterparts (primarily Bureau of Land Management (BLM) to identify the areas in which USGS data can most enhance land planning. In 2007 at the request of BLM, USGS analyzed likely effects of proposed lifting of restriction to mineral entry on Federal lands in Alaska. Formal report submitted to BLM includes maps and text describing effects on Federal lands across the State.
- Energy Resources Program (ERP) has worked with the Minerals Management Service (MMS) assessment group, participating in a number of working meetings and conference calls to help develop the MMS methodology for review. Results from this methodology development will be tested in the upcoming 2008 Gulf of Mexico drilling. USGS is continuing to work and provide input into site selection for this gas-hydrate drilling, of which one of the objectives is to test the assumptions used in developing the MMS methodology, as applied to the Gulf of Mexico.
- Multiple Web theme rooms showed increased usage throughout the year, especially new rooms or those with new products. Surveys were given on the satisfaction with and utility of the Web site. Comments and feedback will be used to make further refinements to the Web site, promote greater usage, and provide a more effective delivery of science and information to customers. An analysis of the ERP Web site found that total ERP Web content expanded by 41 percent over the past fiscal year.

Performance measures resulting from the PART are shown in the performance tables for the Geology Activity programs, and the USGS has submitted a new PART Improvement Plan for

2008. As a result of PART recommendations and associated performance measures, the USGS is implementing the following actions in 2008:

- Work with Federal partners to ensure complementary roles and responsibilities in the delivery of geologic hazard information
- Expand coordination of hazards investments across landslide, earthquake and volcano activities
- Improve FEMA loss estimation capabilities by incorporating USGS geologic hazard information
- Implement findings from 2007 AAAS review of the NCGMP to determine appropriate critical geologic expertise to replace in the three geologic mapping teams
- Increase NCGMP integration of geologic mapping efforts by State geological surveys with USGS efforts
- Develop plans for publishing NCGMP-funded legacy data
- Establish USGS-wide objectives and performance measures for Ocean Research Priorities Plan (ORPP) priority coastal ecosystem studies through regional and program collaboration in study design, review, and implementation
- Establish interagency objectives and performance measures for ORPP priority studies through interagency collaboration in study design, review, and implementation
- Develop measures for enhancements in provision of coastal and ocean mapping information across Federal and non-Federal agencies
- Evaluate utilization of electronic forms for collection of mineral production and consumption data
- Target program funds to support long term land use decisions in Alaska and policy concerning critical minerals
- Validate program performance alignment with measures and goals in the new 5-Year Plan, with emphasis on ERP goals 3 (hydrates), and 7 (partnerships)
- Monitor and expand data delivery from the redesigned ERP Web site

Other Program Reviews

An external review of the VHP was conducted by the American Association for the Advancement of Science (AAAS) in 2007. The AAAS panel determined that the VHP had successfully executed its previous (1999-2003) 5-Year Plan and previous (2000) external review recommendations, and that the current 5-Year Plan was sound. The panel strongly endorsed the National Volcano Early Warning System (NVEWS) effort, and proposed that the VHP work more closely with State and local partners in developing risk-focused products that deal with future eruption scenarios.

As a result of the 2007 AAAS review, the NCGMP will use the 2006 Geologic Discipline Workforce Plan and the new NCGMP 5-Year Plan to determine appropriate critical geologic expertise to replace in the three geologic mapping teams and advertise for identified critical geologic expertise positions.

Workforce Planning

The Geology Discipline implemented a workforce planning strategy in 2005 aligned with USGS science goals and tied to Government Performance and Results Act (GPRA) goals. The plan

identifies areas in which the USGS needs to build internal capacity, contract with the private sector, and partner with other organizations; forecast future critical skill needs and identify mechanisms for recruiting, developing, and retaining a diverse workforce with those critical skills; align individual employee performance and rewards with organizational performance; and make effective use of technology.

Efforts continue to rebalance and renew the skill mix to gain functional and position flexibilities identified through an extensive workforce planning effort. Employees with updated skills are needed to meet current science and business program requirements, changing program goals, new science priorities, and advances in technology. Positions will be redesigned in future years to strengthen hazard and resource assessments, engineering, seismology, geodesy, geomagnetism, information technology, new technological skills in modeling and statistics, and monitoring and analysis, mapping, oceanography, physics, sedimentation, biogeochemistry, and toxicology.

Subactivity Overview

The Geologic Hazards, Resources, and Processes Activity is comprised of three subactivities:

Geologic Hazard Assessments programs operate monitoring networks, provide hazard warnings, assessments, and evaluation of impacts, and work with emergency managers and decisionmakers to develop response strategies and mitigate damage and loss. Programs include Earthquake Hazards Program (EHP), Volcano Hazards Program (VHP), Landslide Hazards Program (LHP), Global Seismographic Network (GSN), and Geomagnetism.

EHP decreases in 2009 include -$3.0 million Earthquake Grants program and -$1.9 million in general program decreases. Other general program decreases include -$492,000 for VHP and -$492,000 for GSN. Details for these program changes are included in the individual program sections which follow this activity summary, beginning on page H-7.

Geologic Landscape and Coastal Assessments programs focus on understanding geologic processes at or near the Earth's surface. Knowledge and models derived from these studies enable more effective, adaptive, and efficient resource and environmental management decisions. Through 2008, programs include Earth Surface Dynamics Program (ESDP), Coastal and Marine Geology Program (CMGP) and National Cooperative Geologic Mapping Program (NCGMP).

The 2009 budget includes establishment of a Global Change budget activity within USGS, resulting in a reduction of -$10.3 million, -78 FTEs and a transfer of all performance metrics from ESDP into the Global Change budget activity. The total Global Change effort is described in detail in the Global Change Activity section, which begins on page L-1. The remainder of the ESDP ($3.0 million) is proposed for elimination in 2009. Details for these program changes are included in the individual program sections which follow this activity summary, beginning on page H-7.

The 2009 budget includes increases within the CMGP for a multi-bureau Ocean and Coastal Frontiers Initiative to address Department priorities in responding to the broad direction of the Ocean Action Plan and responds to national priorities that intersect the priorities and needs of developing regional ocean governance alliances. Increases include +$6.0 million for the Ocean and Coastal Frontiers Initiative and $+500,000 for the Ocean Action Plan, described in detail in

the Science on the Landscape section, which begins on page F-1. Details for these program changes are included in the individual program sections that follow this activity summary, beginning on page H-7.

The 2009 budget includes cross discipline increases as part of the Department's Water for America initiative. This effort includes a requested increase of +$1.5 million and +7 FTE for NCGMP. Details for these program changes are included in the individual program sections which follow this activity summary, beginning on page H-7. The Water for America Initiative is described in detail in the Science on the Landscape section, beginning on page F-1.

Geologic Resource Assessments programs assess the availability and quality of the Nation's mineral and energy resources, including the economic and environmental effects of resource extraction and use. Programs include the Mineral Resources Program (MRP) and the Energy Resources Program (ERP). The MRP is the Federal provider of scientific information for objective resource assessments and research results on mineral potential, production, consumption, and environmental effects, and also provides comprehensive baseline data in the fields of geochemistry, geophysics, and mineral deposits. The 2009 budget requests a program change of -$24.4 million. Details for these program changes are included in the individual program sections that follow this activity summary, beginning on page H-7.

Activity: Geologic Hazards, Resources and Processes

Subactivity: **Geologic Hazard Assessments**
Program Component: **Earthquake Hazards**

	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-) [a]	2009 Program Changes (+/-) [b]	2009 Budget Request	Change From 2008 (+/-)
Earthquake Hazards ($000)	51,152	53,653	+576	-5,173	49,056	-4,597
Total FTE	*226*	*226*	*0*	*0*	*226*	*0*

a/ Fixed cost increases for this program total $57 of which $727 is budgeted and $151 is absorbed.
b/ Changes for this program include a reduction of -$204 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Summary of 2009 Program Changes for Earthquake Hazards Program

Request Component	($000)	FTE
• Earthquake Hazards General Program	-1,969	0
• Earthquake Grants	-3,000	0
• Travel reduction	-204	
TOTAL Program Changes	**-5,173**	**0**

Justification of 2009 Program Changes

The 2009 budget request for the Earthquake Hazards Program is $49,056,000 and 226 FTE, a net program change of -$5,173,000 and 0 FTE from the 2008 Enacted level.

Earthquake Hazards General Program **(-$1,969,000 / 0 FTE)**

The reduction eliminates unrequested congressional funding that was not requested by the Administration or USGS and does not address the highest priority science needs. This will keep the core program intact while allowing the USGS to make the best use of available resources. These funds are currently being used to improve delivery of USGS information to support emergency management in Southern California and to expand the initiative to include activities in high-hazard areas of the Pacific Northwest and Central United States. These activities will be discontinued in 2009.

Earthquake Grants **(-$3,000,000 / 0 FTE)**

This decrease is proposed to offset other higher-priority USGS programs. The reduction would result in a decrease of 20 systematic analyses generated by USGS scientists and potential reduction in out-year delivery of urban seismic hazard maps, as both of these activities rely on

collaboration with external grant-supported researchers, leveraging internal expertise. The program typically funds 100 competitively awarded research grants and cooperative agreements with universities, State geological surveys, and geotechnical consultants. The proposed reduction will result in a decrease in the overall number of awards.

With the remaining funds to support external research, USGS will retain access to talented academic researchers and target their research activities toward the goals of USGS in its role as the applied geoscience research component of the four-agency National Earthquake Hazards Reduction Program (NEHRP). This targeted research has been central to the development of the USGS national seismic hazard maps, urban seismic hazard maps, the National Earthquake Information Center (NEIC) rapid response products (carrying out USGS responsibilities under the Stafford Act), and the critical advances in understanding that underpin these applications.

As a result of external grants program reductions, specific terminations will include:

- Feasibility assessment of earthquake early warning by Caltech, University of California at Berkeley, and University of Southern California. This research is designed to test early-warning methods using actual data streams from Advanced National Seismic System (ANSS) sensors in California urban areas. Early warning systems have been deployed in Japan, Taiwan, Mexico, and Turkey to provide up to tens of seconds warning before strong shaking begins. Such systems can be used by utilities to rebalance electricity distribution and shut off gas lines, hospitals to initiate auxiliary power systems, and for other targeted uses.
- Support for State geological surveys through the Central U.S. Earthquake Consortium (CUSEC) for hazard mapping and other research activities in support of earthquake loss reduction in the New Madrid seismic zone.
- Regional Light Detecting and Ranging (LiDAR) acquisition partnerships in the Pacific Northwest – acquisition of high-resolution topographic imaging that enables active fault identification beneath heavily forested landscapes.
- Southern San Andreas Fault Evaluation project at the Southern California Earthquake Center (SCEC), a 40-institution research consortium that USGS funds in partnership with the National Science Foundation (NSF).

Use of Cost and Performance Information

To track cost, budget, and schedule for the implementation of ANSS, the Program employs the Earned Value Management System (EVMS) and reports quarterly EVMS results to the Department and Office of Management and Budget (OMB).

A broad breakdown of activities and estimated costs linked to ABC codes for funds spent by the program are:

Earthquake Hazards Program ($ million)			
Activity	ABC Code	FY 2007	% of funds
Hazard Assessments	N8	14.8	31
Earthquake Monitoring	J7	18.2	38
Earthquake Research	N7	9.5	20
Response, assistance, training	Z3	3.3	7
Program Planning	04	1.7	4

Activity-based costing is used to balance the program resources in order to meet mission requirements.

Program Performance Change

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
End Outcome Goal: 4.2: Serving Communities: Improve understanding, prediction, and monitoring of natural hazards to inform decisions by civil authorities and the public to plan for, manage, and mitigate the effects of hazard events on people and property.								
# of urban areas for which detailed hazard maps are completed	3	3	3	4	4	4	0	-1
Comments	The Earthquake Grants program reduction will result in a delay in delivery of detailed hazard maps for urban areas. A total of 7 maps were originally scheduled to be delivered in 2012, but this will be reduced to only 6 by 2012. Development of these maps relies on contributions by external grant-supported researchers.							
# of systematic analyses/ investigations delivered to customers				155	155	135	-20	0
Comments	2009 reduction of 20 systematic analyses/investigations results from a 50 percent reduction in EHP's competitively awarded grant activity. A large fraction of publications by USGS scientists are co-authored by grant-supported researchers, whose collaboration is central to the viability of the research.							

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2009 addresses lagging performance — those changes occurring because of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent outyear.

Program Overview

The Earthquake Hazards Program (EHP) provides the scientific information and knowledge necessary to reduce deaths, injuries, and economic losses from earthquakes and earthquake-induced tsunamis, landslides and liquefaction. Products of this program include timely notifications of earthquake locations, size, and potential impacts; regional and national assessments of earthquake hazards; and public outreach to communicate advances in understanding earthquakes, their effects, and the degree to which they can be predicted.

Of all natural hazards facing the United States, earthquakes have the greatest potential for inflicting catastrophic casualties, damage, economic loss, and disruption. Damaging earthquakes are infrequent, but their consequences can be immense. According to recent

studies, a major earthquake in an urbanized region of the United States could cause several thousand deaths and a quarter trillion dollars in losses, impacting the national economy. Although the risk from earthquakes is famously high in California, many other parts of the country are also at risk, including the Mississippi River valley, Pacific Northwest, Intermountain West, Alaska, Hawaii, and parts of the eastern seaboard. Over 75 million people, including 46 million outside California, live in metropolitan areas with significant earthquake risk.

> "The Earthquake Hazards Program, responsible for the Advanced National Seismic System, is critical to the ability of California to measure, predict, react and mitigate losses resulting from earthquakes…."
>
> –from a letter signed by 45 members of the California State Legislature, to Senator Diane Feinstein, August 2007.

As required under the Disaster Relief Act of 1974 (P.L. 92–288), the USGS has the assigned Federal responsibility for monitoring and notification of seismic activity in the United States. The USGS is the only U.S. agency that routinely and continuously reports on current domestic and worldwide earthquake activity. Through ANSS, USGS and its State and university partners provide seismic monitoring coverage for the Nation. The EHP is the applied earth science component of the four-agency NEHRP, most recently re-authorized by the Earthquake Hazards Reduction Authorization Act of 2004 (P.L. 108–360). Through NEHRP, the USGS partners with lead agency National Institute of Standards and Technology (NIST), the Federal Emergency Management Agency (FEMA), and NSF.

Partnerships are crucial to the program's success. Approximately 25 percent of the total EHP budget is directed toward research grants and cooperative agreements with universities, State agencies, and private technical firms to support research and monitoring activities. This external funding is highly leveraged by funds from other Federal agencies, States, and the private sector.

Overall direction for the EHP is established by a 5-Year Plan that results from internal and external inputs such as the USGS and Interior strategic plans, results of periodic reviews by the congressionally established external Scientific Earthquake Studies Advisory Committee, workshops with stakeholders on specific topics, and the advice of senior scientists both within and outside the USGS. The program is a critical component of the national hazards, risk and resilience assessment activity called for in the new USGS science strategy document, *Facing Tomorrow's Challenges*. The program's activities are identified in the National Science and Technology Council's planning documents, including the Subcommittee on Disaster Reduction's (SDR) *Grand Challenges for Disaster Reduction* (2005) and the joint SDR/U.S. Group on Earth Observations document, *Improved Observations for Disaster Reduction: Near-Term Opportunity Plan*. The specific activities being taken by the EHP undergo both management and scientific review of project concepts and of final project proposals when submitted for initial funding using a program council responsive to regional and topical needs. Additionally, periodic reviews are conducted on progress of multiyear projects and peer review of reported project results when completed.

2009 Program Performance

The EHP includes the following three program components: Assessment and Characterization of Earthquake Hazards, Monitoring and Reporting Earthquake Activity and Crustal Deformation, and Conducting Research into Earthquake Causes and Effects. The program's strategic plan also identifies a fourth component—earthquake safety policy—that features activities embedded

in each of the other program components and reflects the overall NEHRP mission to translate improvements in understanding into loss-reduction results. At the 2009 funding level, program accomplishments will include the following:

Assessment and Characterization of Earthquake Hazards

The USGS contributes to earthquake hazard mitigation strategies by (1) developing seismic hazard maps that describe the likelihood of and potential effects of earthquakes throughout the Nation, especially in high-risk urban areas, and (2) making this knowledge available to others so that it can be used to reduce the impact of potentially damaging earthquakes. Federal, State, and local government agencies, architects and engineers, insurance companies and other private businesses, land-use planners, emergency response officials, and the general public rely on the USGS for earthquake hazard information to refine building codes, develop land-use strategies, safeguard lifelines and critical facilities, develop emergency response plans, and take other precautionary actions to reduce losses from future earthquakes.

USGS national seismic hazard maps are used to develop new, unified model building codes for the United States. These digital maps integrate a wide range of geological and geophysical information to provide estimates of the maximum severity of ground shaking that a given location is expected to experience during the next 50, 100, and 250 years. Periodic review and updating of the seismic hazard maps to incorporate new information are among the highest priorities for the EHP. The USGS works closely with earthquake researchers, engineers, and State and local government representatives across the Nation to ensure that the maps represent the most current and accurate information available.

The scale of the national seismic hazard maps precludes taking into account local variations in the size and duration of seismic shaking caused by small-scale geologic structures and soil conditions. For high-to-moderate risk urban areas, the USGS is generating more detailed products that make it possible for local officials to make informed zoning and building code decisions. Modeling of ground motion is provided for engineering applications. In conjunction with release of these targeted products, the USGS conducts workshops to assure the proper transfer of knowledge and to help design effective mitigation strategies.

At the 2009 funding level, EHP accomplishments will include the following:

National Seismic Hazard Maps — In 2007, the USGS provided final drafts of the next-generation national seismic hazard maps to the Building Seismic Safety Council for their consideration in the 2009 version of the NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures. The maps are being publicly released in 2008 following an extensive review process. They replace those from 2002, and will be considered for inclusion in the 2012 version of the International Building Code. These maps were developed using the best available science based on internal USGS studies as well as information available from government agencies, academic institutions, and industry. During 2008, USGS is also producing a set of engineering design maps that are derived from the new hazard maps for use in construction engineering standards for existing buildings developed by the American Society of Civil Engineers, and ultimately the International Building Code. In 2009, USGS will produce a variety of other products derived from the seismic hazard map, for use by engineers, city planners and other end-users. These include uniform hazard spectra for a broad range of structures, maps that portray the degree of certainty and resolution of seismic hazard estimates nationwide, and information on the earthquakes most likely to cause strong shaking at a given site of interest. In 2009, USGS scientists will undertake targeted research

directed toward improvements in the next generation of national seismic hazard maps. As a result of the reduction to external grants, collaborative investigations with external investigators may be curtailed, extending the timetable for delivery of future seismic hazard maps.

California Statewide Earthquake Rupture Forecast — In 2008, the USGS and its partners are delivering the first-ever Statewide earthquake rupture forecast model for the California. This model, developed collaboratively with the California Geological Survey and the SCEC, provides input to the National Seismic Hazard Maps (see above) and will be used by the California Earthquake Authority to update earthquake insurance premiums in the State. The model has been reviewed by a distinguished Scientific Review Panel as well as by both the National and California Earthquake Prediction Evaluation Councils. Innovations include: (1) the first, complete, time-dependent forecast that covers the entire State with a uniform application of methodology, data handling standards, and uncertainty treatment; (2) a more complete analysis and inclusion of paleoseismic data in the model; and (3) a more sophisticated analysis of historical seismicity which revealed a significant over-prediction of earthquake rates in previous models. In 2009, USGS will work with partners to address significant remaining uncertainties in the hazard models and underlying physical processes that determine the time-dependent hazard. Involvement of external partners will be curtailed due to the proposed external grants reduction.

Hazard Maps for Urban Areas — The USGS completed and released new urban seismic hazard maps for Seattle in July 2007. As the first seismic hazard maps that are based on three-dimensional simulations of earthquake ground motions, these maps represent the cutting edge of probabilistic seismic hazard mapping. Over 500 computer simulations of earthquakes were used to create this set of physics-based hazard maps. The new hazard maps incorporate the amplification of ground shaking by the deep structure of the Seattle basin and the shallow layers of artificial fill. They also include the build-up of ground shaking caused when earthquake rupture is directed upwards along a dipping fault. The maps are based on the same fault parameters as used in the national seismic hazard maps, but contain the spatial detail needed for assessing the hazard to medium-sized buildings and some bridges. These maps were presented to the City Council of Seattle and the Washington Department of Transportation. Many uses have already been proposed for the maps, including the prioritization of seismic retrofit for unreinforced masonry buildings and the preliminary design of a major bridge project. For 2008, the Integrated Multi-Hazards Demonstration Project (MHDP) will initiate work on a scenario for the South Whidbey Island Fault system affecting communities north of Seattle. USGS support for that scenario will be terminated in 2009 due to the proposed reduction in funding for the MHDP. During 2009, the USGS will focus efforts on collaborative urban seismic hazard mapping projects in the high-risk St. Louis urban area and the Tri-State (Evansville) area of Indiana, Kentucky, and Illinois. In both these efforts, USGS serves primarily as a coordinator, with most of the technical work being done by local partners. Partners in the St. Louis project include the University of Missouri at Rolla, Missouri Department of Natural Resources, and the Missouri State Geological Survey. Those for the Tri-State (Evansville) project include the State geological surveys of Indiana, Kentucky, and Illinois, the Southwest Indiana Disaster Resistant Community Corporation, Association of CUSEC, State Geological Surveys, and Purdue University. This work supports the Program Assessment Rating Tool (PART) measure for number of urban areas for which detailed hazard maps are completed. Because of the heavy reliance on external partners, completion of these urban hazard studies may be delayed due to the reduction in external grants. The reduction to the MHDP, which was extended to the Central United States in 2008, will delay completion of the St. Louis hazard map.

Monitoring and Reporting Earthquake Activity and Crustal Deformation

The ANSS effort is focused on expanding and improving the performance and integration of national, regional, and urban seismic monitoring networks in the United States. The system consists of a national ANSS Backbone network, the NEIC, 15 partner-operated regional networks in areas of moderate-to-high seismic activity, and the National Strong Motion Project for monitoring structures.

ANSS-Directed Funding within EHP

FY	Amount ($M)
2000	$1.6
2001	$3.6
2002	$3.9
2003	$3.9
2004	$4.4
2005	$8.866*
2006	$8.0
2007	$8.0
2008	$8.8
2009	$8.0

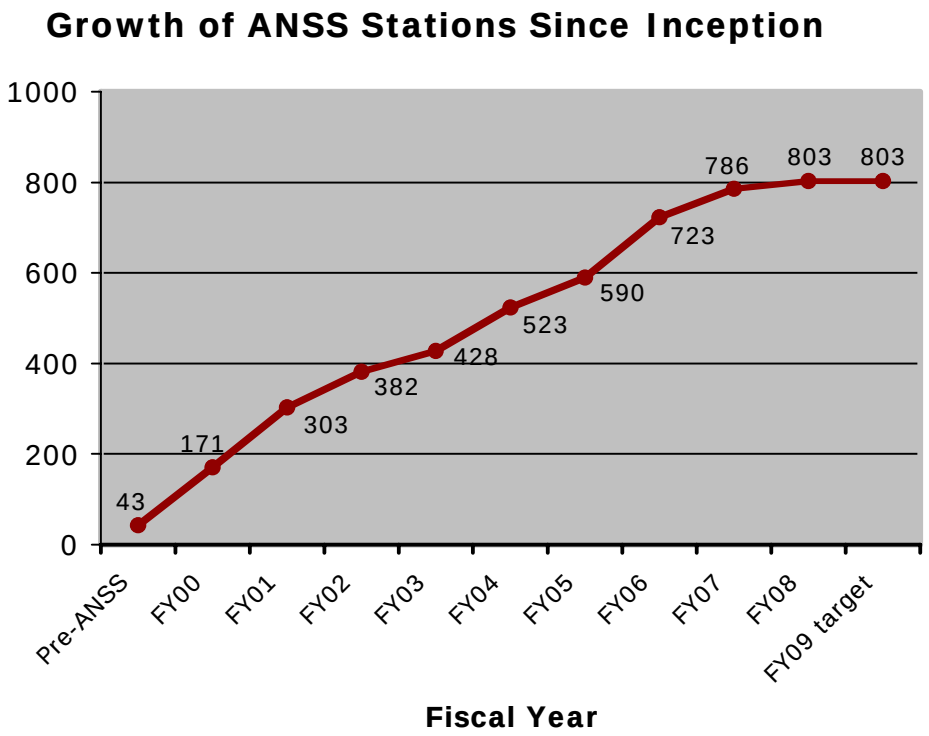
*2005 amount includes supplemental funding received as part of the Administration's response to the tsunami in the Pacific and Indian oceans.

The NEIC reports on potentially damaging earthquakes are provided to the National Command Center; the White House; the Departments of Defense, Homeland Security (including FEMA), Transportation, Energy, and the Interior; State offices of disaster services; numerous public and private infrastructure management centers (e.g., railroads and pipelines); the news media, and the public. Rapid earthquake notifications are delivered by e-mail and text message to over 100,000 users, and a suite of earthquake information products such as ShakeMap, Did You Feel It maps, and technical data are available on the program's Web site, which receives more than two million hits every day. USGS also provides near-real-time data to the National Oceanic and Atmospheric Administration (NOAA) tsunami warning centers, supporting tsunami monitoring in the Pacific Rim and disaster alerting in Alaska, Hawaii, Washington, California, and U.S. territories in the western Pacific.

Begun in 2000, ANSS implementation efforts have focused primarily on the installation of new urban recording stations in five high-risk metropolitan areas: Los Angeles, CA; Salt Lake City, UT; San Francisco, CA; Seattle, WA; and Anchorage, AK. Increasing seismic monitoring capability in urban regions has two major benefits: (1) provide rapid assessments of the distribution and severity of strong ground shaking just after an earthquake–information conveyed graphically via ShakeMap, which provides situational awareness for emergency response officials to help determine the scope and scale of the crisis they face, and (2) provide detailed and accurate data on the shaking of the ground and structures during a damaging earthquake. These data can be used by the structural engineering community in the recovery and rebuilding phase for more earthquake-resistant design and construction in the future.

ANSS supports the following PART measures:

- Number of metropolitan regions where ShakeMap is incorporated into emergency procedures;
- Number of real-time ANSS earthquake sensors; and
- Number of communities/tribes using Department science on hazard mitigation, preparedness, and avoidance for earthquake hazard management activity.



By the end of 2008, USGS and partners expect to have installed a cumulative total of 803 ANSS earthquake monitoring stations (see chart). This includes the completion of the national ANSS Backbone seismic network in the contiguous United States, thanks to a partner contribution by NSF in 2004–2006. The ANSS network is now capable of detecting almost all felt earthquakes in the United States except remote areas of Alaska. In 2009, ANSS-directed resources will be devoted to operating and maintaining the installed system, and no new sensor installations are planned due to the proposed reduction for the MHDP. Efforts will be directed at maintaining a high level of performance of the installed system, and meeting commitments to partners for data availability, management and quality.

Regional Earthquake Monitoring — As part of ANSS, the USGS and cooperating universities operate regional seismic networks in areas of high seismicity. Data from all U.S. seismic networks are used to monitor active faults and ground shaking, in much greater detail and accuracy than is possible with the national-scale network. Each region has appropriate local data processing capabilities; regional data are contributed to a national ANSS catalog of earthquakes. ANSS regional networks serve as State or local distribution points for information about earthquakes to the public, local and State agencies, and other regional interests. The regional data centers also relay earthquake data in real time to the USGS NEIC, as well as to other regional networks. They also provide information about regional earthquake hazards, risks, and accepted mitigation practices, and those centers located at universities provide training and research facilities for students. To support partner activities in regional earthquake monitoring, approximately $6.0 million will be provided in 2008 through cooperative agreements, $3.4 million of which comes from base program funds and $2.6 million of which comes from funds targeted for development and maintenance of the ANSS. In 2008, the USGS is supporting 16 regional seismic networks, structural arrays and geotechnical arrays, operated by the following colleges and universities:

Seismic Monitoring Networks Supported by USGS	
Boston College, Weston Geophysical Observatory	University of California, Los Angeles
California Institute of Technology	University of California, San Diego
Columbia University, Lamont-Doherty Earth Observatory	University of Kentucky
Montana Tech of the University of Montana	University of Memphis
Saint Louis University	University of Oregon
University Nevada at Reno	University of South Carolina
University of Alaska Fairbanks and Anchorage	University of Utah
University of California, Berkeley	University of Washington

In 2009, funding for regional network operations will remain a high priority, and will be directed toward ensuring robust regional network operations and maintenance, both by implementing standardized earthquake processing software in the regional networks and by targeting a larger proportion of the funding for network staffing.

Prompt Assessment of Global Earthquakes for Response — In October 2007, USGS released a prototype system that uses advanced seismological methods to estimate ground motion for earthquakes where instrumental recordings are lacking. The system can rapidly estimate societal impact for major earthquakes domestically and worldwide based on estimates of people and property exposed to potentially damaging levels of ground motion. A developmental version has been available to select users, including the U.S. Agency for International Development (USAID) and other aid providers. This system builds on the ShakeMap capability, adding another dimension to the information being made available to enhance situational awareness in the wake of damaging earthquakes. In 2009, new modules will be developed to estimate casualties and building damage.

Earthquake Early Warning — Since 2006, USGS has funded external research to investigate the feasibility of earthquake early warning. This research is designed to test early-warning methods using actual data streams from ANSS sensors in California urban areas. Early warning systems have been deployed in Japan, Taiwan, Mexico, and Turkey to provide up to tens of seconds warning before strong shaking begins. Such systems can be used by utilities to rebalance electricity distribution and shut off gas lines, hospitals to initiate auxiliary power systems, and for other targeted uses. An evaluation of this research will take place in 2008, to determine whether to the initial results warrant the substantial network upgrades that would be required for an operational system. Based on this evaluation, USGS would seek State and private partnerships in California for the development of a prototype system.

Monitoring Changes in the Shape of the Earth's Surface — Geodetic networks provide essential information about the massive, slow deformation (strain) of the land surface near faults and the forces that cause earthquakes. The USGS is working with universities, local agencies, and the Plate Boundary Observatory component of the NSF's EarthScope program to conduct geodetic investigations using Global Positioning System (GPS), laser-ranging surveys and sensitive borehole instruments. To address the problem of hazards in the urban Los Angeles region and its environs, the USGS operates and distributes data from state-of-the-art, continuously operating GPS stations installed in cooperation with the National Aeronautical and Space Administration (NASA) Jet Propulsion Laboratory, the Scripps Institution of Oceanography, and SCEC. These and similar stations in other regions measure changes in the shape of the Earth's surface that help reveal the way stress accumulates on earthquake faults in the region, and how those faults are moving at depth. In addition, the USGS is employing a new satellite technology, Interferometric Synthetic Aperture Radar (InSAR), to quickly and accurately produce large aerial maps of pre- and post-earthquake land deformation. The USGS

continues to develop computational tools necessary to efficiently analyze, interpret, and model InSAR data.

Geodetic Monitoring Networks Supported by USGS	
Central Washington University	University of California, San Diego
GTSM Technologies	University of Memphis
San Francisco State University	University of Utah
University of California, Berkeley	

Conducting Research into Earthquake Causes and Effects

The USGS conducts research on the causes, characteristics, and effects of earthquakes. This research has direct application in increasing the accuracy and precision of the agency's earthquake hazards assessments, earthquake forecasts, and earthquake mitigation practices.

A major focus of USGS earthquake research is to understand earthquake occurrence in space and time. Ongoing USGS investigations seek to understand the physical conditions for earthquake initiation and growth; processes of earthquake triggering; how individual faults in the same region interact; why some faults slip slowly without generating earthquakes while others generate earthquakes; and the factors that control variations in recurrence intervals of earthquakes along the same fault. USGS research efforts are also directed at improving the understanding of earthquake-induced strong ground shaking and its effects. Specifically, USGS researchers are investigating how complexities in the earthquake source, Earth's crust, and near-surface soils and deposits influence seismic wave propagation and strong ground motion. Improving current techniques for forecasting the effects of strong ground motion will greatly improve seismic hazard maps for urban regions. These efforts are thus critical for cost-effective earthquake hazard mitigation. Another research priority is the identification and understanding of behavior of weak soils that liquefy and fail when subjected to earthquake shaking. Research on ground failure, carried out in collaboration with structural and geotechnical engineers, will lead to improved design of earthquake-resistant infrastructure and lifelines, such as bridges and airports, commonly built on fill or weak soil. These research activities are the principal contributor to the program's output measure for number of systematic analyses and investigations delivered to customers.

Scenarios for Public Preparedness — As part of the MHDP in Southern California, USGS is undertaking a systematic investigation of the earthquake history of the southern San Andreas Fault in partnership with the SCEC. This improved understanding of the recurrence history of large earthquakes in the region and the extent of strong shaking is being incorporated into a multi-hazard scenario to be delivered for use in a major public preparedness exercises in 2009. It also will contribute to an urban hazard assessment for the Los Angeles region to be completed in future years. Completion of that assessment will be delayed due to the reduction in external grants, resulting in the termination of the Southern San Andreas Fault evaluation. The goal of the broader MHDP is to link research results and data with information dissemination to provide an integrated approach to hazards research, warning, and mitigation. This multi-year effort focuses on the eight counties of Southern California, where catastrophic losses from natural hazards such as earthquakes, tsunamis, fires, landslides, and floods exceed $3 billion per year. Partners include State, county, city, and public lands government agencies, public and private utilities, industry, academic researchers, FEMA, NOAA, U.S. Forest Service (USFS), U.S. Bureau of Land Management (BLM), and local emergency response agencies. Also in 2008, USGS and its NEHRP partner, NIST, are supporting a workshop on scenario development in order to identify best practices and develop common approaches to facilitate the

use of these tools by emergency managers and other public officials to better understand and convey the risks faced by at-risk communities. Additional multi-hazard scenarios planned for 2009 will be delayed due to the elimination of unrequested congressional MHDP funding.

Supporting External Research Partnerships — In addition to supporting USGS researchers, the EHP provides competitive, peer-reviewed, external research support through cooperative agreements and grants that enlist the talents and expertise of State and local government, the academic community, and the private sector. Investigations and activities supported though the external awards are closely coordinated with and complement the internal USGS program goals. Many of the external projects are co-funded with other agencies and sources, leveraging the effect of USGS support. External program activities include (1) mapping seismic hazards in urban areas, (2) developing credible earthquake planning scenarios including loss estimates, (3) defining the prehistoric record of large earthquakes, (4) investigating the origins of earthquakes, (5) improving methods for predicting earthquake effects, and (6) testing the feasibility and seismic network requirements for an earthquake early warning system. By involving the external community, the USGS program increases its geographical and institutional impact, promotes earthquake awareness across the Nation, encourages the application of new hazards assessment techniques by State and local governments and the private sector, and increases the level of technical knowledge within State and local government agencies. To support external work in 2008, the EHP is providing competitively awarded earthquake research grants and cooperative agreements with university, State and local partners for work in support of urban seismic hazard mapping other long-term research efforts. USGS also has a cooperative agreement with SCEC, a 40-institution research consortium that USGS funds in partnership with the NSF. The following tables list the grants and cooperative agreements being provided in 2008:

USGS 2008 Grants for Earthquake Research and Hazards Assessments	
Auburn University	University of Arizona
Brown University	University of Buffalo
California Geological Survey	University of California, Los Angeles
California Institute of Technology	University of California, San Diego
California State Polytechnic University	University of California, Santa Cruz
Cambridge Architectural Research Ltd	University of Illinois
Carnegie Mellon University	University of Kentucky
Columbia University Lamont-Doherty Earth Observatory	University of Massachusetts, Amherst
Cornell University	University of Memphis
Gail Atkinson	University of Nevada at Reno
Georgia Institute of Technology	University of South Carolina
Harvard University	University of Texas, Austin
Johns Hopkins University	University of Texas, El Paso
M Tuttle & Associates	University of Washington
Pacific Geoscience Centre	University of Wisconsin, Madison
Princeton University	URS Group, Inc.
San Diego State University	Utah Geological Survey
Stanford University	William Lettis and Associates
Texas A&M University	

USGS 2008 Cooperative Agreements for Earthquake Research	
California Geological Survey	Stanford University
Central U.S. Earthquake Consortium	University of Utah
Southern California Earthquake Center (SCEC)	

The proposed reduction will result in a decrease in the overall number of awards.

PART Findings and Recommendations and Program Progress

The EHP supports the Department of the Interior's Serving Communities strategic goal to improve understanding, prediction, and monitoring of natural hazards to inform decisions by civil authorities and the public to plan for, manage, and mitigate the effects of hazard events on people and property. As described in the Administration's PART review, the EHP role is clearly defined and unique from other Federal, State, local, or private entities. The USGS geologic hazards programs – Earthquake Hazards, Volcano Hazards, Landslide Hazards, Global Seismographic Network, and Geomagnetism – were reviewed as a group in 2003 using PART, and were found to be working effectively with partners and fulfilling the USGS mission. As a result, they received a collective score of 82.

Performance measures resulting from the PART are shown in the performance tables for the Geology programs. The EHP has been responsive to annual PART improvement plan recommendations, completing all milestones for 2007 on time. An example is working with the other USGS geologic hazards programs to link performance measures to measures in other agencies such as FEMA and NOAA that use USGS information to reduce loss of life and property. The USGS has submitted a new PART Improvement Plan for 2008. As a result of PART recommendations and associated performance measures, the USGS is implementing the following actions in 2008:

- Work with Federal partners to ensure complementary roles and responsibilities in the delivery of geologic hazard information,
- Expand coordination of hazards investments across landslide, earthquake and volcano activities, and
- Improve FEMA loss estimation capabilities by incorporating USGS geologic hazard information.

Updates to 2008 Program Performance Targets

Performance targets for 2008 remain unchanged from those portrayed in the 2008 President's Budget and reflect enacted funding levels for 2008.

Program Performance Overview

The table below summarizes the performance measures that either relate exclusively to the EHP or are shared among the USGS programs in Volcano Hazards, Landslide Hazards, Global Seismographic Network, and Geomagnetism.

End Outcome Goal: 4.2: Serving Communities: Improve understanding, prediction, and monitoring of natural hazards to inform decisions by civil authorities and the public to plan for, manage, and mitigate the effects of hazard events on people and property.									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Provide information to assist communities in managing risks from natural hazards**									
# of areas for which detailed hazard assessments are completed **(SP)**	2	3	3	3	4	4	4	0	6
# of urban areas for which detailed hazard maps are completed **(PART) (EHP)**	2	3	3	3	3	4	4	0	6
Comments	The Earthquake Grants program reduction will result in a delay in delivery of detailed hazard maps for urban areas. A total of 7 maps were originally scheduled to be delivered in 2012, but this will be reduced to only 6 by 2012. Development of these maps relies on contributions by external grant-supported researchers.								
# of metropolitan regions where Shakemap is incorporated into emergency procedures **(SP) (PART)**	5	5	5	5	5	5	5	0	5

End Outcome Goal: 4.2: Serving Communities: Improve understanding, prediction, and monitoring of natural hazards to inform decisions by civil authorities and the public to plan for, manage, and mitigate the effects of hazard events on people and property.									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
Use Rate: Earthquakes: X% of communities/tribes using DOI science on hazard mitigation, preparedness and avoidance for each hazard management activity **(07 Plan baseline is 885 at risk counties)**	62.7% 559/891	63.4% 565/891	63.9% 569/891	62.8% 556/885	67% 593/885	67% 593/885	67% 593/885	0	67% 593/885
Comments	Rebaselined # counties to 885 in 2007 Plan; EHP using a new counties database. 2008 revised Nov 2007 to reflect 2007 rebaselined actual and projected flat funding for ANSS in 2008. 2007 Push primarily because of a push to upgrade stations in Hawaii following Oct 2006 Kiholo Bay earthquake.								
PART Efficiency and Other Output Measures **Ensure the quality and relevance of science information and data to support decision making.**									
# of systematic analyses/ investigations delivered to customers (systematic analyses/investigations) (**EHP**)	0	4	2	160	152	155	135	-20	122
Comments	2009 reduction of 20 systematic analyses/investigations results in a 50% reduction in EHP's competitively awarded grant activity. A large fraction of publications by USGS scientists are co-authored by grant-supported researchers, whose collaboration is central to the viability of the research.								
# of real-time ANSS earthquake sensors (cumulative) **(PART) (EHP)**	95 (cum 523)	40 (cum 563)	27 (cum 723)	40 (cum 763)	63 (cum 786)	17 (cum 803)	0 (cum 803)	0	0 (cum 803)
Comments	Assumption of level funding from 2008 through 2012. (Note: 2007 target significantly exceeded primarily because of push to upgrade stations in Hawaii following Oct 2006 Kiholo Bay earthquake. Eleven stations were upgraded, none of which were targeted at the beginning of the year. Also, two ANSS backbone stations that were targeted but not completed in 2006 were completed in 2007.)								

End Outcome Goal: 4.2: Serving Communities: Improve understanding, prediction, and monitoring of natural hazards to inform decisions by civil authorities and the public to plan for, manage, and mitigate the effects of hazard events on people and property.									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
# of formal workshops or training provided to customers (instances/issues/events) **EHP**	6	11	7	6	9	6	6	0	6
# of communities/tribes using DOI science on hazard mitigation, preparedness and avoidance of each hazard management activity **(EHP) (PART) (07 Plan baseline is 885 at risk counties)**	559	565	569	556	593	593	593	0	593

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Activity: Geologic Hazards, Resources, and Processes

Subactivity: **Geologic Hazard Assessments**
Program Component: **Volcano Hazards**

	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-) [a/]	2009 Program Changes (+/-) [b/]	2009 Budget Request	Change From 2008 (+/-)
Volcano Hazards Program ($000)	21,544	22,190	+203	-568	21,825	-365
Total FTE	*134*	*134*	*0*	*0*	*134*	*0*

a/ Fixed cost increases for this program total $203 of which $258 is budgeted and $55 is absorbed.
b/ Changes for this program include a reduction of -$76 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Summary of 2009 Program Changes for Volcano Hazards Program

Request Component	($000)	FTE
• Volcano Hazards General Program	-492	0
• Travel reduction	-76	0
TOTAL Program Changes	**-568**	**0**

Justification of 2009 Program Changes

The 2009 budget request for the Volcano Hazards Program is $21,825,000 and 134 FTE, a net program change of -$568,000 and 0 FTE from the 2008 Enacted level.

Volcano Hazards General Program **(-$492,000 / 0 FTE)**

The reduction eliminates unrequested congressional funding that was not requested by the Administration or USGS or does not address the highest priority science needs. This will keep the core program intact while allowing the USGS to make the best use of resources. The change from 2008 will slow enhancements to the Mount Rainier mudflow warning system and development of a volcanic ash hazard assessment, an output measure in Program Assessment Rating Tool (PART), for the Pacific Northwest.

The overall impact of the -$76,000 for travel reduction is described in the General Statement beginning on page A-1. There are no performance measures impacted by this reduction to the Volcano Hazards Program (VHP).

Program Overview

Under the Stafford Act (P.L. 93–288), the Department of Interior has the responsibility to issue timely warnings of potential geologic disasters to the affected populace and civil authorities. Accordingly, the mission of the VHP is to provide the Earth science data and information,

analyses, and research needed to reduce the loss of life, property, and economic impact of hazards related to volcanoes.

Within the last 10,000 years, 169 volcanic centers within the United States have erupted or exhibited sufficient hydrothermal activity or seismic unrest to indicate that they are capable of erupting in the future. To reduce societal exposure to the threats posed by these volcanoes, the VHP conducts a range of on-going activities that may be broadly divided into volcano-hazard-assessment and volcano-monitoring components. Process-oriented research is conducted under both components to steadily improve accuracy of hazard assessments and accuracy of interpretations and forecasts of volcanic activity. Both components provide training and technical assistance to inform decisionmakers at Federal, State, and local levels on managing risks from natural hazards.

> " The volcanic ash hazard to aviation has cost the commercial aviation community more than 250 million dollars in a 15 year period, but the USGS Volcano Hazards Program has been a vital contributor to aviation safety by informing our operators of potential hazards where eruptions are occurring."
> -Keith Hagy, Director, Engineering & Air Safety, Air Line Pilots Association, International, November 2007
>
> "Hawaii Island is probably the area most threatened by the hazards of volcano, earthquake, and tsunami events in the United States……..How do residents of this island maintain their calm?.....The answer is the great trust and confidence in the professionals of the Hawaiian Volcano Observatory (HVO) and their mission of informing, educating, and working with local government……The island's people …….truly feel that [HVO] belongs to them."
> - Harry Kim, Mayor, County of Hawai'i, November 2007

The long-term goal for the volcano-hazard-assessment component of VHP is to provide hazard assessments for all dangerous volcanoes and to establish response plans for all communities that they threaten. Each volcano hazard assessment requires a geologic map and involves field work, laboratory analysis, and data analysis by research scientists, typically requiring 3 to 5 years to complete. This goal is tracked by performance measures for (1) number of counties or comparable jurisdictions that have adopted emergency response plans, (2) percent of completed hazard assessments for 70 targeted volcanoes, (3) number of formal workshops or training provided to customers, and (4) number of systematic analyses and investigations (risk/hazard assessments) delivered to customers. Process-oriented research conducted in support of hazard assessments includes studies on controls of explosive volcanism and dynamics of volcanic mudflows.

The volcano-monitoring component of VHP involves (1) collection and scientific interpretation of real-time and near-real-time geophysical data indicative of the subsurface state of volcanic systems, (2) management and distribution of data to provide hazard awareness, transparency of operations, and credibility of interpretations with the public and to inform decisionmakers on managing risk from volcanic hazards, and (3) technical assistance to decisionmakers on managing risk from natural hazards. Volcano monitoring is a continuing activity that includes detection of earthquakes and explosions, ground deformation, temperature change, and volcanic gas emissions. Sophisticated instruments are required, including arrays of sensitive seismometers, geodetic instruments and microphones, ground-based and airborne gas and thermal sensors, and satellite-based sensors. Monitoring activities include maintenance of the existing network, expansion of the network to include

> Implementation of VHP's new unified and integrated strategy for monitoring the Nation's volcanoes described in the NVEWS report (National Volcano Early Warning System) led to targeting of Mount Rainier as undermonitored with respect to risk. To improve efficiency, management of the Marianas program was assigned to the Alaska Volcano Observatory (AVO) because of AVO's expertise in establishing instruments and telemetry on remote islands. Hazard mitigation in the Marianas will support the Department of Defense (DoD) planned buildup in Guam. Many changes in volcano hazard warning format and content were made to improve timeliness and to align with those for other hazard warnings and with needs of Federal partners and customers.

previously unmonitored volcanoes, improvements in the monitoring of under-monitored volcanoes, and response to volcanic unrest and eruptions. VHP's volcano monitoring network is maintained and operated through 5 volcano observatories, Alaska Volcano Observatory (AVO); Cascades Volcano Observatory (CVO), Hawaiian Volcano Observatory (HVO), Long Valley Observatory (LVO), and Yellowstone Volcano Observatory (YVO), and their partners, the Universities of Alaska, Washington, Utah, and Hawaii, the Alaska Division of Geological and Geophysical Surveys, and Yellowstone National Park. Collaboration with the National Oceanic and Atmospheric Administration (NOAA), Federal Aviation Administration (FAA), the Air Force Weather Agency (AFWA), and the International Civil Aviation Organization (ICAO) provides early warning and situational awareness of volcanic ash threats to jet aircraft. Through a partnership with U.S. Agency for International Development (USAID), VHP provides emergency response support and training to developing nations faced with volcanic disasters. A global clearinghouse for volcano eruption information, the Global Volcanism Project, is maintained in partnership with the Smithsonian Institution.

The long-term goal of the monitoring component is tracked by performance measures for (1) percent of 70 potentially active volcanoes monitored; (2) number of volcanoes for which information supports public safety decisions; and (3) number of sites (mobile or fixed) monitored for ground deformation to identify volcanic activity. Process-oriented research conducted in support of monitoring includes studies on the origin of long-period earthquakes and tremor associated with volcanic activity, the contributions of hydrothermal fluid and magma to unrest at Long Valley and Yellowstone calderas, the use of gas emission data to assess magma supply rates, and the characteristics and dynamics of the magmatic plumbing system of volcanoes.

The VHP has made steady annual progress on both monitoring and hazard-assessment efforts and in underlying research. Using supplemental funds provided by the FAA, the volcano monitoring network has been expanded to remote volcanoes that threaten international air routes. On average, 2 previously unmonitored volcanoes have been added each year. At the end of 2007, 52 volcanoes were monitored by the VHP. One to 2 hazard assessments have been released to customers each year, 3 in 2007, and there has been steady progress on development of community response plans in Washington and Oregon. Synthesis of the many data streams from erupting volcanoes together with laboratory and numerical simulations have led to a more realistic understanding of the source magma systems, as documented in 60 - 80 peer-reviewed publications per year. Each eruption provides the basis for improving the monitoring and interpretation of the next event.

A need for improved monitoring of the Nation's volcanoes to strengthen disaster warnings was identified by the Office of Science and Technology Policy in "Grand Challenges for Disaster Reduction (2005)," (*http://www.sdr.gov/*), and by the United States Group on Earth Observations (USGEO), a standing subcommittee of the National Science and Technology Council Committee on Environment and Natural Resources, in its "Strategic Plan for the U.S. Integrated Earth Observation System" (*http://usgeo.gov/docs/EOCStrategic_Plan.pdf*). Also, USGEO states in "Improved Observations for Disaster Reduction: Near-Term Opportunity Plan" (*http://usgeo.gov/docs/nto/Disaster_Observations_NTO_2006-0925.pdf*) that existing volcano monitoring is lacking or suboptimal for many volcanoes and that monitoring networks are not fully integrated at the national level.

Development of NVEWS is now a major goal of the VHP following a thorough assessment of volcanic threat and monitoring capabilities for all 169 of the Nation's active volcanoes (USGS Open-File Report 2005-1164; *http://pubs.usgs.gov/of/2005/1164/*). The report concludes that most dangerous U.S. volcanoes are under monitored. The implementation plan for NVEWS will

be completed in 2008. NVEWS is moving the VHP from a regionally-based, loosely affiliated collection of monitoring networks that provide adequate monitoring for only a few volcanoes to a nationally integrated system that provides modern monitoring at levels commensurate with the threats posed, and that provides 24 x 7 situational awareness and data for all potentially hazardous U.S. volcanoes. This goal is consistent with the Department of the Interior's Serving-Communities strategic goal to improve understanding, prediction, and monitoring of natural hazards to inform decisions by civil authorities and the public to plan for, manage, and mitigate the effects of hazard events on people and property. At present, the highest priority NVEWS targets for improvement are:

- Volcanoes that are currently erupting (Mount St. Helens in Washington and Kilauea in Hawaii) or exhibiting precursory unrest (Mauna Loa in Hawaii),
- 13 very-high-threat volcanoes with inadequate monitoring (9 in the Cascade Range, including Mount Rainier, and 4 in Alaska), and
- 19 volcanoes in Alaska and the Mariana Islands that pose threats to aviation but have no real-time, ground-based monitoring to detect precursory unrest or eruption onset.

GPRA/PART performance metrics that will track progress on the development of NVEWS are (1) measures of percentages of volcanoes monitored, (2) sites monitored for ground deformation, (3) number volcanoes for which information supports public safety decisions, and (4) percentage of full monitoring achieved.

An external review of the VHP was conducted by the American Association for the Advancement of Science (AAAS) in 2007, using a panel of six outside experts. The AAAS panel determined that the VHP had successfully executed its previous (1999-2003) 5-Year Plan and previous (2000) external review recommendations, and that the current 5-Year Plan was sound. The panel strongly endorsed the NVEWS initiative, and proposed that the VHP work more closely with State and local partners in developing risk-focused products that deal with future eruption scenarios.

At the 2009 funding level, VHP accomplishments will include the following:

Response to Eruption and Unrest — VHP will direct resources as necessary toward response to volcanoes that are erupting or exhibited unrest (earthquakes, deformation, or gas emissions) that may be precursory to an eruption. Although it is impossible to predict with certainty which volcanoes will be erupting or showing unrest in 2009, the persistent eruptions of Mount St. Helens in Washington State and Kilauea volcano in Hawaii show no signs of ending and will almost certainly require additional close attention in 2009. Early in 2008, changes in the vent system at Kilauea diverted flow of lava away from the sea and towards populated areas south of Hilo. This has stimulated close cooperation and joint planning among HVO, the County of Hawaii, and Hawaii State Civil Defense as well as innovations by HVO in predicting lava flow behavior. Also likely to require extra attention and resources are Mauna Loa in Hawaii, which has erupted about every 5 to 20 years in historical times and which has been deforming since 2002 as a result of magma filling a chamber beneath the summit.

Monitoring Improvements in Support of NVEWS — The VHP will direct resources towards improvement of the monitoring network in the Cascade Range. Plans include further monitoring improvements in Washington at Mount Rainier, where a large population is at risk from debris flows. In Oregon, monitoring improvements will be made at Crater Lake National Park, where no geophysical sensors have yet been installed within 30 miles of the volcano. In addition,

permitting processes will be continued to allow improved monitoring at Mount Shasta in California, and at Newberry Caldera in Oregon. In Alaska, the VHP will focus efforts on improving the reliability of existing volcano monitoring networks and systems for data acquisition and analysis. In addition, the VHP will continue collaboration with Washington State University on a research and development effort to develop smart networks to improve deployment speed, resilience, and data capturing capacity of future volcano monitoring networks. Resources will also be devoted to bringing seismic instrumentation on the Island of Hawaii up to Advanced National Seismic System (ANSS) standards in cooperation with the USGS Earthquake Hazards Program. Monitoring will be extended on Hualalai Volcano on the Island of Hawaii and Haleakala Volcano on Maui. To the extent made possible through supplemental funding, expansion of the monitoring network in the Aleutian Islands in support of aviation safety and in the Commonwealth of Northern Mariana Islands (CNMI) in support of both aviation safety and the DoD buildup in Guam and CNMI will be conducted. A Memorandum of Understanding (MOU) between USGS and the CNMI concerning volcano monitoring was completed and signed in 2007. Hydrothermal explosions and toxic gas emissions pose a significant risk to visitors to Yellowstone. An MOU among the USGS, the University of Utah, and Yellowstone National Park was completed in 2008. This agreement provides the basis for improved hazard mitigation at Yellowstone in 2009 at no increased cost.

Volcanic Hazard Assessments and Systematic Analyses — The VHP will continue to make progress on production of volcanic hazard assessments to guide development of community response plans and interpretation of volcanic unrest. The hazard assessment of Lassen Volcanic National Park and geologic maps for Mount Hood in Oregon and Glacier Peak in Washington will be completed in 2009, following expected completion of a geologic map of Crater Lake National Park and a hazard assessment of Gareloi Volcano, Alaska in 2008. Geologic investigations will continue at Cook Inlet volcanoes in Alaska, which can directly impact over half the population of the State, to better understand their eruptive history and the volcanic processes that drive eruptions. An ash hazard assessment for the United States, with special attention to the Pacific Northwest, will be completed. The VHP will continue to publish the results of research on volcanic processes, aiming at a total of 75 systematic analyses (including reports, maps and hazard assessments) delivered to the public in 2009. These will include peer-reviewed volumes on the continuing eruption of Mount St. Helens that began in 2004 and the eruption of Augustine Volcano, Alaska, in 2006. These publications will document lessons learned for application in future volcanic crises.

Eruption Response Plans — A national volcanic-ash operations plan was completed in 2007. This plan, which is in support of aviation safety and the International Civil Aviation Organization's (ICAO) Global Ash Avoidance Program, will be implemented in 2008 and 2009 in collaboration with NOAA, FAA, and the AFWA to provide early warning and situational awareness of volcanic ash threats to aircraft. An interagency community response plan for the Mount St. Helens – Mount Adams region of Washington State will be completed in 2009, as will a plan for implementing monitoring upgrades throughout the Cascade Range.

Base Program Improvements — To improve the productivity of VHP's geographically dispersed observatories, program-wide tools and technologies are being developed for storing, managing, and interpreting real-time and legacy data. Additional partnerships with neighboring universities and State geological surveys will be developed to extend breadth and depth of expertise and analytical capacity. In 2008, VHP supported 7 cooperative agreements.

USGS 2008 Cooperative Agreements for Volcano Monitoring and Research	
University of Alaska	University of Utah
University of Washington	Alaska Division of Geological and Geophysical Surveys
University of Oregon	Smithsonian Institution
University of Hawaii	

PART Findings and Recommendations and Program Progress

This program supports the Department's Serving Communities strategic goal to improve understanding, prediction, and monitoring of natural hazards to inform decisions by civil authorities and the public to plan for, manage, and mitigate the effects of hazard events on people and property. As described in the Administration's PART review, the VHP role is clearly defined and unique from other Federal, State, local, or private entities. The USGS programs in Earthquake Hazards, Landslide Hazards, Volcano Hazards, Global Seismographic Network, and Geomagnetism were reviewed as a group in 2003 for the 2005 Budget using the PART, and were found to be working effectively with partners and fulfilling the USGS mission. As a result, they received a collective score of 82. The VHP 5-Year Plan has been reviewed, approved by the Bureau, and was released in 2006.

Performance measures resulting from the PART are shown in the performance tables for the Geology programs. Improvement plans have been developed to carry out PART recommendations, with milestones being met on schedule. The USGS has submitted a new PART Improvement Plan that includes taking the following actions in 2008:

- Work with Federal partners to ensure complementary roles and responsibilities in the delivery of geologic hazard information,
- Expand coordination of hazards investments across landslide, earthquake and volcano activities, and
- Improve FEMA loss estimation capabilities by incorporating USGS geologic hazard information.

Geologic Hazard programs efficiently invest in technology that can be used across a variety of hazards. Specifically, investments in seismic monitoring, satellite data purchases and data archiving are all coordinated. VHP warning procedures and formats were modified to align with requirements of Federal partners and with hazard information customers.

Updates to 2008 Program Performance Targets

Performance targets for 2008 remain unchanged from those portrayed in the 2008 President's budget and reflect enacted funding levels for 2008.

Program Performance Overview

The table below summarizes the performance measures that either relate exclusively to the VHP or are shared among the USGS programs in Earthquake Hazards, Landslide Hazards, Global Seismographic Network, and Geomagnetism.

End Outcome Goal: 4.2: Serving Communities: Improve understanding, prediction, and monitoring of natural hazards to inform decisions by civil authorities and the public to plan for, manage, and mitigate the effects of hazard events on people and property.									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
GPRA End Outcome Measures									
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Provide information to assist communities in managing risks from natural hazards**									
# of areas for which detailed hazard assessments are completed **(SP)**	UNK	UNK	45	46	46	47	48	+1	50
Use Rate: Volcanoes: X% of communities/tribes using DOI science on hazard mitigation, preparedness and avoidance for each hazard management activity **(Baseline is 256 at risk counties)**	63.3%	66.4% 170/256	74.2% 190/256	83.6% 214/256	76.6% 196/256	85.9% 220/256	85.9% 220/256	0	85.9% 220/256
Comments	2008 revised Nov 2007 to reflect 2007 rebaselined actual. Lack of timely 2007 FAA funding and eruption of Mt. St. Helens resulted in only 196 of 214 communities in 2007.								
PART Efficiency and Other Output Measures									
# of systematic analyses/ investigations delivered to customers (systematic analyses/investigations) **(VHP)**	2	1	1	75	76	67	75	+8	45
Total Actual/Planned Investigation Cost ($000)		500				TBD			
Actual/Projected Costs Investigation Delivered (whole dollars)		500,000				TBD			
Comments	2007 Plan, new baseline number of systematic analyses. VHP systematic analyses are scientific publications that are typically produced after years of data collection and analysis, and the rate of release is highly variable from year to year. The estimate for 2009 is based on the average rate of release for years without major eruptions. The decline in publications in 2008 is due to the level of response to eruptions of Mount St. Helens, Augustine, and Kilauea.								
# of formal workshops or training provided to customers (instances/issues/events) **(VHP)**	4	5	4	4	4	4	4	0	4

End Outcome Goal: 4.2: Serving Communities: Improve understanding, prediction, and monitoring of natural hazards to inform decisions by civil authorities and the public to plan for, manage, and mitigate the effects of hazard events on people and property.									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
GPRA End Outcome Measures									
Total Actual/Planned Workshop Cost ($000)		120	120	120	120	120	120	0	120
Actual/Projected Costs Workshop Delivered (whole dollars)		30,000	30,000	30,000	30,000	30,000	30,000	0	30,000
# of sites (mobile or fixed) monitored for ground deformation to identify volcanic activity **(VHP)**	85	88	94	125	159	170	180	+10	210
Comments: 2007 exceeded plan. A new base was developed incorporating instruments operated by the NSF Plate Boundary Observatory installed on volcanoes. PBO is in year 4 of a 5-year installation phase and it is difficult to estimate how many they will install in a given year. Based on 2008 plan, VHP intends to increase # of sites monitored by at least +10 per year.									
# of volcanoes for which information supports public safety decisions **(PART) (VHP)**	cum 49	+2 (cum 51)	0 (cum 51)	+1 (cum 52)	+1 (cum 52)	+0 (cum 52)	+0 (cum 52)	0	1 (cum 53)
Total Actual/Planned # volcanoes ($000)			2,000	500 (est)					500 (est)
Actual/Projected Costs per new site monitored (whole dollars)			1,000,000	500,000 (est)					500,000 (est)
X% of potentially active volcanoes monitored (x number of 70) **(PART) (VHP)**	67%	72.9% (51/70)	72.9% (51/70)	74.3% (52/70)	74.3% (52/70)	74.3% (52/70)	74.3% (52/70)	0	75.7% (53/70)
% of potentially hazardous volcanoes with published hazard assessments **(SP) (PART)**	61.4%	62.8% (44/70)	64.3% (45/70)	65.7% (46/70)	65.7% (46/70)	67.1% (47/70)	68.6% (48/70)	+1.5%	71.4% (50/70)
# of communities/tribes using DOI science on hazard mitigation, preparedness and avoidance of each hazard management activity **(VHP) (PART)** (Baseline # is 256 at risk counties**)**	162	170	190	214	196	220	220	0	220
Comments	2007 goal not met. Lack of timely 2007 FAA funding and eruption of Mt. St. Helens and Augustine resulted in only 196 instead of 214 communities in 2007.								

Activity: Geologic Hazards, Resources and Processes

Subactivity: **Geologic Hazard Assessments**
Program Component: **Landslide Hazards**

	2007 Actual	2008 Enacted	2009			Change From 2008 (+/-)
			Fixed Costs & Related Changes (+/-) [a/]	Program Changes (+/-) [b/]	Budget Request	
Landslide Hazards Program ($000)	3,259	3,308	+42	-22	3,328	+20
Total FTE	*20*	*20*	*0*	*0*	*20*	*0*

a/ Fixed cost increases for this program total $42 of which $53 is budgeted and $11 is absorbed.
b/ Changes for this program include a reduction of -$22 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Summary of 2009 Program Changes for Landslide Hazards Program

Request Component	($000)	FTE
• Travel reduction	-22	0
TOTAL Program Changes	**-22**	**0**

Justification of 2009 Program Changes

The 2009 budget request for the Landslide Hazards Program is $3,328,000 and 20 FTE, a net program change of -$22,000 and 0 FTE from the 2008 Enacted level.

The overall impact of the -$22,000 for travel reduction is described in the General Statement that begins on page A-1. There are no performance measures impacted by this reduction to the Landslide Hazards Program.

Program Overview

The 2009 budget request for the Landslide Hazards Program is $3,328,000 and 20 FTE.

The Landslide Hazards Program (LHP) gathers information, conducts research, responds to landslide disasters, and produces scientific reports and other products that can be used by a broadly based user community, including Federal, State, and local governments and the private sector. LHP investigations focus on research to better understand, assess, and monitor the causes and mechanisms of ground failure. Its main goal is to reduce losses from landslides through improved understanding of landslide hazards and application of new strategies for hazard mitigation.

This program supports the Department's Serving Communities strategic goal to improve understanding, prediction, and monitoring of natural hazards to inform decisions by civil authorities and the public to plan for, manage, and mitigate the effects of hazard events on people and property. Two intermediate outcome measures are tracked in support of the intermediate outcome of providing information to assist communities in managing risks from natural hazards—the use rate of products, and the response to inquires. Output measures for which targets are established in support of achieving the intermediate outcome goal include the delivery of systematic analyses (risk assessments) to customers and the presentation of formal workshops or training to customers.

> "The Oregon Department of Geology and Mineral Industries (DOGAMI) hosted Landslide Symposium was a smashing success. DOGAMI was able to meet our goals of bringing together the private, public, and academic sectors for an exchange of ideas and to sow the seeds for future collaboration. We were also able to highlight the new research partnership between DOGAMI and the USGS to share the new tools and techniques that are being used for developing forthcoming regional maps, and landslide hazard maps."
>
> Yumei Wang
> Geohazards Section Leader, DOGAMI
> May 1, 2007

Landslide-hazard assessments provide the scientific basis for land-use, emergency management, and loss reduction measures. For example, studies of landslide susceptibility and hazards are providing much needed information to reduce landslide losses in parts of the country that have significant landslide problems including, but not limited to: California, the Pacific Northwest, and the Blue Ridge of the Eastern United States. The USGS cooperates with local partners in California, Colorado, Oregon, and Washington, as well as Federal agencies such as the National Park Service (NPS) and the Forest Service.

Landslide hazard research concentrates on understanding landslide processes, developing, and deploying instruments that monitor threatening landslides, and forecasting the onset of catastrophic movement of future landslides. Research into processes and forecasting methodologies is conducted on the types of landslides that produce losses in the United States such as landslides related to steep slopes, heavy rains, and vegetation loss due to wildfires.

The USGS deploys near-real-time monitoring systems at sites in California, near Yosemite National Park and in Oregon in Portland and near Newport. These sites provide continuous rainfall and soil-moisture and pore-pressure data needed to understand the mechanisms of landslide occurrence. Such understanding can form the scientific underpinnings for early warning of conditions that may trigger landslides. A landslide early-warning system based on such information will be useful in reducing hazards in landslide-prone areas.

> **Use of Cost and Performance Information**
>
> The LHP is a partner in the Multi-Hazards Demonstration Project (MHDP) in southern California. USGS scientists are cooperatively building a system with real-time continuous Global Positioning System (GPS) sensors that supply millimeter accuracy of ground displacement for both earthquakes and deep-seated landslides, as well as information about the moisture content of the air that is needed by our National Oceanic and Atmospheric Administration (NOAA) partners, which reduces the costs for programs within the USGS and for both USGS and NOAA. The GPS sensors will in turn be used as telemetry hubs to bring in data from debris-flow sensors monitoring soil moisture and ground flow characteristics for the existing Early Warning System for Flash Floods, Debris Flows and Landslides.

USGS scientists respond to landslide emergencies and disasters nationwide. Federal, State, and local agencies are assisted through landslide site evaluations and recommendations of strategies for reducing ongoing and future damages from landslides. When there is sufficient information or knowledge of a particular area, such as in southern California, LHP provides information on potential hazards.

Specifically, if rainfall intensity-duration thresholds for landslide activity have been developed for an area or if landslide-hazard maps have been produced, LHP can issue an advisory. LHP works in conjunction with the National Weather Service (NWS) to issue advisories and press releases regarding the potential for landslide activity in previously burned areas in southern California.

For foreign disasters, the USGS works with the Agency for International Development's Office of Foreign Disaster Assistance (USAID/OFDA) in responding to appeals for technical assistance from affected countries.

The USGS provides timely information through the National Landslide Information Center (NLIC). The Center communicates with the public and media about ongoing emergency responses and provides information to the external user-community through fact sheets, books, reports, and press releases, consistent with the Department's Serving Communities strategic goal to protect lives, resources, and property by providing information to assist communities in managing risks from natural hazards. The NLIC maintains several databases: the Landslide Bibliography (more than 15,000 entries), the International Landslide Experts Roster of about 2,000 entries, and Major Landslide Events of the United States (part of the USGS National Atlas). The NLIC also has real-time measurements from ongoing landslide monitoring projects available for viewing via the Internet. These measurements are used to forecast landslide movement or changes in an individual landslide's behavior.

Monitoring can detect early indications of rapid catastrophic movement. Up-to-the-minute or real-time monitoring provides immediate notification of landslide activity, potentially saving lives and property. Continuous information from real-time monitoring also provides a better understanding of landslide behavior for scientists, engineers, and public officials. The USGS conducts these efforts in cooperation with other Federal, State, and local agencies, including NPS; Bureau of Land Management (BLM); Federal Highway Administration; National Weather Service in NOAA, California, Washington, Oregon, and Colorado State Departments of Transportation; Colorado Geological Survey; Colorado School of Mines; Oregon Department of Geology and Mineral Industries, and private companies.

2009 Program Performance

The LHP includes the following three program components: Landslide-Hazard Assessment Activities, Landslide Monitoring Activities, and Landslide Information Dissemination Activities. At the 2009 funding level, LHP accomplishments will include the following:

Landslide-Hazard Assessment Activities:

Risk/Hazard Assessments Delivered to Customers — In 2009, LHP will deliver emergency assessment of debris-flow hazards in southern California. The assessments are derived from information obtained from basins burned by the fires of 2007 in southern California. In 2007 debris-flow hazard maps for areas burned by fires in this region were delivered within 2 months of the devastating fires. LHP is providing these products as part of the MHDP for southern California where it works with other USGS disciplines, other Federal agencies and State and local government agencies. The burned areas in southern California are highly susceptible to landslides during the winter rainy season, and even small amounts of rain can have disastrous consequences. In 2008 and 2009, LHP will also provide landslide hazard assessments for

neighborhoods in the Portland, Oregon metropolitan area which is expected to encounter numerous debris flows and landslides during the 2008 winter.

Counties or Comparable Jurisdictions that have Adopted Improved Land-Use Plans, Emergency Response Plans or Other Hazard Mitigations Measures — In 2009 LHP will continue to provide information to counties and other jurisdictions in Oregon, California, Colorado, eastern United States, and Interior land management bureaus that incorporate this information into emergency response and land-use plans and warning systems. In 2007, LHP provided susceptibility maps, hazard assessments and emergency warnings to National Forests in northern and southern California and the Rocky Mountains, in several National Parks in California and Wyoming, a county in Kentucky, a city in Oregon, cities in Washington State, and for burned areas in a multi-county area in southern California. All of these jurisdictions used the USGS products to mitigate the effects of landslides and debris flows through land-use planning, response planning, and warning systems.

Landslide Monitoring Activities:

Areas for which Models Exist that are Used to Interpret Monitoring Data — In 2009, LHP will continue to develop rainfall thresholds for areas burned in southern California. Thresholds that have been developed for the Seattle, Washington area and some counties in southern California will be used for landslide and debris-flow warning systems. LHP will continue monitoring and analysis of the rainfall response of landslides and landslide-prone areas in western Oregon.

Landslide Hazards Emergency Response — In 2009, LHP will continue to respond to landslide emergencies in the United States and internationally and to monitor these landslides where necessary. Information and maps of post-fire debris flows in southern California will be entered into interactive geographic information system (GIS) databases to provide immediate and comprehensive response tools for decision makers and the public. Landslide emergencies were posted through the Department's Common Alert Protocol to reach the largest audience of land and emergency managers in 2007 and 2008 and will continue to be posted in 2009.

Landslide Information Dissemination Activities:

National Landslide Information Center (NLIC) — In 2009, LHP will continue to respond to inquiries from the public, educators, and public officials on hazard mitigation, preparedness and avoidance strategies for landslide hazards. The NLIC is leading an effort for States and the USGS and other Federal agencies to exchange landslide data and information and will continue to provide the leadership in 2009 for the National Landslide Hazard Exchange Group.

Publications for Users of Hazard Information — In 2009, LHP will incorporate the lessons learned from educating land-use planners and planning officials using the USGS/American Planning report, "Landslide Hazards and Planning" and non-scientists through the auspices of the International Landslide Consortium, which in 2008 will publish a handbook on landslide hazards. The 2008 findings from a study of how information from the focused landslide research in the Seattle area that has been used by local government and the public will be presented to USGS scientists and will be used in 2009 to assist them in designing future research and application activities. During 2008 and 2009, LHP will complete 15 systematic analyses each year, including maps, technical reports, and peer-reviewed research papers, for technical users of landslide information and decisionmakers.

PART Findings and Recommendations and Program Progress

As described in the Administration's Program Assessment Rating Tool (PART) review, the Geologic Hazard Assessments Subactivity role is clearly defined and unique from other Federal, State, local, or private entities. The LHP was reviewed in 2003 as part of the Geologic Hazard Assessments Program for the 2005 budget using the PART, and was found to be "moderately effective."

The 2007 PART recommendations for improvement included:

- Integrate performance reporting with Federal partners to ensure comprehensive representation of roles and responsibilities in outcomes,
- Based on evaluation of initial efforts, expand coordination of hazards investments across landslide, earthquake and volcano activities, and
- Improve FEMA loss estimates by further integration of USGS geologic hazard information.

Action Plans have been developed to carry out PART recommendations, with milestones being met on schedule. The NOAA/USGS LHP partnership in southern California, which enables both to more effectively warn citizens in the vicinity of damaging debris flow and flash floods, is an example of Federal agencies working together to deliver accurate hazard information. For example, Geologic Hazard programs efficiently invest in technology that can be used across a variety of hazards. Specifically, investments in real-time monitoring, satellite data purchases and data archiving are all coordinated.

Performance measures resulting from the PART are shown in the performance tables for the Geology programs, and the USGS has submitted a new PART Improvement Plan for 2008. As a result of PART recommendations and associated performance measures, the USGS is implementing the following actions in 2008:

- Work with Federal partners to ensure complementary roles and responsibilities in the delivery of geologic hazard information,
- Expand coordination of hazards investments across landslide, earthquake and volcano activities, and
- Improve FEMA loss estimation capabilities by incorporating USGS geologic hazard information.

Updates to 2008 Program Performance Targets

Performance targets for 2008 remain unchanged from those portrayed in the 2008 President's budget and reflect enacted funding levels for 2008.

Program Performance Overview

The table below summarizes the performance measures that either relate exclusively to the Landslide Hazards Program or are shared among the USGS programs in Earthquake Hazards, Volcano Hazards, Global Seismographic Network, and Geomagnetism.

End Outcome Goal: 4.2: Serving Communities: Improve understanding, prediction, and monitoring of natural hazards to inform decisions by civil authorities and the public to plan for, manage, and mitigate the effects of hazard events on people and property.									
End Outcome Measures Intermediate or PART Measures/PART Efficiency or Other Outcome Measures	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
GPRA End Outcome Measures									
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Provide information to assist communities in managing risks from natural hazards**									
# of areas for which detailed hazard assessments are completed **(SP)**	UNK	UNK	1	2	2	2	2	0	6
Use Rate: Landslides: X% of communities/tribes using DOI science on hazard mitigation, preparedness and avoidance for each hazard management activity **(Baseline is 1,800 at risk counties)**	3.7% 70/1800	3.9% 71/1800	4.4% 80/1800	4.9% 89/1800	4.9% 89/1800	5.4% 98/1800	6.0% (107/1800)	+0.6% (+9)	7.4% 134/1800
Use Rate: Landslide Hazards: # of responses to inquiries from the public, educators, and public officials to the National Landslide Information Center on hazard mitigation, preparedness and avoidance strategies for landslide hazards **(BUR)**	1,600	5,200	1,600	1,600	1,600	1,600	1,200	-4,000	1,200
# of systematic analyses/ investigations delivered to customers **(LHP)**	1	1	1	15	16	15	15	0	13
Comments	Systematic analyses rebaselined in the 2007 Plan and LHP completed an additional, one-time, unanticipated SA in 2007. Beginning in 2009, due to increased availability of information on the Landslide Hazard Program Web site, the number of anticipated requests for information will decrease.								
# of formal workshops or training provided to customers (instances/issues/events) **(LHP)**	3	3	2	1	1	1	1	0	1

End Outcome Goal: 4.2: Serving Communities: Improve understanding, prediction, and monitoring of natural hazards to inform decisions by civil authorities and the public to plan for, manage, and mitigate the effects of hazard events on people and property.									
End Outcome Measures Intermediate or PART Measures/PART Efficiency or Other Outcome Measures	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
GPRA End Outcome Measures									
# of areas or locations for which geophysical models exist that are used to interpret monitoring data **(PART) (LHP)**	4	4 1/3	4 2/3	5	5	5 1/3	5 2/3	+1/3	6 2/3
# of communities/tribes using DOI science on hazard mitigation, preparedness and avoidance of each hazard management activity (**LHP**) **(PART)** (Baseline is 1,800 counties and parks with moderate to high landslide susceptibility in the U.S. (99-03, 60 adopted measure)	68	71	80	89	89	98	107	+9	134
Comments	The revision of the Strategic Plan added Tribal communities to the metric on % of communities. Baseline of 1,800 counties remains unchanged as Tribes were already incorporated into the count.								

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Activity: Geologic Hazards, Resources and Processes

Subactivity: **Geologic Hazard Assessments**
Program Component: **Global Seismographic Network**

	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-) [a/]	2009 Program Changes (+/-) [b/]	2009 Budget Request	Change From 2008 (+/-)
Global Seismographic Network ($000)	3,927	4,441	+33	-502	3,972	-469
Total FTE	*9*	*9*	*0*	*0*	*9*	*0*

[a/] Fixed cost increases for this program total $33 of which $42 is budgeted and $9 is absorbed.
[b/] Changes for this program include a reduction of -$10 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Summary of 2009 Program Changes for Global Seismographic Network Program

Request Component	($000)	FTE
• Global Seismographic Network General Program	-492	0
• Travel reduction	-10	0
TOTAL Program Changes	**-502**	**-0**

Justification of 2009 Program Changes

The 2009 budget request for the Global Seismographic Network Program is $3,972,000 and 9 FTE, a net program change of -$502,000 and 0 FTE from the 2008 Enacted level.

Global Seismographic Network General Program **(-$492,000 / 0 FTE)**
The reduction eliminates unrequested congressional funding that was not requested by the Administration or USGS or does not address the highest priority science needs. This will keep the core program intact while allowing the USGS to make the best use of resources. Reduced station maintenance will slow progress in the refreshment of station equipment, resulting in a two percent decrease in data availability.

Program Overview

The Global Seismographic Network (GSN) Program provides high-quality seismic data to support earthquake and tsunami disaster management, hazards assessments, national security (through nuclear test treaty monitoring), loss reduction, and research on earthquake sources and the structure and dynamics of the Earth. The GSN is a joint program between the USGS and the National Science Foundation (NSF), implemented by USGS, the Institute for Geophysics and Planetary Physics (IGPP) of the University of California, and the Incorporated Research Institutions for Seismology (IRIS), a consortium of universities.

2009 Program Performance

Initiated in 1986, the GSN currently consists of 147 stations, installed over two decades by USGS and IGPP. Funds for the purchase and installation of new sites are provided by NSF to IRIS. The USGS is responsible for maintenance and operation, data collection, and quality control of two-thirds of the GSN stations, and IRIS supports the University of California to operate and maintain the other third. Maintenance is accomplished in cooperation with many international partners who, in most cases, provide facilities to shelter the instruments and personnel to oversee the security and operation of each station. USGS tasks include training station operators, troubleshooting problems and providing major repairs, conducting routine service visits to network stations, providing direct financial aid in support of station operations at those sites lacking a host organization, and ensuring data quality and completeness.

As part of GSN activities, the USGS and IRIS also evaluate, develop, and advance new technologies in sensors, instrument installation, data acquisition, and management. To improve performance, stations with unusually high background noise are relocated to quieter sites or configurations (e.g., burying sensors in boreholes) so that smaller events (earthquakes or explosions) or signals of interest may be detected. The planned lifetime of the completed network is 30 years. However, with proper maintenance and upgrades of the data system platform, the GSN can produce data indefinitely, with expanded capabilities.

Use of Cost and Performance Information

USGS shares communications costs with partners including the National Weather Service, Comprehensive Test Ban Treaty Organization, National Science Foundation, and the U.S. Air Force. Where possible, the GSN has worked with local organizations to leverage up-front investment in communications infrastructure with station host institutions agreeing to pay the ongoing costs (for example, the station in Kevo, Finland).

In order to reduce travel costs, and maintain or enhance performance, installation and maintenance visits are conducted in regional “campaigns”. For example, trips to a station in Greenland and two stations in Norway were combined into a single trip.

Under a Memorandum of Understanding between the USGS and NSF, the GSN Program is overseen by a "Standing Committee" of advisors, consisting of external stakeholders and one USGS representative. The GSN Standing Committee typically meets twice a year.

Data and products derived from this program have multiple and diverse uses. This program supports the Department's Serving Communities strategic goal to improve understanding, prediction, and monitoring of natural hazards to inform decisions by civil authorities and the public to plan for, manage, and mitigate the effects of hazard events on people and property. The information provided to end users supports the intermediate outcome goal of providing information to assist communities in managing risks from natural hazards.

GSN real-time data are transmitted continuously to the USGS National Earthquake Information Center (NEIC) in Golden, Colorado, where they are used, with other data, to rapidly determine the locations, depths, magnitudes, and other parameters of earthquakes worldwide. The high quality of GSN data allows them to be used for the rapid determination of the geometric orientation of the fault that caused the earthquake, and provide an estimate of the length of the fault that ruptured during the earthquake.

The rapid availability of earthquake information is critical for first responders and government officials responsible for assessing an earthquake disaster. In the case of significant domestic earthquakes, the USGS and partners provide information to Federal and State emergency management and public safety agencies, operators of transportation facilities, public utilities,

and national news media. In the case of potentially damaging events outside the United States, information from the NEIC is immediately sent to the Department of State, embassies and consulates in the affected region, the Office of Foreign Disaster Assistance, the Red Cross, and the United Nations, as well as national and international news media.

GSN stations provide near-real-time data to National Oceanic and Atmospheric Administration (NOAA) tsunami warning centers, supporting tsunami monitoring in the Pacific Rim and disaster alerting in all U.S. coastal states and territories in the Pacific and Caribbean. NOAA relies on GSN real-time data to trigger analysis of the ocean-bottom sensors that detect tsunami waves, making it possible for NOAA to transmit tsunami alerts to response agencies within minutes of these quakes.

> "The Global Seismic Network … is furnishing unprecedented data on the source processes during major earthquakes in remote areas …. The GSN data acquired over the last 15 years have facilitated many advances in the study of global Earth structure and earthquake sources … [and] have also improved the plate-tectonic framework for understanding earthquake hazards …. Discoveries based on data now being collected by the GSN will undoubtedly continue into the indefinite future …. With each passing year, GSN [will] add new information to the evolving pattern of global seismicity by the direct observation of large, rare events and the delineation of low-level seismicity that may mark the eventual occurrence of such events.
>
> "Stable support of the GSN from a federal agency that embraces the mission of global seismic monitoring is essential to the long-term health of earthquake science."
>
> *Living on an Active Earth: Perspectives on Earthquake Science*, National Academy of Sciences, Board on Earth Sciences and Resources, 2003.

All GSN data are freely and openly available to anyone via the Internet. Copies of all the data from USGS GSN stations are sent to the IRIS Data Management Center (DMC) in Seattle, Washington, which responded to over 140,000 requests for GSN data in 2007. In addition, data from most GSN stations are currently available within hours of large earthquakes to the worldwide user community via the USGS *Live Internet Seismic Server*.

Data from the GSN are used extensively in basic and applied research on earthquakes, Earth structure, and other geophysical problems. Consequently, GSN data are extensively used in studies conducted and supported by USGS and other agencies like NSF, the U.S. Department of Energy, and the U.S. Air Force. Some of this research and data support national security through the seismic monitoring of nuclear explosions and the improved calibration of nuclear explosion monitoring networks.

Many GSN sites have evolved into geophysical observatories. An extended suite of geophysical instrumentation can make use of GSN logistical and telemetry infrastructure, including Global Positioning System (GPS), gravimeters, magnetometers, microbarographs, and meteorological sensors. Microbarographs were installed this year at GSN stations in Madagascar and the Republic of Kiribati. The 43 microbarographs installed globally at GSN sites are the largest open data source of its kind. The GSN continues its close cooperation with the GPS community with co-located instrumentation at 43 sites, and shared telemetry infrastructure in Africa, Siberia, and at Easter Island in the Pacific. USGS is also evaluating the use of GSN data for climate change studies, with encouraging initial results.

Given the high rate of significant earthquakes around the world, the GSN is an important tool in earthquake-related education and outreach. The USGS has worked with IRIS to develop educational museum displays based on data from the GSN. These displays explain the basic concepts of seismology and earthquake occurrence and have proven to be quite popular with the public. Displays are in place at the Smithsonian Institution in Washington, D.C., the American Museum of Natural History in New York, the Carnegie Museum in Pittsburgh, USGS

Headquarters, the New Mexico Museum of Natural History in Albuquerque, and the Franklin Institute's traveling "Powers of Nature" exhibit.
At the 2009 funding level, GSN will:

- Operate the USGS portion of the network at a high level of data recovery, real-time telemetry performance, and high cost-efficiency,
- Begin deployment of next-generation data loggers to improve station reliability and data quality, and make progress on the development of autonomous seismic stations for deployment at less accessible sites, and
- Work with partners in the U.S. Air Force, the Comprehensive Nuclear Test Ban Treaty Organization, and the international Federation of Digital Seismographic Networks, to improve the efficiency of station operations and reduce maintenance costs.

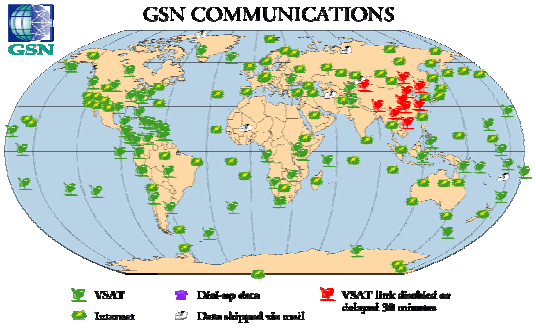

Figure 1. Telemetry has been expanded across the GSN so that now over 90% of the stations provide real-time data for earthquake alerting and tsunami warning.

The performance metrics for percent telemetry and cost efficiency are expected to remain level in 2009, as equipment purchased and deployed in 2008 stabilizes the network.

As station maintenance visits are curtailed due to the proposed program decrease, the metric for percent data availability will go down from a 2008 Plan of 86 percent to 84 percent in 2009 and remain at that rate through 2012.

In 2009, the USGS will continue to strive to maintain the GSN at high reliability and low cost. The USGS portion of the GSN has grown from 72 to 95 stations since 1998. Five stations will be installed in 2008, bringing the total to 100 stations. Through the President's Tsunami Warning Initiative, USGS has added GSN-affiliated stations in the Caribbean and increased the number of stations with real-time telemetry over the past 3 years, providing new capabilities for the network but also increasing operations and maintenance costs, which must be absorbed at fixed funding levels.

The 2009 performance assumes specific goals for 2008 are met including (1) improved station reliability through more timely maintenance, an expanded inventory of spare parts, replacement of obsolete technologies and standardization of equipment, (2) further incorporation of the GSN into the Global Earth Observation System of Systems effort and cooperate with IRIS, NSF, and other agencies in continuing to use the GSN as a platform for global geophysical observations, (3) enhanced network performance by relocating noisy stations to quieter sites and by the use of new seismometer and installation technologies, and (4) enhanced data quality-control operations.

USGS will also participate with partners in the development and testing of new sensor technology. The existing STS-1 seismometers, which are no longer produced, are aging and beginning to fail. A replacement for this seismometer is necessary to support network performance. USGS will collaborate with the Chinese Earthquake Authority in 2008 to test and evaluate possible replacement sensors. USGS also anticipates greater collaboration with the Air Force Technical Applications Center in 2008 in the area of equipment testing, station design, and network operations.

In addition to installing the remaining five stations in the USGS GSN, the first “next generation” datalogger systems will be rolled out in 2008. These new systems will replace the aging existing systems as well as provide a new level of standardization between the USGS and University of California sites. In addition to standard maintenance work, USGS will revive remote Pacific Ocean sites on Wake Island and Johnston Atoll.

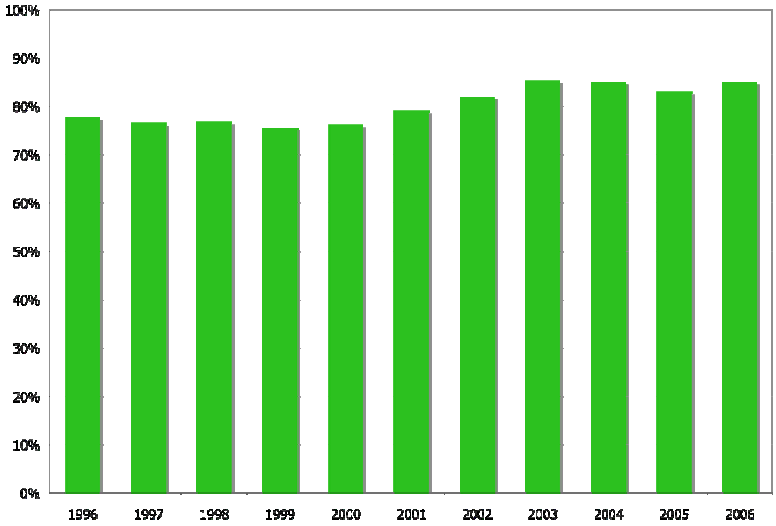

Figure 2. The availability of GSN data increased to over 85 percent in 2006. This exceeds that of other global seismic monitoring operations such as that run by the Comprehensive Nuclear Test Ban Treaty Organization.

All GSN data passes though a quality control process before archiving, and GSN archives are heavily used by researchers.

PART Findings and Recommendations and Program Progress

As described in Administration's Program Assessment Rating Tool (PART) review, the USGS role is clearly defined and unique from other Federal, State, local, or private entities. The GSN program was reviewed using the PART in 2003 as part of the Geologic Hazard Programs for the 2005 Budget. These programs were found to be "moderately effective." GSN-specific performance measures were established as part of that process.

Performance measures, including those resulting from the PART, are shown in the performance tables for the Geology programs. All PART Improvement Plan milestones were met in 2007, and USGS has submitted a new PART Improvement Plan for 2008. As a result of PART recommendations and associated performance measures, the USGS will work with Federal partners to ensure complementary roles and responsibilities in the collection and dissemination of GSN data.

Figure 3. Responding to the Unexpected. GSN station was destroyed by a category 5 typhoon in 2006 (and restored in late 2007). This station provides critical data for tsunami warning in the Pacific Ocean and improved earthquake locations throughout the region.

USGS has leveraged U.S. Coast Guard ship travel to reduce the costs of station re-installation.

The GSN program will continue in 2009 to undertake regular internal and external reviews of its activities. Reviews follow the bureau policy on program review and the requirements for achieving and reporting on bureau performance measures developed in accordance with the Government Performance and Results Act as well as measures identified during the PART process.

Updates to 2008 Program Performance Targets

Performance targets for 2008 remain unchanged from those portrayed in the 2008 President's budget and reflect enacted funding levels for 2008.

Program Performance Overview

The table below summarizes the performance measures that either relate exclusively to the GSN or are shared among the USGS programs in Earthquake Hazards, Volcano Hazards, Landslide Hazards, and Geomagnetism.

End Outcome Goal: 4.2: Serving Communities: Improve understanding, prediction, and monitoring of natural hazards to inform decisions by civil authorities and the public to plan for, manage, and mitigate the effects of hazard events on people and property.									
End Outcome Measures Intermediate or PART Measures/PART Efficiency or Other Outcome Measures	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
GPRA End Outcome Measures									
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure the quality and relevance of science information and data to support decision making.**									
PART Efficiency and Other Output Measures									
% of earthquake monitoring global seismic network stations that have telemetry (increase reporting speed from one hour to 20 minutes)	80%	86%	89%	93%	96%	93%	93%	0	95%
X% data availability for real-time data from the GSN **(PART)**	90.5%	89%	88%	87%	87.8%	86%	84%	-2%	84%
Comments	As station maintenance visits are curtailed due to the 2009 proposed program decrease, percent data availability will go down from a 2008 Plan of 86 percent to 84 percent in 2009 and remain at that rate through 2012.								
Data processing and notification costs per unit volume of input data from sensors in monitoring networks (in cost per gigabyte) **(PART Eff. Measure)**	0.90 $k/GB (-1%)	0.79 $k/GB	1.30 $k/GB	1.33 $k/GB	1.19 $k/GB	1.33 $k/GB	1.33 $k/GB	0	1.33 $k/GB
# of formal workshops or training provided to customers (instances/issues/events) **GSN**	0	0	1	0	0	0	1	+1	0

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Activity: Geologic Hazards, Resources, and Processes

Subactivity: **Geologic Hazard Assessments**
Program Component: **Geomagnetism**

	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-) [a/]	2009 Program Changes (+/-) [b/]	2009 Budget Request	Change From 2008 (+/-)
Geomagnetism ($000)	2,008	2,059	+33	-16	2,076	+17
Total FTE	*15*	*15*	*0*	*0*	*15*	*0*

a/ Fixed cost increases for this program total $33 of which $42 is budgeted and $9 is absorbed.
b/ Changes for this program include a reduction of -$16 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Summary of 2009 Program Changes for Geomagnetism Program

Request Component	($000)	FTE
• Travel reduction	-16	0
TOTAL Program Changes	**-16**	**0**

Justification of 2009 Program Changes

The 2009 budget request for the Geomagnetism Program is $2,076,000 and 15 FTE, a net program change of -$16,000 and 0 FTE from the 2008 Enacted level.

The overall impact of the -$16,000 for travel reduction is described in the General Statement beginning on page A-1. There are no performance measures impacted by this reduction to the Geomagnetism Program.

Program Overview

The mission of the USGS Geomagnetism Program is to monitor the Earth's magnetic field through an array of ground-based magnetic observatories; to provide high temporal resolution records of magnetic field variations covering long timescales; to disseminate magnetic data to various governmental, academic, and private institutions; and to conduct research into the nature of geomagnetic variations for purposes of scientific understanding and hazard mitigation. The program consists of three main elements:

- Geomagnetic observatory operations,
- Data transportation, management, processing and dissemination, and
- Scientific research.

Short-term variations in the Earth's magnetic field, in particular those during geomagnetic storms, are hazardous to satellites and electrical power distribution systems and make radio communications, navigation, and geophysical surveys difficult. During such storms, astronauts and high-flying aircraft pilots can be exposed to dangerous levels of radiation. Data from the program's observatories are used for tracking near-Earth space-weather conditions by both the National Oceanic and Atmospheric Administration (NOAA) Space Weather Prediction Center (SWPC) and the U.S. Air Force Weather Agency (AFWA). With those and other partners, the program is an integral part of the interagency National Space Weather Program.

The estimated annual economic impact of magnetic storms runs into the hundreds of millions of dollars, not to mention the potential impact upon national security. Long-term, secular variation of the field is caused by convection in the Earth's core, resulting in a slow drift in the global-scale structure of the magnetic field. Because many navigational systems use the magnetic field direction as a means of orientation, it is essential to track these long-term changes. Moreover, drilling programs undertaken within the oil industry rely on magnetic orientation, and these can be degraded during magnetic storms, particularly at high latitude. Finally, many historical property boundaries are based on magnetic orientation, and knowledge of the magnetic field is needed to reconstruct or re-establish these boundaries.

Use of Cost and Performance Information

Cost/performance data are used to prioritize maintenance activities across the 14-observatory geomagnetic monitoring network in order to maximize the value of fixed maintenance funds to station performance.

The Geomagnetism program partners with the U.S. Air Force, British Geological Survey, and Natural Resources Canada to ensure adequate dissemination of geomagnetic data and monitoring of the geomagnetic field, leveraging the investment by all three entities by avoiding unnecessary duplication and optimizing station location.

This program supports the Department's Serving Communities strategic goal to improve understanding, prediction, and monitoring of natural hazards to inform decisions by civil authorities and the public to plan for, manage, and mitigate the effects of hazard events on people and property. Output measures for which targets are established in support of achieving the intermediate outcome goal include the presentation of formal workshops or training to customers and systematic analyses/ investigations delivered to customers.

The program's current strategic plan was established in 2006 and was reviewed by an external panel of experts. The program supports the USGS Geology Discipline's strategic goals of conducting geologic hazards assessments for mitigation planning and providing short-term prediction of geologic disasters and rapidly characterizing their effects.

"The panel was impressed with the accomplishments of the Geomagnetism Group in the last few years… Data transport and calibration are greatly improved. Recent developments are likely to significantly improve the Group's interface with the World Wide Web and to greatly enhance the use and value of the USGS geomagnetic data. The relationship between the Geomagnetism Group and its main customers the US Air Force and NOAA SEC have been improved."

Report of the Panel Reviewing the Geomagnetism Program of the USGS
October 2005

Geomagnetic Observatory Operations — The USGS Geomagnetism Program currently operates a network of 14 geomagnetic observatories, distributed across the United States and its territories. Data are collected continuously from each observatory by a variety of instruments housed in buildings designed to provide environmental stability and to ensure long-term baseline stability. Each site is visited regularly by either program staff or contract employees to conduct calibrations of the instruments. Data are transmitted in real time to

program headquarters in Golden, CO, via a set of satellite and Internet linkages. The program is currently working to improve the basic infrastructure at each observatory and to improve the temporal resolution of the measurements, by increasing the sampling frequency from 1 minute to 1 second.

Data Processing, Management, and Dissemination — Once the data from the observatories are received in Golden, CO, they are subjected to an initial processing. They are then organized for immediate transmission to both NOAA's Space Weather Prediction Center in Boulder, CO, and the U.S. Air Force Weather Agency in Omaha, NE. For longer-term studies, the magnetic data are further refined using periodic calibrations for each observatory, making them useful for research on rapid magnetic field variations and for mapping the field on a global scale. These fully calibrated, definitive data are published yearly in cooperation with foreign national geomagnetism programs working through the Intermagnet consortium. The USGS also distributes data and maps and models of the magnetic field through the *http://geomag.usgs.gov* Web site, which receives up to 1,000 visits per day from the public.

Scientific and Applications Research — USGS Geomagnetism Program staff conduct geomagnetic research to achieve a better understanding of basic geomagnetic processes and their effects on physical and social environments. Recent projects have included the development of a statistical framework for characterizing the long-term secular variation of the magnetic field and studies of the dynamo generating the field within the Earth's core. The program has recently begun an analysis of the statistics of rapid magnetic field variations with the goal of characterizing them both spatially and temporally so that geomagnetic hazards can be mapped and so that risks can be quantified.

2009 Program Performance

At the proposed 2009 funding level, the Geomagnetism Program will perform the following activities:

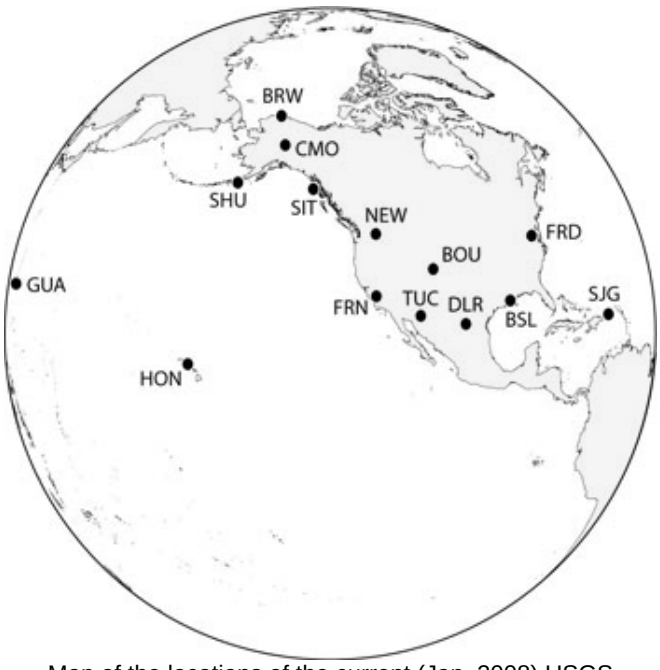
- Continue operation of 13 Geomagnetic Observatories and delivery of 1-second geomagnetic data to customers and users,
- Continue collaboration with the NOAA SWPC and AFWA, to ensure complementary roles and responsibilities in delivery and dissemination of geomagnetic hazards data to the space weather community,
- Complete major upgrades at the Barrow, Alaska, Observatory including repair or replacement of the primary sensor building, installation of the data-acquisition system, and installing Internet links, and
- Release of a geomagnetic hazard map of the United States.

The 2009 performance will build upon the following 2008 accomplishments:

International Observatory Workshop — The USGS Geomagnetism Program will host the 2008 International Association of Geomagnetism and Aeronomy (IAGA) workshop on instrument and observatory operations. This will be the first time the United States has hosted this important workshop. The workshop is divided into two parts, the first of which is concerned with hands-on, side-by-side instrument comparisons that are important for checking system accuracy and reliability. The second part of the workshop is concerned with data analysis and scientific applications, which are important for ensuring high data quality and promoting a

relationship with the data user community. All this will benefit the Geomagnetism Program by helping to improve operations and increase the international profile of the Program. Geomagnetism Program staff are currently working to improve the Boulder observatory so guests can make needed measurements, and possible co-sponsors are being approached to leverage costs.

Geomagnetic Observatory Operations — In 2008, the new 1-second acquisition system will be tested, with the aim of preparing for fully operational 1-second acquisition at selected observatories in 2008 and broader deployment in 2009. Program staff will concentrate on major upgrades at the Barrow Observatory, including repair or replacement of the primary sensor building, installation of the data-acquisition system, and installing Internet links. Work will continue in developing calibration systems at Boulder.



Map of the locations of the current (Jan. 2008) USGS Geomagnetic Observatories

Users will see the benefit of these efforts in 2009, primarily through improved data quality and reduced operational expenses. With the installation of the new data acquisition system at all observatories, continuous operations and software upgrades should make the network easier to manage. Work on the program's Web site should make dissemination of magnetometer data easier and result in improved profile for the program.

The number of observatories to be maintained in 2009 will decrease by one. Based on an operational analysis of the costs, facility needs, and user requirements for data from USGS geomagnetic observatories completed in 2006, USGS has decided to close the observatory at Del Rio, Texas, in order to make resources available for other observatories and program needs.

Data Processing, Management, and Dissemination — Capacities for managing and disseminating 1-second data should be completed in 2007 and made operational in 2008. Management of magnetotelluric and South Pole data will commence.

Scientific and Applications Research — Work will continue on developing a geomagnetic hazard map in 2008, primarily through statistical analysis of observatory data and through development of a magnetic disturbance index service. A simple but operationally useful measure of magnetic activity will be developed for display on the program Web site.

PART Findings and Recommendations and Program Progress

As described in the Administration's Program Assessment Rating Tool (PART) review, the Geomagnetism Program role is clearly defined and unique from other Federal, State, local, or

private entities. The Geomagnetism Program was reviewed in 2003 as part of the Geologic Hazard Programs for the 2005 Budget using the PART. These programs were found to be moderately effective. Performance measures resulting from the PART are shown in the performance tables for the Geology programs, and the USGS has submitted a new PART Improvement Plan for 2008. The Geomagnetism Program works very closely with NOAA SWPC and AFWA to ensure complementary roles and responsibilities in delivery and dissemination of geomagnetic hazards data to the space weather community.

Updates to 2008 Program Performance Targets

Performance targets for 2008 remain unchanged from those portrayed in the 2008 President's budget and reflect enacted funding levels for 2008.

Program Performance Overview

The table below summarizes the performance measures that either relate exclusively to the GSN or are shared among the USGS programs in Earthquake Hazards, Volcano Hazards, Landslide Hazards, and Geomagnetism.

End Outcome Goal: 4.2: Serving Communities: Improve understanding, prediction, and monitoring of natural hazards to inform decisions by civil authorities and the public to plan for, manage, and mitigate the effects of hazard events on people and property.									
End Outcome Measures Intermediate or PART Measures/PART Efficiency or Other Outcome Measures	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
GPRA End Outcome Measures									
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure the quality and relevance of science information and data to support decision making.**									
PART Efficiency and Other Output Measures									
# of systematic analyses/ investigations delivered to customers **(GeoMag)** (new measure beginning in 2007)	NA	NA	NA	2	4	2	2	0	2/yr
Comments	2007 target exceeded on on-time basis due to addition of Mendenhall postdoctoral researcher								
# of formal workshops or training provided to customers (instances/issues/events) **(GeoMag)**	NA	NA	1	1	0	1	1	0	1/yr

Activity: Geologic Hazards, Resources and Processes

Subactivity: **Geologic Landscape and Coastal Assessments**
Program Component: **Earth Surface Dynamics**

	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-) [a]	2009 Program Changes (+/-)	2009 Budget Request	Change From 2008 (+/-)
Earth Surface Dynamics ($000)	13,414	13,342	-10,336	-3,006	0	-13,342
Total FTE	*82*	*82*	*-78*	*-4*	*0*	*-82*

[a] A technical adjustment is proposed as part of a budget restructure that moves funding for global change activities into a new integrated budget activity titled Global Change.

Summary of 2009 Program Changes for Earth Surface Dynamics Program

Request Component	($000)	FTE
• Global Change Realignment	-10,336	-78
• Eliminate Remaining Funding in Earth Surface Dynamics	-3,006	-4
TOTAL Program Changes	**-13,342**	**-82**

Justification of 2009 Program Changes

The 2009 budget request for the Earth Surface Dynamics Program is $0 and 0 FTE, a net program change of -$13,342,000 and -82 FTE from the 2008 Enacted level.

Global Change Realignment **(-$10,336,000 / -78 FTE)**

The Department of the Interior holds a natural leadership role in providing critical science, monitoring, and predictive modeling of information related to changes in climate. As steward of 507 million acres of Federal lands, a primary strategic goal of the Department is to improve the understanding of natural ecosystems and resources through interdisciplinary assessment.

The 2009 budget includes establishment of a Global Change activity within USGS, which will result in science and adaptive management strategies for climate impacts and provide resource managers crucial information and tools to develop land and water management strategies and determine adaptive management activities in a dynamic environment affected by climate change.

The reduction of $10,336,000 in the Earth Surface Dynamics Program (ESDP) reflects the rollup of $10,336,000 and 78 FTE into the new USGS Global Change activity. All funding and performance metrics will move from the ESDP into the new USGS Global Change activity. See Global Change Restructure, beginning on page L-1.

Eliminate Remaining Funding in Earth Surface Dynamics (-$3,006,000 / - 4 FTE)

The President's Budget requests eliminating the Earth Surface Dynamics Program (ESDP). All performance metrics and 78 FTE were moved from the ESDP into the new USGS Global Change activity. See Global Change Restructure, beginning on page L-1, for program specific information. The remaining 4 FTE are being moved from the ESDP to Biological Research and Monitoring to support the Priority Ecosystems. See Priority Ecosystems in the Science on the Landscape section, beginning on page F-1.

Program Performance Change

	2005 Actual	2006 Actual	2007 Plan	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
End Outcome Goal: 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment.								
# annual gigabytes				2.8	2.8	0	-2.8	0
# cumulative gigabytes managed				19.4	22.2	0	-22.2	0
# systematic analyses and investigations delivered to customers			6	38	38	0	-38	0
# formal workshops or training provided to customers (instances/ issues/ events)			6	6	6	0	-6	0
Comments	These measures are part of a budget restructure that moves funding for global change activities into this new integrated budget activity titled Global Change.							

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent outyear.

Program Overview

This program supports the Department's Resource Protection strategic goal to improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment. The goal of the ESDP is to be the primary provider of scientific information on past,

present, and future climates and their effects on Earth and human systems to fulfil the mission of the USGS. Understanding of Earth surface processes and climate change impacts is used to provide perspectives for policymakers and to support land and resource managers.

Program goals are achieved through a series of projects in the following main groups that:

- Document the nature of climatic and environmental change and variability, including distinguishing between human-induced and natural change, on timescales ranging from years to millenia;
- Develop a fundamental understanding of interactions between climate, Earth surface processes, and marine and terrestrial ecosystems on timescales ranging from years to millenia;
- Seek to understand the impacts of climate change and variability on landscapes and marine and terrestrial systems;
- Model and anticipate the effects of climate change and variability on natural and human systems;
- Provide information on the relative sensitivity, adaptability, and vulnerability of ecosystems, resources, and regions to climatic change and variability to support land and resource management and policy decisions; and
- Enhance the quality and relevance of program activities through collaboration with national and international scientific entities.

ESDP-funded projects support the goals of the U.S. Climate Change Science Program (CCSP) to (1) improve knowledge of the Earth's past and present climate and environment, including its natural variability; (2) improve quantification of the forces bringing about changes in the Earth's climate and related systems; (3) reduce uncertainty in projections of how the Earth's climate and related systems may change in the future; (4) understand the sensitivity and adaptability of different natural and managed ecosystems and human systems to climate and related global changes; and (5) explore the uses and identify the limits of evolving knowledge to manage risks and opportunities related to climate variability and change.

Results of scientific activities supported by ESDP are communicated to customers in academia, resource management agencies, and the general public through project reports and peer-reviewed scientific papers, Web sites, databases, and meetings with stakeholders. Metrics of program success in past years have included the number of reports and publications, number of people accessing Web sites, and the frequency of meetings with stakeholders. In past years, outputs for which targets are set relate to the number of gigabytes, number of systematic analyses and investigations, and number of formal workshops or training. These outputs support the intermediate outcome goal of ensuring availability of long-term environmental and natural resource information, data, and systematic analyses needed by land and resource managers for informed decisionmaking. For 2009, these outputs were moved from the ESDP into the new USGS Global Change activity. See Global Change Restructure, beginning on page L-1, for program specific information.

The ESDP has supported research in three principal Earth processes areas of study: (1) Global Change; (2) Central Great Lakes Geologic Mapping Coalition Project; and (3) Priority Ecosystems Studies.

Global Change
(Estimates for 2007, $10.5 million; 2008, $10.5 million; 2009, $0.0)

In 2009, research within the global change area of study has been transferred to a new Global Change budget activity.

Central Great Lakes Geologic Mapping Coalition Project
(Estimates for 2007, $0.5 million; 2008, $0.5 million; 2009, $0.0)

In 2009, research within the Central Great Lakes Geologic Mapping Coalition Project ($0.5 million) has been eliminated. In past years this project contributed to ESDP goals of understanding the interrelationships among Earth surface processes, ecological systems, and human activities by documenting, analyzing and modelling geological and hydrological processes involved in environmental change, as well as providing information on the nature and extent of past climate changes, especially the extent of Pleistocene ice sheet advances in the Midwest.

Priority Ecosystems Studies (PES)
(Estimates for 2007, $2.5 million; 2008, $2.5 million; 2009, $0.0)

In 2009, ESDP-sponsored research within the Priority Ecosystems Studies Project ($2.5 million) has been eliminated. In past years, through PES, ESDP supported interdisciplinary studies of specific ecosystems of critical importance to the Nation, including the Everglades, Chesapeake Bay, San Francisco Bay, the Mojave Desert, and the Platte River. These studies evaluated land use changes and their effects, ecosystem histories and evolution, indices of ecosystem sensitivity to change, and vulnerability of sensitive ecosystems to potential stressors in order to guide the development of restoration and adaptive management strategies for land use managers and other decision makers. Projects within PES will continue through an increase in Biological Research and Monitoring. See page F-1 for further information.

2009 Program Performance

The program accomplishments described below are examples that demonstrate the utility of scientific publications, reports, and other products that result from efforts funded by the program.

Great Lakes — By 2009 the USGS and the State geological surveys of Illinois, Indiana, Michigan, and Ohio, will end activities under the Central Great Lakes Mapping Coalition partnership. This project produced three-dimensional geological maps of the extensive glacial deposits that blanket the upper Midwest. These maps provide a foundation for making economic and environmental decisions related to ground water resources, land, and other natural resources in the Central Great Lakes region.

Priority Ecosystem Studies — In 2009, the ESDP will no longer provide support for PES studies which are described in more detail in the Science on the Landscape section beginning on page F-1. In past years through PES, ESDP supported interdisciplinary studies of ecosystems, including work in the Everglades, Chesapeake Bay, San Francisco Bay, Platte River, Yellowstone, and the Mojave Desert to evaluate land-use changes, ecosystem histories and evolution, indices of ecosystem sensitivity to change, and vulnerability of sensitive ecosystems to potential stressors in order to guide the development of restoration and adaptive management strategies for land use managers and other decision makers. See page F-1 for further

information. PES studies will continue through an increase in Biological Research and Monitoring.

Updates to 2008 Program Performance Targets

Performance targets for 2008 have been updated from those portrayed in the 2008 President's budget. These updates reflect enacted funding levels for 2008. In the case of the ESDP, this involves number of systematic analyses, which were rebaselined to standardize bureauwide counting.

Program Performance Overview

In 2009, all ESDP performance and efficiency measures are transferred to the new Global Change budget activity.

End Outcome Goal: 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment.									
End Outcome Measures Intermediate or PART Measures/PART Efficiency or Other Outcome Measures	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
PART Efficiency and Other Output Measures									
# of annual gigabytes collected **(ESD)**	2.2	2.8	2.8	2.8	2.8	2.8	0	-2.8	0
Comments	2009 transfer out of ESD into the Global Change activity and elimination of program balance.								
# of cumulative gigabytes managed **(ESD)**	8.2	11	13.8	16.6	16.6	19.4	0	-19.4	0
Comments	2009 transfer out of ESD into the Global Change activity and elimination of program balance.								
# of systematic analyses and investigations delivered to customers **(ESD)**	5	6	6	6	38	38	0	-38	0
Comments	Rebaselined 2007 to standardize bureau-wide counting. 2009 transfer out of ESD into the Global Change activity and elimination of program balance.								
# of formal workshops or training provided to customers (instances/issues/events) **ESD**	6	6	6	6	6	6	0	-6	0
Comments	2009 transfer out of ESD into the Global Change activity and elimination of program balance.								

Activity: Geologic Hazards, Resources and Processes

Subactivity: **Geologic Landscape and Coastal Assessments**
Program Component: **National Cooperative Geologic Mapping Program**

	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-) [a/]	2009 Program Changes (+/-) [b/]	2009 Budget Request	Change From 2008 (+/-)
National Cooperative Geologic Mapping Program ($000)	25,239	26,626	+332	+441	27,399	+773
Total FTE	*131*	*131*	*0*	*+3*	*134*	*+3*

a/ Fixed cost increases for this activity total $332 of which $420 is budgeted and $88 is absorbed.
b/ Changes for this activity include a reduction of -$75 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Summary of 2009 Program Changes for National Cooperative Geologic Mapping Program

Request Component	($000)	FTE
• Water for America	+1,500	+3
• National Cooperative Geologic Mapping General Program	-984	0
• Travel reduction	-75	0
TOTAL Program Changes	**+441**	**+3**

Justification of 2009 Program Changes

The 2009 budget request for the National Cooperative Geologic Mapping Program is $27,399,000 and 134 FTE, a net program change of +$441,000 and +3 FTE from the 2008 Enacted level.

Water for America **(+$1,500,000 / +3 FTE)**

In cooperation with the Water Resources Discipline, under the Water for America initiative, the National Cooperative Geologic Mapping Program (NCGMP) FEDMAP and STATEMAP components will work to provide better characterization of the Nation's aquifers, including geologic description and identification of zones of high-quality and poor-quality water. STATEMAP will receive approximately half of the funding.

National Cooperative Geologic Mapping General Program **(-$984,000 / 0 FTE)**

Five hundred thousand dollars of the reduction will come from STATEMAP, which also will reduce the program's leveraging power by an equal amount due to the States' 1:1 match of funds. The remainder of the reduction will be taken from FEDMAP. This will reduce NCGMP capacity related to landslide hazard efforts and wild fires in southern California, reduce geologic

mapping efforts in National Park Service (NPS) units, and end a geologic mapping project along the U.S.-Mexico border.

Program Performance Change

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Plan	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments								
% of U.S. with geologic maps that are being integrated into ground-water availability status and trends to support resource management decisions	5%	6%	8%	10%	12%	13%	+1%	14%
Total projected cost ($000)	11,000	11,000	12,000	12,000	12,000	13,500	1,500	--
Comments	Approximately 47% of total NCGMP budget is devoted to ground-water related studies.							
Systematic analyses and investigations delivered to customers			95	98	98	98	0	103
Total projected cost ($000)			9,500	9,800	9,800	9,800	0	10,300
Actual/projected cost per scientific report or other product (whole dollars)			100,000	100,000	100,000	100,000	0	100,000
Comments	Out-year systematic analyses products are +1 in 2010; +2 in 2011; and +2 in 2012. Definition of systematic analyses was changed to improve consistency of application across the bureau in 2007. NCGMP rebaselined this measure.							

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2009 addresses lagging performance — those changes occurring because of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent outyear.

Program Overview

The NCGMP was created following the passage of the National Geologic Mapping Act of 1992, which was reauthorized in 1997 and 1999 (Public Laws 105–36 and 106–148). In 2008, Congress should reauthorize the Act for the third time. The NCGMP is the primary source of multiple-purpose geologic maps that depict the distribution of the Nation's sediment and rocks and the resources they provide. Geologic maps are vital for exploring, developing, and preserving mineral, energy, and water resources; evaluating and planning for land management and environmental protection; reducing losses from natural hazards, including earthquakes, volcanoes, landslides, and other ground failures; mitigating effects of coastal and stream erosion; siting of critical facilities; and planning for basic Earth science research. In short, geologic maps are the synthesis of Earth science data pulling expertise from many aspects of geology, such as geochemistry, geochronology, paleontology, structural geology, stratigraphy, and geophysics. Geologic maps are three dimensional and provide subsurface data important in the development of models that conceptualize ground water flow, mineral deposition, and earthquake shaking to name a few. The NCGMP represents 15 years of successful cooperation among Federal, State, and university partners in delivering state-of-the-art digital geologic maps to the Nation in a cost-effective, timely manner. Each of these partners has a unique role, yet all work cooperatively to leverage financial resources and to determine the areas of highest priority for new geologic mapping.

This program supports the Department of Interior Resource Protection strategic goal to improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment.

Use of Cost and Performance Information

EDMAP trains the next generation in geologic mapping skills. Minorities have been significantly underrepresented in EDMAP, and in spite of our program's efforts, this has been an intractable issue.

The program is now teaming up with the well-endowed Jackson School (U. Texas Austin) Geoforce Program, which has been successful in getting minority students to major in geoscience.

The cooperative venture effectively leverages their significant knowledge and experience on minority issues with our program's highly successful geologic mapping training program to create a future workforce that better represents the country's population dynamics.

The mission of the NCGMP is to provide accurate geologic maps and three-dimensional frameworks that contribute to sustaining and improving the quality of life and economic vitality of the Nation and mitigating geologic hazardous events and conditions.

Program priorities are outlined in the National Geologic Mapping Reauthorization Act of 1999 (P.L. 106-148) and in the program's 5-Year Plan for 2006-2010. The NCGMP 5-Year Plan has three goals:

- Produce high-quality, multi-purpose digital geologic maps and accompanying databases and reports to solve diverse land-use problems in high-priority areas. Develop three-dimensional geologic frameworks that extend into the subsurface for use in a variety of predictive models, such as ground-water flow, seismic shaking, landslide probabilities, landscape change, and ecosystem health. Measures under this goal deal with increasing regional geologic map coverage of the United States, promoting use of geologic maps by the National Park Service (NPS), water resource managers, and in the mitigation of natural hazards, as well as documenting the Systematic Analyses and Investigations delivered to customers.

- Make geologic map information more accessible to the public by providing geologic maps, reports, and databases in a variety of digital formats. Preserve and make accessible the extensive USGS paleontologic collections and accompanying databases. Measures under this goal document the maps/reports that are made accessible on the internet through the National Geologic Map Database (*http://ngmdb.usgs.gov/*), and the information provided to our customers through formal workshops and training.

- Ensure that the NCGMP will have the capabilities/work force to meet the future needs of the Nation. Measures include documenting how students trained through the EDMAP component of the program use their mapping experience to further their geoscience education and careers.

Over the past few years, geologists within the NCGMP have been working to advance and improve the production of geologic maps through the use of new field mapping techniques that streamline the process from data collection to map production. NCGMP has established ambitious targets to make the process even more efficient and will continue to collect quantitative data on the success of these improvements.

> "Geologic map data improved our ability to manage the Manti-La Sal National Forest. Without such data, our planning and project analysis would be incomplete, missing the vital geologic component."
>
> Howard Sargent
> Forest Supervisor
> Manta-La Sal National Forest, Utah
> October 23, 2007

The NCGMP priorities are reviewed annually by a congressionally mandated Federal Advisory Committee (FAC), which includes representatives from the U.S. Department of Energy (DOE), U.S. Department of Agriculture (USDA), the Office of Science and Technology Policy (OSTP), U.S. Environmental Protection Agency (EPA), State geological surveys, academia, and the private sector. Progress and status reports on the NCGMP are prepared for the Secretary of the Interior to deliver to the Committee on Resources of the House of Representatives and the Committee on Energy and Natural Resources of the Senate. In addition, State Mapping Advisory Committees in 48 States meet each year to prioritize local geologic mapping needs and assist USGS managers in modifying and prioritizing long-range plans. These priorities are based upon customer needs for the maps.

> "The Department of Transportation has begun the process of …widening...Interstate Route 81… to accommodate truck climbing lanes. The mapping performed by your staff has provided us with the base upon which to develop our understanding of the complex geology of this area. This will have a fundamental influence upon our conceptual treatment of the group to be engineered for our roadway."
>
> Stanley L. Hite
> Commonwealth of Virginia Department of Transportation
> October 2, 2007

In 1987, geologic maps had five primary applications: oil and gas, metals, industrial minerals, ground water, and coal, listed in decreasing order. By 2007, the number of justifications has increased and broadened dramatically, as can be seen in Figure 1.

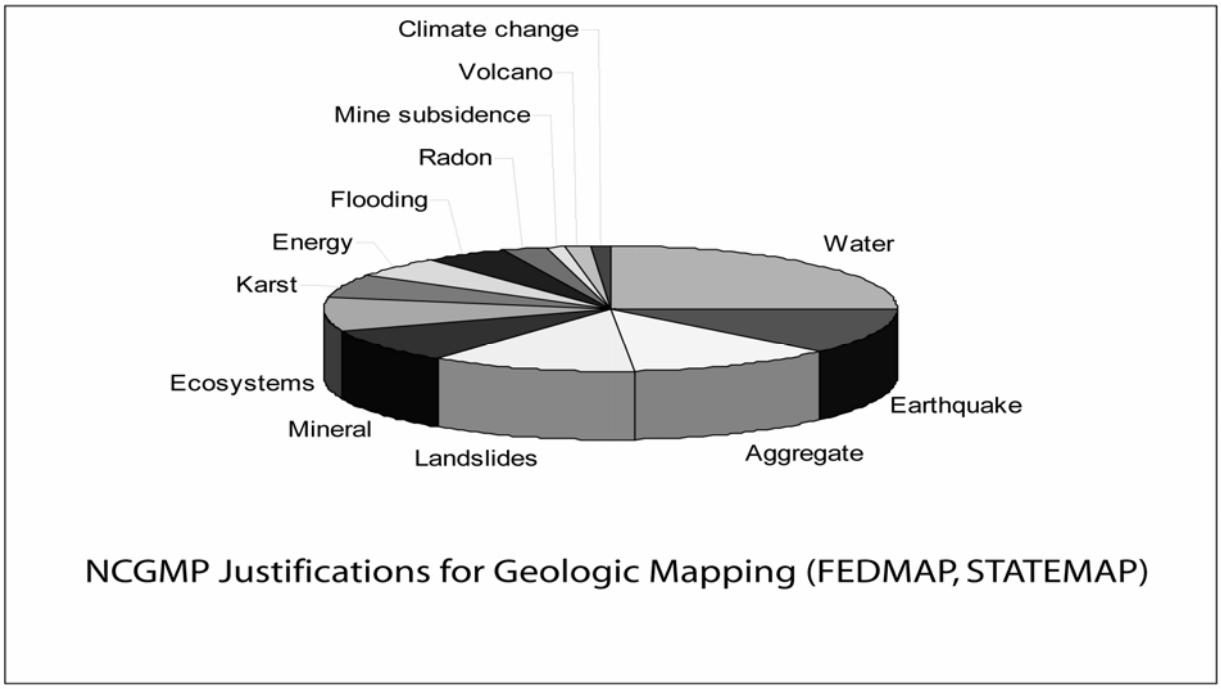
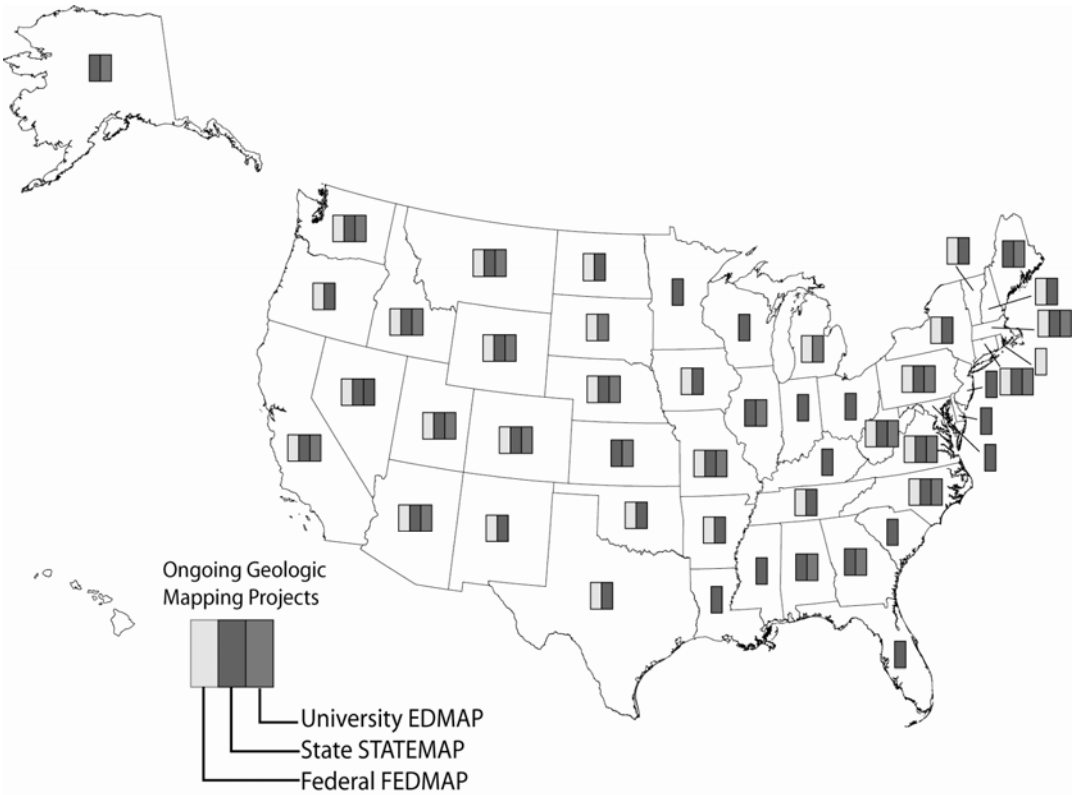


Figure 1. Water (25%), Earthquakes (12%), Aggregates (12%), Landslides (12%), Minerals (9%), Ecosystems (9%), Karst (6%), Energy (5%), Flooding (5%), Radon (2%), Mine Subsidence (1%),Volcano (1%), and Climate Change (1%).

The Energy Policy Act of 2005 contains section 2011, Preservation of geological and geophysical data. This section calls for the establishment of the National Geological and Geophysical Data Preservation Program (NGGDPP) within the USGS, which is to “archive geologic, geophysical, and engineering data, maps, well logs, and samples [and] provide a national catalog of such archival material”. In addition to its duties under the National Geologic Mapping Act, the NCGMP FAC is charged by this act to develop guidelines and procedures for and to review progress of the NGGDPP.

The NCGMP carries out the Mapping Act through three main program components: FEDMAP, STATEMAP, and EDMAP. Each year, panels that include scientists from Federal and State governments and academia critically review all work plans that are submitted to the three components.



FEDMAP

(Estimates for 2007, $17.45 million; 2008, $17.93 million; 2009, $18.37 million)

The FEDMAP component currently supports, totally or in part, 32 regional geologic mapping and synthesis projects that cross jurisdictional boundaries or involve work on Federal lands. These projects are located primarily within three regional teams of the USGS: Western Earth Surface Processes Team, Central Earth Surface Processes Team, and Eastern Earth Surface Processes Team. However, NCGMP also funds interdisciplinary projects with the Mineral Resources Program, Earthquake Hazards Program, Landslide Hazards Program, and the Ground Water Resources Program. Most of these projects have a lifespan of approximately 5 years. In 2008, studies are being undertaken in 38 States. The program also partially supports a number of geochronology and other common-use laboratories in the Geologic Discipline and the National Geologic Map Database Project (NGMDP), which represents a major cooperative effort with the Association of American State Geologists to serve information about all geologic maps produced in the United States. New and ongoing geologic mapping work plans are evaluated annually by a FEDMAP Review Panel, which includes representatives from State geological surveys, NPS, Fish and Wildlife Service (FWS), USGS Water Resources Discipline (WRD), and USGS scientists with diverse scientific backgrounds.

The NGMDP is an ongoing effort with State geological surveys, universities, the Canadian Geological Survey, and the Consejo de Recursos Minerales, Mexico, to present all geologic mapping data from North America on one Web site and with a common set of map standards. Additionally, users can access information on current geologic mapping activities and the proper use of geologic names. The project's Web site serves more than 40,000 users per month. In

2006, thousands of new bibliographic map records were added to the map catalog, and there was an increased effort to obtain information from State geological surveys.

Through a Science in the Parks effort, the NCGMP is the principal USGS partner coordinating and prioritizing geologic mapping studies with the NPS. This decade-long effort is now an integral component of the FEDMAP program, and the NCGMP is committed to working with NPS well into the future. Projects are developed and selected jointly by the NPS and the USGS to merge the Earth science information needs of individual parks with the geologic mapping mission of the USGS. The resulting geologic data is made available in digital, as well as standard, formats that are needed for NPS land-use management, educational outreach, inventory, and monitoring of natural resources. NCGMP-funded projects also work with other Federal land management agencies (e.g., FWS, Bureau of Land Management (BLM), and the U.S. Forest Service).

STATEMAP

(Estimates for 2007, $7.32 million; 2008, $7.52 million; 2009, $8.42 million)

The STATEMAP component currently supports geologic mapping studies by 45 State geological surveys through a competitive grant program that matches every Federal dollar with a State dollar. Since 1993, more than $65 million have been matched by 48 States. Mapping priorities are determined with the help of State Mapping Advisory Committees in each State, which include representatives from all levels of government, the private sector, academia, and industry. Currently, more than 500 individuals offer their time on these committees to prioritize geologic mapping needs.

EDMAP

(Estimates for 2007, $0.57 million; 2008, $0.60 million; 2009, $0.61 million)

The EDMAP component supports the training of a new generation of geologic mappers in universities and colleges through a competitive matching-fund grant program. Since EDMAP's inception in 1996, more than $5.0 million from the NCGMP have supported geologic mapping efforts of more than 600 students working with more than 220 professors at 136 universities in 44 States, the District of Columbia, and Puerto Rico. Funds for graduate projects are limited to $15,000 with undergraduate project funds limited to $7,500. These funds are used to cover field expenses and map production, but not faculty salaries. The college or university matches the EDMAP funding.

In 2007, the NCGMP continued a career study of EDMAP students that was begun in 2004. Students are sent a questionnaire 3 years after completion of their EDMAP experience. The results clearly demonstrate that EDMAP students: (1) fall well above the national average for pursuing advanced academic degrees in the geoscience field, (2) easily obtain geoscience positions due to the knowledge gained through the EDMAP experience, and (3) frequently use the geologic mapping skills gained through the EDMAP. In fact, several of our past EDMAP students, now teachers/professors, are applying for EDMAP grants for their students.

2009 Program Performance

Although NCGMP-funded projects provide support for all of the Bureau’s scientific themes, approximately 70 percent of FEDMAP projects and 95 percent of STATEMAP projects have

some involvement with water issues. One of the program's Program Assessment Rating Tool (PART) measures (percent of United States with geologic maps that are being integrated into ground-water availability status and trends to support resource management decisions) complements the USGS WRD measure: percent of principal aquifers of the United States with ground-water availability status and trends information to support resource management decisions. WRD cannot meet their goal effectively without using information from geologic maps and related information provided by NCGMP scientists because the geologic formations mapped in the subsurface define (1) the shape of the aquifers (the vessels that hold the ground water), (2) how much water can be stored in them, and (3) parameters for water movement through the ground. For example, geologic data gathered about the Arbuckle-Simpson aquifer in Oklahoma will be incorporated into USGS WRD's multi-layer ground-water model of the region.

Because NCGMP-funded projects have worked on ground-water issues for many years, the program is well-suited to play a major role in the proposed 2009 Water for America initiative, which is aimed at long-term monitoring and assessment of the country's water resources. The Water for America initiative is intended to provide citizens, communities, and natural-resource managers with a clearer knowledge of the status of the Nation's water resources. NCGMP will use its partnership with State geological surveys through the STATEMAP component to achieve the goals of characterization of aquifer systems and understanding ecological flow.

2008 is the final year for several FEDMAP water-related projects that will provide significant information for the Water for America initiative. With the completion of these projects, the program is in an excellent position to work in cooperation with WRD to develop new projects that are tailored to meet the needs of the census. Concluding projects worked to understand how (1) the Chesapeake Bay Impact Crater affected the ground water of the region, (2) geology influences ground-water availability, movement, and contamination in the western United States, (3) glacial deposits influence ground-water and aggregate-resource availability, and (4) geology has influenced the topography, water, soils, and plant and animal communities of the Appalachian Blue Ridge Mountains.

As NCGMP-funded projects complete and distribute water-related products, they are then available for use by our customers:

- Geologic mapping information in the Lake Mead area is being used for local groundwater studies driven by rapid urban growth in SE Nevada and NW Arizona.
- Core drilling and analysis of Coastal Plain sections within and above the Chesapeake Bay impact structure provided detailed litho- and biostratigraphic data used in a recent compilation of a Virginia hydrostratigraphic framework, an essential element in the creation of the new Virginia Coastal Plain ground-water model, a resource management and regulation tool.
- The Winter Park West water and sanitation district, which includes the rapidly expanding towns of Fraser and Winter Park, will be financing a cooperative study between the University of Colorado and the USGS on the availability and quality of ground-water resources in Winter Park-Fraser area.
- The USGS WRD received geologic cross sections and narrative that synthesize the geologic framework and history of sedimentation in the San Gorgonio Pass basin. These findings have been incorporated into a ground-water modeling report provided to the San Gorgonio Pass Water Agency, which is using the data to manage ground water in an area that has one of the highest rates of population growth in southern California.

- A bedrock geologic map and related report has contributed to the NAWQA (National Water-Quality Assessment Program) TANC (Transport of Anthropogenic and Natural Contaminants to supply wells) topical study in the Pomperaug River aquifer near Woodbury, CT. One of the geologic units has been identified as a possible source of naturally-occurring arsenic and uranium in wells.

Many NCGMP-funded projects also provide useful information for predicting and dealing with natural hazards, such as landslides, earthquakes, and volcanoes. A program PART measure counts the number of counties or comparable jurisdictions that have adopted hazard mitigation measures based in part on geologic mapping and research. For example, in the multi-county area of southern California where recent forest fires have destroyed 800,000 acres, the USGS has provided FEMA with landslide risk assessment maps. These maps are being used to help make decisions on road closures and home evacuations. The program also funds a recently begun project that is constructing 3-dimensional maps through time of earthquake-induced ground shaking. These maps, based on accurate geologic parameters, offer enormous help in earthquake disaster planning and mitigation efforts.

Through a Science in the Parks effort, the NCGMP is the principal USGS partner coordinating and prioritizing geologic mapping studies with the NPS. This decade-long effort is now an integral component of the FEDMAP program, and the NCGMP is committed to working with NPS well into the future. NCGMP now has a PART measure for this effort: percent of geologic investigations in NPS units that are cited for use by the NPS within 3 years of delivery. Projects in park units are selected and developed jointly with the NPS and the USGS to merge the Earth science information needs of individual parks with the geologic mapping mission of the USGS. The resulting geologic data is made available in digital, as well as standard, formats that are needed for NPS land-use management, educational outreach, inventory, and monitoring of natural resources. NCGMP-funded projects also work with other Federal land management agencies (e.g., FWS, Bureau of Land Management (BLM), and the U.S. Forest Service). At the request of the NPS, and with some funding from them, USGS has been constructing a geologic map of Big Bend National Park. NPS ranks this the second most important national park to receive new geologic mapping. The map is greatly needed for park managers to understand and make decisions related to potential toxic concentrations of heavy metals in the groundwater, springs, and surface water of the park. In 2008, final compilation of the map will occur.

> "Better understanding of the groundwater and geologic resources will more effectively support our comprehensive planning initiatives, guide decision making related to economic development opportunities, and address groundwater quality and quantity issues for our citizens. We have already used information provided to us on bedrock geology and stratigraphy to guide well construction for new residential developments and well location for an ethanol plant."
>
> Scott A. Godfrey
> Office of Planning and Development
> Iowa County, Wisconsin. October 5, 2007

NCGMP anticipates that approximately 45-47 State geologic surveys and 40 universities will receive financial support in 2009 from NCGMP through our grant programs. These projects will produce over 400 new geologic maps and train approximately 60 students.

PART Findings and Recommendations and Program Progress

The NCGMP was reviewed by the PART in 2005 for the 2007 budget and received a score of 81, "moderately effective." Performance measures resulting from the PART are shown in the performance tables for the Geology programs.

In response to the PART findings for the NCGMP to conduct "regular, independent reviews of the program," in 2007, the American Association for the Advancement of Science (AAAS) conducted a review of the program. In response to “increasing integration of geologic information to facilitate analysis and decision making,” the program developed a method to distribute scanned versions of EDMAP geologic maps through the National Geologic Map Database. In response to “setting standards for data collection, preservation and exchange,” the program created a liaison position for the NGGDPP to coordinate preservation of all USGS paleontologic collections and associated data and to develop protocols for their transfer to the Smithsonian. In addition, the two programs worked together to develop an Internet-based search function for finding USGS paleontologic information.

The USGS has submitted a new PART Improvement Plan for 2008, and NCGMP is implementing the following actions in 2008:

- Implement findings from the 2007 AAAS review of the NCGMP by using the Geologic Discipline Workforce Plan and the new NCGMP 5-Year Plan to determine appropriate critical geologic expertise to replace in the three geologic mapping teams,
- Increase NCGMP integration of geologic mapping efforts between State geological surveys and USGS efforts, and
- Develop plans for publishing NCGMP-funded legacy data. As geoscientists move from an ending project to a new project, there can be products left behind that are near completion, but which lack sufficient time and funding to complete in the new project. The program will develop a method for setting priorities for these “legacy” products and a plan for getting them published.

Updates to 2008 Program Performance Targets

Performance targets for 2008 remain unchanged from those portrayed in the 2008 President's budget and reflect enacted funding levels for 2008.

Program Performance Overview

End Outcome Goal: 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment.									
End Outcome Measures Intermediate or PART Measures/PART Efficiency or Other Outcome Measures	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
GPRA End Outcome Measures									
% of targeted science products that are used by partners for land or resource management decision making **(SP)**	85%	90%	93%	≥90%	93%	≥90%	≥90%	0	≥90%
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure availability of long-term environmental and natural resource information, data and systematic analyses needed by land and resource managers for informed decision making**									
X% of U.S. with regional geologic map coverage that is available to customers through the NGMDB **(PART)**	50.25%	53%	55%	57.5%	60.4%	63%	65%	+2.0%	71%
Total Projected Square Mile Cost ($000)						23,460,090			28,260,090
Projected Cost per Square Mile (whole dollars)						1,750			1,750
X% of geologic investigations in NPS units that are cited for use by the NPS within 3 years of delivery **(NCGMP PART)**	UNK	80%	80%	80%	100%	80%	80%	0	80%
Comments	2007 actual exceeded target. Only one geologic map within National Park Service units was completed in 2004, and this map was used by NPS.								
X% of EDMAP students that work on subsequent geoscience degrees or obtain a job in a geoscience field **(NCGMP PART)**	95%	94%	95%	95%	94%	95%	95%	0	95%
X% of U.S. with geologic maps that are being integrated into ground-water availability status and trends to support resource management decisions **(NCGMP PART)**	3%	5%	6%	8%	8%	10%	13%	+3%	14%
Comments	2008 Plan reflects program growth. 2009 reflects Water for America projects +1.								
# of counties or comparable jurisdictions that have adopted hazard mitigation measures based in part on geologic mapping and research **(NCGMP PART)**	UNK	10	12	14	14	14	15	+1	16
PART Efficiency and Other Output Measures									
# of annual gigabytes collected **(NCGMP)**	405	110	200	200	1,525	200	200	0	200

Geologic Landscape and Coastal Assessments

End Outcome Goal: 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment.									
End Outcome Measures Intermediate or PART Measures/PART Efficiency or Other Outcome Measures	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
GPRA End Outcome Measures									
# of cumulative gigabytes managed (**NCGMP)**	840	950	1,150	1,350	2,675	2,875	3,075	+200	3,675
# of systematic analyses and investigations delivered to customers **(NCGMP)**	5	5	9	100	95	98	98	0	103
Comments	Water for America projects = +0 in 2009=98; +1 in 2010=99; +2 in 2011=101; +2 in 2012=103								
Total actual/projected cost per student ($000)				10,000	9,500	9,800	9,800	0	10,300
Actual/projected cost per student (whole dollars)				100,000	100,000	100,000	100,000	0	100,000
# of formal workshops or training provided to customers (instances/issues/events)	10	10	10	10	10	10	10	0	10
# of hours for fieldwork, compilation, and publication of a typical geologic map **(NCGMP PART Eff. Measure)**	3,160	3,070	2,980	2,890	2,890	2,810	2,810	0	2,700
# of State Geological Surveys that add geologic map information to the NGMDB **(NCGMP PART)**	47	48	49	50	50	51	0	-51	Measure ends in 2008 at 51
# of EDMAP students trained each year **(NCGMP PART)**	60	62	66	60	58	60	60	0	60
Total actual/projected cost per student ($000)				7,300		7,300			7,300
Actual/projected cost per student (whole dollars)				473,000		473,000			473,000

Activity: Geologic Hazards, Resources and Processes

Subactivity: **Geologic Landscape and Coastal Assessments**
Program Component: **Coastal and Marine Geology**

	2007 Actual	2008 Enacted	2009			Change From 2008 (+/-)
			Fixed Costs & Related Changes (+/-) [a/]	Program Changes (+/-) [b/]	Budget Request	
Coastal and Marine Geology ($000)	39,674	40,646	+495	+6,298	47,439	+6,793
Total FTE	*213*	*214*	*0*	*+7*	*221*	*+7*

a/ Fixed cost increases for this program total $495 of which $625 is budgeted and $130 is absorbed.
b/ Changes for this program include a reduction of -$202 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Summary of 2009 Program Changes for Coastal and Marine Geology Program

Request Component	($000)	FTE
• Ocean and Coastal Frontiers		
• Extended Continental Shelf	+4,000	0
• Improving Ocean and Coastal Resources through Collaboration	+2,000	
• Ocean Action Plan – Coastal and Marine Geology Program	+500	0
• Travel reduction	-202	0
TOTAL Program Changes	**+6,298**	**+7**

Justification of 2009 Program Changes

The 2009 budget request for the Coastal and Marine Geology Program is $47,439,000 and 221 FTE, a net program change of +$6,298,000 and +7 FTE from the 2008 Enacted level.

Oceans and Coastal Frontiers **(+$6,500,000 / +7 FTE)**

The Department of the Interior's Ocean and Coastal Initiative builds on work begun in response to the U.S. Ocean Action Plan (OAP) issued on December 17, 2004 and the January, 2007 Ocean Research Priorities Plan (ORPP) (*http://ocean.ceq.gov/about/docs/orppfinal.pdf*). Through Executive Order and the OAP, the President directed that Federal agencies enhance existing partnerships by expanding coordination and consultation on ocean-related matters and encouraged State collaborations with Federal agencies to address regional ocean and coastal issues. The Department of the Interior has developed an Ocean and Coastal Frontiers Initiative that addresses Department, OAP, and National priorities as well as needs of developing regional ocean governance alliances. This request supports the USGS component of the broader departmental Ocean and Coastal Initiative.

Partnerships are crucial to this initiative's success and include NOAA, EPA, U.S. Army Corps of Engineers (USACE), the Office of the Secretary of the Interior, Minerals Management Service (MMS), Fish and Wildlife Service (FWS), National Park Service (NPS), and Office of Insular Affairs (OIA).

The USGS implementing program for the Ocean and Coastal Initiative is the Coastal and Marine Geology Program (CMGP) which draws upon expertise across the USGS. This initiative builds upon base-funded activities and enhances efforts supporting the near-term priorities of the ORPP initiated in the 2008 budget. Proposed activities will be substantially leveraged with external resources and expertise to provide services and products in the most efficient and cost-effective manner.

The overall Department's Ocean and Coastal Frontiers Initiative includes $7.0 million for the USGS and $0.9 million for FWS, with $6.5 million going to the CMGP and an additional $0.5 million will continue OAP efforts within the Water Resources Investigations - Hydrologic Networks and Analysis. The Coastal and Oceans Frontier Initiative is described in more detail in the Science on the Landscape section beginning on page F-1.

The USGS is the lead bureau for these initiative elements. The CMGP components include:

- **Extended Continental Shelf: Expanding the Frontiers of Scientific Information ($4,000,000)** — USGS CMGP will provide the geologic base for development of a successful claim to the U.S. Extended Continental Shelf (ECS) that will vastly increase the area of public lands for which the Department has management and regulatory responsibility.

- **Improving Ocean and Coastal Resources through Collaboration ($2,000,000)** — USGS CMGP will develop, in collaboration with other Federal agencies, the tools, information, and management frameworks required to address pressing national issues where they are deemed critical to regional priorities.

- **Ocean Action Plan – Coastal and Marine Geology Program ($500,000)** — This increase will engage and enhance existing regional coastal ocean observing systems (RCOOS) and, in partnership with other federal agencies, apply USGS monitoring, mapping, and modeling capabilities to the development of science-based decision-support tools for coastal managers. Activities supported will advance the near-term priorities of the ORPP.

Activities supported through this initiative will advance the broad goals of the USGS Science Strategy (*Facing Tomorrow's Challenges – U.S. Geological Survey Science in the Decade 2007-2017*, USGS Circular 1309, 2007) with respect to Understanding Ecosystems and Predicting Ecosystem Change; Climate Variability and Change; and National Hazards, Risk, and Resilience Assessment. Additionally, this initiative will enable USGS to reach goals set by (1) the USGS National Coastal Program Plan (NCPP); (2) the OAP and ORPP; and (3) the emerging Regional Ocean Governance Alliances.

The USGS will build on existing partnerships with NOAA, EPA, USACE, and other Interior bureaus.

- Partnerships will (1) provide and integrate monitoring and mapping data from existing and enhanced programs and (2) establish the observational basis for regional forecasting and assessment.
- USGS leadership in water quality and hydrologic monitoring, ecosystem monitoring, and geologic and landscape mapping of coastal and submerged resources will be integrated (e.g., NOAA bathymetric mapping, tide and water level monitoring, and physical modeling, and USACE coastal mapping and monitoring to provide an observational framework for decision-support, models and assessments). Observational programs established by RCOOS will be important contributors.
- Existing interagency collaborative efforts will (1) enhance developing integrated ocean observing systems and (2) through the National Water Quality Monitoring Council-led implementation of the National Water Quality Monitoring Network (NWQMN), facilitate inventory and fill gaps in regional upland, estuarine and coastal monitoring, including physical, biological, and ecological responses. NOAA support for Integrated Ocean and Coastal Observing System Regional Associations will contribute to stakeholder engagement and outreach efforts to prioritize observing needs and integrate observing networks into decision support tools.
- Supported activities, including external community efforts, will result in physical and ecosystem modeling tools that provide critical information for anticipating hazard vulnerability, contaminant and pathogen movement, and ecological and human impacts.

Through this initiative, the USGS will support activities including the following.

- **Ocean Research Priorities Plans —** USGS will build upon a wide range of regionally-based efforts defined by governors.
- **Merit-based efforts will**:
    - Respond to needs identified by regional alliances and enhance provision of scientific information and research products to inform decisionmaking on issues including hazard resilience, resource conservation and restoration, water quality, and public health,
    - Build upon or enhance current topically based efforts such as Ecosystem-based science to evaluate and adaptively manage coral reef Marine Protected Areas and Climate change tools to study response of ecosystems to changing physical and chemical conditions,
    - Translate observations and research on coastal processes, coastal hazards, and managing coastal change into user-friendly decision support tools and applications,
    - Contribute to the coordinated Federal implementation of the ORPP near-term priority “Forecasting the Response of Coastal Ecosystems to Persistent Forcing and Extreme Events”, and
    - Leverage funding and in-kind contributions to maximize science impact and results.

Examples of possible efforts are:

- Rebuild for a Disaster Resilient Gulf Coast — Support data integration and modeling of barrier island and coastal response to severe storms and regional assessments of sand resources to inform restoration and management of coastal

barrier islands; providing tools to assess the feasibility and effectiveness of alternative strategies to enhance ecosystem health and hazard resilience,

- Manage Coastal Change Impacts on Ecosystems and Coastal Communities on Long Island — Assess system wide distribution, transport, and accumulation of sediment and associated contaminants to determine response of coastal resources, including coastal ground water, to sea-level rise and storms; providing resource managers tools to anticipate the impacts of future change and the effectiveness of management strategies,
- Forecast Water Quality and Beach Health in the Great Lakes — Enhance monitoring, consistent with the NWQMN, and integrate observations and models to improve forecasts of pathogens on recreational beaches and water quality; providing tools to reduce human health risks and economic impacts associated with impaired water quality and beach closures,
- Map and Monitor San Francisco Bay/Delta and Coastal Ocean — Conduct mapping and monitoring in support of model development to understand regional sedimentary systems and forecast the evolution of natural, human-altered, and restored coastal landscapes; providing tools to assess the vulnerability of coastal resources, including restored habitat, to natural processes and human activities, and
- Science for Puget Sound Partnership — Evaluate alternatives for restoration of critical habitat; develop tools for State and Tribal agencies that can evaluate the effects of urbanization on components of ecosystems and the effectiveness of different restoration techniques.

Program Performance Change

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan+ Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments.								
# annual gigabytes collected			8	8	8	25	+17	25/year
# cumulative gigabytes managed			79	87	95	112	+17	187
Comments	Increased gigabytes beginning in 2009 are associated with gigabytes of data managed by the CMGP for seafloor mapping of the ECS, within Ocean and Coastal Frontiers Initiative.							
# systematic analyses and investigations delivered to customers			218	200	200	205	+5	+15

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan+ Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
Total Actual/Projected Cost per investigation ($000)			33,745	34,549	34,549	40,323	+5,774	+197,000/ year
Actual/Projected Cost Per investigation (whole dollars)			155,000	173,000	173,000	197,000	+24,000	+40,323/ year
Comments	Rebaselined in 2007 to standardize bureau-wide counting. 2009 Budget has proposed +5 for the Ocean and Coastal Frontiers Initiative beginning in 2009 and +15 additional systematic analyses delivered in the outyears.							
# formal workshops or training provided customers (instances/ issues/events)			11	11	11	15	+4	+5
Total Actual/ Projected Cost of workshop ($000)			277	300	275	375	+75	25/year
Actual/Projected Cost Per Workshop (whole dollars)			25,200	27,200	25,000	25,000	0	25,000/ year
Comments	Funding requested in 2009 results in 4 new workshops to be delivered in 2009; +2 in 2010; +1 in 2011 and +2 in 2012. Variation in location of workshops results in the differences in average costs.							
# environmental products in marine protected and managed areas provided for resource mgt and restoration planning			72	75	75	81	+6	+6

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent outyear.

Program Overview

Reducing Coastal Pollution Realized through Regional Cooperation

The U.S. Geological Survey Woods Hole Science Center was instrumental in bringing together a multidisciplinary research program to map the geology of the Boston Harbor seafloor, to carry out long-term geochemical observations and to develop numerical models of sediment transport in this coastal system that has received waste water since colonial times. Application of this project's results has saved millions of dollars in public money in construction costs during the $4 billion modernization of greater Boston's wastewater-treatment facilities.

Frederick A. Laskey,
Executive Director,
Massachusetts Water Resources Authority

The CMGP maintains and applies capabilities in marine geology, geophysics, geochemistry and oceanography to provide information and research products on geologic conditions and processes critical to the management of the Nation's coastal and marine environments. The CMGP addresses a broad suite of national issues in the thematic areas of natural hazards, environmental quality and human health, and natural resources requiring credible and objective scientific data, information, and understanding. As the primary Federal marine geologic research, information, and knowledge provider, the CMGP develops, maintains, and delivers information, technologies, and products that provide Federal, State, and local agencies and the public the authoritative, scientific basis for regulating, managing, and protecting the Nation's coastal and marine resources and communities. Program objectives spanning the thematic program components include:

- Characterization of geological setting, processes, and change at regional or system scales as required to provide the framework understanding for management and policy in response to a broad range of issues — Framework development and synthesis of geologic information and understanding is the foundation for USGS research activities to understand and model the physical processes that control the status, function, and evolution of coastal and marine systems and the resulting environmental, hazard, and resource implications for human and environmental health, economic growth, public safety, and resource use, protection, and management.

- Development of regional and national hazard, resource and environmental assessments of coastal and marine condition, change and vulnerability to human and natural processes — Regional geological framework development and topical research on geological processes provides the foundation for development of assessment products.

- Development of broadly applicable models of coastal and marine evolution and change — Geologic framework development and process understanding provides the basis for development and evaluation of hindcast and forecast models. Model application to specific issues and settings, expanding the range of relevant applications, is supported by regional information development and targeted process studies.

Use of Cost and Performance Information

In 2009 CMGP will establish interagency objectives and performance measures for ORPP priority studies through interagency collaboration in study design, review, and implementation. Particular emphasis will be placed on evaluating the increased accessibility of coastal and ocean mapping information using the Federal Geographic Data Committee / Geospatial One-Stop (FGDC/GOS) portal. Feedback will be gathered from Interagency Working Group on Ocean and Coastal Mapping (IWG-OCM) agencies.

During 2007, CMGP analyzed expenditures for equipment needed to ensure availability of best technology for meeting future challenges for vital scientific data gathering on the ECS.

Overall direction of CMGP activities is established by a 5-Year Plan. The plan reflects internal and external inputs such as the USGS and Department's strategic plans and periodic reviews of the program and program elements by the National Academy of Sciences (NAS). The CMGP is also broadly directed by the objectives of the National Coastal Program Plan (2003) submitted to Congress by the USGS. The overall goals of this program are to (1) provide the scientific information, knowledge, and tools required to ensure that land and resource use decisions, management practices, and future development in the coastal zone and adjacent watersheds can be evaluated with a complete understanding of the effects on coastal ecosystems and communities and (2) provide a full assessment of the vulnerability of coastal and marine ecosystems and communities to natural and human-driven changes.

The CMGP supports the Department's Resource Protection strategic goal to improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment. GPRA goals for project and program outputs, including analyses, models, information resources, and workshops to transfer information and capabilities are established as part of the program planning process and performance is evaluated quarterly and annually.

In pursuit of these goals, the CMGP develops and implements national, regional, and topical studies that advance knowledge relevant to national issues. Program activities are developed in response to long-term program objectives, partner needs, and potential to leverage USGS resources with partner resources to effectively meet shared objectives. Leveraging or cost-sharing provides partners access to unique USGS capabilities while enhancing the cost-effectiveness of USGS mission activities. Historically partners provide 7 to 10 percent of funding for program activities, with significant in-kind contributions additionally provided through collaborative studies developed to respond to critical needs identified by stakeholders. This practice ensures that study products have immediate application while advancing long-term program objectives. Regional studies are designed to provide essential framework information to Federal, State, and local managers with respect to specific issues/topics as well as providing broadly applicable information products. Topical studies, often implemented within regional efforts, are designed to develop fundamental information that has broad applicability. Synthesis of regional and topical studies provides the basis for national assessments and products. Project work plans submitted to the CMGP are reviewed annually by internal and external scientists and managers knowledgeable in the relevant area of proposed and ongoing work. Reviewers provide guidance that informs program and project directions and implementation.

The CMGP supports research projects implemented primarily by the Coastal and Marine Geology centers in Woods Hole, MA, St. Petersburg, FL, and Menlo Park and Santa Cruz, CA. The CMGP uses the expertise found in other USGS science centers as well as external cooperators (academic, State) to ensure needed capabilities are employed in program activity.

2009 Program Performance

At the 2009 funding level, program performance will be maintained at established levels, except for increases in production of products related to new mapping of the ECS and collaborating with regional partnerships. With increased stakeholder input, largely the result of workshops and meetings with State consortium and with regional ocean councils during 2008, there will be expansion of integrated studies of coastal systems from California and the Gulf of Mexico to the Great Lakes and the Pacific Northwest. Lessons learned from hazard and environmental

studies in the southeastern and mid-Atlantic United States during 2007 and 2008 will be applied the Long Island and northeast national seashores.

With the deadline rapidly approaching for delineating U.S. limits in the ECS, USGS is supporting departmental priorities for Expanding the Frontiers of Scientific Information. USGS will conduct substantial and targeted seafloor mapping activities, using sophisticated equipment, and experienced scientists and field data collection crew members, who will collect and interpret large-volume geophysical and geological data. USGS Federal leadership in geological characterization will marshal interagency resources and engage external technical expertise to establish and document ECS limits. The resulting establishment of U.S. ECS limits will vastly increase public land areas and resources over which the Department will have management and regulatory responsibility. During 2008, USGS and members of an Interagency Task Force on the ECS will initiate data collection on the Arctic. The 2009 target locations will be set based upon the results of that mission.

Program changes (Ocean Action Plan and Ocean and Coastal Frontiers) will have a medium impact on 2009 performance. The number of interactions with partners will increase. The proposed increase will result in greater number of gigabytes of data managed (+17 annually) by the CMGP for ECS seafloor mapping, for evaluation and implementation of tools for coastal managers, and for data collection and modeling of coastal change associated with extreme weather events. Additionally, the proposed increase will allow CMGP to address maintaining skills and capacity to critical seafloor mapping techniques associated with mapping the Arctic terrain (work begun in 2008). Systematic analyses will increase by +5 and workshops or training will increase by +4 in 2009.

PART Findings and Recommendations and Program Progress

The CMGP was reviewed using the Administration's Program Assessment Rating Tool (PART) process in 2006 and received an initial rating of "moderately effective." Program performance measures were established as part of that process, including output, outcome, and efficiency measures.

The 2007 PART recommendations for improvement included:

- Establish USGS-wide performance measures for priority coastal activities along with program partners,
- Establish and implement procedures for engagement of Federal resource management agencies in planning of program activities, design of products, and setting of joint priorities, and
- Increase coordination and provision of coastal and ocean mapping activities and information across Federal and non-Federal agencies.

Action Plans have been developed to carry out PART recommendations, with milestones being met on schedule.

The CMGP has provided leadership within USGS to coordinate bureau-wide coastal activities and is developing targets on all bureau-level actions to ensure long-term progress is measured.

Performance measures resulting from the PART are shown in the performance tables for the Geology programs, and the USGS submitted a new PART Improvement Plan for 2008. As a

result of PART recommendations and associated performance measures, the USGS implements the following actions in 2008:

- Establish USGS-wide objectives and performance measures for ORPP priority coastal ecosystem studies through regional and program collaboration in study design, review, and implementation,
- Establish interagency objectives and performance measures for ORPP priority studies through interagency collaboration in study design, review, and implementation, and
- Develop measures for enhancements in provision of coastal and ocean mapping information across Federal and non-Federal agencies.

The CMGP reports output measures that represent both specific individual technical products (maps, technical reports) and substantial bodies of information and research results under thematic areas of national importance. In 2007 the CMGP met annual output performance targets to provide substantial enhancements to the available scientific knowledge base in the areas of:

- Earthquake hazards in southern California,
- Contaminants in New York/New Jersey coastal and marine sediments,
- Characterization of Atlantic sea-floor habitats,
- Sedimentation and contaminant inputs to Lake Mead and Lake Mojave, and
- Gas Hydrates research and assessment.

These scientific products form the basis for outcome measures which evaluate the use, application, and impact of CMGP products. In 2007 the program assessed external stakeholder valuation of products resulting from major long-term program efforts including:

- Coral Ecosystems,
- Tsunami Hazards,
- Pacific Benthic Habitats,
- Law of the Sea, and
- National Assessment of Coastal Change Hazards.

For 80 percent of these major program elements, stakeholders identified specific applications of CMGP products that informed and improved their decision-making.

Program Performance Overview

End Outcome Goal: 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment.									
End Outcome Measures Intermediate or PART Measures/PART Efficiency or Other Outcome Measures	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
GPRA End Outcome Measures ***Intermediate Outcome Measures and Bureau and PART Outcome Measures*** **Ensure availability of long-term environmental and natural resource information, data and systematic analyses needed by land and resource managers for informed decision making**									
% of NPS units for which environmental characterization based on airborne remote sensing is provided as digital GIS products and for which products are cited or use by NPS within 2 years **(CMGP PART)**	UNK	50%	50%	60%	60%	75%	75%	0	75%
% of regional and major topical studies for which interpretive and synthesis products are cited by identified partners and users within 3 years of study completion **(CMGP PART)**	60%	80%	80%	80%	80%	80%	80%	0	80%
PART Efficiency and Other Output Measures									
# of annual gigabytes collected **(CMGP)**	0	5	16	8	8	8	25	+17	25/yr
# of cumulative gigabytes managed **(CMGP)**	50	55	71	79	79	87	112	+17	187
# of systematic analyses and investigations delivered to customers **(CMGP)**	8	8	8	9	218	200	205	+5	220
Total/actual projected cost ($000)	36,000	36,000	36,000	36,000	33,745	34,549	40,323	+5,774	197,000/year
Total/projected cost per systematic analysis (whole dollars)	4,000,000	4,000,000	4,000,000	4,000,000	155,000	173,000	197,000	+24,000	40,323/year
Comments	Rebaselined 2007 to standardize bureau-wide counting. 2009 Budget has proposed +5 2009 for the Ocean and Coastal Frontiers Initiative beginning 2009, and an additional 15 in the outyears.								
# of formal workshops or training provided to customers (instances/issues/events) **(CMGP)**	10	10	10	10	11	11	15	+4	20
Total/actual projected cost ($000)	250	250	250	250	277	300	375	+75	+25/year
Total/projected cost per systematic analysis (whole dollars)	25,000	25,000	25,000	25,000	25,200	27,200	25,000	-2,200	25,000
Comments:	2007 exceeded plan by 1. 2009 Budget proposes +4 in 2009 for the Ocean and Coastal Frontiers Initiative; +2 in 2010; +1 in 2011 and +2 in 2012. Variation in location of workshops results in the differences in average costs per year.								
# of conceptual or numerical models developed **(Puget Sound CMGP)**	2	0	0	0	0	1	1	0	1

End Outcome Goal: 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment.									
End Outcome Measures Intermediate or PART Measures/PART Efficiency or Other Outcome Measures	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
GPRA End Outcome Measures									
# of digital geographic information products for priority National Park Service units that provide environmental characterization based on airborne remote sensing **(CMGP) PART**	3	10	8	9	10	10	10	0	10
Comments	2007 – one more product requested and provided than planned								
Fraction of significant landfalling hurricanes (conterminous U.S.) for which post-storm assessments of impact are developed **(CMGP) PART**	4/5	3/3	>=3/4	>=3/4	0/1	>=3/4	>=3/4	0	>=3/4
Comments	2007, post-assessment survey not required for Category Hurricane Humberto.								
% of open Ocean and Great-Lakes shoreline of coterminous US for which up-to-date characterization of the shoreline is provided **(CMGP) PART**	62%	62%	80%	90%	80%	90%	90%	0	90%
Comments	2007, West Coast survey proposed for 2007 moved to 2008 due to Gulf Coast efforts related to impact of Hurricane Katrina								
Cost of collection and processing of airborne remote sensing data for coastal characterization and impact assessments **(CMGP) PART Eff Measure)**	0.58	0.56	0.55	0.47	0.57	0.35	0.35	0	0.35
Comments:	In 2007, to better characterize vertical structure used more expensive system with more powerful laser and 3-band digital multispectral high resolution camera.								
# of environmental products in marine protected and managed areas provided for resource management and restoration planning **(CMGP) PART**	40	54	63	72	76	75	81	+6	87
Comments	In 2007, requirement for 4 more products than planned. 2009 Budget includes +6 in 2009 and +6 in 2012 for the Ocean and Coastal Frontiers Initiative.								

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Activity: Geologic Hazards, Resources, and Processes

Subactivity: **Geologic Resource Assessments**
Program Component: **Mineral Resources**

	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-) [a]	2009 Program Changes (+/-) [b]	2009 Budget Request	Change From 2008 (+/-)
Mineral Resources ($000)	51,636	50,830	+947	-25,499	26,278	-24,552
Total FTE	*354*	*334*	*0*	*-210*	*124*	*-210*

a/ Fixed cost increases for this program total $947 of which $1,197 is budgeted and $250 is absorbed.
b/ Changes for this program include a reduction of -$89 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Summary of 2009 Program Changes for Mineral Resources

Request Component	($000)	FTE
• Mineral Resources Assessments and Activities	-25,410	-210
• Travel reduction	-89	0
TOTAL Program Changes	**-25,499**	**-210**

Justification of 2009 Program Changes

The 2009 budget request for the Mineral Resources Program is $26,278,000 and 124 FTE, a net program change of -$25,499,000 and -210 FTE from the 2008 Enacted level.

Mineral Resources **(-$25,499,000 / -210 FTE)**

In the 2009 budget, a program change of -$25,499,000 and -210 FTE is proposed. This proposal is made to provide funding resources for higher priority activities in USGS and the Department of the Interior.

The proposed reduction to the budget for the Mineral Resources Program (MRP) will result in a scaled-back program in 2009 that will complete one systematic analysis, continue work on a unique first-ever global mineral resource assessment, conduct research to provide mineral deposit models of targeted nonfuel mineral commodities for decisionmakers, collect data on domestic and international production and utilization of 70-80 essential mineral commodities, and manage four national-scale long term databases. The proposed reduction will:

- Discontinue research on environmental consequences of mined and unmined mineral deposits,
- Eliminate mineral resource studies in support of economic development and land management in rural Alaska,

- Eliminate research on rare and scarce metals required for emerging technologies,
- Eliminate specialized studies of materials flows and recycling of nonfuel minerals throughout the economy,
- Reduce the number of mineral commodity reports available for decisions,
- Delay by 2-3 years completion of research and primary data collection required to update the 1995 National Mineral Resource Assessment,
- Discontinue support for most MRP-funded geochemical, geophysical, and geographic information laboratories,
- Reduce funding available for managing MRP's digital databases,
- Eliminate the Mineral Resources External Research Program, which makes grants to States and other non-Federal entities to conduct research that supports MRP goals.

The proposed decrease would require that USGS eliminate 210 occupied scientific and technical positions from ten locations across the United States (Anchorage, AK; Denver, CO; Flagstaff, AZ; Menlo Park, CA; Mounds View, MN; Reno, NV; Reston, VA; Spokane, WA; Seattle, WA; and Tucson, AZ).

The proposed decrease will eliminate 3 systematic analysis scheduled to be delivered to customers in 2009, and 7 more that are underway and scheduled through 2012. One systematic analysis that is scheduled for delivery in 2010 will be delayed until at least 2011. Starting in 2009, MRP will be able to produce 1-2 systematic analysis per year.

MRP will provide 1-2 formal workshops or training for customers in 2009 and beyond. The number of mineral commodity and related reports (including materials flow studies) produced annually will be reduced from 700 in 2008 to 650 or fewer in 2009 and beyond; the remaining reports will focus on a limited group of commodities for which data are most essential to other Federal agencies, industry, and the public.

Program Performance Change

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
End Outcome Goal 2.4 Resource Use: Improve the understanding of energy and mineral resources to promote responsible use and sustain the nation's dynamic economy Resource Protection.								
# of systematic analyses & investigations delivered to customers **(PART)**	3	6	6	3	4	1	-3	-10 in the period 2009-2012
Total Actual/ Projected Cost ($000)	12,000	25,665	12,399	18,078				

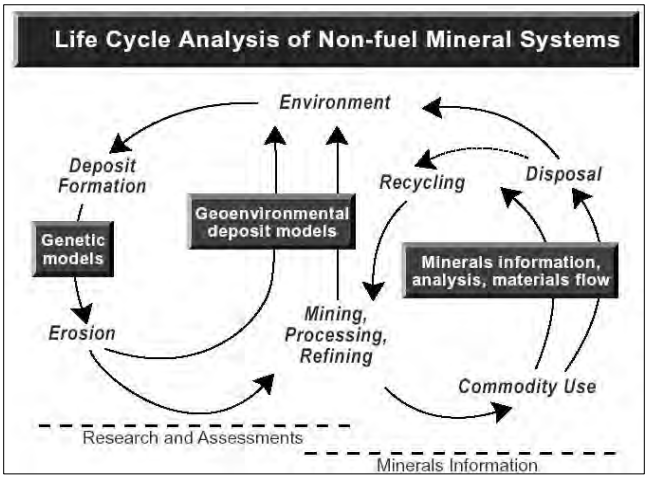
	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
Actual/Projected Cost Per Analysis (unit in whole dollars)	3,999,663‡	4,277,478	3,725,422,	4,909,866	4,747,132	16,953,397	+12,206,265	7,000,000
Comments	2009 includes sunk costs of four systematic analyses that must be eliminated because of the proposed budget reduction.							
# of cumulative gigabytes managed	16.131	16.221	16.3	16.3	16.4	16.3	-0.1	
Comments	No cost data are available for this measure.							
# formal workshops or training provided to customers **(PART)**	8	8	7	6	6	2	-4	
Comments	No cost data are available for this measure.							
# of mineral commodity reports available for decisions	746	690	717	700	700	650	-50	
% of nonfuel mineral commodities for which up-to-date deposit models are available to support decision making	UNK	UNK	0%	7%	27%	7%	-20%	Rather than completing this measure in 2012, it will take until 2014
Comments	New measure started in 2007 (new DOI Strategic Plan).							

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Out-year performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent out-year.

Program Overview



Nonfuel Minerals in U.S. Economy

- The United States is the world's largest user of mineral commodities.
- Processed materials of mineral origin accounted for an estimated $575.0 billion in the U.S. economy in 2007, an increase of 6 percent over the estimated 2006 value.
- U.S. manufacturers and consumers of mineral products depended on other countries for 100 percent of 17 mineral commodities and for more than 50 percent of 45 mineral commodities that are critical to the U.S. economy.
- Current and reliable information about both domestic and international mineral resources and the consequences of their development informs decisions about supply and development of mineral commodities.

Major Program Components

- MRP is the sole Federal provider of scientific information for objective resource assessments and unbiased research results on mineral potential, production, consumption, and environmental effects.
- Life cycle analysis of nonfuel mineral systems (see figure, above) demonstrates the connections between various natural and anthropogenic processes through which minerals are made available to sustain developed societies.
- In its most recent review of the MRP (2003), the National Research Council identified four Federal roles in mineral science and engineering:
    - an unbiased national source of science and information,
    - basic research on mineral resources,
    - advisory, and
    - international (undertaking or supporting international activities that are in the national interest).
- MRP addresses these four roles through work in two functions:
    - a **research and assessment function** that provides information for land planners and decisionmakers about where mineral commodities are known and suspected in the Earth's crust, and
    - a **minerals information function** that collects, analyzes, and disseminates data that describe current production and consumption of about 100 mineral commodities, both domestically and internationally for approximately 180 countries.

> "I want to thank you for the information on Bulletin 1594 map. I couldn't have asked for more timely information. … We will use the map on a web site that we will keep updated with unit-train-capable customers on CSX, so the utilities can more quickly make contacts to meet their new needs."
>
> Mike Darragh, CSX
> July 16, 2007

- Each function meets the needs of different parts of the community of mineral resource information users, including
    - Federal, State, and local land managers;
    - Federal, State, and international departments and agencies concerned with materials availability, defense, security, the economy, trade, environmental management, human health and safety;
    - private sector companies concerned with materials availability, defense, security, the economy, trade, environmental management, human health and safety; academic institutions;
    - policymakers in the U.S. Congress, and State and local governments; and
    - the general public.
- Together these activities provide information ranging from that required for land planning decisions on specific management units to that required for national and international economic decisions.
- The Federal Land Policy and Management Act of 1976 requires USGS to "conduct mineral surveys of public lands to support the designation of Wilderness Areas . . . Prior to BLM making any recommendation for the designation of any area as wilderness, the Secretary of Interior shall cause minerals surveys to be conducted by USGS."
- In addition, USGS has significant responsibilities deriving from the Minerals Policy Act of 1970 and the National Materials and Minerals Policy, Research, and Development Act of 1980. The MRP responds to these and other economic and public policy needs of the Nation with both the research and information functions of the program.

Use of Cost and Performance Information

USGS shares costs for the Global Mineral Resource Assessment with more than 30 national geological surveys, non-governmental organizations, private companies, and international associations of geological organizations. Partners make available geologic maps, geochemical data, and mineral resource information at no cost to USGS and provide local experts, visits to the most significant mineral deposits, and access to relevant unpublished data.

Facilities and support for assessment workshops are provided by host countries; organizers bring together groups of neighboring countries to a single location, minimizing costs and maximizing the sharing of expertise. USGS travelers combine trips to maximize the benefit of each trip. In one recent example, a geologist assigned to lead a workshop for sub-Saharan Africa met with French colleagues in Europe on the way to Africa, conducted two workshops and two mine site visits while in Africa, and then met with British colleagues in the United Kingdom on the return journey.

2009 Program Performance

The 2009 budget request for the Mineral Resources Program is $26,278,000 and 124 FTE, a net program change of -$25,499,000 and -210 FTE from the 2008 Enacted level.

All activities funded in 2008 address the key PART finding, requiring MRP to "Target program funds on activities that support long-term land use and economic policy decisions and improve accessibility and application of MRP information."

Research and Assessments Function
(Estimates for 2007, $36.028 million; 2008, $35.466 million, 2009, $15.996 million)

The 2009 budget request for MRP's Research and Assessments function is $15,996,000, a net program change of -$19,470,000 and -167 FTE from the 2008 Enacted level.

With funds proposed for 2009, this function will conduct the following activities addressing the Department's Resource Use goal for non-energy minerals, meeting performance targets listed in the performance overview:

- Complete and deliver 1 systematic analysis on methods for assessing undiscovered mineral deposits,
- Conduct regional-scale geologic data compilation, leading to a new State geologic map for Alaska,
- Continue 3 research and development projects, begun in 2007, designed to provide tools required for the scheduled update of the 1995 National Mineral Resource assessment,
- Manage 4 national-scale long term databases,
- Provide 2 formal workshops or training to customers on topics such as understanding the utility of geoscience data for land planning.

MRP will deliver the results of a 5-year research project developing methods required for quantitative assessment of undiscovered mineral deposits. This work builds on 30 years of experience within USGS, where these methods have been developed, tested, and refined as a part of ongoing activities that provide national and global assessments of potential for undiscovered mineral deposits.

> "We have received the mineral reports…and are currently using the reports for the review and renewal of mineral withdrawals as provided by the Clark County Conservation of Public Land and Natural Resources Act of 2002."
>
> Mark R. Chatterton
> Assistant Field Managers for Non-Renewable Resources for the U.S. Bureau of Land Management
> June 12, 2007

MRP-funded project work in Alaska meets the needs of a variety of State, Federal, and private sector partners for fundamental geologic, geochemical, geophysical, and mineral resource information for our largest and least-well explored State. Work to be conducted in 2009 is done in partnership with the State of Alaska, aimed at providing new digital geologic map data for high priority areas of the State.

Beginning in 2008, as a part of the Department's Strategic Plan, MRP has a new performance measure, designed to demonstrate progress towards updating the 1995 National Mineral Resource assessment. This update is currently scheduled to begin in 2011, delayed 1 year by the budget cuts to MRP in 2007 and 2008, and relies on national-scale geologic, geochemical, geophysical, and mineral deposits data for which a 10-year update project was completed in 2007. The new performance measure demonstrates progress towards providing mineral deposit models required for decisionmaking on 15 targeted nonfuel mineral commodities. The proposed budget reduction in 2009 will delay preparation of deposit models and postpone

beginning the update of the National Mineral Resource assessment until at least 2012. In 2008 MRP is funding 3 research and development projects providing data and methods required for this update; the budget reduction proposed for 2009 will require restructuring the scientific and technical workforce, delaying progress on technical projects.

Developing and upgrading national databases, as well as converting those databases to standard formats, is an ongoing effort and will continue in 2009. Evolving online data delivery tools provide information in digital format to any customer with Internet access; this has been of particular interest to land-management agencies and regional-planning groups. Features of this unique online system include sophisticated data set search options, user viewing of data tables, and downloading of page-sized maps with user control of map data layers, legend, title, and other parameters. The system is available at *http://mrdata.usgs.gov/.*

> "This particular subfield of tectonics is … one of the frontier areas of modern geology in that the processes involved in ridge subduction are among the most poorly understood tectonic processes on earth. Alaska is THE premier site in the world for studying this problem… and this [USGS] group is on the forefront of the research. …This group is working on a world class problem that puts the USGS back in the spotlight."
>
> Terry Pavlis
> Professor of Geological Sciences at the University of Texas, El Paso
> May 17, 2007

Data and conclusions from USGS minerals research will continue to be available to users in easily accessible, accurate, and timely products in 2009. Information is disseminated through traditional paper products, in digital form, on the Internet *(http://minerals.usgs.gov/)*, through interagency collaborations, and in technical and non-technical public presentations. Other methods through which MRP projects provide timely results for all customers include development of new geophysical and geochemical techniques for mineral-resource studies and the application of mineral-resource expertise and techniques to other societally relevant issues such as mapping earthquake and volcanic hazards, location and evaluation of energy resources, characterization of hydrology, or location of buried ordnance.

The Mineral Resources Data System (MRDS) is a worldwide database of metallic and industrial mineral sites with related geologic, commodity, and deposit information. It currently contains information describing about 115,000 locations; new records are continually being added and existing records updated or upgraded. In 2009 and beyond no new records will be added; work will be limited to updating and upgrading existing records. About 200 data fields are available for each location, permitting storage of such disparate information as location, geology, description of deposit, exploration and development, description of workings, commodities present, production, reserves and resources, and published and unpublished references. The data can be searched and sorted using any of these fields. The data are available on CD-ROM and as part of the MRP's data delivery Web site *(http://minerals.usgs.gov/)*.

Minerals Information Function

(Estimates for 2007, $15.608 million; 2008, $15.364 million, 2009, $10.282 million)

The 2009 budget request for MRP's Minerals Information function is $10,282,000, a net program change of -$5,083,000 and -43 FTE from the 2008 Enacted level.

With funds proposed for 2009, this function will conduct the following activities addressing the Department's Resource Use goal for non-energy minerals, meeting performance targets listed in the performance overview:

- Collect, analyze, and disseminate timely information and data on domestic supply and availability for 70-80 mineral commodities, in the United States and 180 other countries, and
- Deliver about 650 mineral commodity and related reports.

Mineral materials are essential to the U.S. economy and national security. USGS information and data cover the extraction, production, and refining of mineral commodities and some of their products. The Departments of Interior, Defense, and State, Central Intelligence Agency, the Federal Reserve, and private sector companies utilize USGS mineral-related policy analysis in their regional and global analyses. Information on strategic minerals is also provided to the Department of Defense for managing the National Defense Stockpile.

USGS mineral commodity specialists provide production and capacity data for the U.S. nonfuel minerals industry to the Federal Reserve Board (FRB). The FRB uses data in USGS minerals information reports to calculate the indexes of industrial production, capacity, and capacity utilization, which are among the most widely followed monthly indicators of the U.S. economy. These capacity indexes and the rates of capacity utilization based upon them are published monthly in FRB's G.17 release, Industrial Production and Capacity Utilization. USGS scientists also provide assistance to FRB economists and policymakers in analyzing mineral industry indicators and trends.

USGS mineral commodity specialists conduct an annual workshop for students and faculty from the National Defense University, Industrial College of the Armed Forces (ICAF). The workshop, which this year focused on the aluminum, beryllium, rare earths, rhenium, steel, and titanium industries, is designed to increase the understanding of future leaders in the U.S. military and supporting agencies about the importance of minerals and materials availability, as well as the natural resource considerations required for defense planning and decision making. After this year's workshop, Rear Admiral Gerard M. Mauer, Jr., commended the USGS mineral commodity specialists for their ability to help "….our students to understand materials as commodities, and as strategic items that are often critical to defense needs."

Gerard M. Mauer, Jr., Rear Admiral, U.S. Navy
Commandant, National Defense University, Industrial College of the Armed Forces (ICAF)
June 12, 2007

Reduction in Force

In order to achieve the program reduction required in this budget request, USGS will need to eliminate 210 positions in 10 locations across the United States. The anticipated cost of this reduction-in-force (RIF) is $9.3 million, based on methodologies developed in the 1995 RIF, adjusted for inflation.

PART Findings and Recommendations and Program Progress

- MRP is the only USGS program addressing the **non-energy minerals** aspects of the Department's Resource Use strategic goal.
- MRP funds basic and applied research, within USGS and outside, that provides world-class Earth science research and data used by policy and decisionmakers, land managers, other Federal and State agencies, the mineral resources industries, foreign governments, nongovernmental organizations, academia, other scientists, and the public. Results of MRP-funded projects completed 2002-2007 are available at *http://minerals.usgs.gov/about/history.html* (USGS projects) and

http://minerals.usgs.gov/mrerp/reports.html (projects conducted outside USGS, funded by the Mineral Resources External Research Program).

- Program funding is allocated for projects whose products support goals outlined in the current 5-Year Plan (*http://minerals.usgs.gov/plan/mrp-plan-2006-2010.pdf*); both project activities and funding are adjusted annually as required to accommodate increases or decreases in staffing, fixed costs, and overall availability of funds.
- To clearly measure USGS progress in providing information in the Department's strategic plan for 2003-2008, three outcome measures (average square miles of the United States with non-energy mineral information available to support management decisions; customer satisfaction with information provided to support decisions in non-energy minerals; and percent of studies validated through appropriate peer review or independent review) were identified in partnership with Department and Office of Management and Budget (OMB) and designed to roll up into the intermediate goal of ensuring availability of energy and mineral resource information and systematic analyses needed by land and resource mangers for informed decision making.
- In the DOI Strategic Plan for 2007-2012, MRP works toward two measures, still within the Resource Use goal. Together with the Energy Resources Program, MRP addresses the end outcome goal "Improve the understanding of energy and mineral resources to promote responsible use and sustain the Nation's dynamic economy."
- In addition to assessments of the potential for undiscovered mineral deposits, the MRP provides long-term national and regional data on mineral production, use, and recycling to land-management agencies, regulatory agencies, industry, academia, and the public (*http://minerals.usgs.gov/*). MRP statistics and information on the global supply of, demand for, and flow of minerals and materials essential to the U.S. economy, national security, and environmental protection are available on the Web (*http://minerals.usgs.gov/minerals/*).
- Customer satisfaction surveys of use of data from the national mineral resource assessment, minerals databases, and geochemical data sets indicate a total satisfaction score of 86 percent.

The Mineral Resources Program supports the Department of the Interior’s Resource Use strategic goal to improve the understanding of energy and mineral resources to promote responsible use and sustain the nation’s dynamic economy. In 2003, MRP was reviewed using the Administration’s PART. The MRP role is clearly defined and unique from other Federal, State, local, or private entities; MRP is working effectively with partners and fulfilling its missions and was found to be “moderately effective.”

Using PART, ABC, and other performance information, such as customer surveys and reviews by the National Research Council, MRP continues to evolve toward a research- and information-based program that assists others in using results of USGS research and data collection to meet the needs of land management agencies and a broad spectrum of professional and general users.

Updates to 2008 Program Performance Targets

Performance targets for 2008 have been updated from those portrayed in the 2008 President's budget. These updates reflect enacted funding levels for 2008 and other changes described in the "comments" rows of the performance tables.

Program Performance Overview

End Outcome Goal 2.4 Resource Use: Improve the understanding of energy and mineral resources to promote responsible use and sustain the nation's dynamic economy Resource Protection:									
End Outcome Measures Intermediate or PART Measures/PART Efficiency or Other Outcome Measures	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
GPRA End Outcome Measures									
% of targeted science products that are used by partners and customers for land or resource management decision making **(SP)**	80%	86.5%	87.5%	≥80%	99%	≥90%	≥90%	0	≥90%
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure availability of energy and mineral resource information and systematic analyses needed by land and resource mangers for informed decision making**									
% of targeted nonfuel mineral commodities for which up-to-date deposit models are available to support decision making **(SP)**	0%	0%	0%	Baseline	0%	7%	7%	0	67%
Baseline Information: Average square miles of the United States with non-energy mineral information available to support management decisions **(PART)**	2,401,329	3,097,647	3,318,208	3,346,737	3,346,000	3,346,000	3,346,000	0	3,346,000
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure the quality and relevance of science information and data to support decision making**									
% of studies validated through appropriate peer review or independent review **(SP)**	100% (5/5)	100% (3/3)	100% (6/6)	100% (6/6)	100% (6/6)	100% (3/3)	100% (1/1)	0	100% (2/2)
% satisfaction with scientific and technical products and assistance for natural resource decision making **(SP)**	88.5%	97.5%	97.5%	≥80%	97%	≥80%	≥80%	0	≥80%
PART Efficiency and Other Output Measures									
# of systematic analyses & investigations delivered to customers (assessments) **(PART)**	5	3	6	6	6	3	1	-2	2
Comments	During 2009 OMB budget submission, it was determined this measure became inaccurate in March 2007 due to impact of the Continuing Resolution, subsequent unspecified appropriation, and the operating plan approval process. One systematic analysis was affected by this in 2008; therefore 2008 plan changed from 3 to 2. It is now included in the 2009 Plan target.								
# of cumulative gigabytes managed	15.420	16.131	16.221	16.3	16.3	16.3	16.3	0	16.3
# of formal workshops or training provided to customers (instances/issues/events) **(PART)**	8	8	8	7	7	6	2	-4	2
# of mineral commodity reports available for decisions **(BUR)**	733	746	690	720	717	700	650	-50	600

Program Performance Overview

End Outcome Goal 2.4 Resource Use: Improve the understanding of energy and mineral resources to promote responsible use and sustain the nation's dynamic economy Resource Protection:									
End Outcome Measures Intermediate or PART Measures/PART Efficiency or Other Outcome Measures	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
X% of expected responses for which canvass forms have been converted to electronic format	58%	81%	88%	100%	100%	100%	100%	0	100%
X% of targeted analyses delivered which are cited by identified partners within 3 years after analysis delivered **(PART)**	80%	87%	93%	≥80%	93%	≥80%	≥80%	0	≥80%
Average cost of a systematic analysis or investigation **(PART Eff. Measure)**	4.31M	4.18M	4.3M	3.8M	3.7M	4.9M	17M	+13.1M	7.0M
Comments	The average cost reported for 2009 includes the sunk cost of four systematic analyses that should be delivered in 2009 but are eliminated with the proposed reduction in 2009. An additional six systematic analyses that are due for delivery in 2010 and beyond are not included in this cost.								

Activity: Geologic Hazards, Resources, and Processes

Subactivity: **Geologic Resource Assessments**
Program Component: **Energy Resources**

	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-) [a]	2009 Program Changes (+/-) [b]	2009 Budget Request	Change From 2008 (+/-)
Energy Resources ($000)	25,150	26,381	+368	-107	26,642	+261
Total FTE	*151*	*151*	*0*	*0*	*151*	*0*

[a] Fixed cost increases for this program total $368 of which $466 is budgeted and $98 is absorbed.
[b] Changes for this program include a reduction of -$107 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Summary of 2009 Program Changes for Energy Resources Program

Request Component	($000)	FTE
• Travel reduction	-107	0
TOTAL Program Changes	**-107**	**0**

Justification of 2009 Program Changes

The 2009 budget request for the Energy Resources Program is $26,642,000 and 151 FTE, a net program change of -$107,000 and 0 FTE from the 2008 Enacted level.

The overall impact of the -$107,000 for travel reduction is described in the General Statement on page A-1. There are no performance measures impacted by this reduction to the Energy Resources Program.

Program Overview

The Nation faces simultaneous challenges from an increasing need for energy resources, a growing dependence on imported oil resources, and growing demands to minimize environmental effects associated with energy resource development and utilization. The USGS Energy Resources Program (ERP) addresses these challenges by conducting research to better understand the fundamental processes that lead to the formation and accumulation of energy resources (oil, natural gas, coal, and others such as geothermal) and the environmental and human health effects of energy resource occurrence and use. ERP scientists use the results of these geoscientific studies to evaluate energy resource accumulation and distribution and to assess the energy resource potential of the Nation and the world (exclusive of U.S. Federal offshore waters). ERP conveys results from these studies to land and resource

managers and policymakers in support of the Department's strategic goal of managing resources to enhance public benefit, promote responsible use, and ensure optimal value. Collectively, this information is used to plan for a secure energy future and to allow for the strategic use and evaluation of resources. Major consumers of ERP products are the Department's land and resource management bureaus, other land management agencies such as the U.S. Forest Service (USFS), Federal environmental and national security agencies, policymakers and other Congressional offices, State geological surveys, the energy industry, the environmental community, the international energy community, academia, and the public.

2009 Program Performance

Energy Policy Act of 2005 Implementation — The Energy Policy Act of 2005 calls for several major activities for which USGS science is a critical component:

National Geological and Geophysical Data Preservation Program
(Estimates for 2007, $0.75 million; 2008, $0.74 million; 2009 $0.75 million)

Established with the passage of the Energy Policy Act of 2005, this program provides a unique opportunity to inventory, archive, and preserve geologic and geophysical data collected by numerous organizations. These data include collections of physical Earth materials (rocks, soils, fluids, minerals, fossils), digital data collected from the Earth (seismic data, chemical data, well log data), and conventional library collections (books, journals, maps, charts). These data are irreplaceable and critical to the present and future understanding of our Nation’s resources.

Geoscience data preservation involves a number of steps, and a successful strategy for managing geoscience data and collections in the United States must address all of these components. The Data Preservation Working Group prepared an implementation plan is available at *http://energy.usgs.gov/PDFs/2006DataPreservation.pdf.*

In 2007, State geological surveys had the opportunity to apply for funds to inventory their data holdings, and 35 States responded and were awarded funding. Also in 2007, Web-based applications were developed to collect the inventory information. In 2008, a Program Announcement will solicit proposals from States and USGS Geology Teams to create metadata for individual items held in their collections and for projects related to preserving data and making it accessible to the public. Also in 2008, USGS will work with the State geological surveys to design the National Catalog. In 2009, the program will work with the States to continue developing and populating the National Catalog.

Other Energy Policy Act Implementation — The Act addresses many energy sources, with an emphasis on assessment of geothermal resources, alternative energy sources such as gas hydrates and oil shale, and research into unconventional gas resources. The Act also reauthorizes the Energy Policy and Conservation Act Amendments of 2000 (EPCA), in which the USGS assesses the oil and gas resources underlying Federal lands in the United States. Detailed descriptions of these activities are given in the following sections. All of these activities support the Department of Interior's End Outcome Goal to Improve the Understanding of Energy and Mineral Resources to Promote Responsible Use and Sustain the Nation’s Dynamic Economy and are responsive to the Secretary's priorities to support increased production that is environmentally responsible.

National Oil and Gas Resources

(Estimates for 2007, $14.0 million; 2008, $14.5 million; 2009, $14.5 million)

There is a low probability that many more large oil accumulations would be discovered in the onshore areas and State waters of the United States. Instead, the Nation's future energy supplies will likely come from a mix of domestic natural gas accumulations, existing domestic oil and gas fields, and from imports. The combination of concern about greenhouse gas emissions to the atmosphere and the re-enactment of the EPCA have collectively introduced a sense of urgency in the effort to identify the Nation's remaining accumulations of natural gas. ERP research continues to focus on areas of the Nation that have high potential for future natural gas production, including coalbed gas (Figure 1); those areas that have oil and gas resources under public lands; and on the scientific challenge of reducing the uncertainty (or “improving the precision”) of petroleum resource assessments.

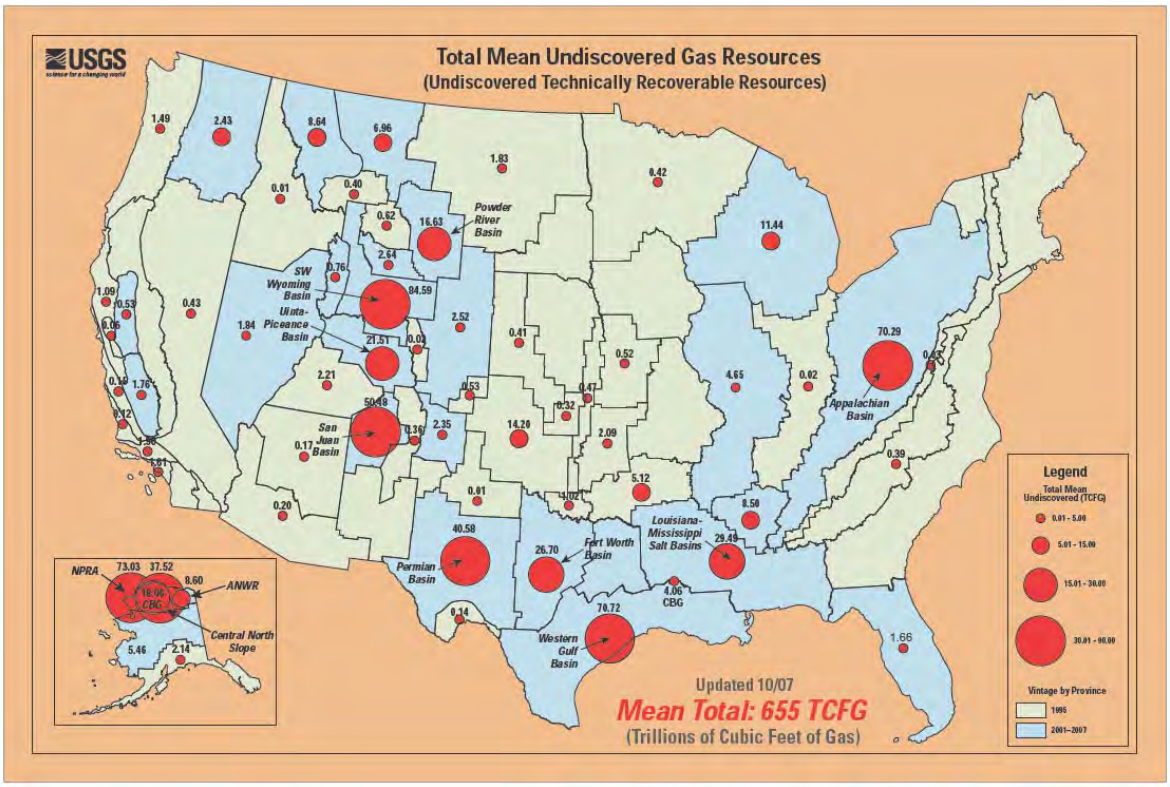


Figure 1. USGS estimates of total, mean, undiscovered, technically recoverable gas resources in the United States (available at *http://certmapper.cr.usgs.gov/data/noga00/natl/graphic/2007/total_gas_mean_07.pdf*)

The ERP is estimating the volume of undiscovered oil and gas resources that underlie Federal lands. This scientific inventory of oil and gas resources on Federal lands is mandated by the EPCA (P.L. 106-469 §604) and forms the basis for the periodic report to Congress required by the Act. The EPCA legislation was reauthorized with the passage of the Energy Policy Act of 2005, P.L. 109-58. In 2007, ERP contributed the following basins to the EPCA inventory: Powder River Basin, Sacramento Basin, Illinois Basin, and undiscovered gas resources in the Cretaceous Tuscaloosa and Woodbine Formations of the Western Gulf Province. The second phase of the EPCA inventory, "Scientific Inventory of Onshore Federal Lands' Oil and Gas Resources and Reserves and the Extent and Nature of Restrictions or Impediments to their Development," was delivered to Congress and released to the public in November 2006. This document presented a comprehensive review of Federal oil and gas resources in eleven basins

in the United States and constraints on their development. Work on the third phase of the EPCA inventory report will be completed in 2008.

The USGS will continue to update its oil and gas resource assessments for the United States and the world using a consistent, peer-reviewed methodology as authorized in the Energy Policy Act of 2005 (P.L. 109-58 §364). In 2008, the USGS will complete assessments of the Permian Basin, Big Horn Basin, the Bakken Formation of the Williston Basin, and Western Washington Province. In 2009, the USGS will complete assessments of the Williston Basin and Cherokee Platform Province.

Alaska — The North Slope of Alaska is thought to have the greatest remaining petroleum resource potential of any U.S. onshore area. The USGS is conducting an intensive examination of Alaska's geology and petroleum potential with current research focused on: synthesizing conventional oil and gas resources information for the entire North Slope of Alaska, including the National Petroleum Reserve, Alaska (NPRA), Arctic National Wildlife Refuge (ANWR)-1002 area, and the central portion of the North Slope (CNS); and, gathering the geologic information necessary to assess the nonconventional and unconventional resources of the North Slope, including heavy oil, coalbed methane, and gas hydrates. Unconventional resources on the North Slope probably occur in great abundance, but relatively little is known about them.

During 2008, reports summarizing the aggregation of assessment results from ANWR, NPRA, CNS, and the area west of NPRA will be completed and estimates of undiscovered, technically recoverable petroleum resources for the entire northern Alaska province will be released. Work on the Cook Inlet, an area of high resource potential and important to Alaska, will continue in 2008 and 2009.

ERP continues to support preservation of irreplaceable legacy digital and hardcopy data from the North Slope of Alaska and to provide government, industry, academic, and public institutions the ability to query and download NPRA data directly from the Internet. Similar efforts continue on a national scale to archive approximately 80,000 miles of seismic data and other data sets that currently reside on 9-track and 21-track magnetic tape. These data will be indexed in a geographic information system to facilitate ease of access and retrieval.

Gas Hydrates — Gas hydrate is a crystalline solid formed of water and natural gas (usually methane) and is potentially one of the most important energy resources for the future. The precise magnitude and producibility of a hydrate accumulation at a given site remains very much in question. Future contributions from gas hydrate to world energy supplies depend on issues pertaining to the availability, producibility, and cost of extracting methane from the hydrate phase. To date, few surveys dedicated to producing hydrate deposits have been conducted, and better methods to identify and survey gas hydrates, especially the high-concentration zones, need to be developed. USGS has state-of-the-art approaches, field work, and laboratories studying the nature of gas hydrates and has made important strides in improving the general knowledge of gas hydrates.

The ERP participates in several international consortia composed of research, industry, and academic institutions. One of these is the Mallik Research Consortium, which drilled three test wells in the Mackenzie Delta in 2002, the results of which were published in 2005. Currently, ERP works closely with the Indian Directorate General of Hydrocarbons (DGH) in an effort to study, characterize, and explore for hydrates off the coast of India. During the summer of 2006, the USGS provided scientific and technical expertise and training to key U.S. and international research collaborators and stakeholders, and led a scientific effort funded by the DGH to

explore for and drill gas hydrate occurrences at 21 sites in offshore India. In 2007 and 2008, characterization of these data, as well as examination of 3-D seismic data, will be conducted for future, more detailed study of offshore gas hydrates. The ultimate goal, depending on the results of the current studies, will be a gas hydrate production test in Indian waters. In 2008, the results from the scientific cruise will be released publicly. These data, synthesis, and analyses will be invaluable in understanding world class hydrate accumulations and lessons learned will be transferable to U.S. domestic gas hydrate resources.

In 2007 and 2008, efforts have focused on research to characterize and assess the recoverability and production characteristics of permafrost-associated natural gas hydrates in the Prudhoe Bay-Kuparuk River area on the Alaska North Slope. In 2007, the U.S. Department of Energy - BP Exploration (Alaska) (DOE/BPXA)/USGS successfully drilled a research well on the North Slope of Alaska to collect samples and information about gas hydrates from a prominent accumulation (Mount Elbert). The Mount Elbert science team, led by USGS, concluded an extensive program of data collection at the Mount Elbert 1 gas hydrate test well in the Milne Point area on the Alaska North Slope, resulting in one of the most comprehensive datasets to date on a naturally-occurring gas hydrate accumulation.

In 2008, USGS will analyze and interpret the drilling results from the DOE/BPXA/USGS Mount Elbert Gas Hydrate Research Test Well in order to continue to refine our geologic and engineering characterization of regional Alaska North Slope (ANS) gas hydrate occurrences and to develop detailed interpretations of the Milne Point Mount Elbert gas hydrate prospect.

In addition, the USGS ERP is assessing the recoverability, resource potential, and production characteristics of Alaskan permafrost-associated natural gas hydrates in cooperation with Bureau of Land Management (BLM) and the State of Alaska. This work builds on the efforts (described above) addressing the known gas hydrate accumulations overlying the Prudhoe Bay and Kuparuk River oil fields, and provides the basis from which to assess the occurrence of gas hydrate accumulations on unexplored State and Federal managed lands. USGS cooperators (BLM and Alaska Division of Geological and Geophysical Surveys in this effort are responsible for oil and gas development that takes place on Alaskan and Federal public lands, as well as for most pipeline right-of-ways. The basic and applied research that the USGS produces through this cooperative study will provide the BLM and the Alaska Department of Natural Resources with the knowledge of where potential gas hydrate development may take place. In 2008, USGS research will culminate with an assessment of the estimated technically recoverable gas hydrate resources of the Alaska North Slope. This work builds on cooperative efforts between USGS and Minerals Management Service (MMS) in creating a methodology to assess the in-place and technically recoverable resources of gas hydrates in the Outer Continental Shelf of the United States. In 2009, building on the assessment, USGS and BLM will then focus on improving our understanding of gas hydrates as an energy resource in general and as a potential energy resource in northern Alaska, so that gas hydrates can be more effectively regulated and managed as a national resource. This understanding comes from developing conceptual and quantitative models, testing and refining assumptions, improving observations of natural gas hydrates, and ultimately deriving better estimates of the gas hydrate resource and its producibility. This project will also contribute to the DOE and industry lead field programs designed to test existing and emerging gas hydrate production technology.

Gulf Coast Region — The Gulf Coast region is one of the major hydrocarbon-producing areas of the world. As such, the USGS ERP is conducting investigations—using seismic, well, and geochemical data—into the geologic framework of this region. This effort will provide the geologic, geophysical, and geochemical framework studies necessary to evaluate the oil-, gas-,

and coal-bearing rocks of TX, LA, MS, and AL that have the greatest potential for future oil, gas, and coalbed methane production. A better understanding of the stratigraphic, structural, and biostratigraphic framework and petroleum systems will enable USGS scientists to: (1) better assess the potential for undiscovered petroleum resources; and, (2) define potential onshore extensions of plays identified by the MMS for offshore Federal resources. Current cooperative efforts with industry, the State Geological Surveys and the MMS will continue to improve data quality and availability. During 2008 and 2009, project staff will conduct research in support of an assessment of the undiscovered petroleum resources within Jurassic and Cretaceous intervals of the Gulf Coast.

Coalbed Methane — USGS geologists are investigating the potential coalbed methane (CBM) resources around the country, including southernmost Texas and north-central Louisiana, the Powder River Basin (PRB), and other areas.

The USGS and the BLM have an ongoing cooperative agreement in the PRB under which the USGS, in the course of its national geologic studies, produces coal reservoir maps, stratigraphic cross sections, reservoir gas drainage maps, charts of coal reservoir characteristics, graphs of chemical and isotope composition of co-produced water, gas content charts, and estimates of CBM resources. These data and interpretations are used directly by BLM land managers, as well as gas operators and pipeline companies who are exploring and developing CBM resources. This information also enables land managers to moderate disputes between coal miners and gas operators. These data are also used by BLM, the Bureau of Indian Affairs (BIA), and several tribes for land use management plans to forecast both the minimum number of wells necessary to produce a given volume of gas, and the anticipated effect of water extraction during field development on the surficial environment. The information helps BLM, BIA, and Native groups identify areas on Federal and Native land leases where the gas resource is being drained by wells on State or private lands, consistent with the Department's strategic goal to manage resources to enhance public benefit, promote responsible use, and ensure optimal value.

CBM gas content, high pressure adsorption isotherms, isotope gas and chemical composition, and indigenous gas-generating microbes in low rank coals have not been well documented in coal basins such as in the PRB, Green River Basin (GRB), and Williston basins. Lack of publicly available, reliable, accurate data necessitated BLM to request ERP to collect new data in advance of development for their resource evaluation and land management work of Federal leases in these basins. In 2008 and 2009, the GRB, which is a new active CBM play, will be the focus of this effort and is following the PRB in the need of new data for BLM.

Origin and Controls on Microbial Gas Accumulations — Natural gas generated from microbial activity involving organic deposits (coal, black shale, petroleum) represents an increasingly important natural resource. Until recently, producers tended to ignore microbially derived natural gas deposits because they were considered too small to be economic; however the development in the PRB changed that perception. It is estimated that natural gas from microbial activity (methanogenesis) accounts for about 20 percent of the world's natural gas resource. Since this gas is biologically produced, it also represents a possible renewable resource.

Although a considerable body of research exists on the biology of methanogenesis, there is much less known about the microbially mediated conversion of materials such as coal to methane. Preliminary studies by USGS and others have shown that coal gas in many parts of the United States is generated from microbial methanogenesis. The USGS will continue to

conduct field and laboratory studies to better define the processes and organisms involved in microbial production of methane from these materials, focusing especially on samples from the PRB. In 2008, ERP will explore new drilling opportunities in cooperation with BLM to examine factors influencing biogenic CBM production (e.g., geology, coal fracturing, groundwater quality, gas geochemistry), and to obtain new samples of coal, coal gas, coal-associated water, and endemic microbial populations for laboratory studies. ERP will also explore opportunities for sample collection from exploration wells and coal mines (especially in the Gulf Coast and the eastern United States) for laboratory studies.

Continuous Resources — Continuous gas accumulations generally consist of large, single fields having spatial dimensions equal to or exceeding those of conventional plays, and, in contrast to conventional gas fields, cannot be represented in terms of discrete units delineated by downdip hydrocarbon-water contacts. Estimates show that the largest remaining undiscovered domestic resource occurs in what USGS scientists term "continuous" gas accumulations, e.g., coalbed methane and basin-centered gas from low-permeability geologic units such as 'tight gas sands' and ‘shale-gas’ reservoirs. (Note: Others use the term 'unconventional' when referring to these resources; however, because these resources can be developed with currently available technology and practices, the USGS employs a narrower definition for unconventional resources, e.g., referring to truly frontier, and currently uneconomic, energy resources such as gas hydrates.) Understanding continuous gas resources – the fastest growing resource produced in the United States – is therefore critical, both in terms of the responsible use of this energy resource as well as the sustainability of the domestic energy supply. This work focuses on the identification of the controls on continuous-unconventional gas accumulations, the role of gas–generation processes, and the characteristics of petroleum and associated water. The goal is to develop a sound understanding of the evolution of present-day hydrocarbon accumulations, many of which are currently being produced, but with difficulty, because little is understood about these resources. The mechanisms of the petroleum systems that create and preserve continuous gas accumulations through geologic time are poorly understood for all types of continuous reservoirs. Efforts to reduce these uncertainties will substantially improve the USGS’ ability to conduct future natural gas resource assessments. Research that will be emphasized during 2008 and 2009 are: (1) examination of gas-water-oil production, and (2) continued integration of controls on gas emplacement and preservation.

Reserve Growth — The ERP has an important role in understanding and assessing petroleum resources, both domestically and internationally. Potential additions to reserves from these resources are from the discovery of new accumulations and reserve growth of existing fields. Approximately half of the world's additions to reserves are estimated to come from reserve growth. Because of the significant volumes of petroleum resources involved, the estimation of reserve growth is an integral part of USGS assessments. Because of the importance of reserve growth in accurately estimating resources, the ERP has a research activity focused on reserve growth to establish procedures to assess reserve growth by modifying new and existing methods and developing a strategy for assessing reserve growth that is peer reviewed before implemented. Reserve growth methods were evaluated by the American Association of Petroleum Geologists (AAPG) Committee on Resource Evaluation (CORE).

Based on the recommendations of the outside peer-panel review, new and existing USGS methods will be selected to use individually or in combination to assess reserve growth. Test cases will be conducted on large and small parcels, as recommended by the panel, for quality assurance and applicability. Adjustments and modifications to the methods will be made and tested as needed. The resulting methodology will be implemented to provide probabilistic

estimates of reserve growth for selected geologic and geographic parcels. Activities in 2008 and 2009 will build on the AAPG CORE review and finalize a reserve growth methodology, publish that methodology, and begin the implementation of that methodology toward an estimation of reserve growth for selected geologic and geographic regions.

Oil Shale Resources

(Estimates for 2007, $0.5 million; 2008 $0.5 million; 2009, $0.5 million)

Published oil shale assessments are nearly 20 years old and need to be updated in order to understand the potential of oil shales to contribute to the U.S. energy mix. The Energy Policy Act of 2005 (P.L. 109-58 §369) recognized this need, and the USGS, in support of this Act, began a new national assessment of oil shale resources. In addition, previous studies did not include an evaluation of the presence or absence of minerals such as halite, nahcolite, or trona. Halite, in some cases occurring in significant quantities in oil shale, may require special handling. Nahcolite and trona are valuable resources that are presently mined at other locations, but the presence of these minerals in oil shale can affect the generation and extraction of oil from oil shale, as these minerals decompose when heated. Within this new ERP effort, new methods to assay oil shale will be examined. The Fischer assay method, which has been used to analyze oil shale samples for more than 50 years, is no longer endorsed by the American Chemical Society. Concerns over this methodology include the fact that not all gases generated in the process are measured, and these gases can be valuable byproducts, and the Fischer assay method may not indicate the maximum amount of oil that can be produced by a given oil shale.

The current USGS effort focuses on the oil shale resources of the Green River Basin. An assessment of these resources will be completed in 2009. Efforts are also underway to study and assess Devonian oil shales and other hydrocarbon bearing rocks having the nomenclature of ‘‘shale’’ located east of the Mississippi River, as mandated in the Act.

Geothermal Resources

(Estimates for 2007, $0.5 million; 2008, $0.5 million; 2009, $0.5 million)

Geothermal Resources — The last national geothermal resource assessment was published in 1979, and advances in the field of geothermal energy and technology indicate that much of that information, as well as the geologic models for geothermal resources, contained in the earlier assessment are outdated. In 2006, in support of the Energy Policy Act of 2005 (P.L. 109-58 §226), the USGS began a 3-year project to produce a new national assessment of geothermal resources capable of producing electric power, with a focus on the western United States, including Alaska and Hawaii. This work will continue to update and improve our understanding of geothermal systems (Figure 2), and culminate in 2008 with a completed assessment. The research effort, in partnership with the DOE, BLM, National Laboratories, universities, State agencies, and a consortium of the geothermal industry, will highlight geothermal energy resources located on public lands. The assessment will include a detailed estimate of electrical power generation potential and an evaluation of the major technological challenges and environmental effects of increased geothermal development. Support products will include online geospatial databases of regional and system-specific geological, geophysical, geochemical, and hydrological information relevant to geothermal resources as well as research publications.

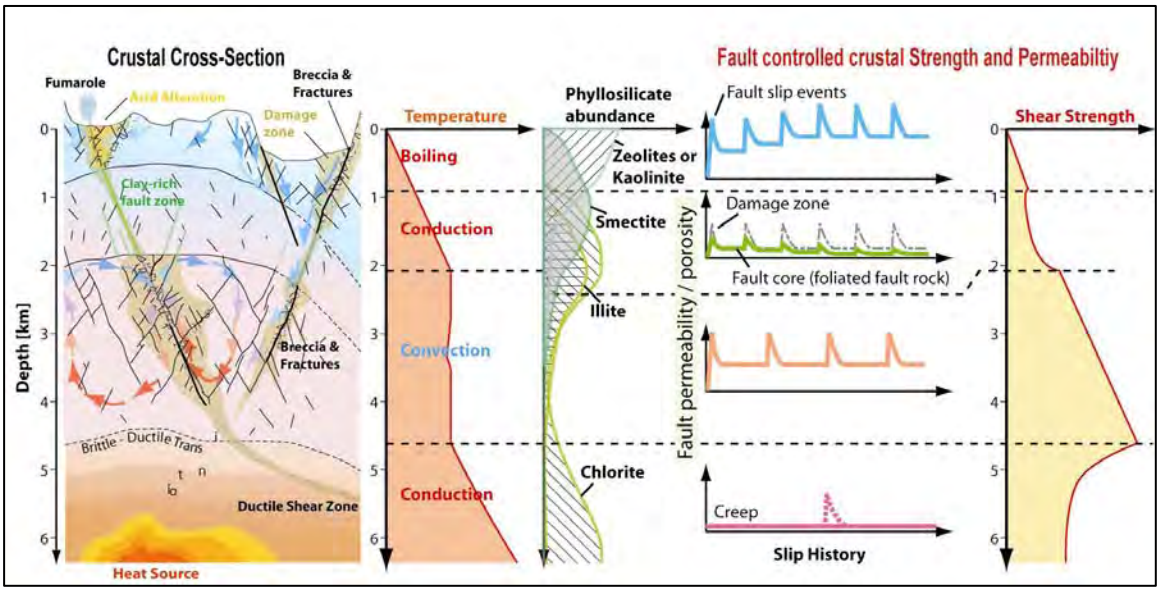


Figure 2. Revised conceptual model depicting a geothermal system and relationship to associated geologic properties, such as fault permeability and rock strength.

In 2009, work will focus on regional studies to augment the resolution of the national assessment. The primary objectives of which will be to (1) collect, analyze, and interpret those regional datasets that form the basis for the resource assessment and (2) support development of a conceptual model that ties observations of particular parameters (e.g., thermal state of the crust, variations in basin depths) to the physical and tectonic processes (e.g., active extension, magmatic intrusions, fault interactions) responsible for the formation of geothermal systems. Consequently, a key emphasis throughout the life of the project will be on determining how information available at the regional level can be used to identify factors critical to the formation of geothermal systems that are often smaller than 10 km^2 in area and may not be characterized or identified by abundant surface manifestations. This effort represents an important extension of the national assessment, which focuses on geothermal resources within identified geothermal systems.

National Coal Resources

(Estimates for 2007, $2.1 million; 2008, $2.2 million, 2009, $2.2 million)

Previous USGS ERP coal resource assessments evaluated the total in-ground coal resource. The USGS ERP has recently revised the USGS assessment methodology to determine the subset of U.S. coal resources that is both available for mining and technically recoverable (i.e., the coal reserve base). In 2006, ERP started to systematically evaluate the PRB, the single largest producing coal basin in the United States. In 2008, ERP will publish the revised assessment for the PRB. Work on other basins will begin in 2008 and continue into 2009 using this new approach, with a focus on coal-bearing basins of the Colorado Plateau. These new studies will illustrate how much resource is actually available and technically recoverable.

Federal and State land managers can use these results to support land-use decisions; environmental regulators use the information to evaluate compliance with regulations stemming from the 1990 Amendments to the Clean Air Act; and economists use the results to forecast economic trends at regional and national scales. Electric utilities, coal producers, and coal consumers also use these results and products for evaluating the availability and quality of coal feedstock to electricity generating power plants and to achieve compliance with emission

standards and other environmental regulations. These studies form the basis for addressing the challenge of future changes in the energy mix as the Nation responds to increasing demands for cleaner-burning coal. The ERP is working closely with counterparts at other organizations (BLM, the Energy Information Administration, the Securities and Exchange Commission, and the Office of Surface Mining) to ensure that the revised products address a variety of needs.

The need for such a reserve evaluation of the U.S. coal endowment was emphasized in a recent National Academies of Science study "Coal: Research and Development to Support National Energy Policy" (2007). That study recognized the importance of coal to the U.S. economy and that Federal policy makers require accurate and complete estimates of national coal reserves to formulate coherent national energy policies. The study also validated the USGS role in such an effort by recommending that the USGS lead a Federal-State-industry initiative to quantify and characterize the Nation's coal reserves.

World Oil and Gas Resources

(Estimates for 2007, $2.3 million; 2008, $2.3 million; 2009, $2.3 million)

Energy is critical to the health and vitality of the United States' and world societies. Credible scientific information on the abundance and geologic distribution of energy resources is critically needed. The USGS World Petroleum Assessment Project conducts geologic studies that improve the understanding of the quantity, quality, and geologic distribution of world oil and gas resources.

Because of the great petroleum potential of the Arctic, the USGS has undertaken a comprehensive assessment of the Circum-Arctic in order to provide consistent and comparable geologically based estimates of the potential additions to world oil and gas reserves. In 2007, the USGS released the petroleum resource assessment for Northeastern Greenland, the prototype for the USGS Circum-Arctic Resource Appraisal (CARA), and the USGS will be releasing assessments of all the Arctic provinces over the next year.

The highest priority work within this effort is a comprehensive study and geologic assessment of the undiscovered petroleum resources of the Arctic region. This CARA effort builds on the work of the USGS World Petroleum Assessment 2000, which identified the Arctic region as an area of significant petroleum potential. Since not all Arctic provinces were assessed for the World Petroleum Assessment 2000, the USGS is currently in the process of studying and assessing the Arctic systematically and in its entirety. Knowing the potential resources of the Arctic — an area of tremendous resource potential, environmental sensitivity, technological risk and geological uncertainty — is critical to the understanding of natural resources and of future energy supplies to the United States and the world. Once the USGS has completed the CARA, a comprehensive, consistent estimate of the undiscovered petroleum resources of the Circum-Arctic will be available in the public domain, for the first time, facilitating comparisons between the Arctic and world estimates of undiscovered petroleum resources.

In 2008, the USGS ERP will continue to assess those oil and gas provinces of the world that were not targeted in previous assessments, including Arctic provinces in Canada, United States, Russia, Norway, Greenland, and other circum-Arctic countries. This task is strongly supported by the DOE, the national security community, a consortium of companies, and most especially by the foreign governments and academic institutions of the assessed countries.

Currently, ERP is also conducting a petroleum assessment of the South Afghanistan Basin in support of rebuilding efforts on behalf of the Afghan Ministry of Mines and Industry. In addition

to the assessment work, ERP is providing training courses for Afghan personnel on such topics as carbonate stratigraphy, petroleum geochemistry, seismic interpretation, petroleum systems, and oil and gas lease sale preparation.

In 2008 are anticipated the release of the following assessments: Laptev Sea Province, Southern Afghanistan, and West Greenland.

Explanation

		Assessed Province (Province Name and Code in database)
– – –		Arctic Circle
		Arctic Shelf (water depths less than 500m)
		Land above Arctic Circle

Figure 3. Map showing the status of the USGS CARA as of fall 2007. This study is the first comprehensive, consistent assessment of Arctic oil and gas resources ever conducted in the public domain. Results from individual province evaluations will be released during the coming year, with final synthesized results presented in the summer of 2008. Updates to this effort are available at *http://energy.usgs.gov/arctic/*.

Energy Information and the Environment

(Estimates for 2007, $4.6 million; 2008, $4.6 million, 2009, $4.6 million)

The production and use of all energy sources generates some type of environmental impact. For example, oil and gas production is attended by water production that must be disposed of in some way and coal combustion sometimes produces a wide range of potentially hazardous substances.

ERP scientific studies focused on environmental and human health challenges include characterization of waters co-produced with oil, gas, and coalbed methane, in order to determine best disposal practices, coastal subsidence associated with oil and gas production, and human health impacts of energy resource occurrence and use.

> "There are many energy outlooks, but most base their projections for future fossil-fuel production on a few publicly available resource estimates, most notably the U.S. Geological Survey (USGS) assessments."
>
> The NPC study validates several current ERP research efforts and directions (National Oil and Gas Assessment, World Petroleum Assessment, and National Coal Assessment) by two of their major recommendations:
> 1. "The USGS should conduct a comprehensive geological assessment of U.S. and global oil and natural gas endowment and recoverable resources."
> 2. "The USGS should conduct a new, comprehensive survey of U.S. and global recoverable coal resources and reserves using common analysis and reporting methodologies."
>
> National Petroleum Council (a FAC to DOE) 2007 report "Facing the Hard Truths about Energy", Executive Summary, pages 27 and 28.

Coal Quality and Human Health — The USGS ERP conducts research to understand the natural variability of coal quality, and the ramifications of such variability on environmental quality and human health. For example, in many parts of the country and the world, coal deposits may act as natural aquifers and convey large amounts of potable water. Balkan Endemic Nephropathy (BEN), a disease thought to develop from long-term exposure of susceptible individuals to low levels of toxic organic compounds derived from coal in drinking water in many parts of the Balkans, has been extensively studied by the USGS in conjunction with the human health care sector and international doctors. The ERP continues to build on the expertise developed during the BEN study by evaluating linkages in the United States and other countries where the confluence of specific human diseases and toxic organic compounds from coal may occur. In the United States, the water obtained from low-rank coal beds, either by drinking water wells or by coalbed methane production wells, may have leached toxic organic compounds from coal. The ERP is characterizing water quality in these settings. ERP researchers have been contacted by a number of foreign scientists who have noted BEN-like symptoms within their own countries. A number of cooperative efforts have formed from these contacts, leading to an increased understanding of this disease.

> The NAS study validates the current ERP effort focused on a national coal reserve assessment.
>
> "Federal policy makers require accurate and complete estimates of national coal reserves to formulate coherent national energy policies. ... Recent programs to assess reserves in limited areas using updated methods indicate that only a small fraction of previously estimated reserves are economically recoverable. Such findings emphasize the need for a reinvigorated coal reserve assessment program using modern methods and technologies to provide a sound basis for informed decision making. ... The committee recommends that the U.S. Geological Survey should lead a federal-state-industry initiative to quantify and characterize the nation's coal reserves, and estimates that this will require additional funding of approximately $10 million per year [for 10 years]."
>
> National Academies of Science 2007 report "Coal: Research and Development to Support National Energy Policy" (Summary on pages 4 and 5).

Because more than half of the Nation's electric power supply relies on coal as a fuel, and electric power demand will continue to increase in the future, an understanding of the connections among coal quality, environmental quality, and human health during aspects of coal resource utilization is essential to resource managers and policymakers alike. The ERP will continue to work with representatives from the human health care sector Center for Disease Control (CDC), National Institutes of Health (NIH), National Institute of Environmental Health Sciences, and other domestic and international groups of doctors, epidemiologists, and health care providers to investigate health effects that may be associated with energy resource use. In one such project, which will conclude in 2008, the USGS is collaborating with the Navajo Nation to study the relationship of indoor and ambient air quality to respiratory diseases in the Navajo Nation. This work is studying possible linkages between indoor coal burning and human respiratory ailments.

The National Coal Resources Data System (NCRDS)
(Estimates for 2007, $0.8 million; 2008, $0.8 million; 2009, $0.8 million)

NCRDS provides the world's largest, most comprehensive, publicly available, electronic coal quality and quantity databases. Started more than 25 years ago, the USGS databases contain information on the location, quantity, attributes, stratigraphy, and chemical components of U.S. coal deposits, including quality analyses of more than 14,000 coal samples and some 200,000 stratigraphic records. At least 136 coal-quality parameters are determined, including detailed location information and a wide range of physical and chemical properties. The NCRDS stratigraphic database contains more than 30 parameters describing the geologic section measured from drill holes and surface exposures including specific geo-referenced information. These data are accessible through USGS-constructed interfaces to perform several analytical capabilities and produce a robust suite of products addressing several coal resource assessment issues, including: locating coal deposits having desirable characteristics for various uses; assessing environmental impacts of coal use; evaluating coal resources; and describing technological properties of coal from specific areas and beds. A long-term partnership of the USGS and approximately 22 State geological surveys, both contributors to and users of the databases, has formed the basis of this sustained effort to collect, correlate, and analyze the basic data, build and verify the databases, and digitally utilize these USGS-maintained data sets. Portions of the coal resource and geochemical databases can be found on the USGS Energy Web site *(http://energy.usgs.gov)*, or interested parties may request selected data in several formats.

A training workshop held November 2007, provided State cooperators an opportunity for open discussion and to obtain information on upcoming changes. The workshop also included discussion of future capabilities and architecture of the NCRDS hardware and software platforms will be topics of discussion. Results from the workshop will be used to improve the overall cooperative program. Creation of a State Coops Web page within the ERP Web site and resurrection of some formerly existing NCRDS databases that would be of benefit to the public (e.g. USALYT) will be priority items in 2008.

PART Findings and Recommendations and Program Progress

As described in the Administration's Program Assessment Rating Tool (PART) review, the ERP role is clearly defined and unique from other Federal, State, local, or private entities. The ERP was reviewed in 2003 as an independent, stand-alone program, and received a PART score of 84. The PART findings indicate that the ERP generates and provides objective, science-based

energy information essential for: shaping policies regarding domestic and foreign energy resources, making sound decisions regarding Federal land and resource use, and maintaining a healthy domestic energy industry. The information ERP produces can be used to determine both current and future resource options.

To clearly measure progress in providing information essential to its customers, ERP tracks four outcome measures associated with producing baseline information about oil and gas assessments for targeted basins, and the quality, content, and satisfaction with the data provided. Outputs associated with these intermediate outcome measures include the delivery of systematic investigations and analyses (assessments) to customers, the maintenance and growth of three long-term data collections, and the provision of formal workshops or training to customers. The number of ERP long-term data collections currently maintained remains the same and consists of: (1) the National Coal Resources Data System, (2) the National Energy Research Seismic Library, and (3) the Organic Geochemical Database. The ERP is developing a framework to expand the Organic Geochemical Database and incorporate analytical results from the Energy Analytical Laboratory (EAL). The EAL is responsible for the analyses of major, minor and trace elements in coal, overburden, water, and related samples from all the coal regions in the United States and major coal provinces around the world. As part of a continuing effort to demonstrate government accountability and improve performance, the ERP will continue, in 2008, an external audit and review process of the Organic Geochemical Laboratory.

In addition, as indicated in the PART review, the ERP will gather information regarding the customer citation of select ERP products within a 3-year time period following product delivery, and will expand the number of ERP products released in digital format to the public. In 2006, for the first time in the ERP's history, a single, unified, and integrated Web site representing the broad range of ERP research activities, products, and capabilities was made available to the Public. The site has a consistent look and feel across the diverse research areas, simplified navigation, and increased functionality to discover, access, and download science information by geography (region), product type, or commodity. Further, the ERP continues to follow up on recommended actions from the ERP PART. The ERP 2008 PART Improvement Plan consists of these follow-up actions and associated milestones:

Performance measures resulting from the PART are shown in the performance tables for the Geology programs, and the USGS has submitted a new PART Improvement Plan for 2008. As a result of PART recommendations and associated performance measures, ERP is implementing the following actions in 2008:

- Validate program performance alignment with measures and goals in the 5-Year Plan, with emphasis on ERP goals 3 (gas hydrates) and 4 (geothermal):

    - Deliver a national geothermal assessment of those resources capable of producing electricity - September 30, 2008
    - Work with BLM to assess the technically recoverable gas hydrate resources of the North Slope of Alaska September 1, 2008

- Monitor and expand data delivery from the redesigned Energy Resources Web site:

    - Measure the increased ERP newsletter subscription growth
        March 15, 2008, target = increase 10 percent
        September 15, 2008, target = increase 10 percent

- Implement new ERP Web site template to improve navigation, layout, and data accessibility - June 15, 2008

Action Plans have been developed to carry out PART recommendations, with milestones being met on schedule. For example:

- ERP has worked with MMS' assessment group, participating in a number of working meetings and conference calls to help develop the MMS methodology for review. Results from this methodology development will be tested in the upcoming Gulf of Mexico drilling in 2008. USGS is continuing to work and provide input into site selection for this gas-hydrate drilling, of which one of the objectives is to test the assumptions used in developing the MMS methodology, as applied to the Gulf of Mexico.

- Multiple Web theme rooms showed increased usage throughout the year, especially new rooms or those with new products. Surveys were given on the satisfaction with, and utility of, the Web site and the comments and feedback will be used to further refine the Web site, promote Web site usage, and provide a more effective delivery of science and information to customers. An analysis of the ERP Web site found that total ERP Web content expanded by 41 percent over the past fiscal year.

Updates to 2008 Program Performance Targets

Performance targets for 2008 remain unchanged from those portrayed in the 2008 President's budget and reflect enacted funding levels for 2008.

Program Performance Overview

The Energy Resources Program addresses the Department of the Interior Resource Use strategic goal to improve the understanding of energy and mineral resources to promote responsible use and sustain the nation's dynamic economy. The following table highlights important performance measures for the Energy Resources Program

End Outcome Goal: 2.4: Resource Use: Improve the understanding of energy and mineral resources to promote responsible use and sustain the nation's dynamic economy									
End Outcome Measures Intermediate or PART Measures/PART Efficiency or Other Outcome Measures	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure availability of energy and mineral resource information and systematic analyses needed by land and resource mangers for informed decision making**									
# of targeted basins/areas with energy resource assessments available to support management decisions (SP) (PART)	5	7	6	5	5	5	5	0	2
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure the quality and relevance of science information and data to support decision making**									
% of studies validated through appropriate peer review or independent review (SP)	100% (5/5)	100% (7/7)	100% (6/6)	100% (5/5)	100% (5/5)	100% (5/5)	100% (5/5)	0	100% (5/5)
% satisfaction with scientific and technical products and assistance for natural resource decision making (SP)	88.5%	97.5%	97.5%	≥80%	97%	≥80%	≥80%	0	≥80%
PART Efficiency and Other Output Measures									
# of systematic analyses & investigations delivered to customers (assessments)	5	7	6	5	5	5	5	0	5
# of formal workshops or training provided to customers (instances/issues/events)	8	8	7	8	8	8	8	0	8
Total actual/projected cost ($000)	120,000	120,000		120,000	120,000	120,000	120,000	0	120,000
Actual/projected cost per workshop (whole dollars)	15,000	15,000		15,000	15,000	15,000	15,000	0	15,000

End Outcome Goal: 2.4: Resource Use: Improve the understanding of energy and mineral resources to promote responsible use and sustain the nation's dynamic economy									
End Outcome Measures Intermediate or PART Measures/PART Efficiency or Other Outcome Measures	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
X% of targeted analyses/investigations delivered which are cited by identified partners within 3 years of delivery (PART)	80%	86%	82%	≥80%	82%	≥80%	≥80%	0	≥80%
Average cost of a systematic analysis or investigation (PART Eff. Measure)	2.2M	2.73M	1.98M	2.75M	1.3M	2.75M	2.75M	0	2.75M
Comments	2007 actual exceeded target. Target cost per systematic analysis is based on a National average that includes research in varied terrain, conditions, and geographic locations. The analyses completed in 2007 did not include extreme conditions and the cost was therefore were lower than the National average.								
# of annual gigabytes collected	0.745	97.793	158.048	20.038	37.409	20.038	20.038	0	20.038
# of cumulative gigabytes managed	211.458	351.289	509.338	524.826	546.747	544.864	564.902	+20.038	625.016

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Water Resources Investigations

Subactivity	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-) [a/]	2009 Program Changes (+/-) [b/]	2009 Budget Request	Change From 2008 (+/-)
Hydrologic Monitoring, Assessments, and Research ($000)	145,147	151,367	-661	-9,964	140,742	-10,625
FTE	*1,007*	*1,012*	*-48*	*-64*	*900*	*-112*
Cooperative Water Program ($000)	64,345	62,849	+1,170	-1,734	62,285	-564
FTE	*725*	*715*	*0*	*-6*	*709*	*-6*
Water Resources Research Act Program ($000)	5,404	6,304	0	-6,304	0	-6,304
FTE	*2*	*2*	*0*	*-2*	*0*	*-2*
Total Requirements ($000)	**214,896**	**220,520**	**+509**	**-18,002**	**203,027**	**-17,493**
Total FTE [c/]	***1,734***	***1,729***	***-48***	***-72***	***1,609***	***-120***

a/ Fixed cost increases for this activity total $4,514, of which $3,571 is budgeted and $943 is absorbed. A technical adjustment is proposed as part of a budget restructure that moves funding for global change activities into a new integrated budget activity titled Global Change.

b/ Changes for this activity include a reduction of -$984 for travel. The impact of this change is described in the General Statement that begins on page A-1.

c/ FTE above for 2007 include 3 FTE associated with contributed funds.

Activity Summary

The 2009 budget request for the Water Resources Investigations Activity is $203,027,000 and 1,609 FTE, which is a net program change of -$18,002,000 and -72 FTE from the 2008 Enacted level. Additional information on program changes is provided in each program element section of this document and in the Science on the Landscape section, which begins on page F-1.

Since 1879, the USGS has been involved in issues related to water availability, water quality, and flood hazards. This work, conducted by more than 3,500 hydrologists, technicians, and support staff located in every State, includes collection, management, and dissemination of hydrologic data; analysis of hydrologic systems through modeling or statistical methods; and research and development leading to new methods and new understanding.

The mission of the USGS water programs supports the Department's Strategic Plan, in particular End Outcome Goal 1.4: "Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment." This is accomplished through activities that contribute to two Intermediate Outcomes — "Ensure availability of long-term environmental and natural resource information, data and systematic

> "Severe and recurring flooding and drought have caused extensive loss of life, property damage and economic hardship in so many parts of our country, and reliable science to support sound water resource management has never been more important. Without timely information from the [Cooperative Water Program] and [National Streamflow Information Program], our safety, health, property, businesses and many elements of our natural environment are at greater risk."
>
> Letter to Senate and House Appropriations Subcommittees on Interior and Environment, signed by 27 non-governmental organizations, March 2007

analyses needed by land and resource managers for informed decisionmaking" and "Ensure the quality and relevance of science information and data to support decisionmaking" — and to a number of GPRA and PART program performance measures that are shown in the performance tables for the individual water programs.

Program Assessment Rating Tool (PART) Evaluation

In 2004, the majority of the Water Resources Investigations program underwent PART evaluation. In keeping with the President's Business Reference Model, rather than conducting the PART for eight individual water programs, the USGS was evaluated in (1) research and (2) data collection and dissemination categories and was rated "moderately effective." The PART evaluations found that the programs have a clear purpose, do a good job at leveraging resources, work with a wide array of partners, and maintain an effective Web site for distributing and visualizing water information. The evaluations also concluded that the USGS has effectively used the FACA Advisory Committee on Water Information and the National Water Quality Monitoring Council for feedback to improve programs and coordinate activities.

USGS Flood Monitoring

"The United States Geological Survey has provided great service to the effort of providing real time River data during this flood emergency. They have had crews working through the weekend and on the 4th of July holiday. Many crews worked from daylight until after dark. Most of their gages have worked flawlessly in providing real time stage data. A few critical gages have failed but the USGS has responded to make emergency repairs ….

"The USGS made numerous flood discharge measurements at record high stages …. Some of the measurements were made by boats in rapidly flowing water in very dangerous situations. Results of the measurements were called or emailed to the Corps in a timely fashion, usually within the hour of the measurement. This timely communication permitted the real time corrections … in the Corps database and the data was immediately used to adjust the reservoir Forecast."

Ray Barnes, Hydraulic Engineer
U.S. Army Corps of Engineers, Tulsa, OK
August 13, 2007

The USGS worked with the OMB to develop an Improvement Plan for carrying out the PART recommendations. Activities resulting from the 2007 PART improvement plan included the following items, which also align with the bureau's Water Census science strategy:

- ***Action:*** *Standardize water quality parameter definitions to enable integration of data across agencies.*
  Status: The initial round of assigning USGS parameters to EPA Substance-Registry System (SRS) names has been completed, and 92 percent of USGS-measured water-quality results are now associated with an SRS name. Discussions are continuing for resolving the remainder.
- ***Action:*** *Work with the National Academy to facilitate drafting of the first independent, holistic review of the Water Resources programs.*
  Status: The National Academy of Sciences (NAS) WRD review committee is on schedule. A final information-collection briefing/meeting was held in October 2007, in Washington, D.C. The review committee has met with senior USGS and Department officials, and the NAS report publication is expected in 2008.
- ***Action:*** *Revise the means by which WRD hydrologic data are provided to cooperators and the public in Annual Data Reports.*
  Status: All USGS Water Science Centers have received and have implemented the revised template and tools for the 2007 Annual Data Reports.

- ***Action:*** *USGS will work with the Committee on Environment and Natural Resources (CENR) Subcommittee on Water Availability and Quality (SWAQ) to develop a strategy for Federal science and technology to support U.S. water availability and quality.* **Status:** The SWAQ report, *A Strategy for Federal Science and Technology to Support Water Availability and Quality in the United States,* has been approved and made available to the public on the Internet. In September 2007, SWAQ reported annual progress to CENR in preparation for CENR's November meeting.

Performance measures resulting from the PART are shown in the performance tables for the Water programs, and the USGS has submitted a new PART Improvement Plan for 2008, for which all first quarter milestones were met. As a result of PART recommendations and associated performance measures, the USGS is implementing the following actions in 2008 —

- Outline a multi-year program of study to improve estimates of ground-water availability status and trends to meet the needs of decisionmakers across the Nation.
- Coordinate water research with EPA and the Mississippi River Basin/Gulf of Mexico Hypoxia Task Force to inform EPA guidance for targeting Federal funding to reduce nitrogen and phosphorus in 100 Mississippi River Basin watersheds.
- Convert USGS streamgaging stations to high data-rate radio transmission capability. This action, which supports the National Streamflow Information Program and is funding dependent, has two purposes:
    - Increase frequency of data transmission between streamgages and the satellite, thereby increasing the value and use of streamflow data by multiple users and partners, and
    - Meet the requirement, based on changes in satellite technology, that all USGS streamgaging stations have high data-rate radio capability before 2013.

Other Program Reviews

In 2006, the National Academy of Sciences' National Research Council (NRC) formed a Committee on River Science of the USGS. The Committee looked at a wide variety of work along rivers, ranging from monitoring streamflow and water-quality parameters to integrated, watershed-based research and national synthesis. The report recommends a potential future set of activities that the USGS should undertake related to River Science. The report is also available online at: *http://newton.nap.edu/catalog/11773.html*.

Based on PART recommendations, the USGS has asked the NRC's Water Science and Technology Board to conduct an in-depth review of the entire USGS Water Discipline. The purpose of the review is to assess the water program and recommend how the USGS can best address the Nation’s priority water issues. Such reviews in the past have yielded a strong endorsement of the USGS mission and provided useful insights to guide future program development. In recent years, the NRC has conducted detailed reviews of NSIP, NAWQA, the Water Use Program, Watershed Research, and River Science, among other topics. The last comprehensive review of the Water Discipline as a whole was completed in 1991.

The review of the entire Water Discipline was begun in 2007 and is continuing into 2008, with a final report anticipated in October 2008. The NRC has assembled a highly qualified panel of water resources experts from government, academia, and nongovernmental organizations. The

intention of the committee is to meet with a wide range of USGS managers, scientists, and customers to obtain a full range of insights into our current program.

Regarding internal reviews, the USGS Regional Hydrologists typically carry out an annual program review of each USGS Water Science Center (WSC) in the spring or summer of the year. The purpose of this review is to assess the technical, financial, and management strength of each WSC and to discuss project plans for the upcoming fiscal year. These reviews serve multiple purposes in that they help the WSCs plan their technical program for the coming year, they help the Regional Hydrologist identify where WSCs might need assistance, and they help the Water Discipline senior staff identify emerging technology or water-management trends to guide the direction of Water Discipline programs. The Regional Hydrologists summarize the cumulative findings of these reviews into a document that describes consistent themes, emerging technical and management issues, and noteworthy technical successes. This summary document is provided to the Water Discipline senior staff and Regional Executives to identify internal technical and management issues that need immediate attention. The summary document also provides external input from cooperating agencies that helps guide the long-term technical direction of Water Discipline programs.

Workforce Planning

The USGS is working hard to change skill sets to keep pace with changing customer needs, anticipated level budgets, and reduced reimbursable income. The bureau is using creative solutions for rapid changes in technology and workforce flexibility through the use of contractors and term appointments. In some cases, funding freed from salary load will be used to invest in partnerships through grants. However, in some cases the nature of the work requires the use of government employees. Thus, the USGS has initiated a VSIP/VERA process for a number of Water Science Centers and the National Research Program (NRP). Some of the positions vacated through the VSIP/VERA process will be filled with new employees who possess the requisite skills.

In 2007, the USGS implemented a VSIP/VERA for the NRP, which is funded largely by the Hydrologic Research and Development program and encompasses research units at three major centers: Reston, VA, Denver, CO, and Menlo Park, CA. This action was the result of an extensive workforce/staff planning effort that identified and quantified workforce requirements in the NRP. Changing program goals and priorities require a different balance of workforce skills to implement new strategic opportunities and directions. Also, restructuring and reduction of programmatic activities as a result of years of level funding, coupled with rising salary and other fixed costs, have reduced funds available for operational expenses. Programmatic restructuring is occurring

Competitive Sourcing at the National Water Quality Laboratory

In September 2007, the USGS announced the conclusion of a competitive sourcing study designed to improve the effectiveness and cost efficiency of Government operations at the National Water Quality Laboratory (NWQL) in Lakewood, CO. This was the first USGS standard competitive sourcing study to be conducted on an entire science center.

The competed Federal positions represented all operational areas of the NWQL. The successful offer was submitted by a team of Federal employees who will continue to provide the USGS and its many cooperators with cost-effective, high-quality, nationally consistent, and reproducible chemical analyses of water, sediment, and tissues, as well as identification and enumeration of benthic macro invertebrates. This team provides the USGS with demonstrated success and a flexible workforce to meet the NWQL's science mission.

The NWQL is beginning the transition to the Most Efficient Organization proposed by the USGS team. The highly dedicated staff composed of Federal employees and contractor staff will continue to provide the quality analytical, research, and field supply services that USGS customers have come to expect. No changes to the 2008 laboratory pricing catalog are anticipated as a result of this action.

within the current organizational structure. Positions were identified for VSIP and VERA offers through analyses of workforce needs and funding projections for programs managed by the NRP.

The VSIP/VERA was extended into 2008 because of late approval in 2007. To date, 20 scientists and support staff have opted for the VSIP/VERA. Hiring of several new scientists in the focus areas of surface-water hydrology, surface-water chemistry, and geomorphology is planned for 2008.

Subactivity Overview

Water Resources Investigations comprises three subactivities that operate with three distinctly different funding mechanisms:

The **Hydrologic Monitoring, Assessments, and Research subactivity** includes six programs funded directly from Federal appropriations and conduct work primarily inhouse, using the expertise of scientists on the Federal payroll. The programs in this subactivity include: Ground-Water Resources Program (GWRP), National Water-Quality Assessment (NAWQA), Toxic Substances Hydrology, Hydrologic Research and Development, National Streamflow Information Program (NSIP), and Hydrologic Networks and Analysis (HNA). These programs are primarily research oriented, with the exception of NSIP and portions of HNA, which focus on long-term data collection, and NAWQA, which provides status and trends information on water-quality conditions across the Nation. For 2009, the USGS is requesting increases in the GWRP (+$3.0 million) and NSIP (+$5.0 million), as part of the Department's Water for America initiative. This full initiative (+$9.5 million, including a component in the National Cooperative Geologic Mapping Program) is described in detail in the Science on the Landscape section, which begins on page F-1. Details for each of the three programs requesting funds in 2009 for the initiative are included in the individual program sections. The 2009 budget also requests +$0.5 million in the HNA program to augment activities begun in 2007 and 2008 related to implementation of the National Water Quality Monitoring Network, as called for in the Ocean Action Plan.

The **Cooperative Water Program subactivity** provides information needed to understand the Nation's water resources through a program of shared efforts and funding with 1,400 State, tribal, and local partner agencies. Authorizing legislation requires that States and localities pay at least half the cost of the work that the USGS performs under this subactivity, so program resources are leveraged and program priorities are determined in concert with partners. About half the funding supports basic data collection, including 65 percent of the USGS streamgaging network, and the remaining half supports interpretive investigations, which seek solutions to water-resources issues of national and local concern. Although the Coop Program is not requesting additional funds in 2009 for the Water for America initiative, partnerships established through this program will be used to transfer knowledge and results from the initiative to State, local, and tribal agencies.

Through the **Water Resources Research Act subactivity,** the USGS administers grants for 54 State research institutes designated by the Water Resources Research Act. The program supports academic research to aid in the resolution of State and regional water problems, promotes technology transfer, and provides for the training of scientists and engineers. Grant monies under this program must be matched by the receiving universities. This subactivity is proposed for elimination in 2009.

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Activity: Water Resources Investigations

Subactivity: **Hydrologic Monitoring, Assessments, and Research**
Program Component: **Ground-Water Resources Program**

	2007 Actual	2008 Enacted	2009			Change From 2008 (+/-)
			Fixed Costs & Related Changes (+/-)[a/]	Program Changes (+/-)[b/]	Budget Request	
Ground-Water Resources Program ($000)	8,098	7,853	+100	+2,618	10,571	+2,718
Total FTE	*61*	*61*	*0*	*+12*	*73*	*+12*

a/ Fixed cost increases for this program total $127, of which $100 is budgeted and $27 is absorbed.
b/ Changes for this program include a reduction of -$37 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Summary of 2009 Program Changes for the Ground-Water Resources Program

Request Component	($000)	FTE
• Water for America Initiative	+3,000	+12
• Memphis Aquifer study	-345	0
• Travel reduction	-37	0
TOTAL Program Changes	**+2,618**	**+12**

Justification of 2009 Program Changes

The 2009 budget request for the Ground-Water Resources Program (GWRP) is $10,571,000 and 32 FTE, a net program change of +$2,618,000 and +12 FTE from the 2008 Enacted level. This change includes an increase of $3,000,000 for the Water for America initiative and a decrease of $345,000 associated with eliminating congressional action related to a study of the Memphis aquifer.

Water for America Initiative **(+$3,000,000 / +12 FTE)**

Water is essential to maintain human and environmental health, agriculture, energy, and industry – in short, water is essential for the economic vitality of communities and the Nation. In its early history, U.S. water management focused on alleviating or controlling the impacts of floods and droughts. Investments in water infrastructure such as dams and canals provided safe, abundant, and inexpensive sources of water, aided flood management, and dramatically improved health and economic prosperity. The U.S. water resources, infrastructure, and technologies became the envy of the world.

The dawning of the 21st Century brings a new set of water resource challenges. Aging infrastructure and rapid population growth, mining of finite ground-water resources, reduced

water quality associated with particular land uses and land covers, water needed for human and environmental uses, and climate variability and change determine the amount of fresh water available at any time. Water shortage and water-use conflict have become more commonplace in many areas of the U.S. – even in normal water years – for irrigation of crops, for growing cities and communities, for energy production, and for the environment and species protected under the law.

The Water for America initiative involves the participation of the Bureau of Reclamation (BOR) and several USGS programs, as described in the Science on the Landscape section of the budget, which begins on page F-1. The USGS request for 2009 for GWRP is +$3,000,000, building upon a base of $1,567,000.

To continue managing vital water resources well, good information and predictive tools are needed to guide decisions made by the private sector, localities, Tribes, States, and the Federal government. The Nation needs a Census of Water that tracks changing flow, use, and storage of water, as well as models and predictive tools that will provide information necessary to inform decisions. The last overall assessment of water resources for the Nation was published by the Water Resources Council in 1978. Much has changed since that time. These changes have been driven by economics, demographics, technology, law, and climate.

Scientists and managers alike now recognize that surface water and ground water are a single resource and need to be managed as such. And, since 1978, data collection and delivery have undergone a technical revolution.

Under this initiative, the GWRP will —

- Perform the first nationwide assessment of water availability, water quality, and human and environmental water use by 2019 describing the change in water flows, ground-water storage, and water use in all sectors,
- Proceed with regional-scale studies by performing statistical analyses of the history and status of storage (in aquifers and reservoirs) and flows (in rivers and aquifers) for each of the Nation's 21 Water Resource Regions (to achieve the first cycle of a national water census by 2019, 6 regions will be studied for 3 years until the first cycle is complete — see *http://water.usgs.gov/GIS/regions.html*),
- Use statistical methods to significantly enhance the quality and timeliness of the Nation's water use information, in accordance with recommendations from the National Research Council, and
- Cooperate with State and local government in selected watersheds or aquifer systems to increase use of new technologies in water planning and management, such as regional ground-water / surface-water models that enable planners to assess the true limits of sustainability of the total water resource of a region and conjunctive (ground-water / surface-water) modeling and aquifer storage and recovery.

Memphis Aquifer study **(-$345,000 / 0 FTE)**

The reduction eliminates congressional action related to hydrologic monitoring, geologic mapping, and modeling of the Memphis Aquifer. This project is not an Administration or USGS priority and does not address the highest priority science needs in ground-water research and monitoring. This reduction will keep the core GWRP intact while allowing the USGS to make the best use of resources.

Program Performance Change

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Outyears
					A	B=A+C	C	D
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments								
% of targeted science products that are used by partners for land or resource manage-ment decision-making **(SP)**	85%	90%	93%	≥90%	≥90%	≥90%	0	≥90%
% of U.S. with ground-water availability status and trends information to support resource management decisions **(PART)** (denominator = 65 principal aquifers)	7% (4.5)	8% (5.5)	9% (6)	11% (7)	11% (7)	12% (8)	+1% (+1)	0
Total projected cost ($000)	1,575	1,925	2,100	2,625	2,625	3,000	+375	--
Projected cost per regional ground-water availability project (national average) (whole dollars)	350,000	350,000	350,000	375,000	375,000	375,000	375,000	--
Comments	Regional studies in 2007 included Carolina Coastal Plain, Denver Basin, Central Valley, Michigan Drainage Basin, Mississippi Embayment, and Basin and Range carbonate aquifers. Changes reflect the addition of one new study area in 2008 (Columbia Plateau) and one in 2009 (High Plains). Measure indicates the number of regional ground-water evaluation projects (status and trends in ground-water availability) that coincide with the Nation's 65 principal aquifers, as designated in the National Atlas. Average cost per project is $425,000, though actual costs range from <$100,000 to >$500,000 per project, depending on the scope and location of the study. Project costs include salaries, travel, training, vehicles, supplies, report production, and printing.							
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure the quality and relevance of science information and data to support decisionmaking**								
% of studies validated through appropriate peer review or indepen-dent review (SP)	100%	100%	100%	100%	100%	100%	0 (+1)	0
PART Efficiency and Other Output Measures								
Systematic analyses and investigations delivered to customers	16	18	42	36	36	37	+1	+1 in 2010 +2 in 2011 +2 in 2012
Total projected cost ($000)	4,800	5,400	6,300	5,400	5,400	5,550	+150	--
Actual/projected cost per scientific report or other product (whole dollars)	300,000	300,000	150,000	150,000	150,000	150,000	150,000	--

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Outyears
					A	B=A+C	C	D
Comments	Decrease in 2008 results from 2007 conclusion of a modeling effort in the Ozarks aquifer and from normal, planned cycling projects. Change in 2009 results from elimination of funds in 2009 for unrequested congressional action related to a study of the Memphis Aquifer and a requested increase for the Water for America initiative. Outyear changes result from the 2009 requested increase for the Water for America initiative. Actuals for 2007 are higher than the target due to transition from the old WRD Reports Tracking System to the new enterprise-wide IPDS, which tracks status of scientific products for the entire USGS. More authors are complying with requirements to enter all scientific publications and other products into the system. Since the transition to IPDS was made in the middle of the year, the increased compliance rate results in exceeding the target for the water programs. Targets for 2008 have been revised based on increased compliance in reporting completion of publications and other products, and unit projected costs have been adjusted accordingly. Cost per scientific product is an average that includes the cost of writing, editing, peer review, and publication of each product, as well as the cost of the studies from which the products are derived. Reimbursements from other Federal agencies are included in the calculation, but the portion of funding housed in the Enterprise Information Activity (associated with the Enterprise Publishing Network) is not included.							
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure availability of long-term environmental and natural resource information, data, and systematic analyses needed by land and resource managers for informed decisionmaking**								
% of the Nation's 65 principal aquifers with monitoring wells used to measure responses of water levels to drought and climatic variations to provide information needed for water-supply decisionmaking **(PART)** (denominator = 65 principal aquifers)	61% (40)	61% (40)	60% (39)	60% (39)	60% (39)	60% (39)	0	0
Comments	Change in 2008 is due to decrease proposed in the President's budget for the Cooperative Water Program.							
% of ground-water stations that have real-time reporting capability in the ground water climate response network **(PART)** (denominator = 347 sites in climate network)	67% (233)	47%	52%	53%	53%	53%	0	0
Comments	During 2006 and 2007, the network in total grew more than the number of wells reporting real-time because funding partners opted to fund more non-real-time stations. As a result, the relative proportion of the network that is reporting real-time declined. Real-time measurement continues to grow in the USGS-funded portion of the network. The USGS is requesting to delete this measure and refine the measure regarding "% of the Nation's 65 principal aquifers with monitoring wells." As noted in the 2006 and 2007 year-end reports, overall expansion of the network can result in a decrease in the performance metric because not all of the new wells added to the network are real-time.							

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Outyears
					A	B=A+C	C	D

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 President's budget level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent outyear.

Program Overview

Ground water is one of the Nation's most important natural resources and is becoming increasingly important to all our lives. Ground water is the primary source of drinking water to approximately half the Nation's population, provides about 40 percent of the irrigation water essential for the Nation's agriculture, sustains the flow of most streams and rivers, and helps maintain a variety of aquatic ecosystems. The continued availability of ground water is essential for current and future populations and the health of the economy in all 50 States.

The goals of the GWRP are to —

- Identify, describe, and make available fundamental information regarding ground-water availability in the Nation's major aquifer systems, and evaluate this information over time,
- Characterize the natural and human factors that control recharge, storage, and discharge in the Nation's major aquifer systems, and to improve understanding of these processes,
- Develop and test new tools and field methods for analyzing ground-water flow systems and their interactions with surface water, and
- Provide scientific leadership across all USGS programs on matters pertaining to the Nation's ground-water resources, including research directions, quality control, technology transfer, and information storage and delivery.

2009 Program Performance

The 2009 budget request for the GWRP is $10,571,000 and 73 FTE. To address the goals listed above, the GWRP is planning the following activities for 2009, many of which will be enhanced by the Water for America initiative:

Specific GWRP Activities for 2009 Water for America Initiative

- Develop, test, and apply new statistical tools for estimating water use and improving the water-use data base in accordance with the recommendations of the National Research Council.
- Work with the National Cooperative Geologic Mapping Program to develop better characterization of aquifers that provide important water supplies or have the potential to

augment existing water supplies, including assessment of the amount of fresh water stored in major aquifers, through improved data networks, better systems for data sharing, and retrospective assessment and modeling studies.

- Work with NSIP to provide national-level analyses of the long-term trends in streamflows (including shifts in seasonal patterns and in flood flows and low flow conditions) and analyses of changes in ground water storage in the Nation's principle aquifers.

Regional Ground-water Investigations
(Estimates for 2007, $4.0 million; 2008, $4.0 million; 2009, $7.0 million)

Investigations consist of multiple large-scale study areas or aquifers that collectively make up a national assessment of ground-water availability. Individual studies form the building blocks that can be used to develop a comprehensive regional and national perspective. In 2009, the regional ground-water availability study in the Mississippi Embayment (Arkansas, Mississippi, Tennessee, and Louisiana) will be completed. At the same time, regional ground-water evaluation studies focused on the Basin and Range carbonate-rock aquifers (Utah and Nevada), the Columbia Plateau basaltic-rock aquifers (Oregon and Washington), and the initial year of the High Plains aquifer (Wyoming, South Dakota, Colorado, Nebraska, Oklahoma, Kansas, New Mexico, and Texas) study will be underway.

Water Availability and Use — Great Lakes Basin Pilot Accomplishments

Two significant reports were released in 2007 on historical and current water availability conditions in the Great Lakes Basin.

A report released early in 2007 described historic lake level changes and their ecological impacts. Changes in water levels in the Great Lakes were related to climate changes of the past, and the report highlights major implications of lake level rise for storage, coastal ecosystems, and human activities.

The second recently released publication indicated that more precipitation and an earlier snowmelt runoff was observed over the most recent couple of decades than in the earlier part of the 1900s. Annual low streamflows increased more during the last 50 years in some of the few regulated and urban basins analyzed compared to relatively natural basins.

Reports on ground-water flow and storage and on water use in the Great Lakes region also have been published, and more are planned (*http://water.usgs.gov/wateravailability/greatlakes/*).

Finally, the information and understanding acquired from this study has provided science support for other regional initiatives such as the Great Lakes Regional Collaboration.

In addition, the National Water Availability and Use Program, which began in 2005 at the request of Congress with a pilot study of the Great Lakes Basin, will be wrapping up in 2009. The goal of this pilot study: improve the ability to forecast water availability for future economic and environmental uses. The study provides information necessary to characterize the status of present water supply, evaluate how water availability is changing over time, and estimate the condition of future water supplies, given projected needs. The Great Lakes Basin study focuses on improving fundamental knowledge of the water budget of the basin, including the flows, storage, and water use by humans. An improved quantitative understanding of the basin's water budget not only provides key information about water quantity but also provides a fundamental basis for many analyses of water quality and ecosystem health.

Long-term monitoring and assessment of water resources by the USGS provides the science needed by the public and decisionmakers to assess water availability and use, to understand drought and its impact on water supply, and to manage and use our water resources responsibly. The National Water Availability and Use Program is intended to provide citizens, communities, and natural-resource managers with a clearer knowledge of the status of the Nation's water resources (how much water we have now), trends over recent decades in water

availability and use (how water availability is changing), and an improved ability to forecast the availability of water for future economic and environmental uses (how water availability needs might change in the future).

The Great Lakes Basin pilot study ($1,200,000) was accompanied by a scaled back effort in the Lower Colorado River Basin ($400,000). The Lower Colorado River Basin study focused on methods development for analysis and presentation of ground-water conditions in western states utilizing available information that could possibly be used in other regions of the country. The approach taken will display ground-water conditions through multiple layers of data in an interactive web-based mapping system. The Lower Colorado River Basin part of the overall pilot effort is helping determine the best ways to evaluate the present ground-water resource and how to deliver the information in a manner that is most helpful to planners and policymakers working at local, regional, and national levels. The program is based on concepts presented in the report, *Concepts for National Assessment of Water Availability and Use* (*http://water.usgs.gov/pubs/circ/circ1223/*), which was produced at the request of the House Appropriations Committee.

Field Methods and Model Development

(Estimates for 2007, $1.2 million; 2008, $1.1 million; 2009, $1.1 million)

The GWRP is continuously searching for more efficient methods to evaluate ground-water resources at a variety of scales. The USGS has been at the forefront of devising new analytical techniques to solve practical problems in the study of ground-water resources. Geophysical methods and application research, along with ground-water model development are specialized activities that support and benefit all USGS projects in accomplishing organizational goals. In 2009, the Branch of Geophysics will direct their efforts towards quantitative investigations of the spatial and temporal nature of hydrogeologic structures and processes. Ultimately, this continued effort to explore new technologies and their implementation in the field will help solve real world problems like the mapping and quantification of ground-water discharge into streams, lakes, and coastal zones using a fiber-optic distributed temperature sensor. Furthermore, efforts will continue to develop and apply our ground-water models to provide critical tools and information needed for informed water-resource decision making. In 2009, the GWRP will support the application of a recently developed USGS advanced modeling capability to comprehensively simulate watershed hydrologic processes and water budgets in several basins of the United States. This new capability—the GSFLOW code (Ground-Water/Surface-Water FLOW model)—allows for detailed analysis of the important hydrologic processes that control water flow and storage within small- and large-scale watersheds—from precipitation that falls within a watershed; to the generation of streamflow throughout a watershed; and to the flow, storage, and discharge of ground water in aquifers that underlie a watershed. In addition, applications of our ground-water models will be made in complex aquifer settings and to inform challenging water-resource management issues such as assessing water availability, saltwater intrusion, aquifer storage and recovery systems, and the effects of ground-water withdrawals on sensitive ecosystems.

Fundamental Data and Ground-water Level Monitoring

(Estimates for 2007, $0.5 million; 2008, $0.4 million; 2009, $0.4 million)

Collection of fundamental ground-water information is critical to the ability to assess and assure the availability of the Nation's ground-water resources. The USGS maintains a database of ground-water data records from about 850,000 wells that have been compiled during the course of ground-water hydrology studies over the past 100 years. The GWRP has added value to this

information by making these data available for several networks in an easily accessible manner via the Internet *(http://groundwaterwatch.usgs.gov/)*. The Web sites group related wells and data from active well networks, and provide basic statistics about the water-level data collected by USGS water science centers and supplied by USGS partners through cooperative agreements. The Active Ground-Water Level Network contains water levels and well information from more than 20,000 wells that have been measured by the USGS or USGS cooperators at least once within the past 365 days. This network includes all of these wells, regardless of measurement frequency, aquifer monitored, or the monitoring objective. Additionally, the Ground-Water Climate Response Network was also developed and continues to be maintained to assess changes in ground-water conditions due to climate stresses. The ground-water climate response network, although small, continues to grow as the public, water managers, and scientists better understand the connection between climatic variations and shallow ground-water aquifers. Moreover, it is clearly recognized that periodic evaluation of water levels on a regional scale is necessary to properly inventory ground-water reserves in areas experiencing intense development, such as the High Plains aquifer, Mississippi Embayment, and the Columbia Plateau.

Technical Support

(Estimates for 2007, $1.7 million; 2008, $1.9 million; 2009, $1.9 million)

This support provides quality control to assure the technical excellence of the ground-water field programs and provides a structured way of transferring new technology to activities that are conducted at USGS Water Science Centers in each State. This program component also provides a formal way of establishing research priorities and making ground-water information available to other agencies, the scientific community, and the public.

The goals of the GWRP support the Department's strategic plan, specifically the goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment. In conjunction with the Cooperative Water Program and an array of reimbursable projects, the GWRP contributes to the outcome measures and PART program performance measures shown in the Program Performance Overview table.

Updates to 2008 Program Performance Targets

Performance targets for 2008 have been updated from those portrayed in the 2008 President's budget. These updates reflect enacted funding levels for 2008. In the case of the GWRP, this involves congressional action that adds funds for a study of the Memphis aquifer and the resulting systematic analyses and investigations.

Program Performance Overview

There are no performance measures that can be tied exclusively to the GWRP, except for "systematic analyses and investigations delivered to customers." However, in conjunction with the Cooperative Water Program, Hydrologic Networks and Analysis, and an array of reimbursable projects, the GWRP contributes to all the measures listed below.

End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment.									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
GPRA End Outcome Measures									
% targeted science products that are used by partners for land or resource management decisionmaking **(SP)**	85%	90%	93%	≥90%	93%	≥90%	≥90%	0	≥90%
Intermediate Outcome Measures and Bureau and PART Outcome Measures Ensure availability of long-term environmental and natural resource information, data, and systematic analyses needed by land and resource managers for informed decisionmaking									
% of the Nation's 65 principal aquifers with monitoring wells used to measure responses of water levels to drought and climatic variations to provide information needed for water-supply decisionmaking **(PART)** (denominator = 65 principal aquifers)	60% (39)	61% (40)	61% (40)	60% (39)	60% (39)	60% (39)	60% (39)	0	66% (43)
Comments	Changes in 2007 and 2008 are due to decreases proposed for the Cooperative Water Program.								
Contributing Programs	GWRP, HNA, Coop Water Program (USGS and State/local contributions), and reimbursements from other Federal agencies.								
% of ground-water stations that have real-time reporting capability in the ground water climate response network **(PART)** (denominator = sites in climate network)	57%	67%	47%	63% (220/347)	52% (181/347)	53% (290/544)	53% (290/544)	0	53% (305/574)
Comments	During 2006 and 2007, the network in total grew more than the number of wells reporting real-time because funding partners opted to fund more non-real-time stations. As a result, the relative proportion of the network that is reporting real-time declined. Real-time measurement continues to grow in the USGS-funded portion of the network. The USGS is requesting to redefine this measure. As noted in the 2006 and 2007 year-end reports, overall expansion of the network can result in a decrease in the performance metric because not all of the new wells added to the network are real-time.								
Contributing Programs	GWRP, HNA, Cooperative Water Program (USGS and State/local contributions), and reimbursements from other Federal agencies.								

End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment.									
End Outcome Goal **End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure**	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
% of U.S. with ground-water availability status and trends information to support resource management decisions **(PART)** (denominator = 65 principal aquifers)	5% (3.5)	7% (4.5)	8% (5.5)	9% (6)	9% (6)	11% (7)	12% (8)	+1% (+1)	12% (8)
Total Projected Cost ($000)		***1,575***	***1,925***	***2,100***	***2,100***	***2,625***	***3,000***	***+375***	**--**
Projected Cost per regional ground-water availability project (national average) (whole dollars)		***350,000***	***350,000***	***350,000***	***350,000***	***375,000***	***375,000***	***375,000***	**--**
Comments	Regional studies in 2007 included Carolina Coastal Plain, Denver Basin, Central Valley, Michigan Drainage Basin, Mississippi Embayment, and Basin and Range carbonate aquifers. Changes reflect the addition of one new study area in 2008 (Columbia Plateau) and one in 2009 (High Plains). Measure indicates the number of regional ground-water evaluation projects (status and trends in ground-water availability) that coincide with the Nation's 65 principal aquifers, as designated in the National Atlas. Average cost per project is $425,000, though actual costs range from <$100,000 to >$500,000 per project, depending on the scope and location of the study. Project costs include salaries, travel, training, vehicles, supplies, report production, and printing.								
Contributing Programs	Cooperative Water Program, Ground-Water Resources Program								
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure the quality and relevance of science information and data to support decisionmaking**									
% of studies validated through appropriate peer review or independent review **(SP)**	100%	100% (16)	100% (18)	100% (18)	100% (42)	100% (36)	100% (37)	0 (+1)	100% (38)
PART Efficiency and Other Output Measures									
# systematic analyses & investigations delivered to customers	UNK	16	15	18	42	36	37	+1	38
Total actual/projected cost ($000)		***4,800***	***4,500***	***5,400***	***6,300***	***5,400***	***5,550***	***+150***	**--**
Actual/projected cost per scientific report or other product (whole dollars)		***300,000***	***300,000***	***300,000***	***150,000***	***150,000***	***150,000***	***150,000***	**--**

End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment.									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
Comments	Actuals for 2007 are higher than the target due to transition from the old WRD Reports Tracking System to the new enterprise-wide IPDS, which tracks status of scientific products for the entire USGS. More authors are complying with requirements to enter all scientific publications and other products into the system. Since the transition to IPDS was made in the middle of the year, the increased compliance rate results in exceeding the target for the water programs. Targets for 2008 have been revised based on increased compliance in reporting completion of publications and other products, and unit projected costs have been adjusted accordingly. Cost per scientific product is an average that includes the cost of writing, editing, peer review, and publication of each product, as well as the cost of the studies from which the products are derived. Reimbursements from other Federal agencies are included in the calculation, but the portion of funding housed in the Enterprise Information Activity (associated with the Enterprise Publishing Network) is not included.								
# real-time ground-water sites reporting in NWISWeb	799	796	917	685	983	984	987	+3	900
Comments	Exceeded 2007 target because of increased interest by partner agencies, who contributed additional funding amounts that were not anticipated when targets were set. A portion of the change in 2007, 2008, and 2009 is due to budget increase for the Healthy Lands initiative, for which the funds reside in the Biological Research and Monitoring Subactivity.								
Contributing Programs	GWRP, HNA, Coop Water Program (USGS and State/local contributions), and reimbursements from other Federal agencies. In addition, the Biological Research and Monitoring Subactivity houses the funds for the Healthy Lands initiative, which will add new sites to the network in 2008.								

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Activity: Water Resources Investigations

Subactivity: **Hydrologic Monitoring, Assessments, and Research**
Program Component: **National Water-Quality Assessment Program**

	2007 Actual	2008 Enacted	2009			Change From 2008 (+/-)
			Fixed Costs & Related Changes (+/-) [a/]	Program Changes (+/-) [b/]	Budget Request	
National Water-Quality Assessment ($000)	62,818	63,912	+1,144	-10,943	54,113	-9,799
Total FTE	*400*	*400*	*0*	*-72*	*328*	*-72*

a/ Fixed cost increases for this program total $1,445, of which $1,144 is budgeted and $301 is absorbed.
b/ Changes for this program include a reduction of -$298 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Summary of 2009 Program Changes for the National Water-Quality Assessment Program

Request Component	($000)	FTE
• Reduce NAWQA activities	-10,645	-72
• Travel reduction	-298	0
TOTAL Program Changes	**-10,943**	**-72**

Justification of 2009 Program Changes

The 2009 budget request for the National Water-Quality Assessment (NAWQA) program is $54,113,000 and 328 FTE, a net program change of -$10,943,000 and -72 FTE from the 2008 Enacted level.

Reduce NAWQA activities **(-$10,645,000 / -72 FTE)**

The proposed reduction to targeted NAWQA activities will free up resources for higher priority activities being conducted in the Water Resources Discipline. Monitoring of ground-water quality to determine current conditions and trends, as well as data collection for topical studies, would be stopped until data analysis and reporting on prior year work is completed, while all surface-water monitoring would continue. Suspension of ground-water monitoring will allow the USGS to focus resources on targeted sampling sites and delivering products resulting from prior year investments.

Regional and Study Unit Assessments of Status and Trends — Status and trend assessments focus on surface-water quality in 42 Study Units grouped within 8 major river basins in the United States, and ground-water-quality in about one-third of the Nation's principal aquifers. In 2009, source-water and ground-water monitoring activities would be stopped, affecting data currently collected in 28 States and 14 of the 42 NAWQA Study Units. The

proposed budget reduction for this program component will result in a loss of approximately 65,000 of physical and chemical measurements from more than 200 wells and about 22 large surface and ground-water supply intakes. It is possible that in some cases, external stakeholders would need to build the capability to provide water-quality information for themselves.

Topical Studies of National Priority — Topical studies address five national priority topics that establish links between sources and transport of contaminants, and the potential effects of contaminants on humans and aquatic ecosystems. The topics are effects of nutrient enrichment on stream ecosystems; sources, transport, and fate of agricultural chemicals; transport of contaminants to public-supply wells; effects of urbanization on stream ecosystems; and bioaccumulation of mercury in stream ecosystems. In 2009, monitoring and assessments associated with five national priority topics will be reduced. Specifically, existing field studies would be stopped and no new field studies would be started. Available funds would be used to support the highest priority planned reports resulting from studies started in 2001 and 2005. No new studies would be initiated in 2009 as originally planned in areas such as California, New York, North Carolina, and South Carolina.

Supporting Research and Methods — To ensure NAWQA data collection and analyses are relevant to emerging issues, about 10 percent of program resources is devoted to developing state-of-the art methods of water-quality sample collection and analysis and to innovative research techniques, such as those involving age-dating, dye tracer tests, and isotope analysis. This program area would be reduced, affecting the number of systematic analyses and investigations produced by the National Research Program (a cadre of senior researchers who receive funding from NAWQA), and there would be reductions in the services provided by the Hydrologic Instrumentation Facility, the National Water Information System, the National Water Quality Laboratory, and USGS support for the Advisory Committee on Water Information's National Water Quality Monitoring Council.

Technical Support of USGS Water-Quality Activities — This program component provides national technical support and training for the geographically distributed water-quality studies. In 2009 this program component would be reduced by 20 percent, including reductions in Office of Water Quality technical support and quality assurance oversight activities across USGS. This would result in eliminating Office of Water Quality reviews of WSC activities.

Other Effects:

- Reduce the number of physical and chemical analyses produced by the National Water Quality Laboratory (NWQL) by tens of thousands of analytical results.
- Reduce scientific report production in NAWQA by about 20 percent. In addition to reducing the number of USGS reports and journal articles, NAWQA will not have the new data to continue supporting the following regional and national scale reporting efforts of other agencies such as —
    - Heinz Center's State of the Nation's Ecosystem Report,
    - EPA's State of the Environment Report, and
    - EPA's Science Advisory Board on Gulf Hypoxia.
- Reduce the overall USGS water resources staff by 72 FTE (hydrologists, biologists, and hydrologic technicians). Options for implementing this reduction would be targeted

VSIP/VERA offerings, consolidation of current and future vacancies, and targeted reductions in force.

Program Performance Change

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Outyears
					A	B=A+C	C	D
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments								
Systematic analyses and investigations delivered to customers	137	136	330	306	306	245	-61	0
Total actual/projected cost ($000)	41,100	40,800	49,500	45,900	45,900	36,750	-9,150	--
Actual/projected cost per scientific report or other product (whole dollars)	300,000	300,000	150,000	150,000	150,000	150,000	150,000	--
Comments	Change for 2009 is due to the 15 percent reduction proposed for the program. Actuals for 2007 are higher than the target due to transition from the old WRD Reports Tracking System to the new enterprise-wide IPDS, which tracks status of scientific products for the entire USGS. More authors are complying with requirements to enter all scientific publications and other products into the system. Since the transition to IPDS was made in the middle of the year, the increased compliance rate results in exceeding the target for the water programs. Targets for 2008 have been revised based on increased compliance in reporting completion of publications and other products, and unit projected costs have been adjusted accordingly. Cost per scientific product is an average that includes the cost of writing, editing, peer review, and publication of each product, as well as the cost of the studies from which the products are derived. Reimbursements from other Federal agencies are included in the calculation, but the portion of funding housed in the Enterprise Information Activity (associated with the Enterprise Publishing Network) is not included.							
% of U.S. with ground-water quality status and trends information to support resource management decisions **(PART)**	39%	58%	68%	70%	70%	70%	0	0
Comments	This measure is determined by the incremental completion of the total number of planned ground-water studies (both status and trends) annually and over a 5-year period. Annual completion of sampled aquifers would drop from a planned 8 percent annual increase to 0, and the 5-year total would stop in 2009 at the 2008 level of 70 percent of the original 100 percent planned for assessment through 2013.							
% improvement in accuracy of watershed (SPARROW) model prediction for total nitrogen and total phosphorus (measured as reduced error) **(PART)**	31%	24%	20%	20%	20%	20%	0	0

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Outyears
					A	B=A+C	C	D
Comments	This measure has proved extremely difficult to calculate with any degree of accuracy and difficult to understand in terms of linkage to the budget; thus, the USGS will be proposing a change to the measure. Best estimates based on the 2009 budget indicate that all progress on improving this model will cease if the program sustains a 15 percent funding reduction.							
Average cost per analytical result, adjusted for inflation, is stable or declining over a 5-year period **(PART)**	$8.63	$8.34	$8.08	$8.64	$8.64	$9.15	+$0.51	--
Comments	Target for 2007 was exceeded because of continual efforts to reduce costs by using new instruments and technologies that require less personnel time and maintenance, streamlining sample processing procedures automating more of the sample tracking costs, and applying additional energy saving approaches throughout the National Water Quality Laboratory (NWQL). Target for 2008 has not been adjusted based on 2007 actual because of uncertainty at the NWQL during this period of transition to a Most Efficient Organization, pursuant to the 2007 competitive sourcing study. Target for 2009 reflects a reduction of 65,000 analytical results per year for 5 years, due to the reduction in NAWQA program. In 2009, the cost per analytical result at the NWQL would rise, due to the reduction in analytical results processed for the NAWQA program. The USGS estimates a reduction of about 65,000 analytical results, out of a total 1.2 million. The decreased lab workload would cause basic infrastructure costs at the NWQL (such as rent and utilities) to be shared over a much smaller number of analyses. If these 65,000 analytical results were the only results lost in 2009, the cost per result at a straight-line level would rise to at least $9.15. But at this time, it is not possible to precisely quantify the expected rise in cost, due to several complicating factors, including implementation of a Most Efficient Organization at the NWQL (following a recent competitive sourcing study) and uncertainty in the number of analytical results that other USGS programs may request during 2009 (for example, there may be a decline in the number of results that the NWQL will process for the Cooperative Water Program and Toxic Substances Hydrology, due to the reduction proposed for those programs). This PART efficiency measure (a comparison between annual costs and a 5-year moving average) is computed by calculating the total number of determinations (sample analyses) for the year, divided by the total income to the NWQL for analytical services. The calculation does not include funding that supports "sustaining" activities at the NWQL, which take place regardless of the number of samples processed.							

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 President's budget level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent outyear.

Program Overview

The National Water-Quality Assessment (NAWQA) program addresses three long-term goals:

- Describe the status and trends in the quality of a large, representative part of the Nation's surface-water and ground-water resources,
- Provide an improved understanding of the primary natural factors and human activities affecting these conditions, and
- Provide information that supports development and evaluation of management, regulatory, policy, and monitoring decisions by other Federal, State, and local agencies.

The full scale NAWQA program began in 1991. During its first decade, the Program conducted interdisciplinary assessments and established a baseline understanding of water-quality conditions in 51 of the Nation's river basins and aquifers, referred to as Study Units. New studies were initiated in 2001 to be completed in 42 of the 51 Study Units. The studies, including anticipated activities through 2012, are outlined in NAWQA's 5-Year Plan.

The goals of the NAWQA program support the bureau's Science Strategy and the Department's Strategic Plan, specifically by contributing to the improvement in our understanding of stream ecosystems and ecosystem change due to human and natural causes, the role of the water environment in human and ecosystem health, effects of climate variability and change on aquatic resources; and as the water quality component of a water census for the U.S. In conjunction with other USGS programs and an array of reimbursable projects funded by partner agencies, NAWQA contributes to the outcome measures and PART program performance measures shown in the table at the end of this section.

To share program knowledge and to solicit external input on program direction, NAWQA managers coordinate extensively with Federal agencies such as the EPA, USDA, State and local agencies, non-governmental organizations, and the private sector. For example —

- NAWQA staff share office space in selected EPA offices to ensure that technical information and resources are shared, so that duplication can be avoided and Federal dollars can be saved. This collaboration has been highly beneficial; for example, during 2007, aquatic-life benchmarks for a total of 71 pesticides, developed by NAWQA in collaboration with EPA, were adopted by States in their implementation of the Federal Insecticide, Fungicide, and Rodenticide Act. Aquatic-life benchmarks for 39 additional pesticides have been developed and are undergoing EPA review.
- The Program continues coordination with its National Liaison Committee, consisting of about 100 representatives with water-resources responsibilities or interests from Federal, State, and regional organizations, academia, public interest groups, professional and trade associations, and the private industry.
- The NAWQA Program continues its extensive working relationship with the H. John Heinz III Center for Science, Economics, and the Environment (Heinz Center) and the EPA Office of Information to develop national indicators on nutrients (phosphorus and nitrogen) and contaminants (including pesticides) in streams and ground water. This information is used in the development of 21 water-quality indicators for the Heinz Center *State of the Nation's Ecosystems* and 6 indicators for EPA *State of the Environment Report,* produced every 3–5 years, including in 2007 and 2012. In 2007,

Application of NAWQA Information for Gulf of Mexico Hypoxia

During 2007, NAWQA released results from an enhanced SPARROW model of the Mississippi River and Atchafalaya River Basins. The results —

- Reveal important nonpoint and point sources of nitrogen and (for the first time) results for phosphorus,
- Identify key States and sub-basins contributing nutrients to the northern part of the Gulf of Mexico, and
- Show for the first time at this scale, the importance of reservoirs, stream size, and other hydrologic factors in controlling nutrient delivery to the Gulf.

These findings are used by the EPA Science Advisory Board and the Gulf of Mexico Hypoxia Task Force in their development of recommendations and actions to reduce the nutrient burden flowing into the Mississippi and Atchafalaya Rivers and causing hypoxia in the Gulf of Mexico.

NAWQA information was key to 21 indicators, including the core indicator describing annual loads of nitrogen from more than 22,000 watersheds across the United States.

- The NAWQA program continues collaboration and support for the National Water-Quality Monitoring Council (composed of more than 50 representatives from other Federal, State, Tribal, and local agencies, non-governmental organizations, industry, and academia) in their effort to develop consistent methodology and national water monitoring networks.
- The program hosts public congressional briefings on key findings relevant to water-issues of national concern. Since 1998, the Program has co-hosted or participated in 20 congressional briefings, in large part supported by the Water Environment Federation.

Application of NAWQA information to Departmental Salinity Control Responsibilities

In 2007, the USGS released a regional assessment of salinity in important surface and ground-water supplies in parts of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming.

The assessment is directly relevant to the Department of Interior's responsibilities to the Colorado River Basin Salinity Control Program, a successful cooperation among a multitude of local, State, and Federal agencies in the Southwest.

Findings show success of salinity control efforts in the Upper Colorado River Basin, implemented in large part by Bureau of Reclamation, Bureau of Land Management, and U.S. Department of Agriculture, resulting in significant decreases since 1989 in salinity loads downstream in the Colorado River.

2009 Program Performance

The 2009 budget request for the NAWQA program is $54,113,000 and 328 FTE, a program change of -$10,943,000 and -72 FTE from 2008 Enacted. At the proposed level, the program would continue national synthesis of selected topics; regional and national assessments of status and trends in streams and ground water; studies of source-water quality associated with large community water systems; and five topical studies:

- Effects of nutrient enrichment on stream ecosystems,
- Sources, transport, and fate of agricultural chemicals,
- Transport of contaminants to public-supply wells,
- Effects of urbanization on stream ecosystems, and
- Bioaccumulation of mercury in stream ecosystems.

Data collection on ground water and source water would stop, along with all data collection for the topical studies listed above. Long-term stream monitoring would continue at all 113 sites and ecological sampling would continue at all 58 stream sites.

The NAWQA Program implements and supports outreach and liaison activities at local, State, regional, and national scales. NAWQA's Web site *(http://water.usgs.gov/nawqa/)* provides rapid access to NAWQA data, products, and methods documents, and includes an up-to-date listing of current developments that allows interested parties to get new information in a timely fashion. In 2006, the program made public more than 11 million records of data on water quality, ecology, and hydrology, providing one of the largest nationally consistent on-line collections of water-quality data and associated information. Data include over 8,000 stream sites, over 8,000 wells, concentrations in water, sediment, and aquatic tissues for 2,000 chemical compounds, and fish, aquatic insect, and algal community data for about 16,000 samples. In 2007, geographic maps displaying data and data-collection locations and data graphing capabilities

were added. As follow-up to user requests for specific information, over 675,000 data retrievals were delivered to the public and internal users. All data from NAWQA collected during prior years would continue to be available for users in 2009.

Major products anticipated in 2009 include —

- Comprehensive national summary report (USGS Circular) on the quality of source water used for drinking water, including in domestic and public-supply wells and at surface-water intakes. Observed conditions are compared to national drinking-water standards, guidelines, and benchmarks to place water-quality conditions in a human health context. Insights into key processes, natural factors, and human activities controlling the transport and fate of contaminants to source waters are to be included.
- Comprehensive national summary report (USGS Circular) on the quality of stream ecosystems across the U.S. ecological communities (fish, algae, and aquatic insects) are described and conditions are assessed in relation to human activities, land use, chemical use, and natural factors that can affect ecological health in the Nation's streams in diverse geographic and environmental settings.
- Comprehensive national summary report (USGS Circular) on the occurrence and trends in nutrients in streams and ground water. Nutrients in water are assessed in relation to human activities, land use, and natural factors that can affect water quality. In addition, observed conditions are compared to national water-quality standards, guidelines, and benchmarks to assess the potential effects of water-quality conditions on human health and aquatic life.
- Comprehensive national summary report (USGS Circular) on trends in pesticide concentrations in U.S. streams from 1992-2006.
- Comprehensive summary report (USGS Circular) on the quality of the High Plains aquifer spanning areas in Colorado, Kansas, Nebraska, Oklahoma, Texas, and Wyoming.
- Release of a Mississippi River Basin water-quality model that identifies top priority watersheds contributing the largest amounts of nitrogen and phosphorus to the northern Gulf of Mexico. Findings will help States, EPA and other Federal agencies, and other Gulf of Mexico partners to target nutrient sources—such as from agricultural fields, livestock operations, pastureland, atmospheric deposition, and wastewater discharges—in the implementation of nutrient reduction strategies. Model findings will be used to identify watersheds where it would be most cost effective to implement such strategies, and to test and fine tune the possible effectiveness of different nutrient management options for meeting the goals of reducing the size of the zone of hypoxia in the northern Gulf of Mexico.
- Release of a data system for all USGS water program aquatic ecological data, based on an enhancement of the existing NAWQA Data Warehouse system.

The USGS approaches the program goals listed in the Program Overview using six major program elements, newly organized from previous years, for which 2009 activities are described below:

National Synthesis of Key Findings Related to Important Water-Quality Topics

(Estimates for 2007, $7.5 million; 2008, $7.6 million; 2009, $7.6 million)

National synthesis topics cover pesticides, nutrients, and aquatic ecology, and to a lesser extent, volatile organic compounds and trace elements. Findings contribute to a comprehensive national-scale perspective on water-quality conditions and trends and key factors (such as land use, hydrology, geology, and soils) that govern water quality.

Regional and Study Unit Assessments of Status and Trends

(Estimates for 2007, $24.4 million; 2008, $25.3 million; 2009, $19.5 million)

Status and trend assessments focus on surface-water-quality in the 42 Study Units grouped within 8 major river basins in the United States, and ground-water-quality in about one-third of the Nation's 62 principal aquifers. These broad-scale assessments integrate modeling with monitoring to help extend water-quality understanding to unmonitored, yet comparable areas. They also involve collaboration and inclusion of data from other USGS programs, such as the National Stream Quality Accounting Network, and other Federal agencies, and regional, State, Tribal, and local organizations to maximize the use of stream-monitoring information for broad water-resource understanding. Source-water-quality assessments are conducted to characterize water in selected drinking-water supply wells, stream intakes, and in finished drinking water associated with large community water systems. The source-water assessments complement drinking-water monitoring required by other Federal, State, and local programs, which focus primarily on post-treatment compliance monitoring.

Topical Studies of National Priority

(Estimates for 2007, $12.4 million; 2008, $11.9 million; 2009, $10.2 million)

Topical studies address five national priority topics that establish links between sources and transport of contaminants, and the potential effects of contaminants on humans and aquatic ecosystems. The five topical studies are conducted in selected Study Units most affected by the issues. NAWQA relies on fundamental research accomplished in other water programs like the National Research Program and the Toxic Substances Hydrology program. For example, NAWQA collaborates with other USGS scientists on sampling and analytical techniques to understand key chemical and biological processes affecting water quality, such as mercury bioaccumulation in fish, stream metabolism, and contaminant degradation. The topical studies examine the following 5 issues:

- Mercury bioaccumulation in fish,
- Effects of urbanization on stream ecosystems,
- Effects of nutrient enrichment on stream ecosystems,
- Nutrient and pesticide transport and fate in agricultural ecosystems, and
- Transport of contaminants to public water supply wells

Supporting Research and Methods
(Estimates for 2007, $6.1 million; 2008, $6.2 million; 2009, $5.4 million)

To ensure NAWQA data collection and analyses are relevant to emerging issues, about 10 percent of program resources is devoted to developing state-of-the art methods of sample collection and analysis and to innovative research techniques, such as those involving age-dating, dye tracer tests, and isotope analysis.

Coordination at Local, State, Regional, and National Levels
(Estimates for 2007, $2.7 million; 2008, $2.7 million; 2009, $2.7 million)

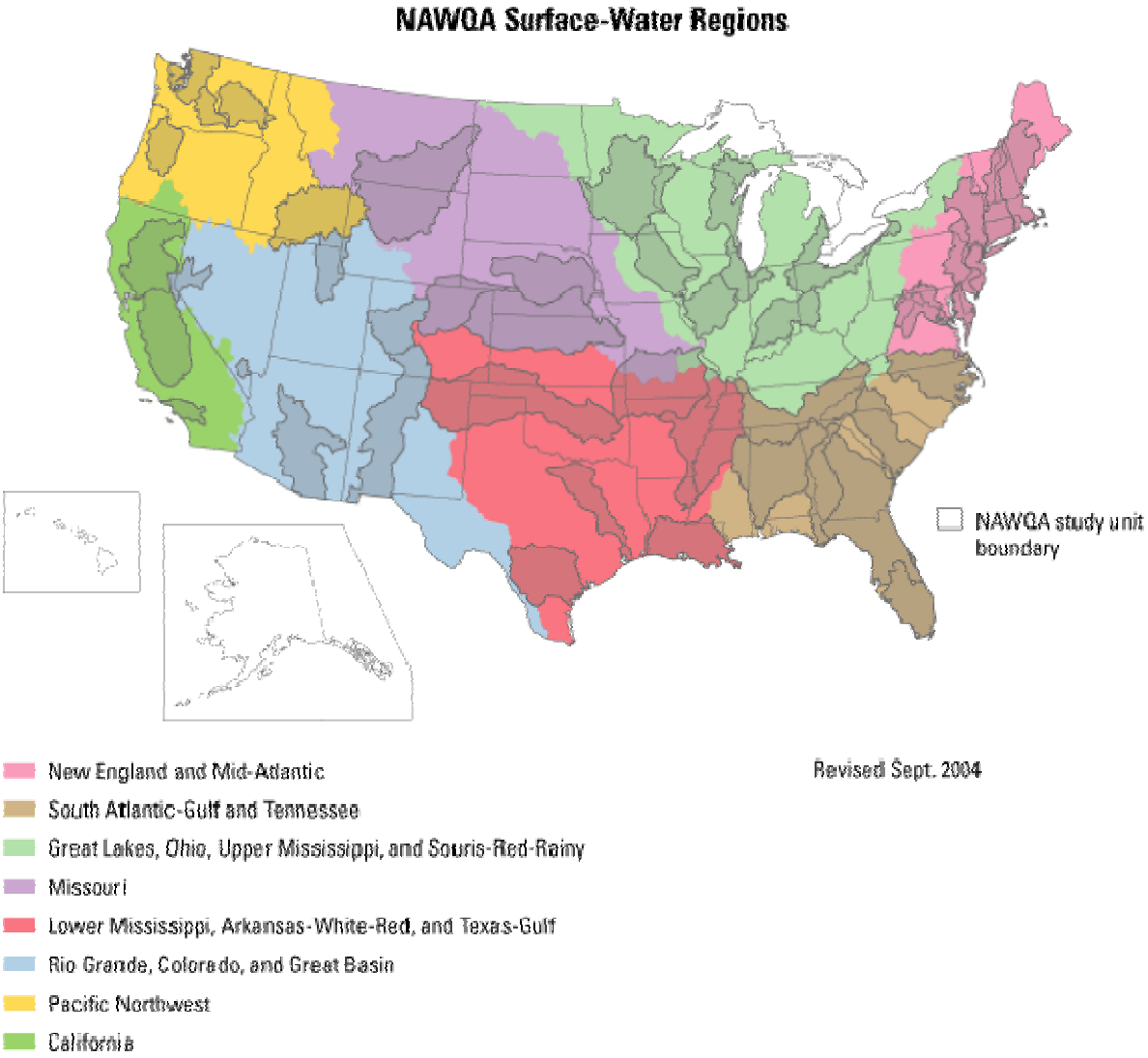
NAWQA continues to provide direct service to the EPA Office of Pesticide Programs; Office of Wetlands, Oceans, and Watersheds; Office of Ground Water and Drinking Water; and Office of Science and Technology, assisting in the timely and relevant application of NAWQA data and predictive models to those offices' decisionmaking processes. Partnerships and liaisons with environmental and natural resources managers, regulators, planners, and policy makers, from national to local, have involved over 1,500 organizations and individuals.

Technical Support of USGS Water-quality Activities
(Estimates for 2007, $9.2 million; 2008, $10.2 million; 2009, $8.7 million)

The USGS has a long tradition of providing national technical support and training for its geographically distributed water-quality studies. This support provides quality control to assure the technical excellence of water-quality field programs and provides a structured way of transferring new technology to investigative and data activities that are primarily conducted in USGS Water Science Centers in each State. Technical support also includes a formal way of establishing priorities for water-quality research by the USGS and provides a mechanism to make water-quality information available to other agencies, the scientific community, and the public.

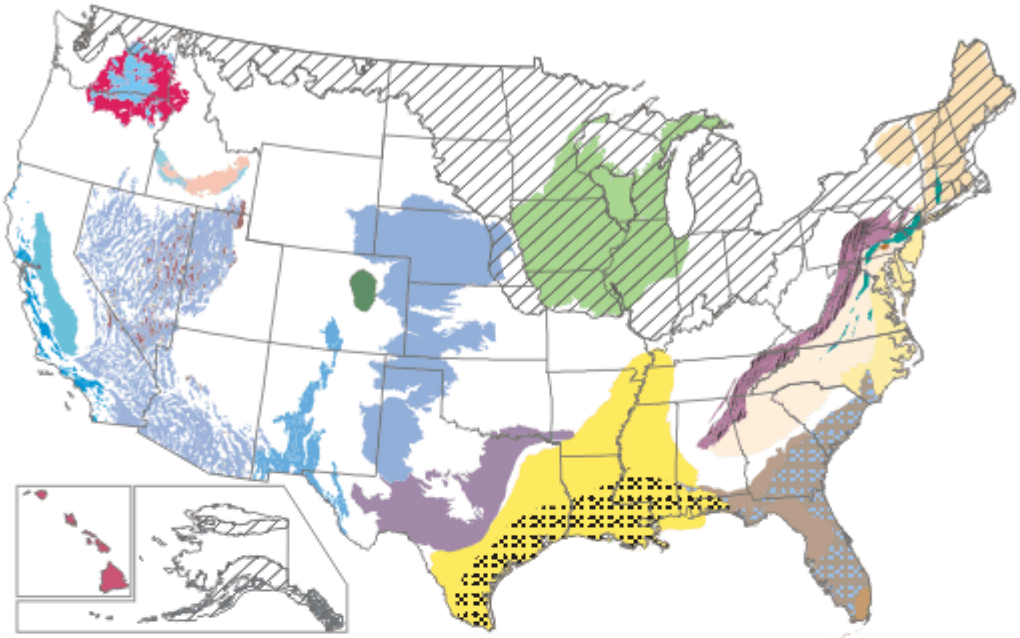
Updates to 2008 Program Performance Targets

Performance targets for 2008 have been updated from those portrayed in the 2008 President's budget. These updates reflect enacted funding levels for 2008 and other changes described in the "Comments" rows of the performance tables.



Source: Seaber and others, 1987, Hydrologic Unit Maps, USGS Water-Supply Paper 2294.

Locations of Regional Assessments in Principal (or Other) Aquifers



EXPLANATION

Basin And Range
- Basin-fill aquifers
- Carbonate-rock aquifers

Biscayne Aquifer

California Coastal Basin Aquifers

Cambrian-Ordovician Aquifer System

Central Valley Aquifer System

Coastal Lowlands Aquifer System

Columbia Plateau
- Basin-fill aquifers
- Basaltic-rock aquifers

Denver Basin Aquifer System

Edwards-Trinity Aquifer System

Floridan Aquifer System

Surficial Aquifer System (overlying the Floridan)

Glacial Aquifer System

Hawaiian Volcanic-rock Aquifers–Locally Overlain By Sedimentary Deposits

New England Crystalline-rock Aquifers

High Plains Aquifer

Mississippi Embayment-texas Coastal Uplands Aquifer System

Northern Atlantic Coastal Plain Aquifer System

Piedmont and Blue Ridge
- Carbonate-rock aquifers
- Crystalline-rock aquifers

Early Mesozoic Aquifers

Rio Grande Aquifer System

Snake River Plain
- Basaltic-rock aquifers
- Basin-fill aquifers

Valley And Ridge Aquifers – Carbonate-rock Aquifers Are Patterned

Program Performance Overview

Only one GPRA output measure and one PART performance measure can be tied exclusively to NAWQA; however, in conjunction with the other USGS water programs and an array of reimbursable projects funded by partner agencies, NAWQA contributes to all the measures listed in the performance table below.

End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment.									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2008**	**Long-term Target 2012**
GPRA End Outcome Measures									
% targeted science products that are used by partners for land or resource management decisionmaking **(SP)**	85%	90%	93%	≥90%	93%	≥90%	≥90%	0	≥90%
Intermediate Outcome Measures and Bureau and PART Outcome Measures Ensure the quality and relevance of science information and data to support decisionmaking									
% of U.S. with ground-water quality status and trends information to support resource management decisions **(PART)**	0	39%	58%	51%	68%	70%	70%	0	70%
Comments	Target for 2007 was exceeded because sampling from out years was shifted into 2007 in anticipation of not being able to afford it in future years as this type of work grows more expensive while future budgets will likely remain level. This measure is determined by the incremental completion of the total number of planned ground-water studies (both status and trends) annually and over a 5-year period. Annual completion of sampled aquifers would drop from a planned 8 percent annual increase to 0, and the 5-year total would stop in 2009 at the 2008 level of 70 percent of the original 100 percent planned for assessment through 2013.								
% improvement in accuracy of watershed (SPARROW) model prediction for total nitrogen and total phosphorus (measured as reduced error) **(PART)**	40%	31%	24%	32%	20%	20%	20%	0	20%
Comments	This measure has proved extremely difficult to calculate with any degree of accuracy and difficult to understand in terms of linkage to the budget; thus, the USGS will be proposing a change to the measure. Best estimates based on the 2009 budget indicate that all progress on improving this model will cease if the program sustains a 15 percent funding reduction.								
% of streamflow stations with real-time measurement/ reporting of water quality **(PART)**	6% (450 / 7,451)	7% (520 / 7,451)	9% (700 / 7,451)	8% (600 / 7,451)	11% (820 / 7,451)	11% (826 / 7,508)	12% (900 / 7,508)	+1% (+74)	15%

End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment.									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2008**	**Long-term Target 2012**
Comments	Exceeded 2007 target because of increased interest by partner agencies, who contributed additional funding amounts that were not anticipated when targets were set. This measure indicates the number of sites (out of the total real-time streamgage sites) equipped to provide real-time information on at least one water-quality parameter such as pH, specific conductance, water temperature, or dissolved oxygen. Reliable cost information for this metric is not yet available because of the complexity of equipment variations involved, the variance in costs at different sites, and the diverse patchwork of funding that supports this activity.								
Intermediate Outcome Measures and Bureau and PART Outcome Measures Ensure the quality and relevance of science information and data to support decisionmaking									
Quality: X% of studies validated through appropriate peer review or independent review **(SP)**	100%	100% (137)	100% (136)	100% (135)	100% (330)	100% (306)	100% (260)	0 (-46)	100% (237)
PART Efficiency and Other Output Measures									
Systematic analyses and investigations delivered to customers	UNK	137	130	135	330	306	245	-61	224
Total actual/projected cost ($000)	UNK	41,100	40,800	40,500	49,500	45,900	36,750	-9,150	--
Actual/projected cost per scientific report or other product (whole dollars)	UNK	300,000	300,000	300,000	150,000	150,000	150,000	150,000	--
Comments	Actuals for 2007 are higher than the target due to transition from the old WRD Reports Tracking System to the new enterprise-wide IPDS, which tracks status of scientific products for the entire USGS. More authors are complying with requirements to enter all scientific publications and other products into the system. Since the transition to IPDS was made in the middle of the year, the increased compliance rate results in exceeding the target for the water programs. Targets for 2008 have been revised based on increased compliance in reporting completion of publications and other products, and unit projected costs have been adjusted accordingly. Cost per scientific product is an average that includes the cost of writing, editing, peer review, and publication of each product, as well as the cost of the studies from which the products are derived. Reimbursements from other Federal agencies are included in the calculation, but the portion of funding housed in the Enterprise Information Activity (associated with the Enterprise Publishing Network) is not included.								
Contributing Programs	NAWQA, Cooperative Water Program.								
Average cost per analytical result, adjusted for inflation, is stable or declining over a 5-year period **(PART)**	$8.64	$8.63	$8.34	$8.64	$8.08	$8.64	$9.15	+$0.51	--

End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment.									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2008**	**Long-term Target 2012**
Comments	Target for 2007 was exceeded because of continual efforts to reduce costs by using new instruments and technologies that require less personnel time and maintenance, streamlining sample processing procedures automating more of the sample tracking costs, and applying additional energy saving approaches throughout the National Water Quality Laboratory (NWQL). Target for 2008 has not been adjusted based on 2007 actual because of uncertainty at the NWQL during this period of transition to a Most Efficient Organization, pursuant to the 2007 competitive sourcing study. Target for 2009 reflects a reduction of 65,000 analytical results per year for 5 years, due to the reduction in NAWQA program. This PART efficiency measure (a comparison between annual costs and a 5-year moving average) is computed by calculating the total number of determinations (sample analyses) for the year, divided by the total income to the NWQL for analytical services. The calculation does not include funding that supports "sustaining" activities at the NWQL, which take place regardless of the number of samples processed.								

Activity: Water Resources Investigations

Subactivity: **Hydrologic Monitoring, Assessments, and Research**
Program Component: **Toxic Substances Hydrology**

	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-) [a]	2009 Program Changes (+/-) [b]	2009 Budget Request	Change From 2008 (+/-)
Toxic Substances Hydrology ($000)	13,293	13,516	+251	-3,063	10,704	-2,812
Total FTE	*52*	*52*	*0*	*-14*	*38*	*-14*

[a] Fixed cost increases for this program total $317, of which $251 is budgeted and $66 is absorbed.
[b] Changes for this program include a reduction of -$63 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Summary of 2009 Program Changes for Toxic Substances Hydrology

Request Component	($000)	FTE
• Priority Ecosystems Science program	-2,257	-10
• Amphibian Research and Monitoring Initiative and related activities	-743	-4
• Travel reduction	-63	0
TOTAL Program Changes	**-3,063**	**-14**

Justification of 2009 Program Changes

The 2009 budget request for Toxic Substances Hydrology (Toxics) is $10,704,000 and 38 FTE, a net program change of -$3,063,000 and -14 FTE from the 2008 Enacted level. This change includes two decreases: -$2,257,000 that eliminates Toxics program funding for the Priority Ecosystems Science program and -$743,000 that eliminates Toxics program funding for the Amphibian Research and Monitoring Initiative.

Priority Ecosystems Science (PES) **(-$2,257,000 / -10 FTE)**

The Toxics program contributes approximately half of the funds that the Water Resources Investigations activity allocates to PES projects. These resources support water quality characterizations of aquatic ecosystems with emphasis on the effects of human stresses on the water-quality conditions of natural ecosystems. Increased funds in the Biological Research and Monitoring (BRM) subactivity will support the projects currently underway and planned—such as research on mercury methylation in the Everglades, intersex fish in the Chesapeake Bay, and water-quality effects on aquatic organisms in San Francisco Bay—which will result in 11 systematic analyses and investigations in BRM.

Amphibian Research and Monitoring Initiative and Other Toxics Activities (-$743,000 / -4 FTE)

Most of this remaining decrease supports the interagency Amphibian Research and Monitoring Initiative (ARMI). These resources provide water-quality information that supports investigations into the causes of declining amphibian populations and the causes of the increasing occurrence of populations with excessive limb deformities. Evidence indicates that stress from human influences is either a direct or a contributing factor. Toxics program contributions to the ARMI have included efforts with USGS biologists and scientists from other Interior bureaus to collect hydrologic and water quality data in the habitat of various amphibian species across the Nation. The portion of the decrease not associated with ARMI will reduce Toxics program research on contamination from hard-rock mining, pesticides, and emerging contaminants.

Program Performance Change

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Outyears
					A	B=A+C	C	D
End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment								
Systematic analyses and investigations delivered to customers	32	30	70	65	65	51	-14	--
Total actual/projected cost ($000)	12,800	12,000	14,000	13,000	13,000	10,200	-2,800	--
Actual/projected cost per scientific report or other product (whole dollars)	400,000	400,000	200,000	200,000	200,000	200,000	200,000	--
Comments	Change in 2009 is due to elimination of Toxics funding for integrated Priority Ecosystems Science projects and the Amphibian Research and Monitoring Initiative. Of the 14 products lost from this program in 2009, 11 are transferred to the Biological Research and Monitoring subactivity. Actuals for 2007 are higher than the target due to transition from the old WRD Reports Tracking System to the new enterprise-wide IPDS, which tracks status of scientific products for the entire USGS. More authors are complying with requirements to enter all scientific publications and other products into the system. Since the transition to IPDS was made in the middle of the year, the increased compliance rate results in exceeding the target for the water programs. Targets for 2008 have been revised based on increased compliance in reporting completion of publications and other products, and unit projected costs have been adjusted accordingly. Cost per scientific product is an average that includes the cost of writing, editing, peer review, and publication of each product, as well as the cost of the studies from which the products are derived. Reimbursements from other Federal agencies are included in the calculation, but the portion of funding housed in the Enterprise Information Activity (associated with the Enterprise Publishing Network) is not included.							

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 President's budget level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent outyear.

Program Overview

The Toxics program provides reliable scientific information and tools that explain the occurrence, behavior, and effects of toxic substances in the Nation's hydrologic environments. These results support sound decisionmaking by resource managers, regulators, industry, and the public at the Federal, State, and local levels.

The contamination problems investigated by the Toxics program are widespread and pose significant risk to human health and the environment. Based on input from many agencies and organizations, the USGS identifies high priority problems for intensive, field-based research. These field studies are conducted at representative sites, watersheds, or areas that focus on subsurface, point-source contamination or nonpoint source contamination at the watershed or regional scale. Study results help water managers improve environmental monitoring, characterize and manage contamination, develop best management practices, form regulatory policies and standards, register the use of new chemicals, and guide chemical manufacture and use. The program complements other USGS programs that monitor and assess the quality of the Nation's waters by focusing rapidly on new issues and on new and understudied contaminants, by identifying which issues warrant future attention, and by developing improved and needed methods.

Streamflow and Nutrient Delivery from the Mississippi River Basin to the Gulf of Mexico

The delivery of nutrients and streamflow from the Mississippi River Basin has been linked to the formation of a "hypoxic zone" in the northern Gulf of Mexico — a zone of water with low dissolved oxygen that can cause stress or death in bottom-dwelling organisms.

In 2007, USGS scientists published a new analysis of streamflow and the delivery of nutrients (nitrogen, phosphorus, and silica) from the Mississippi Basin to the Gulf. The report provides information on streamflow and nutrient delivery for the five major subbasins that comprise the entire Mississippi Basin and 30 smaller subbasins that have varied nutrient yields based on differing hydrology, land use, and climate. The information covers the period of record, dating back to the early 1960s for some basins.

Scientists are using this information to investigate causal linkages between the delivery of nutrients and streamflow to the northern Gulf and the magnitude and duration of the "hypoxic zone." Managers, including the Mississippi River/Gulf of Mexico Watershed Nutrients Task Force, have used this information to develop their *Gulf Hypoxia Action Plan 2008* for mitigating problems associated with excess nutrients in local receiving waters and the Gulf of Mexico.

The Toxics program's strengths are its long-term field-based approach, interdisciplinary research teams, ability to address contamination problems with a wide range of geographic scales and geologic terrain, and ability to bring fundamental scientific knowledge to define the natural environmental response to contamination and natural clean-up capacity. Maintenance of long-term field research laboratories and data collection on extensive regional and national networks makes this contribution particularly unique.

The Toxics program works in partnership with other Federal agencies to ensure that priorities for science needs are coordinated, including other Interior bureaus, the EPA, USDA, DOD, DOE, the Nuclear Regulatory Commission, and more recently, public health agencies such as the Centers for Disease Control and Prevention, the Food and Drug Administration, and the National Institute for Environmental Health Sciences. Because the USGS is a science agency without any regulatory or management responsibilities, program information and methods often provide a basis for consensus in contentious issues and for achieving cost efficiencies by meeting the needs of numerous management and regulatory agencies. Scientists from universities, other Federal agencies, and industry find significant research opportunities through collaboration in Toxics program activities and at program research sites as evidenced by about

150 student dissertations published as part of program research activities. Program results are distributed at briefings for regulatory agencies and industry groups, at workshops, at national scientific meetings, in USGS reports, and in scientific journals and books. In the last 5 years (2002–06), the Program has contributed to more than 1,100 scientific publications.

The Toxics program complements and coordinates with a range of other USGS programs by —

- Providing new methods and information to monitoring and assessment programs such as the National Water-Quality Assessment program and National Stream Quality Accounting Network (part of the Hydrologic Networks and Analysis program),
- Addressing environmental effects of resource development with programs such as the Energy Resources and Mineral Resources programs, and
- Evaluating the connections between environmental contamination of toxicological effects in fish and wildlife with the Contaminant Biology program.

Pharmaceuticals Found in Soil Irrigated with Reclaimed Water

Many areas of the Nation are faced with water shortages due to significant demand for water. As a result, supplies are being augmented with treated wastewater for uses such as irrigation. In a study published during 2007 in the journal *Environmental Toxicology and Chemistry,* a team of USGS scientists reported that pharmaceuticals in wastewater used for irrigation persist in soil for several months after the irrigation stopped for the season. Previous studies have documented that wastewater from sewage treatment plants contains a variety of pharmaceuticals and other organic-wastewater contaminants. As a result, increased attention is being given to the use of reclaimed water as a potential source for such contaminants in the environment.

The goals of the Toxics program support the Department's strategic plan, specifically the goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment. In conjunction with other USGS programs and an array of reimbursable projects funded by partner agencies, the Toxics program contributes to the measures and PART program performance measures shown in the table at the end of this section.

Toxics program activities over the next 5 years will be guided by *The U.S. Geological Survey, Toxic Substances Hydrology Program Five-Year Plan, 2007–11*, which has been compiled with broad input from stakeholders and from other USGS programs.

More information about the Toxics program is available on the Web at *http://toxics.usgs.gov/*.

2009 Program Performance

The 2009 budget request for the Toxics program is $10,704,000 and 38 FTE. The program includes three major components:

Investigations of Subsurface, Point-source Contamination
(Estimates for 2007, $4.8 million; 2008, $4.9 million; 2009, $5.0 million)

Interdisciplinary USGS research teams conduct long-term intensive field investigations of common types of subsurface contamination in a variety of hydrogeologic environments. These investigations provide fundamental knowledge of the processes that control contaminant-plume transport and persistence. This knowledge and new methods are applied to similar sites across the Nation. The Toxics program is the only USGS program organized to conduct research on subsurface contamination from point sources. It is looked upon by those responsible for contaminated site cleanup as a unique provider of information and methods on issues such as contamination in fractured rock aquifers and long-term performance of monitored natural attenuation. Research in this program component will be guided by a major planning activity conducted in 2009 with participation of major Federal stakeholders, including USEPA, DOD, DOE, and other Interior bureaus. This program component also includes development of laboratory and field methods. In 2009, the program will contribute increased scientific knowledge and tools related to subsurface point-source contamination issues associated with —

- Hydrocarbons, fuel oxygenates, biofuels, and other petroleum-related contaminants,
- Mixed (radionuclide and conventional) waste disposal and contamination in arid environments,
- Contamination in fractured-rock aquifers, and
- Contaminant plumes with complex chemical mixtures, such as landfills and treated wastewater discharges.

Toxics Program Partnerships: Cleaning up Toxic Waste the Natural Way

Observing natural processes that remove contaminants at toxic waste sites is known as monitored natural attenuation. Although monitored natural attenuation can be extremely effective in some circumstances, the most challenging question is "When can it be relied on to clean up toxic waste sites?"

In cooperation with the Strategic Environmental Research and Development Program, sponsored by DOD, DOE, Virginia Polytechnic Institute, and the U.S. Navy, in 2007 USGS scientists developed a framework to answer this question for environmental managers. The framework, recently published as USGS Circular 1303 — *A Framework for Assessing the Sustainability of Monitored Natural Attenuation* — presents methods to assess the sustainability of natural attenuation at toxic waste cleanup sites. The methods include the Natural Attenuation Software (NAS), which enables environmental professionals to estimate how far plumes will migrate and how long natural attenuation processes will take to clean up contaminants like chlorinated solvents and petroleum hydrocarbons.

The DOD's Environmental Security Technology Certification Program is supporting an evaluation of the ability of NAS to estimate cleanup times using Monitored Natural Attenuation combined with source-area remediation technologies at eight representative sites across the Nation.

Investigations of Watershed-scale and Regional-scale Contamination

(Estimates for 2007, $5.6 million; 2008, $5.7 million; 2009, $5.2 million)

Watershed-scale and regional-scale investigations address contamination problems typical of widespread land uses or human activities that may pose a threat to human and environmental health throughout a significant portion of the Nation. These investigations involve characterizing contaminant sources, investigating the mechanisms by which nonpoint-source contamination affects aquatic ecosystems, and investigating the processes that transform contaminants into different and possibly more toxic forms. This program component also includes development of laboratory and field methods. In 2009, the program will contribute increased scientific knowledge and tools related to regional- and watershed-scale contamination issues associated with —

- Hard-rock mining,
- Chemicals of emerging environmental concern (emerging contaminants),
- Mercury in aquatic ecosystems, and
- Pesticide contamination in hydrologic environments,

Widespread Accumulations of Natural Perchlorate in Southwestern Soils

USGS scientists and their colleagues found substantial quantities of perchlorate that occurs naturally just below the active root zone in deserts and other arid regions in the southwestern United States. Perchlorates are salts that derive from perchloric acid and occur in the environment both naturally and as a result of manufacturing (flares, rocket fuel, airbags for automobiles, thyroid medications, and other products).

Scientists estimated that the amount of natural perchlorate may exceed the total amount of perchlorate manufactured to date. The perchlorate is present with high concentrations of naturally occurring chloride and other salts, and represents thousands of years of atmospheric deposition and concentration through evaporation.

Perchlorate in drinking water is a significant human health concern. Naturally occurring perchlorate has great significance to investigations that may incorrectly assume a human source for naturally occurring perchlorate. Furthermore, irrigation of desert and semi-desert areas, a shift to higher rainfall, disposal of liquid wastes, or construction of dams could cause naturally accumulated perchlorate to move through ground water, threatening drinking-water supplies.

The paper resulting from USGS work in this area, titled *Widespread Natural Perchlorate in Unsaturated Zones of the Southwest United States,* was published during 2007 in the journal *Environmental Science and Technology.*

Technical Support

(Estimates for 2007, $2.8 million; 2008, $2.9 million; 2009, $0.5 million)

The USGS has a long tradition of providing national technical support for its geographically distributed water resources studies. This support provides quality control to assure the technical excellence of water resources field programs and provides a structured way of transferring new technology to investigative and data activities that are primarily conducted in USGS Water Science Centers in each State. Technical support also includes a formal way of establishing priorities for water research by the USGS and provides a mechanism to make water resources information available to other agencies, the scientific community, and the public. In the case of the Toxics program, this amount also includes support for various interdisciplinary Priority Ecosystem studies, some of which are described in the Science on the Landscape section beginning on page F–1.

As outlined in the Toxics Program 5-Year Plan, Program activities related to subsurface point-source contamination research will be reevaluated and prioritized through a planning workshop with stakeholder representation.

Updates to 2008 Program Performance Targets

Performance targets for 2008 have been updated from those portrayed in the 2008 President's budget. These updates reflect enacted funding levels for 2008 and other changes described in the "Comments" rows of the performance tables.

Program Performance Overview

End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
GPRA End Outcome Measures									
% targeted science products that are used by partners for land or resource management decisionmaking **(SP)**	85%	90%	93%	≥90%	93%	≥90%	≥90%	0	≥90%
Intermediate Outcome Measures and Bureau and PART Outcome Measures Ensure availability of long-term environmental and natural resource information, data, and systematic analyses needed by land and resource managers for informed decisionmaking									
% of targeted contaminants for which methods are developed to assess potential environmental and human health significance **(PART)**	10%	20%	85%	33% (55 / 168)	41% (77 / 187)	33% (76 / 232)	33%	0	33%
Comments	USGS targeted 187 chemicals to have methods developed for 2007, and developed methods and published information for 77 of those chemicals, resulting in performance of 41%. As noted during the 2006 reporting process, setting targets for this measure is problematic because performance depends upon schedules that are set in consultation with other Federal agencies through the CENR Toxics and Risk Subcommittee and associated workgroups.								
Contributing Programs	Toxic Substances Hydrology, Hydrologic Research and Development.								
Intermediate Outcome Measures and Bureau and PART Outcome Measures Ensure the quality and relevance of science information and data to support decisionmaking									
% of studies validated through appropriate peer review or independent review **(SP)**	100%	100% (32)	100% (30)	100% (31)	100% (70)	100% (65)	100% (51)	(-14)	100% (47)
PART Efficiency and Other Output Measures									
Systematic analyses and investigations delivered to customers	NA	32	30	31	70	65	51	-14	47
Total actual/projected cost ($000)		***12,800***	***12,000***	***12,400***	***14,000***	***13,000***	***10,200***	***-2,800***	**--**
Actual/projected cost per scientific report or other product (whole dollars)		***400,000***	***400,000***	***400,000***	***200,000***	***200,000***	***200,000***	***200,000***	**--**

End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
Comments	Change in 2009 is due to elimination of Toxics funding for integrated Priority Ecosystems Science projects and the Amphibian Research and Monitoring Initiative. Of the 14 products lost from this program in 2009, 11 are transferred to the Biological Research and Monitoring subactivity. Actuals for 2007 are higher than the target due to transition from the old WRD Reports Tracking System to the new enterprise-wide IPDS, which tracks status of scientific products for the entire USGS. More authors are complying with requirements to enter all scientific publications and other products into the system. Since the transition to IPDS was made in the middle of the year, the increased compliance rate results in exceeding the target for the water programs. Targets for 2008 have been revised based on increased compliance in reporting completion of publications and other products, and unit projected costs have been adjusted accordingly. Cost per scientific product is an average that includes the cost of writing, editing, peer review, and publication of each product, as well as the cost of the studies from which the products are derived. Reimbursements from other Federal agencies are included in the calculation, but the portion of funding housed in the Enterprise Information Activity (associated with the Enterprise Publishing Network) is not included.								

Activity: Water Resources Investigations

Subactivity: **Hydrologic Monitoring, Assessments, and Research**
Program Component: **Hydrologic Research and Development**

	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-) [a/]	2009 Program Changes (+/-) [b/]	2009 Budget Request	Change From 2008 (+/-)
Hydrologic Research and Development ($000)	14,754	15,423	-1,991	-1,537	11,895	-3,528
Total FTE	*253*	*255*	*-42*	*-2*	*211*	*-44*

a/ Fixed cost increases for this program total $266, of which $211 is budgeted and $55 is absorbed. A technical adjustment is proposed as part of a budget restructure that moves funding for global change activities into a new integrated budget activity titled Global Change.

b/ Changes for this program include a reduction of -$61 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Summary of 2009 Program Changes for Hydrologic Research and Development

Request Component	($000)	FTE
• Unrequested congressional action	-1,476	-2
• Travel reduction	-61	0
TOTAL Program Changes	**-1,537**	**-2**

Justification of 2009 Program Changes

The 2009 budget request for Hydrologic Research and Development is $11,895,000 and 211 FTE, a net program change of -$1,537,000 and -2 FTE from the 2008 Enacted level.

Unrequested congressional action **(-$1,476,000 / -2 FTE)**

The reduction eliminates congressional action related to four projects that are not Administration or USGS priorities and do not address the highest priority science needs in water research and monitoring. This will keep the core program intact while allowing the USGS to make the best use of resources. The specific projects are fish mortality research at Hood Canal, WA (-$197,000), for USGS participation in the Upper San Pedro Partnership in Arizona (-$295,000), participation in lower Mississippi monitoring and research with the Long-Term Estuary Assessment Group (-$492,000), and initiation of work authorized by the U.S.-Mexico Transboundary Aquifer Assessment Act (-$492,000).

Program Performance Change

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Outyears
					A	B=A+C	C	D
End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment								
Quality: X% of studies validated through appropri-ate peer review or independent review **(SP)**	100% (35)	100% (32)	100% (77)	100% (67)	100% (60)	100% (60)	--	--
Comments	See comments for measure "# systematic analyses & investigations delivered to customers."							
# systematic analyses & investi-gations delivered to customers	35	32	77	67	60	60	--	--
Total actual/pro-jected cost ($000)	14,000	12,800	15,400	14,000	12,000	12,000	--	--
Actual/projected cost per scientific report or other product (whole dollars)	400,000	400,000	200,000	200,000	200,000	200,000	--	--
Comments	-6 within base due to Global Change budget restructure. -1 within base due to discontinuation in the 2008 President's Budget of congressional action related to USGS participation in the San Pedro partnership. Actuals for 2007 are higher than the target due to transition from the old WRD Reports Tracking System to the new enterprise-wide IPDS, which tracks status of scientific products for the entire USGS. More authors are complying with requirements to enter all scientific publications and other products into the system. Since the transition to IPDS was made in the middle of the year, the increased compliance rate results in exceeding the target for the water programs. Targets for 2008 have been revised based on increased compliance in reporting completion of publications and other products, and unit projected costs have been adjusted accordingly. Cost per scientific product is an average that includes the cost of writing, editing, peer review, and publication of each product, as well as the cost of the studies from which the products are derived. Reimbursements from other Federal agencies are included in the calculation, but the portion of funding housed in the Enterprise Information Activity (associated with the Enterprise Publishing Network) is not included.							

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 President's budget level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent outyear.

Program Overview

The Hydrologic Research and Development (HR&D) program conducts long-term sustained research on complex problems in the hydrologic sciences and supports the research and development needs of other water resource and USGS programs. HR&D program investigations integrate hydrological, geological, chemical, climatic, and biological science in addressing water resources issues. The program seeks to maintain an appropriate balance between high-risk high-reward research that leads to major scientific breakthroughs and future

applications, and more applied research that helps keep the program relevant and focused on today's water resource issues. The efforts of the HR&D program are typically multidisciplinary in nature and require strong collaborative relations, both among scientists funded by the program and with scientists in other parts of the USGS, in Federal and State agencies, universities, and foreign countries.

The long-term goals of HR&D are —

- To understand ecological and biogeochemical processes in the context of the hydrologic cycle and of process responses to system perturbations, to enable discrimination between natural and human-induced changes, and to ensure effective water-availability, water-quality, and ecosystem management,
- To understand chemical and biochemical processes affecting organic and inorganic solutes and gases in aquatic systems to enable evaluation of water quality, helping managers make informed water-management decisions,
- To understand the physical processes controlling the distribution and quality of the Nation's surface-water resources to improve flood and drought hazard mitigation,
- To understand the movement, availability, and transport of subsurface water in order to minimize further contamination of the Nation's ground waters, optimize aquifer remediation efforts, and ensure effective ground-water management,
- To understand stream-channel morphology and erosional processes governing the source, mobility, and deposition of sediment to ensure scientifically based management of rivers, dams, and reservoirs, and
- To understand long-term processes in small watersheds, including the effect of atmospheric and climatic variables, and provide water and land managers with information needed for water resources management.

The goals of HR&D support the Department's strategic plan, specifically the goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment. In conjunction with other USGS programs and an array of reimbursable projects funded by partner agencies, HR&D contributes to the outcome measures and PART program performance measures shown in the table at the end of this section.

Use of Cost and Performance Information

In 2007 the USGS implemented a VSIP/VERA for the National Research Program (NRP), which is funded largely by HR&D and encompasses research units at three major centers: Reston, Denver, and Menlo Park.

This action was the result of an extensive workforce and staff planning effort that identified and quantified workforce requirements in the NRP. Changing program goals and priorities require a different balance of workforce skills to implement new strategic opportunities and directions. Also, restructuring and reduction of programmatic activities as a result of years of level funding, coupled with rising salary and other fixed costs, have reduced funds available for operational expenses.

Programmatic restructuring is occurring within the current organizational structure. Positions were identified for VSIP and VERA offers through analyses of workforce needs and funding projections for programs managed by the NRP.

The VSIP/VERA was extended into 2008 because of late approval in 2007. To date, 20 scientists and support staff have opted for the VSIP/VERA. Hiring of several new scientists in the focus areas of surface-water hydrology, surface-water chemistry, and geomorphology is planned for 2008.

In 2009, HR&D will permanently transfer $2,202,000 to the new Global Change budget activity, primarily associated with the Water, Energy, and Biogeochemical Budgets (WEBB) studies that began in 1991. The WEBB studies were designed to understand the processes controlling

water, energy, and biogeochemical fluxes over a range of temporal and spatial scales and to understand the interactions of these processes, including the effect of atmospheric and climatic variables. Five small research watersheds were selected, in part because they had existing long-term research data sets on which the WEBB program could build, and in part to be geographically and ecologically diverse and represent a range of hydrologic and climatic conditions: Loch Vale watershed in Colorado, Luquillo Experimental Forest in Puerto Rico, Panola Mountain watershed in Georgia, Sleepers River watershed in northeastern Vermont, and Trout Lake watershed in north central Wisconsin.

The funds being transferred to the Global Change budget activity also support basic long-term research in several National Research Program projects devoted to the study of topics such as dissolved organic carbon in soil and water, carbon transport by rivers, isotope geochemistry, mercury cycling, mineral weathering, and gas exchanges of carbon dioxide as methane from soils, wetlands, and rivers, and feedbacks in the global carbon cycle. This work is carried out at the five WEBB study areas and other field locations. It provides important science underpinnings to the global change research community. These research activities will continue into 2009 under the new budget structure, which is described in greater detail in Section E.

National Research Program in the Hydrologic Sciences

HR&D is the primary source of funding for the USGS National Research Program (NRP). NRP scientists often take a leading role in the design and conduct of complex projects, bringing advanced scientific thinking and tools to the project. Areas where the NRP has provided expertise essential for making science-based decisions include —

- Everglades restoration,
- CALFED and San Francisco Bay/Delta investigations,
- Grand Canyon environmental studies,
- Platte River management for wildlife habitat,
- Emerging contaminants in water supplies, and
- Denitrification of agricultural sources of nitrogen.

NRP scientists also provide leadership and scientific services such as —

- Teaching formal training courses for USGS and cooperating agency staffs,
- Participating in technology transfer,
- Consulting on USGS projects at the State level,
- Participating in reviews of USGS programs and Water Science Centers nationwide,
- Participating in the development of new programs, and
- Serving as scientific advisors for the USGS, as well as local, State, and other Federal agencies and for the public.

2009 Program Performance

The 2009 budget request for HR&D is $10,704,000 and 211 FTE. To fulfill their critical role in support of other USGS programs, scientists funded by HR&D —

- Conduct research in collaboration with scientists in other USGS programs and provide training, workshops, reviews, and advice on water resource issues to respond to national, regional, and local needs,
- Provide specialized laboratory services, such as chemical and isotopic analyses and methods to characterize microbes,
- Develop new geophysical and geochemical techniques and numerical modeling tools, and
- Provide advice to USGS leadership on future program directions.

The program includes two components:

Long-term interdisciplinary research
(Estimates for 2007, $14.4 million; 2008, $14.3 million; 2009, $11.9 million)

The long-term interdisciplinary research funded by the program provides the core funding for the National Research Program (NRP), which also depends other USGS programs for about 57 percent of its appropriated funding and also leverages funds from other Federal and State agencies. These linkages ensure that research efforts are focused on developing new concepts and future techniques and remain relevant to current USGS programs and Interior management responsibilities. The NRP focuses on long-term investigations that integrate hydrological, geological, chemical, climatological, and biological information relating to water-resources and environmental problems. Study results provide the scientific basis that enables the USGS to tackle and resolve complex hydrologic problems.

The 5-Year Plan for HR&D was updated in 2007 to align with and increase focus on bureau science strategies that were developed in 2006. HR&D-funded scientists work in all six of the bureau science strategy priority areas; however, there is particular emphasis on Ecosystems, Climate Variability and Change, and A Water Census of the United States. Several forms of internal and external reviews are used to evaluate progress in the HR&D program. Plans and accomplishments of each scientific project are internally reviewed on a yearly basis. In addition, in-depth reviews of projects and associated personnel are conducted to examine —

- The relationship of project work to the USGS mission,
- Productivity, relevance, and scientific impact,
- Plans and goals for the next 5 years, and
- The expertise and responsibilities of project personnel.

The National Academy of Sciences (NAS) Committee on USGS Water Resources Research is conducting a review (scheduled for completion in 2008) of USGS water science activities that includes scrutiny of HR&D activities.

The planned activities listed below demonstrate the utility of products that are counted under the output measures for "systematic analyses and investigations delivered to customers" and "formal workshops or training provided to customers." They are all related to the "long-term interdisciplinary research" component of the HR&D program.

Spokane–Rathdrum Aquifer Study Wraps it Up

Thanks to USGS studies, water managers in Idaho and Washington have a new tool available to help manage water supplies that depend on the Spokane Valley-Rathdrum Prairie aquifer.

The new tool, a computer model of the two-State aquifer, was developed as part of a comprehensive study of the aquifer by a partnership of the Idaho Department of Water Resources, the Washington Department of Ecology, and the USGS.

The Spokane Valley-Rathdrum Prairie aquifer in Spokane County, WA, and Bonner and Kootenai Counties, ID, is the sole source of drinking water for a large segment of the population in these rapidly growing counties. Concerns about the impacts of increased ground-water withdrawals resulting from urban growth had spurred the comprehensive study of the aquifer to better understand and manage the resource.

The new aquifer model lets users analyze aquifer inflows and outflows, simulate the effects of future changes in ground-water withdrawals from the aquifer, and evaluate aquifer management strategies. The scale of the model and the level of detail are for analysis of aquifer-wide water-supply issues.

Yukon River Basin — Recent climate warming has accelerated permafrost thawing throughout the Yukon River basin. Thawing is making vast stores of frozen organic material available for hydrologic export to the Bering Sea or for decomposition and subsequent emission of carbon dioxide and methane to the atmosphere. Continued studies in the Yukon basin will focus on the total input of dissolved organic carbon to the Arctic Ocean, which appears to be 5-20 percent greater than previously reported and about 2.5 times greater than temperate rivers with similar watershed sizes and water discharge. Planned USGS work will demonstrate that the ground-water contribution to total annual flow has shown an overall increase, while there has been minimal change in annual flow; new and planned work suggests that the increases in ground-water contributions may be largely due to enhanced infiltration brought about by permafrost thawing.

Drought and Water Resources — During recent decades, droughts of 1-3 years have affected some parts of the United States, but prolonged droughts of the magnitude experienced during the 1930s and 1950s have not occurred. To help the country prepare to face the potential effects of a prolonged drought, USGS scientists, along with colleagues in universities and other government agencies, have been studying regional, national, and global spatial patterns of drought. Coping with a prolonged drought is anticipated to be difficult, particularly in the arid and semi-arid West, where water demand has increased significantly and water supplies are likely to be insufficient for demand. In 2008, USGS scientists and their collaborators will publish studies examining historic and predicted streamflow in the Colorado River Basin and estimate impacts of 21st century warming on water availability. In 2009 these studies will expand to include developing projections based on climate change scenarios for the western U.S.

Integrated Modeling of Ground-Water / Surface-Water Interactions — Traditionally, numerical models of ground-water and surface-water flow and transport have been conducted in isolation, at the expense of a proper description of their significant interactions and feedback effects. In 2008, the USGS will publish models that integrate ground-water/surface-water interactions and will apply these models to a diversity of water resource management problems, including "whole-system" management of watersheds and assessments of the potential impacts of ground-water pumping on streamflow. This effort will extend the capabilities and impact of current USGS-developed numerical models, such as MODFLOW and the Modular Modeling System. In 2009 these numerical models will be used to improve our understanding of watershed system dynamics by evaluating the effects of various combinations of precipitation, climate, and land use on streamflow, sediment yield, and other hydrologic components.

Potomac River and benefits from an exotic species of submerged aquatic vegetation — An exotic species of aquatic vegetation, *Hydrilla verticillata,* was seen as a severe invasive nuisance in the 1980s when the fast-growing Asian plant began spreading in the Potomac River. However, recent analyses indicate that fears of some of *Hydrilla's* adverse effects appear to have been unfounded. In 2008, the USGS will complete a long-term, quantitative study of aquatic plant biodiversity in an estuary where millions of dollars are spent annually to reduce nutrient input and demonstrate that exotic plants are not always harmful to an ecosystem. The findings will support current Federal and State management strategies to improve water clarity and reduce nutrient loads. In 2009 research will be conducted to further understand the interactions between macrophytes and other aquatic vegetation and the hydrologic environment.

Enhancement of a General Surface Flow and Sedimentation Model — In cooperation with the National Streamflow Information Program, HR&D scientists will develop enhancements for a two-dimensional surface-water computer model as a precursor to increasingly complex models

that will include features such as sediment transport, flow over dry areas, and dam-break flows. This work has a wide range of potential applications, ranging from the improved management of sediment transport in the Lower Mississippi to slow land loss and seawater encroachment in the wetlands, to the management or restoration of ecological environments in river systems.

Short-term Research to Meet Congressional Priorities
(Estimates for 2007, $0.4 million; 2008, $1.1 million; 2009, $0 million).

Occasionally the Congress appropriates funds not requested by the Administration for short-term research on particularly difficult water issues. This portion of the program has included such work as a study of fish mortality in Hood Canal, WA, a study of the Spokane Valley and Rathdrum Prairie aquifer system in Washington and Idaho, and a ground-water assessment in the Potomac River basin.

Updates to 2008 Program Performance Targets

Performance targets for 2008 have been updated from those portrayed in the 2008 President's budget. These updates reflect enacted funding levels for 2008 and other changes described in the "Comments" rows of the performance tables. In the case of HR&D, this involves congressional action that added funds for several projects and the various systematic analyses and investigations associated with those studies: fish mortality research at Hood Canal, WA ($200,000), USGS participation in the Upper San Pedro Partnership in Arizona ($300,000), participation in lower Mississippi monitoring and research with the Long-Term Estuary Assessment Group ($500,000), and of work authorized by the U.S.-Mexico Transboundary Aquifer Assessment Act ($500,000).

Program Performance Overview

Only one performance measure can be tied exclusively to HR&D (systematic analyses and investigations delivered to customers); however, in conjunction with the other programs in this subactivity and an array of reimbursable research projects, HR&D contributes to the PART measures listed below.

End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
GPRA End Outcome Measures									
% targeted science products that are used by partners for land or resource management decisionmaking **(SP)**	85%	90%	93%	≥90%	93%	≥90%	≥90%	0	≥90%
Intermediate Outcome Measures and Bureau and PART Outcome Measures Ensure the quality and relevance of science information and data to support decisionmaking									
Quality: X% of studies validated through appropriate peer review or independent review **(SP)**	100%	100% (35)	100% (32)	100% (32)	100% (77)	100% (67)	100% (60)	0 (-7)	100% (54)
PART Efficiency and Other Output Measures									
# systematic analyses & investigations delivered to customers	UNK	35	32	32	77	67	60	-7	54
Total actual/projected cost ($000)		***14,000***	***12,800***	***12,800***	***15,400***	***13,400***	***12,000***	***-1,400***	**--**
Actual/projected cost per scientific report or other product (whole dollars)		***400,000***	***400,000***	***400,000***	***200,000***	***200,000***	***200,000***	***200,000***	**--**
Comments	-6 within base due to Global Change budget restructure. -1 within base due to discontinuation in the 2008 President's Budget of congressional action related to USGS participation in the San Pedro partnership. Actuals for 2007 are higher than the target due to transition from the old WRD Reports Tracking System to the new enterprise-wide IPDS, which tracks status of scientific products for the entire USGS. More authors are complying with requirements to enter all scientific publications and other products into the system. Since the transition to IPDS was made in the middle of the year, the increased compliance rate results in exceeding the target for the water programs. Targets for 2008 have been revised based on increased compliance in reporting completion of publications and other products, and unit projected costs have been adjusted accordingly. Cost per scientific product is an average that includes the cost of writing, editing, peer review, and publication of each product, as well as the cost of the studies from which the products are derived. Reimbursements from other Federal agencies are included in the calculation, but the portion of funding housed in the Enterprise Information Activity (associated with the Enterprise Publishing Network) is not included.								

End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
# of formal workshops or training provided to customers	UNK	3	3	3	3	3	3	0	3

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Activity: Water Resources Investigations

Subactivity: **Hydrologic Monitoring, Assessments, and Research**
Program Component: **National Streamflow Information Program**

	2007 Actual	2008 Enacted	2009			Change From 2008 (+/-)
			Fixed Costs & Related Changes (+/-) [a/]	Program Changes (+/-) [b/]	Budget Request	
National Streamflow Information Program ($000)	16,612	20,126	+257	+3,429	23,812	+3,686
Total FTE	*45*	*45*	*0*	*+12*	*57*	*+12*

a/ Fixed cost increases for this program total $325, of which $257 is budgeted and $68 is absorbed.
b/ Changes for this program include a reduction of -$94 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Summary of 2009 Program Changes for National Streamflow Information Program

Request Component	($000)	FTE
• Water for America initiative for 2009	+5,000	+12
• Unrequested congressional action related to general program increase	-1,477	0
• Travel reduction	-94	0
TOTAL Program Changes	**+3,429**	**+12**

Justification of 2009 Program Changes

The 2009 budget request for the National Streamflow Information Program (NSIP) is $23,812,000 and 57 FTE, a net program change of +$3,429,000 and +12 FTE from the 2008 Enacted level. The proposed change includes two parts:

- An increase of $5,000,000 for the Department's Water for America initiative, including $3,000,000 for enhancements in assessments of the Nation's surface water and $2,000,000 to support a required upgrade of data transmission radios at streamgages, to ensure USGS equipment remains compatible with the GOES satellite system,
- A decrease of -$1,477,000 that was added by Congress above the 2008 President's request for streamgaging activities and augmentation of the Hazards Assessment and Mitigation initiative.

Water for America Initiative for 2009 (+$5,000,000 / +12 FTE)

This initiative involves the participation of the Bureau of Reclamation and several USGS programs, as described in the Science on the Landscape section of the budget, which begins on page F-1. The USGS request for 2009 for the NSIP is +$5,000,000, building upon a base of $20,126,000.

To continue managing vital water resources well, good information and predictive tools are needed to guide decisions made by the private sector, localities, Tribes, States, and the Federal government. The Nation needs a Census of Water that tracks changing flow, use, and storage of water, as well as models and predictive tools that will help to inform decisions. The last overall assessment of water resources for the Nation was published by the Water Resources Council in 1978. Much has changed since that time. These changes have been driven by economics, demographics, technology, law, and climate.

Environmental flows are of increasing interest and importance, including from a legal standpoint (the Endangered Species Act). Healthy ecosystems require a full range of streamflows—not just minimum flow, but also flow to establish or recondition habitats. Water quality issues have changed, largely due to the impact of the Clean Water Act. Point sources of water pollution are now well-managed, but the Nation now must tackle nonpoint sources of pollution, or water-quality degradation associated with land use and land cover. Scientists and managers alike now recognize that surface water and ground water are a single resource and need to be managed as such. And, since 1978, data collection and delivery have undergone a technical revolution.

None of these issues can be addressed without reliable, long-term data on streamflows and a solid understanding of the relationship between surface water and ground water. The USGS is uniquely positioned to provide this information and analysis through the NSIP and the GWRP, which will work together under the 2009 initiative.

Under this initiative, the USGS NSIP will —

- Proceed with regional-scale studies by performing statistical analyses of the history and status of storage (in aquifers and reservoirs) and flows (in rivers and aquifers) for each of the Nation's 21 Water Resource Regions (to achieve the first cycle of a national water census by 2019, 6 regions will be studied for 3 years until the first cycle is complete—see *http://water.usgs.gov/GIS/regions.html*),
- Cooperate with State and local government in selected watersheds or aquifer systems to increase use of new technologies in water planning and management, such as regional ground-water / surface-water models that enable planners to assess the true limits of sustainability of the total water resource of a region and conjunctive (ground-water / surface-water) modeling and aquifer storage and recovery,
- Modernize the Nation's 7,000 streamgages by replacing obsolete telemetry systems that will permit continued real-time operations and provide more timely information needed for better water management during floods and droughts (Phase 1: Upgrade 350 streamgages), and stabilize the long-term network by reestablishing critical streamgages discontinued in past decade (Phase 1: Reinstate 50 streamgages).

A comprehensive description of the initiative, including all program components, appears in the Science on the Landscape section, which begins on page F-1.

Unrequested Congressional Action Related to General Program Increase **(-$1,477,000 / 0 FTE)**

This decrease eliminates funds for unrequested congressional action related to a general program increase for streamgaging operations and the Hazards Assessment and Mitigation initiative.

Most of the decrease would be taken from the operational funding for streamgages in the national streamgaging network that are currently supported by USGS. These operational costs include such items as vehicle costs (acquisition, operation, and maintenance), equipment, supplies, and travel. The decrease will not result in deactivation of streamgages in the short term, but in 2008 these funds are being used to stabilize the network by support streamgages that previously received a disproportionate share of funding from partner agencies. In 2009, the higher costs will revert to partner agencies, who may not be able to continue paying a larger share of the costs indefinitely; as a result, some streamgages (an amount that cannot be quantified at this time) may need to be discontinued in 2010 or beyond. It will also result in a decrease in USGS monitoring activity and analysis of flood and debris flow hazards in Southern California.

Program Performance Change

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Outyears
					A	B=A+C	C	D
End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment								
% of proposed streamflow sites currently in operation that meet one or more Federal needs (denominator = 4,425) **(PART)**	61% (2,700)	61% (2,700)	62% (2,742)	64% (2,845)	64% (2,845)	65% (2,895)	+1% (+50)	0
Total projected cost ($000)	35,100	36,450	37,017	39,830	41,253	41,978	+725	--
# real-time stream-gages reporting in NWISWeb	6,246	6,496	6,728	6,830	6,830	6,880	+50	0
Total actual/ pro-jected cost ($000)	84,321	87,696	90,828	88,158	99,035	99,760	+725	--
% of Nation's river basins that have streamflow stations **(PART)** (denomin-ator = 2,223 river basins defined by 8-digit hydrologic unit codes)	82% (1,825)	81% (1,800)	81% (1,800)	84% (1,870)	84% (1,870)	86% (1,920)	+2% (+50)	0
Total actual/ pro-jected cost ($000)	23,725	24,300	24,300	26,180	27,115	27,840	+725	--
Actual/projected cost per stream-gage (national average) whole dollars)	13,500	13,500	13,500	14,000	14,500	14,500	+14,500	--

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Outyears
					A	B=A+C	C	D
Comments	The increase in 2009 results from the addition of 50 new or reactivated (existing) streamgages. The proposed upgrade of 500 additional streamgages gives more frequent reporting capability to existing streamgages but does not increase the number of streamgages in operation, so the upgrades do not affect this performance measure. However, if streamgages are **not** upgraded, they will cease to deliver information when NOAA changes the data-delivery satellite technology in 2013. The increase in 2008 results from the proposed increases for NSIP streamgage operations and for Hazards Assessment and Mitigation. Most of the new streamgages in 2008 will be reactivated, rather than completely new gages. A completely new gage incurs construction costs ranging from $25,000–$30,000, plus 6 months of operation (average of about $7,000); after the first year the new streamgages reverts to the national average cost of $14,000. Cost is a national average that includes operation and maintenance, salary and transportation for technicians who perform site visits, salary for records management and validation, and a small amount for replacement of equipment when a gage is disabled by lightning strike or other event. This replacement of equipment does not include replacement of gages that are lost in large numbers during floods or hurricanes. In practice, the cost of an individual streamgage varies depending on the size of the stream, type of terrain, need for cableways or other specialized equipment at the site, and distance of each site from the nearest USGS office. The measure "% of Nation's river basins that have streamflow stations" assumes a single streamgage in each basin, where 2,223 basins are defined nationwide by 8-digit hydrologic unit codes; however, many basins require more than one streamgage to accurately assess conditions. This metric may never attain 100% because not all basins may require streamflow data (e.g., a basin with no population may not require any assessment of flood risk or land use changes).							
# systematic analyses & investi-gations delivered to customers	0	0	87	89	89	89	0	+2 in 2010 +2 in 2011 +2 in 2012
Comments	+2 systematic analyses accrue in 2008 due to increase received for the Hazards Mitigation and Assessment initiative. Actuals for 2007 are higher than the target due to transition from the old WRD Reports Tracking System to the new enterprise-wide IPDS, which tracks status of scientific products for the entire USGS. More authors are complying with requirements to enter all scientific publications and other products into the system. Since the transition to IPDS was made in the middle of the year, the increased compliance rate results in exceeding the target for the water programs. Targets for 2008 have been revised based on increased compliance in reporting completion of publications and other products. NSIP systematic analyses and investigations have never been counted before, so there are no data for precise cost estimation. For the Water programs in general, cost per scientific product is an average that includes the cost of writing, editing, peer review, and publication of each product, as well as the cost of the studies from which the products are derived. Reimbursements from other Federal agencies are included in the calculation, but the portion of funding housed in the Enterprise Information Activity (associated with the Enterprise Publishing Network) is not included.							

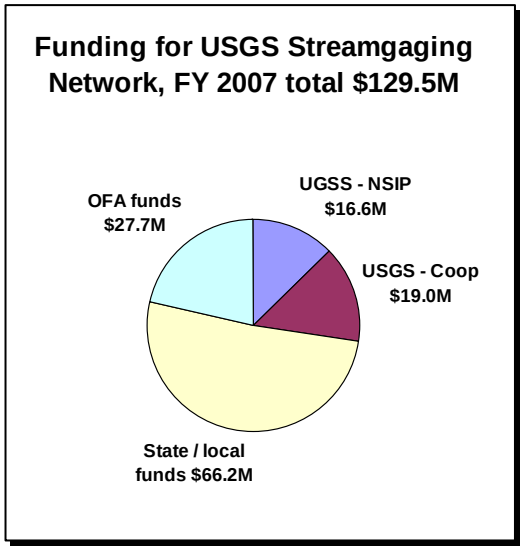
Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 President's budget level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent outyear.

Program Overview

The mission of the National Streamflow Information Program (NSIP) is to provide the streamflow information and understanding required to meet national, regional, State, and local needs. To meet this mission, NSIP has five major objectives:



- Develop an enhanced streamgaging network in which there is a baseline of about 4,780 streamgages to meet national needs that are fully funded by the NSIP, supplemented by streamgages that are funded in partnerships to meet State and local needs.
- Improve streamflow data delivery to users. This includes robust and redundant data delivery systems to ensure the continued availability of data during catastrophic events and improved storage, retrieval, and data analyses abilities.
- Evaluate and describe streamflow characteristics and trends through regional assessments.
- Improve and enhance data collection and analysis for floods and droughts.
- Research and develop new procedures, equipment, and techniques for obtaining and analyzing streamflow information.

USGS flood hazard experts work closely with local, State, and Federal partners, in pursuit of the national goals of reducing the toll of natural disasters and building disaster-resilient communities. The streamflow information produced by the USGS is crucial to the success of the NWS Advanced Hydrologic Prediction Services and the FEMA's floodplain map modernization initiative that began in 2003. Neither of these programs designed to save lives and property from flooding can be successful without the streamflow information provided by the USGS NSIP.

NSIP Federal goal streamgages reflect that portion of the national streamgaging network that is planned to be funded exclusively by the USGS and, therefore, that part of the network over which the USGS maintains maximum control. NSIP is the Federal core of the national streamgaging program that helps to assure stability of the national streamgage network and of long-term data collection. In addition to NSIP funding, support for the network is supplied by other Federal agencies and by 800 State, local, municipal, and tribal partners through the Cooperative Water Program. The shared funding and single-agency operation of the USGS streamgage network provides relevant, high-quality information to all potential users, for a wide variety of uses, at a reduced cost to the Federal Government. Because a single agency operates this network, data are collected using nationally consistent methods, which enables comparability of data across jurisdictional boundaries and acceptance of results by water management agencies and courts at all levels of government. Operation of the national network by a single agency also helps to minimize the costs of providing the needed streamflow information by consolidating the data collection and information management infrastructure required.

The goals of NSIP support the Department's strategic plan, specifically the goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment. In conjunction with the Cooperative Water Program, Hydrologic Networks and Analysis, and an array of reimbursable projects funded by partner agencies, NSIP contributes to the outcome measure and PART performance measures shown in the table at the end of this section.

Storm Surge Sensors Swiftly Sent to Measure Swelling Tides

Hurricanes Katrina and Rita vividly demonstrated that storm surge can be as dangerous as riverine floods.

To determine the timing, extent, and magnitude of hurricane-driven surge waters and waves, the USGS has designed and developed a network of rugged, inexpensive water-level and barometric-pressure sensors, called storm-surge sensors, which can be quickly installed in anticipation of a storm.

The information from these sensors is used to calibrate the storm-surge models employed by forecasters along the Gulf and Atlantic Coasts and helps them provide improved forecasts of what lands will be inundated and to what depth in future hurricanes.

2009 Program Performance

The 2009 budget request for NSIP is $23,812,000 and 57 FTE, a net program change of +$3,429,000 and +12 FTE from 2008 Enacted. Program activities for 2009 fall into the following major categories:

Federal Network Operations
(Estimates for 2007, $12.0 million; 2008, $11.0 million; 2009, $11.2 million)

This program component is dedicated to maintaining and operating a nationwide Federal-interest streamgaging network for measuring streamflow and related environmental variables (precipitation, temperature) reliably and continuously. The 2009 Water for America initiative will allow the USGS to continue to modernize the Nation's 7,000 streamgages with real-time telemetry to permit better management during floods and droughts, stabilize the long-term network by reestablishing critical streamgages discontinued in the past 2 decades, and improve a variety of data collection and processing activities. In particular, funding to NSIP will be used to upgrade 350 streamgages to hourly real-time data transmission and reestablish 50 long-term streamgages that had been discontinued in the past 2 decades.

Hydrologic Extremes
(Estimates for 2007, $0.1 million; 2008, $0.1 million; 2009, $0.1 million)

This portion of the program is designed to provide a better understanding of hydrologic extremes (floods and droughts) by more intensive data collection during and immediately following the event and analyses of the information collected.

Regional Streamflow Assessments
(Estimates for 2007, $0.1 million; 2008, $0.6 million; 2009, $2.6 million)

NSIP scientists provide regional assessments and interpretation of streamflow information to provide estimates of streamflow at ungaged locations and to identify trends in streamflow due to land use, water use, or climate changes. Under the 2009 Water for America initiative, NSIP will work with the GWRP to provide national-level analyses of the long-term trends in streamflows (including shifts in seasonal patterns and in flood flows and low flow conditions) and analyses of changes in ground water storage in the Nation's principle aquifers.

In 2009, together with the GWRP and the National Cooperative Geologic Mapping Program, the NSIP will provide regional-scale analysis of water availability and use as part of an overall national assessment. These studies will be focused initially on 6 of the 21 water resources

regions of the U.S. They will provide standard products summarizing the status and trends in streamflow, floods, droughts, ground-water storage, recharge, and water use. Within three of these six regions, significant large watersheds will be analyzed to develop regional simulation models that can be used for evaluating sustainability of water resources at a regional scale.

Real-Time Information Delivery
(Estimates for 2007, $1.6 million; 2008, $1.3 million; 2009, $3.6 million)

NSIP works with staff from the National Water Information System's Web application (NWISWeb) to develop, implement, and maintain a highly reliable system for real-time streamflow information delivery to customers that includes data processing, quality assurance, storage, and easy access. The 2009 Water for America initiative will allow the USGS to increase network cost-efficiency by improving data collection and processing software, and to enhance real-time data delivery through development of Web services.

Development of Methods and Equipment
(Estimates for 2007, $1.2 million; 2008, $1.3 million; 2009, $1.3 million)

Under this program component, USGS scientists investigate, develop, and implement new methodologies and equipment to more accurately, safely, and inexpensively obtain and deliver streamflow information. The 2009 Water for America initiative will allow the USGS to increase network cost-efficiency by using new data-collection instruments that are more reliable and improve safety for field technicians during flood conditions.

Program Coordination
(Estimates for 2007, $0.4 million; 2008, $0.6 million; 2009, $0.6 million)

This portion of the program provides for coordination with other USGS programs and with funding partners.

Technical Support
(Estimates for 2007, $2.5 million; 2008, $2.7 million; 2009, $2.7 million)

This program component includes technical support for geographically distributed USGS water resources studies and data collection activities, including mechanisms for quality control, technology transfer, and priority setting.

Integrated Multi-Hazards Demonstration Project
(Estimates 2007, $0.9 million; 2008, $1.5 million; 2009, $1.2 million)

In 2007 the USGS began an integrated Hazards Assessment and Mitigation Demonstration Project, focused on Southern California and the Gulf of Mexico coastal area.

The 5-Year Plan for NSIP is being updated, with a goal of completion in 2008, to align with the bureau science strategies that were developed in 2006. A priority topic in the USGS science strategy (*http://www.usgs.gov/science_strategy/*) is a water census. The objective of a water census is identical to the objective of the 2009 Water for America initiative. Further, the interdisciplinary science capabilities of USGS scientists ensures that all aspects of USGS earth science—water, geology, biology, and geography—will be brought to bear on this critical issue.

Updates to 2008 Program Performance Targets

Performance targets for 2008 have been updated from those portrayed in the 2008 President's budget. These updates reflect enacted funding levels for 2008 and other changes described in the "Comments" rows of the performance tables.

Program Performance Overview

There are no performance measures that can be tied exclusively to NSIP; however, in conjunction with the Cooperative Water Program, Hydrologic Networks and Analysis, and an array of reimbursable projects funded by 800 partner agencies, NSIP contributes to all the measures listed below.

End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
GPRA End Outcome Measures									
% targeted science products that are used by partners for land or resource management decisionmaking **(SP)**	85%	90%	93%	≥90%	93%	≥90%	≥90%	0	≥90%
Intermediate Outcome Measures and Bureau and PART Outcome Measures Ensure availability of long-term environmental and natural resource information, data, and systematic analyses needed by land and resource managers for decisionmaking									
% of proposed streamflow sites currently in operation that meet one or more Federal needs (denominator = 4,425) **(PART)**	64% (2,832)	61% (2,700)	62% (2,742)	62% (2,742)	62% (2,742)	64% (2,845)	65% (2,895)	+1% (+50)	55% (2,450)
Total Projected Cost ($000)	***55,313***	***35,100***	***36,450***	***37,017***	***37,017***	***39,830***	***41,978***	***+725***	**--**
# real-time streamgages reporting in NWISWeb **(PART)**	5,978	6,246	6,496	6,195	6,728	6,830	6,880	+50	6,125
Total Projected Cost ($000)	***80,703***	***84,321***	***83,227***	***83,633***	***90,828***	***88,158***	***99,760***	***+725***	**--**
% of river basins that have streamflow stations **(PART)** (denominator = 2,223 river basins, as defined by 8-digit hydrologic unit codes)	77%	82% (1,825)	81% (1,800)	84% (1,870)	81% (1,800)	84% (1,870)	86% (1,920)	+2% (+50)	92% (2,038)
Total actual/projected cost ($000)	***UNK***	***24,637***	***24,300***	***25,245***	***24,300***	***26,180***	***27,840***	***+725***	**--**
Projected cost per streamgage (national average) (whole dollars)	***UNK***	***13,500***	***13,500***	***13,500***	***13,500***	***14,000***	***14,500***	***14,500***	**--**

End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
Comments	The increase in 2009 results from the addition of 50 new or reactivated (existing) streamgages. The proposed upgrade of 500 additional streamgages gives more frequent reporting capability to existing streamgages but does not increase the number of streamgages in operation, so the upgrades do not directly affect this performance measure. However, if streamgages are **not** upgraded, they will cease to deliver information when NOAA changes the data-delivery satellite technology in 2013. The increase in 2008 results from the proposed increases for NSIP streamgage operations and for Hazards Assessment and Mitigation. Most of the new streamgages in 2008 will be reactivated, rather than completely new gages. A completely new gage incurs construction costs ranging from $25,000–$30,000, plus 6 months of operation (average of about $7,000); after the first year the new streamgages reverts to the national average cost of $14,000. Cost is a national average that includes operation and maintenance, salary and transportation for technicians who perform site visits, salary for records management and validation, and a small amount for replacement of equipment when a gage is disabled by lightning strike or other event. This replacement of equipment does not include replacement of gages that are lost in large numbers during floods or hurricanes. In practice, the cost of an individual streamgage varies depending on the size of the stream, type of terrain, need for cableways or other specialized equipment at the site, and distance of each site from the nearest USGS office. The measure "% of river basins that have streamflow information" assumes a single streamgage in each basin, where 2,223 basins are defined nationwide by 8-digit hydrologic unit codes; however, many basins require more than one streamgage to accurately assess conditions. This metric may never attain 100% because not all basins may require streamflow data (e.g., a basin with no population may not require any assessment of flood risk or land use changes).								
Contributing Programs	NSIP, Hydrologic Networks and Analysis, Cooperative Water Program (USGS and State/local contributions), reimbursements from other Federal agencies.								
% of States with Web-based Streamflow statistics tools to support water management decisions **(PART)** (denominator = 50 States)	4%	10% (5)	14% (7)	20% (10)	18% (9)	26% (13)	26% (13)	0	30%
Comments	Cooperative Water Program funding limitations have slowed progress on jointly funded streamstats projects at the State level, causing USGS to not meet the 2007 target for this measure. See *http://water.usgs.gov/osw/streamstats/ssonline.html* for current national status. Changes in 2008 and 2012 planned (not due to budget increase).								
Contributing Programs	NSIP, Hydrologic Networks and Analysis, Coop Water Program.								
PART Efficiency and Other Outcome Measures									
# systematic analyses & investigations delivered to customers	0	0	0	0	87	89	89	0	91

End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
Comments	+2 systematic analyses accrue in 2008 due to increase received for the Hazards Mitigation and Assessment initiative. Actuals for 2007 are higher than the target due to transition from the old WRD Reports Tracking System to the new enterprise-wide IPDS, which tracks status of scientific products for the entire USGS. More authors are complying with requirements to enter all scientific publications and other products into the system. Since the transition to IPDS was made in the middle of the year, the increased compliance rate results in exceeding the target for the water programs. Targets for 2008 have been revised based on increased compliance in reporting completion of publications and other products. NSIP systematic analyses and investigations have never been counted before, so there are no data for precise cost estimation. For the Water programs in general, cost per scientific product is an average that includes the cost of writing, editing, peer review, and publication of each product, as well as the cost of the studies from which the products are derived. Reimbursements from other Federal agencies are included in the calculation, but the portion of funding housed in the Enterprise Information Activity (associated with the Enterprise Publishing Network) is not included.								
Contributing Programs	NSIP, Hydrologic Networks and Analysis, Cooperative Water Program (USGS and State/local contributions), reimbursements from other Federal agencies.								
% of WRD streamflow stations with 30 or more years of record **(PART)** (denominator = number of real-time streamgages reporting in NWISWeb)	60% (baseline)	58% (3,622 / 6,246)	59% (3,833 / 6,496)	63% (3,902 / 6,195)	59% (3,970 / 6,728)	58% (3,970 / 6,830)	62% (4,620 / 6,880)	+4% (+25 / +50)	65% (3,976 / 6,125)
Total actual/projected cost ($000)	***UNK***	***48,897***	***51,597***	***52,677***	***53,589***	***55,580***	***61,764***	***+725***	***--***
Actual/projected cost per streamgage (national average) (whole dollars)	***UNK***	***13,500***	***13,500***	***13,500***	***13,500***	***14,000***	***14,500***	***14,500***	***--***
Comments	Percentage decreases in 2008 due to addition of new streamgages to the network. As new streamgages are added, the percentage of streamgages with 30 years of record decreases. This decrease should not be interpreted as a decline in performance. Increase in 2009 is due to the reactivation of long-term streamgages through the Water for America initiative.								
Contributing Programs	NSIP, Cooperative Water Program (USGS and State/local contributions), reimbursements from other Federal agencies.								

Activity: Water Resources Investigations

Subactivity: **Hydrologic Monitoring, Assessments, and Research**
Program Component: **Hydrologic Networks and Analysis**

	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-) [a/]	2009 Program Changes (+/-) [b/]	2009 Budget Request	Change From 2008 (+/-)
Hydrologic Networks and Analysis ($000)	29,572	30,537	-422	-468	29,647	-890
Total FTE	*196*	*199*	*-6*	*0*	*193*	*-6*

a/ Fixed cost increases for this program total $554, of which $438 is budgeted and $116 is absorbed. A technical adjustment is proposed as part of a budget restructure that moves funding for global change activities into a new integrated budget activity titled Global Change.

b/ Changes for this program include a reduction of -$138 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Summary of 2009 Program Changes for Hydrologic Networks and Analysis

Request Component	($000)	FTE
• Ocean Action Plan — National Water Quality Monitoring Network	+500	0
• Unrequested congressional action	-830	0
• Travel reduction	-138	0
TOTAL Program Changes	**-468**	**0**

Justification of 2009 Program Changes

The 2009 budget request for Hydrologic Networks and Analysis is $29,647,000 and 193 FTE, a net program change of -$468,000 and 0 FTE from the 2008 Enacted level. This change includes an increase of $500,000 for the Ocean Action Plan Initiative (originally proposed in the 2008 President's budget) and elimination of two unrequested congressional actions: a decrease of $338,000 for water-quality studies in the Lake Champlain basin and a decrease of $492,000 for water monitoring in Hawaii.

Ocean Action Plan — National Water Quality Monitoring Network (+$500,000 / +0 FTE)

The program increase, which was originally proposed as part of the 2008 President's budget and was partially funded in 2008, continues USGS efforts to implement the President's Ocean Action Plan (OAP) and to engage in interagency efforts to advance the implementation strategy of the Ocean Research Priorities Plan in support of the Near-term Priorities identified therein. The proposed activities address the Department's Resource Protection strategic goal in support of the end outcome goal: "improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment." This increase complements a related increase

in the Coastal and Marine Geology Program ($1,500,000), and both increases are coordinated with new, complementary efforts in the NOAA and the EPA.

This 2008 increase permitted the initial implementation of the National Water Quality Monitoring Network (NWQMN) called for in the OAP and defined through the efforts of some 40 Federal, State, and local agencies, monitoring associations, or professional organizations including the USGS, EPA, and NOAA and described in the plan entitled, "National Water Quality Monitoring Network for U.S. Coastal Waters and their Tributaries." This plan, approved by members of the Advisory Committee on Water Information (ACWI) and by the Council on Environmental Quality, National Science and Technology Council (CEQ/NSTC), provides for interagency pilot studies in 2007 to inventory existing monitoring assets, identify gaps between network design specifications and current data collection, refine the NWQMN's observational and data sharing requirements, and identify next steps for network implementation. That work is continuing in 2008 at the 2007 level. The 2009 proposed increase ($500,000 to Hydrologic Networks and Analysis) will build upon 2008 efforts to provide assessments and water-quality monitoring and sampling activities needed to advance the NWQMN. Activities in 2009 supported by the proposed increase will build upon pilot study results leading to demonstration projects designed to reveal the feasibility of the NWQMN, refine observational parameters and temporal and geographic sampling frequencies and scales, and develop data sharing, summarization, and reporting methodologies.

New Activities Related to the Ocean Action Plan

The next phase of the National Water-Quality Monitoring Network will include demonstration studies that will begin in 2008.

During the first phase, one or more regional networks (most likely those participating in the 2007 pilot projects) will be redesigned or augmented to address data gaps identified through the pilot projects by adding sensors in the field, collecting and analyzing additional environmental parameters (or sampling existing parameter suites more frequently or more densely), improving data management and sharing, or other activities that move existing demonstration study area networks toward functionalities described in the network design.

An integrated overview of activities related to the OAP, including this proposed increase and the related increase proposed for the Coastal and Marine Geology Program, is presented in the Science on the Landscape section, which begins on page F-1.

Unrequested Congressional Action **(-$830,000 / 0 FTE)**

The reduction will end two unrequested congressional actions related to water-quality monitoring in the Lake Champlain basin and expanded monitoring of water resources in Hawaii. These projects are not Administration or USGS priorities and do not address the highest priority science needs in water research and monitoring. This will keep the core program intact while allowing the USGS to make the best use of resources. In these particular projects, the USGS would end expanded water-quality monitoring for mercury and other toxic substances in Lake Champlain (-$338,000, leaving $154,000 in the program for basic data collection in the Lake) and end expanded monitoring of water resources in Hawaii, in cooperation with the State Department of Natural Resources (-$492,000).

Program Performance Change

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Outyears
					A	B=A+C	C	D
End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment								
# systematic analyses & investigations delivered to customers	65	64	155	144	142	141	-1	0
Total actual/projected cost ($000)	26,000	25,600	31,000	28,800	28,400	28,400	-200	--
Actual/projected cost per scientific report or other product (whole dollars)	400,000	400,000	200,000	200,000	200,000	200,000	200,000	--
Comments	-1 in 2009 due to discontinuation funds for Lake Champlain that were added by unrequested Congressional action in 2008. -2 within the 2009 base due to Global Change budget restructure. Other changes in the 2009 base are planned (not due to budget changes). Actuals for 2007 are higher than the target due to transition from the old WRD Reports Tracking System to the new enterprise-wide IPDS, which tracks status of scientific products for the entire USGS. More authors are complying with requirements to enter all scientific publications and other products into the system. Since the transition to IPDS was made in the middle of the year, the increased compliance rate results in exceeding the target for the water programs. Targets for 2008 have been revised based on increased compliance in reporting completion of publications and other products, and unit projected costs have been adjusted accordingly. Cost per scientific product is an average that includes the cost of writing, editing, peer review, and publication of each product, as well as the cost of the studies from which the products are derived. Reimbursements from other Federal agencies are included in the calculation, but the portion of funding housed in the Enterprise Information Activity (associated with the Enterprise Publishing Network) is not included.							
Real-time ground-water sites reporting in NWISWeb	796	917	983	984	984	987	+3	--
Comments	Increases in 2008 and 2009 are due to the Healthy Lands initiatives, for which funding resides in the Biological Research and Monitoring subactivity. Exceeded target in 2007 because of increased interest by partner agencies, who contributed additional funding amounts that were not anticipated when targets were set.							

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 President's budget level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent outyear.

Program Overview

Data on the quantity and quality of water in the Nation's streams, lakes, and aquifers, as well as analytical studies, are necessary for the wise planning, development, utilization, and protection of the Nation's water resources. The Federal funds appropriated through the Hydrologic Networks and Analysis (HNA) program support three distinct water-quality networks described below, selected hydrologic analysis and modeling activities, and a small but vital portion of the overall information delivery activity of the USGS water resources programs.

Because of the wide range of activities funded by HNA, the water-quality data and analytical information that the USGS provides through this program are used by a variety of stakeholders, including other Interior bureaus (through the NPS water quality partnership and the DOI Cost-Share), EPA and USDA (both customers for baseline water-quality information), Department of Commerce (for real-time flood level information provided through the National Water Information System, which this program supports), State and local governments (for both water-quality and flood level information), academia, consulting and advocacy organizations, industry, and private citizens.

The HNA program supports the Department's strategic plan, specifically the goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment. In conjunction with other USGS programs and an array of reimbursable projects funded by partner agencies, HNA contributes to the outcome measure and PART program performance measures shown in the table at the end of this section.

2009 Program Performance

The 2009 budget request for HNA is $29,647,000 and 193 FTE, a net program change of -$468,000 and 0 FTE from 2008 Enacted. HNA includes four major components:

Hydrologic Networks
(Estimates for 2007, $4.4 million; 2008, $5.4 million; 2009, $5.9 million)

This program component includes long-term national networks for the collection of data on water quality and acid precipitation, including the National Stream Quality Accounting Network, the Hydrologic Benchmark Network, and the National Atmospheric Deposition Program / National Trends Network. This program component also includes activities related to the new National Water Quality Monitoring Network, a multi-agency effort conducted under the auspices of the Ocean Action Plan. The objectives of this program component are —

- Monitor the chemical quality of rain and snowfall,
- Monitor streamflow and the water quality of streams to fulfill USGS obligations for specific river basin compacts and treaties, and
- Monitor the water quality and trends of selected major rivers.

Hydrologic Analysis

(Estimates for 2007, $11.7 million; 2008, $11.1 million; 2009, $9.5 million)

This program component includes studies of climate variability and change, watershed modeling activities in support of the BOR, USGS water-quality partnership with the NPS, DOI Cost-Share (which pays the portion of indirect costs not covered by the standard overhead charge on reimbursable projects that the USGS water programs conduct for other Interior bureaus), support for the USGS National Research Program in the hydrologic sciences, and support for the USGS Priority Ecosystems Science program. The objectives of this program component are —

- Understand the impacts of global climate change; monitor long-term changes in streamflow and stream quality at sites relatively unaffected by human activities (this component is being transferred in 2009 to the new Global Change budget activity, which is described in detail in Section E),
- Provide direct technical support to Interior bureaus for hydrologic concerns,
- Provide direct technical support to the NPS for water-quality concerns, and
- Develop decision-support systems for specific river basins in the western United States.

In 2009, HNA will permanently transfer $860,000 from this program component to the new Global Change budget activity, primarily associated with the Hydroclimatology Program that began in 1990. The Hydroclimatology Program was designed to develop data, understanding, and predictive capabilities related to water in relationship to long-term climate variation and change. Major components include funding for operation of the USGS Benchmark Glacier Monitoring Program and research on large-scale hydrologic trends that may be related to long-term climate variations or changes. This budget structure change is described in detail in Section E.

Information Delivery

(Estimates for 2007, $4.9 million; 2008, $4.3 million; 2009, $4.4 million)

This program component includes delivery of results and water information beyond the immediate needs of funding agencies or programs (the USGS funds the delivery of basic hydrologic data directly as a part of the overall cost of the data collection). This activity has two pieces: publications and the computer-based National Water Information System. This component of the HNA program also supports activities of the ACWI and its subcommittees. The objective of this program component is to maintain and enhance USGS data delivery systems to process and disseminate water data and study results.

Technical Support

(Estimates for 2007, $8.2 million; 2008, $9.7 million; 2009, $9.8 million)

This program component includes national technical support for geographically distributed USGS water-resources studies, including quality control to assure the technical excellence of water resources programs. Technical support also provides a structured way of transferring new technology to USGS investigative and data activities that are primarily conducted in the USGS Water Science Centers located in each State, and a formal way of establishing priorities for water-resources research by the USGS. In addition, this program component supports the

regional reorganization and various bureau-level activities such as CALFED science coordination and the Enterprise Publishing Network

Some of the activities listed above (such as monitoring) are fairly fixed and will not change for a number of years. Others have some flexibility in planning and implementation. The 5-Year Plan for HNA is being updated, with a goal of completion in 2008, to align with the bureau science strategies that were developed in 2007.

Updates to 2008 Program Performance Targets

Performance targets for 2008 have been updated from those portrayed in the 2008 President's budget. These updates reflect enacted funding levels for 2008 and other changes described in the "Comments" rows of the performance tables.

In the case of HNA, this involves the addition of funds for projects added to the budget in 2008 by congressional action and the various systematic analyses and investigations associated with those studies: $338,000 for water-quality studies in the Lake Champlain basin and $492,000 for water monitoring in Hawaii. The 2008 Plan targets also reflect the decrease in the 2008 appropriation from the funding level requested for Ocean Action Plan activities ($1,500,000 requested and $984,000 appropriated).

Program Performance Overview

End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
GPRA End Outcome Measures									
% targeted science products that are used by partners for land or resource management decisionmaking **(SP)**	85%	90%	93%	≥90%	93%	≥90%	≥90%	0	≥90%
Intermediate Outcome Measures and Bureau and PART Outcome Measures Ensure the quality and relevance of science information and data to support decisionmaking									
Quality: X% of studies validated through appropriate peer review or independent review **(SP)**	100%	100% (65)	100% (64)	100% (63)	100% (155)	100% (144)	100% (142)	0 (-2)	100% (142)
Intermediate Outcome Measures and Bureau and PART Outcome Measures Ensure availability of long-term environmental and natural resource information, data, and systematic analyses needed by land and resource managers for decisionmaking									
% of proposed streamflow sites currently in operation that meet one or more Federal needs (denominator = 4,425) **(PART)**	64% (2,832)	61% (2,700)	62% (2,742)	62% (2,742)	62% (2,742)	64% (2,845)	65% (2,895)	+1% (+50)	55% (2,450)
Comments	The change in 2008 is a result of the proposed increase for NSIP streamgage operations and the proposed increases for Hazards Assessment and Mitigation.								
Contributing Programs	NSIP, Hydrologic Networks and Analysis, Cooperative Water Program (USGS and State/local contributions), reimbursements from other Federal agencies.								
PART Efficiency and Other Output Measures									
# systematic analyses & investigations delivered to customers	UNK	65	64	63	155	144	142	-2	142
Total actual/projected cost ($000)	***UNK***	***26,000***	***25,600***	***25,200***	***31,000***	***28,800***	***28,400***	***-400***	**--**
Actual/projected cost per scientific report or other product (whole dollars)	***UNK***	***400,000***	***400,000***	***400,000***	***200,000***	***200,000***	***200,000***	***200,000***	**--**

End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
Comments	-2 within the 2009 base due to Global Change budget restructure. Changes from 2007 to 2008 are planned (not due to budget changes). Actuals for 2007 are higher than the target due to transition from the old WRD Reports Tracking System to the new enterprise-wide IPDS, which tracks status of scientific products for the entire USGS. More authors are complying with requirements to enter all scientific publications and other products into the system. Since the transition to IPDS was made in the middle of the year, the increased compliance rate results in exceeding the target for the water programs. Targets for 2008 have been revised based on increased compliance in reporting completion of publications and other products, and unit projected costs have been adjusted accordingly. Cost per scientific product is an average that includes the cost of writing, editing, peer review, and publication of each product, as well as the cost of the studies from which the products are derived. Reimbursements from other Federal agencies are included in the calculation, but the portion of funding housed in the Enterprise Information Activity (associated with the Enterprise Publishing Network) is not included.								
# real-time streamgages reporting in NWISWeb	5,978	6,246	6,496	6,195	6,728	6,830	6,880	+50	6,125
Total actual/projected cost ($000)	***80,7033***	***84,321***	***87,696***	***83,633***	***90,828***	***88,158***	***99,760***	***+725***	***--***
Actual/projected cost per streamgage (national average) (whole dollars)	***13,500***	***13,500***	***13,500***	***13,500***	***14,000***	***14,500***	***14,500***	***14,500***	***--***
Comments	2007 targets were set before 2006 year-end actuals were known and were based on a "likely enacted" funding level that never came to pass. In addition, the USGS exceeded the target for this measure because of increased interest by partner agencies, who contributed additional funding amounts that were not anticipated when targets were set. The change in 2008 is a result of the increases for NSIP streamgage operations and the Hazards Assessment and Mitigation initiative proposed in the 2008 President's Budget. Most of the additional streamgages in 2008 will be reactivated, rather than completely new gages. A completely new gage incurs construction costs ranging from $25,000–$30,000, plus 6 months of operation (average of about $7,000); after the first year the new streamgages reverts to the national average cost of $14,000. Cost is a national average that includes operation and maintenance, salary and transportation for technicians who perform site visits, salary for records management and validation, and a small amount for replacement of equipment when a gage is disabled by lightning strike or other event. This replacement of equipment does not include replacement of gages that are lost in large numbers during floods or hurricanes. In practice, the cost of an individual streamgage varies depending on the size of the stream, type of terrain, need for cableways or other specialized equipment at the site, and distance of each site from the nearest USGS office.								
Contributing Programs	NSIP, Hydrologic Networks and Analysis, Coop Water Program (USGS and State/local contributions), and reimbursements from other Federal agencies.								

End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
# real-time ground-water sites reporting in NWISWeb	799	796	917	685	983	984	987	+3	900
Comments	Exceeded target in 2007 because of increased interest by partner agencies, who contributed additional funding amounts that were not anticipated when targets were set. Changes in 2008 and 2009 are due to the Healthy Lands Initiative, for which funding resides in the Biological Research and Monitoring subactivity.								
Contributing Programs	Ground-Water Resources Program, Hydrologic Networks and Analysis, Coop Water Program (USGS and State/local contributions), and reimbursements from other Federal agencies.								
# real-time water-quality sites reporting in NWISWeb	1,062	1,125	1,102	887	1,249	1,249	1,249	0	1,141
Comments	Exceeded target because of increased interest by partner agencies, who contributed additional funding amounts that were not anticipated when targets were set.								
Contributing Programs	Hydrologic Networks and Analysis, Coop Water Program (USGS and State/local contributions), and reimbursements from other Federal agencies.								
# of formal workshops or training provided to customers	UNK	11	11	11	11	11	11	0	11

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Activity: Water Resources Investigations

Subactivity: Cooperative Water Program

	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-) [a/]	2009 Program Changes (+/-) [b/]	2009 Budget Request	Change From 2008 (+/-)
Cooperative Water Program ($000)	64,345	62,849	+1,170	-1,734	62,285	-564
Total FTE [c/]	*725*	*715*	*0*	*-6*	*709*	*-6*

a/ Fixed cost increases for this subactivity total $1,480, of which $1,170 is budgeted and $310 is absorbed. A technical adjustment is proposed as part of a budget restructure that moves funding for global change activities into a new integrated budget activity titled Global Change.

b/ Changes for this subactivity include a reduction of -$293 for travel. The impact of this change is described in the General Statement that begins on page A-1.

c/ The 2008 decrease of 10 FTE is matched by a decrease ranging from -10 to -20 FTE in the reimbursable program, for a total decrease ranging from -20 to -30 FTE. The 2009 decrease of 6 FTE is matched by a decrease ranging from -6 to -12 FTE in the reimbursable program, for a total decrease ranging from -12 to -18 FTE.

Summary of 2009 Program Changes for Cooperative Water Program

Request Component	($000)	FTE
• Cooperative interpretive studies	-1,441	-6
• Travel reduction	-293	0
TOTAL Program Changes	**-1,734**	**-6**

Justification of 2009 Program Changes

The 2009 budget request for the Cooperative Water Program is $62,285,000 and 709 FTE, a net program change of -$1,734,000 and -6 FTE from the 2008 Enacted level.

Cooperative Interpretive Studies **(-$1,441,000 / -6 FTE)**

This decrease was originally proposed in the 2008 President's budget to offset the $1,400,000 increase proposed for the National Streamflow Information Program and other higher priority USGS programs. In 2009, the decrease would result in about 20 fewer interpretive studies of water resources issues that are conducted through the Cooperative Water Program, starting with studies that were scheduled to conclude at the end of 2008.

Since the cooperators provide about two-thirds of the funding for the program, the content of projects is determined in consultation with those cooperators, and specific focus areas are often not known until workplans and joint funding agreements are established during the fiscal year. Thus, the USGS cannot say which specific studies would be stopped in 2009. However, likely topical areas to be reduced include —

- Water quality issues such as determining the effects of land use practices on water quality,
- Water availability and use,
- Wetlands, lakes, reservoirs, and estuaries,
- Water resources issues in the coastal zone, and
- Environmental effects on human health.

Program Performance Change

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 Pres. Budget	Program Change Accruing in 2009	Program Change Accruing in Outyears
					A	B=A+C	C	D
End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment								
# systematic analyses & investi-gations delivered to customers	138	137	338	323	323	303	-20	0
Total Projected Cost ($000)	23,460	23,460	33,800	32,300	32,300	30,300	-2,000	--
Projected Cost per scientific report or other product (whole dollars)	170,000	170,000	100,000	100,000	100,000	100,000	100,000	--
Comments	Decreases in 2008 and 2009 are due to a reduction in the number of interpretive cooperative studies resulting from decreases in funding. Actuals for 2007 are higher than the target due to transition from the old WRD Reports Tracking System to the new enterprise-wide IPDS, which tracks status of scientific products for the entire USGS. More authors are complying with requirements to enter all scientific publications and other products into the system. Since the transition to IPDS was made in the middle of the year, the increased compliance rate results in exceeding the target for the water programs. Targets for 2008 have been revised based on increased compliance in reporting completion of publications and other products, and unit projected costs have been adjusted accordingly. Cost per scientific product is an average that includes the cost of writing, editing, peer review, and publication of each product, as well as the cost of the studies from which the products are derived. Reimbursements from other Federal agencies are included in the calculation, and for the Cooperative Water Program non-Federal matching funds are included, but the portion of funding housed in the Enterprise Information Activity (associated with the Enterprise Publishing Network) is not included.							

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 President's budget level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent outyear.

Program Overview

As the primary Federal science agency for water-resource information, the USGS monitors the quantity and quality of water in the Nation's rivers and aquifers, assesses the sources and fate of contaminants in aquatic systems, develops tools to improve the application of hydrologic information, and ensures that its information and tools are available to all potential users.

For more than 100 years, the Coop Program has been a highly successful cost-sharing partnership between the USGS and water-resource agencies at the State, local, and tribal levels. This partnership provides support for a majority of the USGS National hydrologic data network, including 4,500 stream gages, 10,000 ground-water observation wells, and 2,500 water-quality monitoring sites directly supported through the Coop Program. The Coop Program has been successful because it —

- Combines Federal and non-Federal resources in addressing many of the Nation's most pressing water resource issues, resulting in shared benefits and cost savings to both the Federal Government and the States,
- Conducts studies across the country in each of the 50 States, Puerto Rico, and U.S. Trust Territories, allowing the USGS to form a national picture of important water-resources issues and potential solutions,
- Uses standardized methods of data collection and analysis across the country, so that information can be aggregated into National databases, results of studies are comparable from one State to another, and knowledge gained from one study has transfer value to understanding the hydrology in other parts of the country,
- Helps resolve inter-jurisdictional disputes by assessing conditions at State boundaries and by assuring all parties that the data and results of investigations are objective and are equally available to all parties, and
- Combines the utilization of USGS offices within the State with the much larger national infrastructure of the USGS. This infrastructure includes the National Water Quality Laboratory, the National Water Information System, the National Research Program (which provides new methods and consultation on difficult scientific issues), instrumentation testing facilities, and a national system of quality assurance.

In addition to providing information responsive to State or local needs, the Coop Program provides information that supports the activities of many Federal agencies. Some of these activities are —

- Forecasting floods,
- Managing surface-water supplies,
- Monitoring hydroelectric power production,
- Setting waste disposal limitations,
- Regulating industrial discharges,
- Designing highway structures,
- Measuring the downstream transport of pollutants or nutrients,
- Determining total maximum daily loads,
- Evaluating mine permits,
- Planning and evaluating land reclamation,
- Evaluating fish habitat,
- Quantifying Indian water rights, and
- Quantifying Federal reserved water rights.

The goals of the Coop Program support the Department's strategic plan, specifically the goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment. In conjunction with NSIP, Hydrologic Networks and Analysis, and an array of reimbursable projects funded by partner agencies, the Coop Program contributes to

the outcome measures and PART program performance measures shown in the table at the end of this section.

This program effectively leverages Federal appropriations, working with State, local, municipal, and Tribal officials to develop a program that responds to both local and national needs and attracts more than two non-Federal dollars for each Federal dollar appropriated. In 2007, non-Federal cooperators provided $163.2 million to match USGS funding of $64.3 million, well above the one-to-one match required by provisions of the annual appropriations act.

2009 Program Performance

The 2009 budget request for the Cooperative Water Program subactivity is $62,285,000 and 709 FTE, a net program change of -$1,734,000 and -6 FTE from 2008 Enacted.

Topical areas that will receive special attention in 2009 include the following:

Water availability — The availability of water to meet the needs of growing communities, agriculture, energy production, and critical ecosystems continues to be a nationwide challenge. The Cooperative Water Program provides essential hydrologic information needed to assess the quantity of water available to communities to support water supply planning and allocation to a wide range of users. In 2008 and 2009, the Coop Program will support thousands of streamgages and ground-water observation wells that define the availability of surface and ground waters, and will conduct numerous hydrologic investigations needed to evaluate the quantity of available ground water. A recent example of this work includes completion of a sophisticated computer ground-water flow model of the Virginia Coastal Plain, an important water supply for more than 2 million people. This work includes detailed characterization of the newly discovered Chesapeake Bay Impact Crater and its influence on the regional ground water system. For more information, see *http://va.water.usgs.gov/projects/va089.html.*

Linkage to Water for America Initiative

Although the Coop Program requests no funds in 2009 for the Department's Water for America initiative, which addresses issues of water availability, the program remains supportive of initiative goals and will assist in information transfer to State, local, and tribal agencies. In 2008, the matching funds that these non-Federal agencies provide to the CWP support the operation of over 4,000 streamgages, 10,000 ground-water observation wells, a total of 700 hydrologic investigations, and the national water use database.

Drinking water — Providing clean, safe drinking water to citizens is a high national priority, and the Coop Program works with State and local governments to assess the quality of the Nation's drinking water supply. In 2008, the USGS will work with the California Water Resources Control Board to continue an assessment of 116 of California's priority ground-water basins. With many partners, the USGS is developing an understanding of natural and human factors that affect ground-water quality, providing early indications of potential water-quality problems, and contributing to the long-term management and protection of ground-water resources affecting one in eight Americans. For more information, see *http://ca.water.usgs.gov/gama/.*

Ecosystem needs — One of the most pressing ecosystem questions that the Nation faces is how to preserve and enhance the quality of aquatic and riparian ecosystems in the face of increasing pressure to withdraw surface water and ground water. Through the Coop Program the USGS is working with State and local agencies to evaluate the instream flow requirements of aquatic ecosystems. This effort entails the development of both new information and new techniques. A recent notable example includes the USGS effort to develop a hydroecological

integrity assessment process for New Jersey, which should provide a prototype for broad applicability nationwide. A report describing this new tool can be found at *http://www.fort.usgs.gov/products/publications/21598/21598.pdf.*

All three of these priority areas will receive attention in both the data collection portion of the program and the interpretive studies portion of the program. The Coop Program includes three major components:

Data Collection Activities

(Estimates for 2007, $34.8 million; 2008, $34.1 million; 2009, $34.1 million)

Cooperatively funded hydrologic data collection activities are underway in every State, Guam, Puerto Rico, and the U.S. Virgin Islands. Over the past few years, the Coop Program has provided sole support or partial support for well over half of the sites where the USGS collects data on surface-water levels and flow, ground-water levels, and ground-water quality. In addition, the Coop Program supports collection of data on surface-water quality, which is becoming increasingly important to the States as they monitor total maximum daily loads (TMDLs), to comply with the requirements of the Clean Water Act.

All these data provide resource managers with the information they need to determine the suitability of water for various uses, identify trends in water quality, and evaluate the effects of various stresses on the Nation's ground water and surface water resources. Much of the data collected at USGS monitoring sites is provided free of charge on the Internet. This includes historical data, as well as real-time data, which are generally less than 4 hours old. The real-time data are used routinely by emergency management agencies, State and municipal agencies, businesses, irrigators, and recreational boaters and fishers.

Use of Cost and Performance Information

A synthesis of results from reviews of the water science centers confirmed that salary load is increasing across the Nation and is having a major impact on operations. This impact is keenly felt in the streamgaging, operations, with costs growing 4-6 percent per year, resulting largely from increasing personnel costs. The impact is also significant for the Coop Program, which is the largest program component in most WSCs.

Over the years the Coop Program has maintained about a 50:50 balance between data collection and interpretive studies. To maintain the requisite level of data collection to support stakeholder needs, the USGS has reduced the number of new research hires and combined research resources among science centers to ensure that the right skill mix is available to conduct interpretive studies.

Most of the USGS data collection stations serve multiple purposes and many are funded, wholly or in part, through joint-funding agreements. Normally, these stations, though funded by various organizations, are operated as part of an integrated network rather than as stand-alone entities. For this reason, cooperating organizations are billed on the basis of average station cost, rather than actual cost, which rarely can be precisely known. This procedure benefits these organizations and the USGS in at least two ways: administrative costs are reduced because financial transactions are simplified, and definitive cost information is available to all parties for planning purposes at the beginning of the fiscal year. This arrangement also ensures that data collection in remote areas or areas which may be otherwise problematic (due to vandals, extreme flooding, lightning strikes) during a given period of time do not become so expensive that they must be dropped from the network.

Interpretive Studies
(Estimates for 2007, $23.2 million; 2008, $22.7 million; 2009, $22.1 million)

In addition to data collection activities, the Coop Program supports about 750 hydrologic studies each year. Water resource studies define, characterize, and evaluate the extent, quality, and availability of water resources. The results of these investigations are published and provided to State agencies, which use them as the basis for managing the water resources for which they are responsible. Also, these investigations provide information that can be synthesized and applied to a variety of hydrogeologic and climatic settings across the Nation, greatly expanding the usefulness and transferability of USGS study results nationwide.

Technical Support
(Estimates for 2007, $6.3 million; 2008, $6.1 million; 2009, $6.1 million)

The USGS has a long tradition of providing national and regional technical support for its geographically distributed water resources studies. This support provides quality control to assure the technical excellence of water resources field programs and provides a structured way of transferring new technology to USGS investigative and data activities that are primarily conducted in Water Science Centers in each State. Technical support also includes a formal way of establishing priorities for water resources research by the USGS and provides a mechanism to make water resources information available to other agencies, the scientific community, and the public.

Updates to 2008 Program Performance Targets

Performance targets for 2008 have been updated from those portrayed in the 2008 President's budget. These updates reflect enacted funding levels for 2008 and other changes described in the "Comments" rows of the performance tables.

Program Performance Overview

There are no performance measures that can be tied exclusively to the Coop Program; however, in conjunction with the NSIP, Hydrologic Networks and Analysis, and an array of reimbursable projects funded by 800 partner agencies, the Coop Program contributes to all the measures listed below.

End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
GPRA End Outcome Measures									
% targeted science products that are used by partners for land or resource management decisionmaking **(SP)**	85%	90%	93%	≥90%	93%	≥90%	≥90%	0	≥90%
Intermediate Outcome Measures and Bureau and PART Outcome Measures Ensure availability of long-term environmental and natural resource information, data, an systematic analyses needed by land and resource managers for informed decisionmaking									
% of proposed streamflow sites currently in operation that meet one or more Federal needs (denominator = 4,425) **(PART)**	64% (2,832)	61% (2,700)	62% (2,742)	62% (2,742)	62% (2,742)	64% (2,845)	65% (2,895)	+1% (+50)	55% (2,450)
Comments	The change in 2008 is a result of the proposed increases for NSIP streamgage operations and Hazards Assessment and Mitigation. The change in 2009 is a result of the Water for America initiative.								
Contributing Programs	NSIP, Hydrologic Networks and Analysis, Cooperative Water Program (USGS and State/local contributions), reimbursements from other Federal agencies.								
% of U.S. with ground-water quality status and trends information to support resource management decisions **(PART)**	0	39%	58%	51%	68%	70%	70%	0	70%
Comments	Target for 2007 was exceeded because sampling from out years was shifted into 2007 in anticipation of not being able to afford it in future years, as this type of work grows more expensive while future budgets will likely remain level. Change in 2008 planned (not due to budget changes).								
% of U.S. with ground-water availability status and trends information to support resource management decisions **(PART)** (denominator = 65 principal aquifers)	5% (3.5)	7% (4.5)	8% (5.5)	9% (6)	9% (6)	11% (7)	12% (8)	+1% (+1)	12% (8)
Total Projected Cost ($000)	***UNK***	***1,575***	***1,925***	***2,100***	***2,100***	***2,625***	***3,000***	***+375***	**--**

End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
Projected Cost per regional ground-water availability project (national average) (whole dollars)	***UNK***	***350,000***	***350,000***	***350,000***	***350,000***	***375,000***	***375,000***	***375,000***	**--**
Comments	Change in 2008 results from decrease proposed for the Cooperative Water Program. Measure indicates the number of regional ground-water evaluation projects (status and trends in ground-water availability) that coincide with total number of the Nation's 65 principal aquifers, as designated in the National Atlas. Average cost per project is $350,000–$375,000, though actual costs range from <$100,000 to >$500,000 per project, depending on the scope and location of the study. Project costs include salaries, travel, training, vehicles, supplies, report production, and printing.								
Contributing Programs	Cooperative Water Program, Ground-Water Resources Program								
% of States with Web-based Streamflow statistics tools to support water management decisions **(PART)** (denominator = 50 States)	4%	10% (5)	14% (7)	20% (10)	18% (8)	26% (13)	26% (13)	0	30% (15)
Comments	Target not met in 2007 because the bureau did not receive an approved budget or an apportionment until halfway through the fiscal year, delaying progress on implementation of the Streamstats web application. By the end of the first quarter of 2008, progress on this measure has already exceeded the 2007 year-end target and is well on the way to achieving the 2008 target.								
Contributing Programs	NSIP, Hydrologic Networks and Analysis, Coop Water Program.								
Intermediate Outcome Measures and Bureau and PART Outcome Measures Ensure the quality and relevance of science information and data to support decisionmaking									
X% of studies validated through appropriate peer review or independent review **(SP)**	100%	100% (138)	100% (137)	100% (137)	100% (338)	100% (323)	100% (303)	0 (-20)	100% (276)
PART Efficiency and Other Output Measures									
# systematic analyses & investigations delivered to customers	UNK	138	137	137	338	323	303	-20	276
Total Projected Cost ($000)	***UNK***	***23,460***	***23,460***	***23,290***	***33,800***	***32,300***	***30,300***	***-2,000***	**--**
Projected Cost per scientific report or other product (whole dollars)	***UNK***	***170,000***	***170,000***	***170,000***	***100,000***	***100,000***	***100,000***	***100,000***	**--**

End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
Comments	Decreases in 2008 and 2009 are due to a reduction in the number of interpretive cooperative studies resulting from decreases in funding. Actuals for 2007 are higher than the target due to transition from the old WRD Reports Tracking System to the new enterprise-wide IPDS, which tracks status of scientific products for the entire USGS. More authors are complying with requirements to enter all scientific publications and other products into the system. Since the transition to IPDS was made in the middle of the year, the increased compliance rate results in exceeding the target for the water programs. Targets for 2008 have been revised based on increased compliance in reporting completion of publications and other products, and unit projected costs have been adjusted accordingly. Cost per scientific product is an average that includes the cost of writing, editing, peer review, and publication of each product, as well as the cost of the studies from which the products are derived. Reimbursements from other Federal agencies are included in the calculation, and for the Cooperative Water Program non-Federal matching funds are included, but the portion of funding housed in the Enterprise Information Activity (associated with the Enterprise Publishing Network) is not included.								
# real-time streamgages reporting in NWISWeb **(PART)**	5,978	6,246	6,496	6,195	6,728	6,830	6,880	+50	6,125
Total Projected Cost ($000)	***80,703***	***84,321***	***83,227***	***83,633***	***90,828***	***88,158***	***99,760***	***+725***	***--***
Projected cost per streamgage (national average) (whole dollars)	***13,500***	***13,500***	***13,500***	***13,500***	***13,500***	***14,000***	***14,500***	***14,500***	***--***
Comments	2007 targets were set before 2006 year-end actuals were known and were based on a "likely enacted" funding level that never came to pass. In addition, the USGS exceeded the target for this measure because of increased interest by partner agencies, who contributed additional funding amounts that were not anticipated when targets were set. The change in 2008 is a result of the proposed increases for NSIP streamgage operations and Hazards Assessment and Mitigation. Most of the additional streamgages in 2008 will be reactivated, rather than completely new gages. A completely new gage incurs construction costs ranging from $25,000–$30,000, plus 6 months of operation (average of about $7,000); after the first year the new streamgages reverts to the national average cost of $14,000. Cost is a national average that includes operation and maintenance, salary and transportation for technicians who perform site visits, salary for records management and validation, and a small amount for replacement of equipment when a gage is disabled by lightning strike or other event. This replacement of equipment does not include replacement of gages that are lost in large numbers during floods or hurricanes. In practice, the cost of an individual streamgage varies depending on the size of the stream, type of terrain, need for cableways or other specialized equipment at the site, and distance of each site from the nearest USGS office.								

End Outcome Goal 1.4: Resource Protection: Improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
% of WRD streamflow stations with 30 or more years of record **(PART)** (denominator = number of streamgages reporting in NWISWeb)	60% (baseline)	58% (3,622 / 6,246)	62% (3,822 / 6,165)	63% (3,902 / 6,195)	59% (3,970 / 6,728)	58% (3,970 / 6,830)	62% (4,260 / 6,880)	+4%	65%
Total Projected Cost ($000)	***UNK***	***48,897***	***51,597***	***52,677***	***53,589***	***55,580***	***61,764***	***+6,184***	**--**
Projected cost per streamgage (national average) (whole dollars)	***UNK***	***13,500***	***13,500***	***13,500***	***13,500***	***14,000***	***14,500***	***14,500***	**--**
Comments	Decrease in 2007 and steady-state in 2008 are due to NSIP funding increases (reactivating or establishing new streamgages causes a drop in % of stations with 30 years of record because it increases the value of the denominator). Denominator changes every year because it reflects the number of streamgages reporting in real time in NWISWeb. For this measure, the denominator changes annually (or in some cases daily) because the measure represents the number of 30-year streamgages as a percentage of the total number of streamgages in operation. Since the total number of streamgages changes constantly throughout the year, the denominator must change if this measure is to reflect the state of the streamgaging network accurately.								

Activity: Water Resources Investigations

Subactivity: Water Resources Research Act Program

	2007 Actual	2008 Enacted	2009			Change From 2008 (+/-)
			Fixed Costs & Related Changes (+/-)	Program Changes (+/-)	Budget Request	
Water Resources Research Act Program Subactivity ($000)	5,404	6,304	0	-6,304	0	-6,304
Total FTE	*2*	*2*	*0*	*-2*	*0*	*-2*

Summary of 2009 Program Changes for the Water Resources Research Act Program

Request Component	($000)	FTE
• Grants to State Water Research Institutes and associated program administration activities	-6,304	-2
TOTAL Program Changes	**-6,304**	**-2**

Justification of 2009 Program Changes

The 2009 budget request for the Water Resources Research Act Program is $0 and 0 FTE, a program change of -$6,304,000 and -2 FTE from the 2008 Enacted level.

Grants to the State Water Resources Research Institutes (-$6,304,000 / -2 FTE)

The proposed reduction eliminates USGS funding, which was restored through 2008 congressional action, for each of the 54 State Water Resources Research Institutes. The reduction also eliminates USGS support for research projects under the national competitive grant program authorized by section 104(g) of the Water Resources Research Act. This USGS support amounts to less than 6 percent of their total funding. Most of the Institutes have been very successful in generating funding from non-USGS sources and no longer need USGS funding to continue operating.

Program Performance Change

Though the program contributes to the strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment, there are no performance measures specifically linked to this program change.

Program Overview

Section 104 of the Water Resources Research Act of 1984 (P.L. 98–242), as amended by P.L. 101–397, P.L. 104–147, P.L. 106–374, and P.L. 109-471 establishes a Federal-State partnership in water resources research, education, and information transfer through a matching grant program that authorizes State Water Resources Research Institutes at land grant universities across the Nation. There are currently 54 Institutes: one in each State, the District of Columbia, Puerto Rico, the Virgin Islands, and Guam, which also serves the Federated States of Micronesia and the Commonwealth of the Northern Mariana Islands.

This program addresses the Department's Serving Communities strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment. A key indication of USGS performance in administering this program is reflected in the end outcome measure for research: soundness of methodology, accuracy, and reliability of science (most of the research proposals are funded only after a competitive, peer review, selection process). Although the Water Resources Research Act does not give the USGS either the authority or the resources to peer review every project funded by this program at the participating universities, review of these projects is conducted as part of each Institute's own peer review process. The Water Resources Research Act requires each Institute to have a State advisory panel to recommend research priorities for the Institute, thus ensuring the relevance of its research. For the competitive grants, the USGS receives many more proposals each year than budget levels can support, so the proposals receive rigorous peer review before any funds are awarded. In addition, the Institutes have in the past been evaluated on a 5-year cycle and in the future are to be evaluated on a 3-year cycle, to determine their eligibility to continue receiving grants under the program. One such evaluation occurred during 2004.

The Water Resources Research Act Program provides an institutional mechanism for promoting State, regional, and national coordination of water resources research and training and a network of Institutes to facilitate research coordination and information and technology transfer. With its matching requirements, the program is also a key mechanism for promoting State investments in such research and training. In fact, the Institutes have developed a constituency and a program that far exceeds that supported by their direct Federal appropriation. According to the results of a 2007 survey conducted by the National Institutes for Water Resources, in 2007, the Institutes collectively generated an additional $17 in support for each dollar appropriated to them under the USGS program, with $8 coming from other Federal sources and $9 coming from non-Federal sources.

Each Institute operates a program of multi-year research, education, and information transfer projects focused on State and regional water resource priorities. In 2007, total Institute funding from all sources (USGS grant, plus 2:1 non-Federal matching funds, plus other sources of funding) supported more than 1,200 research projects involving researchers from over 200 universities and colleges nationwide. Though the emphasis varies across the Nation, depending upon State and regional priorities, the most common topics were concerned with control of non-point source pollutants, understanding the fate and transport of chemical, biological, and microbial contaminants, and the impact of land use changes and Best Management Practices on water quality. During 2007, the Institutes collaborated with more than 700 Federal, State, and local agency offices and private sector organizations.

The 5-Year Plan for this program is being updated and reviewed to align with the bureau science strategies that were developed in 2006. The goal is for completion of the revised plan by the end of the third quarter in 2008.

2009 Planned Program Performance

The reduction proposed in the budget eliminates all funding for this program. No further grants would be issued to the State Water Resources Research Institutes.

Program Performance Overview

Though the program contributes to the strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment, there are no performance measures specifically linked to this program change.

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Biological Research

Subactivity	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-)[a/]	2009 Program Changes (+/-)[b/]	2009 Budget Request	Change From 2008 (+/-)
Biological Research and Monitoring ($000)	143,342	141,275	-2,991	+7,056	145,340	+4,065
FTE	*1,025*	*1,029*	*-13*	*+35*	*1,051*	*+22*
Biological Information Management and Delivery ($000)	22,856	22,422	+174	-3,017	19,579	-2,843
FTE	*72*	*72*	*0*	*-18*	*54*	*-18*
Cooperative Research Units ($000)	14,764	16,174	+275	-1,039	15,410	-764
FTE	*133*	*141*	*0*	*-8*	*133*	*-8*
Total Requirements ($000)	**180,962**	**179,871**	**-2,542**	**+3,000**	**180,329**	**+458**
Total FTE [c/]	***1,230***	***1,242***	***-13***	***+9***	***1,238***	***-4***

[a/] Fixed cost increases for this activity total $3,119, of which $2,465 is budgeted and $654 is absorbed. A technical adjustment is proposed as part of a budget restructure that moves funding for global change activities into a new integrated budget activity titled Global Change.

[b/] Changes for this activity include a reduction of -$657 for travel. The impact of this change is described in the General Statement that begins on page A - 1.

[c/] FTE above for 2007 include 18 FTE associated with contributed funds.

Activity Summary

The 2009 budget request for the Biological Research Activity is $180,329,000 and 1,238 FTE, which is a net program change of +$3,000,000 and +9 FTE from the 2008 Enacted level. Additional information on program changes is provided in each subactivity section and in Science on the Landscape.

The U.S. Geological Survey (USGS) Biological Research Activity generates and distributes information needed in the conservation and management of the Nation's biological resources. This program serves as the Department of the Interior's biological research arm and continues the strong traditions for management-oriented research developed within the Department's land management bureaus. Core biological research capability at 17 research centers and associated field stations, one technology center, and 40 Cooperative Research Units supports research on fish, wildlife, and habitats that is used by Federal and State government and nongovernmental organizations.

The USGS works closely with its partners and customers in defining priorities, developing science plans, and carrying out its biological research to support the needs of research management organizations. This focus on knowing and meeting partners' needs, establishing a goal for partner satisfaction, and measuring performance toward reaching that goal has improved the quality of USGS products and services.

This program addresses the Department's Resource Protection strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment.

USGS biologists work toward program goals in collaboration with other scientists, customers, and partners. Biologists combine their expertise with that of the other USGS disciplines in interagency ecosystem initiatives across the United States, from South Florida to Alaska, where scientists are working together to understand, evaluate, and provide options for restoring fish and wildlife habitats and for better resource-management decisions.

Information generated by the Biological Research program also contributes to achieving improved management of the Nation's water resources, availability of maps and map data, and improved decisionmaking regarding land and water use. These goals are supported by the efforts conducted in three subactivities: Research and Monitoring, Information Management and Delivery, and Cooperative Research Units.

Use of Cost and Performance Information

Using customer input in planning at the Western Fisheries Research Center (WFRC):

The WFRC conducted a 5-year program review during FY 2007. In support of this, a partner satisfaction survey was conducted in January and February 2007. Results of the survey were presented to the Review Team, a large interagency team with members coming from the U.S Fish and Wildlife Service, Minerals Management Service, Bureau of Reclamation, National Oceanic Atmospheric Administration Fisheries, Forest Service, and the USGS. The results demonstrated high favorability with WFRC science products, and especially strong support for our technical support and assistance to Departmental partners. Although most science information users continue to seek out results in the published literature, web-based information is increasingly critical to information transfer. To this end, WFRC management has used the survey results to upgrade the WFRC website and to use this capability to increase their visibility within the resource management and science communities involved in aquatic research and monitoring.

Science Strategy

The Biological Research discipline began preparing a discipline specific Science Strategy that tiers from the Bureau's Science Strategy developed in 2007. Biology's Science Strategy will help to align and focus future activities with the broader priority Bureau goals. These activities include understanding ecosystems and predicting ecosystem change, forecasting climate change variability and change, the role of the environment in human health and in the health of other biological resources, understanding water availability for ecological needs, and enhancing information science and technology research needs. In addition, Biology will establish operational goals to: improve knowledge transfer, facilitate data integration and strengthening of the scientific process, strengthen partnerships and collaborative relationships, and manage Biology's programs more effectively.

The Biological Research discipline plans to fund work in certain focal areas that will support the alignment to the Bureau's Science Strategies. These focal areas include:

- Effects of climate change on wildlife and ecosystems
- Large river ecosystem processes and aquatic habitat
- Vertebrate diseases and impacts
- Gap Analysis Program (GAP) and Integrated Taxonomic Information System (ITIS) Development
- adaptive management partnerships

Workforce Planning

Continued success in providing the Nation with outstanding biological science depends on developing and maintaining a flexible, skilled workforce that can take advantage of science and business opportunities of the future. The Biological Resources discipline continues to review occupations, along with retirement projections, to identify workforce gaps and future skill needs. From these data, this activity assembles a comprehensive profile of its workforce and anticipate hiring needs as to meet future science needs of the USGS.

Combining existing vacancies with natural attrition and new vacancies created through previous management actions, the Cooperative Research Units (CRU) program expects to have about 24 or more research scientist vacancies which is about one-quarter of all Unit science positions as 2009 begins. To date, through targeted rehires, CRU has been able to maintain staffing levels at two or more scientists per Unit. University and State agency contributions to the program remain strong, as does Federal, State, and local government reimbursable funding for research and technical assistance activities. The program's available appropriated dollars continue to be matched by State, university, and Federal partners, and other entities' contributions at a ratio of approximately three matching dollars to each appropriated dollar.

Subactivity Overview

Biological Research comprises of three subactivities:

Research and Monitoring — The USGS serves the biological research needs of Interior bureaus and others by providing scientific information through research, inventory, and monitoring investigations. Biological studies develop new methods and techniques to identify, observe, and manage fish and wildlife, including invasive species, and their habitats; inventory populations of animals, plants, and their habitats; and monitor changes in abundance, distribution, and health of biological resources through time. Interior land and resource managers use USGS biological science to maintain the health, diversity, and ecological balances of biological resources while meeting public needs, such as game harvests and the use of public lands and waters, all of which enable the managers to address the Department's strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment.

USGS specialists also provide technical assistance to Interior bureaus and other customers in applying the information, methodologies, and tools developed by the USGS in addressing resource management problems. In a collaborative process, the USGS involves the users of scientific results by engaging them in the identification and prioritization of their information needs as research is planned. Interior bureaus and other customers and partners, where appropriate, are involved in an adaptive process to find solutions and develop new methods by testing research results in the field.

For 2009, the USGS is requesting an increase in this subactivity for the Birds Forever Initiative (+$1.0 million), Healthy Lands Initiative (+$3.5 million), and Priority Ecosystems (+$6.62 million). These proposed increases are described in detail in the Science on the Landscape section, which begins on page F - 1. A technical adjustment is proposed as part of a budget restructure that moves funding for global change activities into a new integrated budget activity titled Global Change. Funding from this subactivity is $5.0 million.

Information Management and Delivery — Science-based decisionmaking is a Department of the Interior priority, particularly as it pertains to the conservation, management, and use of the Nation's natural resources. To facilitate this, the USGS is committed to making available the data and information that are critical to scientific discovery and application. Data sets, maps, and other information on products are vital to achieve this goal. This subactivity supports the Department's Resource Protection strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment.

The USGS works in cooperation with many organizations across the country to provide critical information to partners, stakeholders, customers, and the general public. Through electronic infrastructures, the USGS delivers relevant data and information faster and in more usable formats than in the past, leading to better stewardship of our natural resources.

For 2009, the USGS is requesting a $2.9 million decrease for the National Biological Information Infrastructure.

Cooperative Research Units — This cooperative program allows government and nongovernmental entities with common interests and responsibilities for natural resource management to address biological resources issues collaboratively. Through this unique program, biologists from Federal and State governments and academia are able to work as a team and focus their expertise and creativity on the resolution of biological resources issues. This subactivity supports the Department's Resource Protection strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment.

Federal support of the Cooperative Research Units program is matched with State and university contributions of expertise, equipment, facilities, and project funding. Through university affiliations, Federal scientists train future natural resource professionals.

For 2009, the USGS is requesting a $1.0 million decrease for the Cooperative Research Units.

Activity: Biological Research

Subactivity: Biological Research and Monitoring

Subactivity	2007 Actual	2008 Enacted	2009			Change From 2008 (+/-)
			Fixed Costs & Related Changes (+/-)[a/]	Program Changes (+/-)[b/]	Budget Request	
Biological Research and Monitoring ($000)	143,342	141,275	-2,991	+7,056	145,340	+4,065
Total FTE [c/]	*1,025*	*1,029*	*-13*	*+35*	*1,051*	*+22*

[a/] Fixed cost increases for this subactivity total $2,551, of which $2,016 is budgeted and $535 is absorbed. A technical adjustment is proposed as part of a budget restructure that moves funding for global change activities into a new integrated budget activity titled Global Change.

[b/] Changes for this subactivity include a reduction of -$517 for travel. The impact of this change is described in the General Statement that begins on page A - 1.

[c/] FTE above for 2007 include 18 FTE associated with contributed funds.

Summary of 2009 Program Changes for Biological Research and Monitoring

Request Component	($000)	FTE
• Birds Forever	+1,000	+3
• Healthy Lands	+3,500	+7
• Priority Ecosystems	+6,620	+34
• Unrequested congressional actions	-3,847	-9
• Travel reduction	-517	0
• Biological studies related to the 2008 Enacted	+300	0
TOTAL Program Changes	**+7,056**	**+35**

Justification of 2009 Program Changes

The 2009 budget request for the Biological Research and Monitoring (BRM) subactivity is $145,340,000 and 1,051 FTE, a net program change of +$7,056,000 and +35 FTE from the 2008 Enacted level. This is a net program change that includes the following proposed increases and decreases:

Birds Forever **(+$1,000,000 / +3 FTE)**

Program Changes associated with the Birds Forever Initiative are described in the Science on the Landscape section that begins on page F - 1.

Healthy Lands **(+$3,500,000 / +7 FTE)**

Program Changes associated with the Healthy Lands Initiative are described in the Science on the Landscape section that begins on page F - 1.

Priority Ecosystems **(+6,620,000 / +34 FTE)**

Program Changes associated with the Priority Ecosystems are described in the Science on the Landscape section that begins on page F - 1.

Unrequested Congressional Actions **(-$3,847,000 / -9 FTE)**

The reduction will end eight unrequested congressional actions. These projects are not Administration or USGS priorities and do not address the highest priority science needs in biology research and monitoring. This will keep the core program intact while allowing the USGS to make the best use of resources. The specific projects are mammalian population ecology and habitat (-$295,000), Contaminant Biology research efforts (-$246,000), Pacific Northwest forest program (-$886,000), Wildlife: Terrestrial and Endangered Species studies (-$500,000), molecular biology at Leetown (-$788,000), equipment for the anadromous fish lab (-$148,000), San Francisco salt ponds studies (-$492,000), and Great Lakes research (-$492,000).

Biological Studies Related to the 2008 Enacted **(+$300,000 / 0 FTE)**

The USGS proposes an increase of $300,000 to restore scientific capabilities related to wildlife studies that were reduced in 2008.

Program Performance Change

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 President's Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments								
Increase long-term trend precision (decrease bias) for existing species monitored through the Breeding Bird Survey to enable a detection of 50% population decline of relevant species within 20 years **(PART) (BRM)**	UNK	0.0008	0.0008	0.0008	0.0008	0.0008	0	0
Comments	Major advances in knowledge through research support for major areas that include several species (Birds Forever Initiative).							
% of North American migratory birds for which scientific information on their status and trends are available **(SP) (PART) (BRM)**	26%	26%	26.6% (173/ 650)	26.6% (173/ 650)	26.6% (173/ 650)	27.13% (176/ 650)	+0.53%	+0.11%
Comments	Changes are due to major advances in knowledge through research support for major areas that include several species (Birds Forever Initiative).							
% of focal migratory bird populations for which scientific information is available to support resource management decisionmaking (USGS in coordination with FWS) **(PART) (BRM)**	UNK	56.88%	57.02%	57.16%	57.16%	57.22%	+0.06%	+0.04%
Comments	Changes are due to major advances in knowledge through research support for major areas that include several species (Birds Forever Initiative).							
Resource Protection: # of real-time ground-water sites reporting in NWIS-Web	0	0	0	0	0	4	+4	0
Total actual/ projected cost ($000)	$0	$0	$0	$0	$0	*	*	$0

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 President's Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
Actual/projected cost per ground water site (whole dollars)	--	--	--	--	--	*	*	--
Comments	Proposed increase for the Healthy Lands Initiative results in 4 new real-time ground-water sites reporting in NWIS-Web. * In the first year of operation, the cost of a single well ranges from $4,000–$10,000 and includes the cost of getting permission to use a landowner's existing well, characterization of the site (depth of well, type of pump, establishment of measurement benchmark), and installation of scientific instruments. Wherever possible, the USGS retrofits existing wells with the needed equipment, but if a well is required in a location where none are available, drilling costs can range from $5,000–$25,000, depending on terrain, rock type, and the depth and diameter of the well. After the first year, annual operating costs range from $1,000–$7,000, depending on frequency of sampling, presence or absence of a recorder, real-time capability, distance of the well from the office, and other factors.							
Resource Protection: Percent of targeted science products that are used by partners for land or resource management decision making	90%	93%	93%	≥90%	≥90%	≥90%	--	≥90%
Comments	Proposed increase for the Healthy Lands Initiative results in 11 new systematic analyses and investigations delivered in 2011.							
Resource Protection: Quality: % of studies validated through appropriate peer review or independent review	1,314/ 1,314 100%	1,093/ 1,093 100%	1,101/ 1,101 100%	869/869 100%	869/869 100%	833/833 100%	-36 --	8/8 --
Resource Protection: # of systematic analyses and investigations	1,314	1,093	1,101	869	869	833	-36	+8
Total Projected Cost ($000)	$262,800	$218,600	$220,200	$173,800	$173,800	$168,200	-$5,600	$0
Projected Cost per systematic analysis (whole dollars)	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	--	--
Comments	Proposed increases in 2009 including the Birds Forever and Healthy Lands Initiatives, and Priority Ecosystems result in 25 new systematic analyses and investigations delivered in 2011. Proposed reductions in 2009 result in -17 systematic analyses and investigations delivered in 2011. Change in 2009 is a net result due to decreases in the 2007 budget (-8) and a technical adjustment that reflects the proposed Global Change budget restructure (-28). The USGS used an annual snapshot of the Resource Protection ABC research work activity cost data averaged over time as a surrogate cost per unit. To this the USGS added a proportional share of the cost derived for the Resource Protection science management activity. The average unit cost for systematic analyses is approximately $200,000 for the Resource Protection mission area which correlates to the average cost that the program had historically used before implementation of ABC.							

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 President's Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
Resource Protection: # of formal workshops and training provided to customers	247	127	135	72	72	73	+1	0
Total Projected Cost ($000)	$19,760	$10,160	$10,800	$5,760	$5,760	$5,840	+$80	--
Projected Cost per workshop (whole dollars)	$80,000	$80,000	$80,000	$80,000	$80,000	$80,000	--	--
Comments	Change in 2009 is a net result due to a technical adjustment that reflects the proposed Global Change budget restructure (-3), and proposed funding for the Birds Forever and Healthy Lands Initiatives, and Priority Ecosystems resulting in an increase of 4 new workshops and training provided to customers in 2009. For workshops, which support land managers in applying the science, and are a shorter term product, the USGS used the average unit cost of $80,000 based on the technical assistance and proportional share of the science management work activity for the Resource Protection mission. Other Department goals will also accrue performance from workshops.							

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent out-year.

Program Overview

The Department manages vast Federal lands and the biological resources that inhabit them. The Department's land- and resource-management bureaus need the scientific understanding and the technical tools to wisely manage these lands and resources on a sustainable basis. The BRM subactivity conducts research and monitoring that focuses on understanding how ecosystems (diverse communities of living organisms interacting with one another and with the physical environment) are structured, function, and provide "ecosystem services." This research and monitoring generates specialized information needed to effectively manage and conserve biological resources. This program addresses the Department's Resource Protection strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment and by providing the science information that resource managers need.

The USGS tracks several performance measures. Some of these are included in the Department's Strategic Plan under the Resource Protection mission goal to protect the Nation's natural, cultural, and heritage resources. The end outcome goal is to improve the understanding of national ecosystems and resources through integrated interdisciplinary

assessment. The performance measure of this goal is to identify the percent of targeted science products that are used by partners for land or resource management decision-making.

The USGS tracks intermediate outcomes to: 1) ensure the availability of long-term environmental and natural resources information, data, and systematic analysis needed by land and resource managers for informed decisions; and 2) ensure the quality and relevance of science information and data to support decision making.

The USGS also tracks outputs including the number of systematic analyses and investigations delivered to customers and the number of workshops/training with USGS sponsorship or participation to transfer results to customers and partners.

In 2012, under the end outcome goal of understanding of national ecosystems and resources through integrated interdisciplinary assessment, the USGS BRM subactivity expects to deliver to its customers about 880 systematic analyses and investigations and 69 formal workshops and training.

There is a 2-year lag between initiating research and obtaining results (systematic analyses and investigations). For example, additional funds provided in 2007 will increase the number of systematic analyses or investigations delivered to customers in 2009.

Use of Cost and Performance Information

Enhancing partner satisfaction with the products and communication of the Science Support partnership (SSP) Program:

The results of this survey of U.S. Fish and Wildlife Service partners on completed SSP projects indicated a high level of overall satisfaction. Partner comments and suggestions enabled the SSP program to identify points for improvement and to develop plans to remedy them. Several steps have been taken to enhance communications and information flow. For example, lists of past activities have been added to the SSP Web page and new tools have been developed to aid partners in locating appropriate potential principle investigators.

Research is needed to reduce and avoid the costs of controlling and eradicating the rapidly growing number of invasive species being introduced into and spreading within the United States as a result of increasing global travel and commerce and increasing human impacts on lands and water. For example, the damage to wildlife, livestock, and public health from invasive fire ants, plus the cost of control, is estimated at $500 million annually in Texas alone. Diseases among wildlife can have profound impacts on both people and animals. They can devastate poultry and livestock operations, threaten the last remaining individuals of an endangered species, or spread from animals to humans, creating a public health hazard. Since 1999, outbreaks of West Nile Virus in the United States have infected more than 26,800 people, caused nearly 1,000 deaths, and resulted in billions of dollars of economic loss. Highly pathogenic avian influenza outbreaks have occurred in at least 65 countries, with a total of 335 confirmed human cases and 206 fatalities. The disease also has the potential to cause major economic impacts to the U.S. poultry industry. USGS biological research seeks to understand the underlying causes of wildlife disease and disease emergence and to provide resource managers and decision-makers with the tools needed to manage and prevent diseases that impact the Nation's natural resources.

USGS conducted research on the **polar bear to support the decision making process of the FWS** as it evaluates whether to list the bear under the Endangered Species Act as threatened or endangered. Researchers with the USGS's Alaska Science Center completed studies and delivered results to the FWS on the polar bear (Ursus maritimus) and its habitat. Supporting information developed by USGS included information on population, distribution and movement, food habits, and condition of a sample of polar bears. Models were developed and data provided regarding the flux of sea ice and trends in the decline of sea ice that can potentially contribute to the species' decline. This work was completed through the Wildlife: Terrestrial and Endangered Resources program.

Adaptive management, a system of sequential, objective-driven decisionmaking in which resource managers learn from and continually adapt their management strategies with new knowledge and findings, is a valuable tool in the biological resource community. USGS scientists were lead authors in producing the Technical Guide for Adaptive Management in the Department. The Guide presents an operational definition of adaptive management, identifies the conditions in which it should be considered, and describes the process of using adaptive management for managing natural resources. The adaptive approach to management is framed in terms of structured decision making, with an emphasis on uncertainty about resource responses to management actions and the value of reducing that uncertainty to improve management. The Guide provides a general framework for adaptive management for Department agencies that can be further tailored as needed to specific agency resource responsibilities and institutional arrangements.

One example of efforts in adaptive management is the Glen Canyon Dam Adaptive Management Program (GCDAMP). The GCDAMP was established in 1996 to provide a process for cooperative integration of Glen Canyon dam operations, downstream resource protection and management, monitoring and research information, and improving the values for which the Glen Canyon National Recreation Area and the Grand Canyon National Park were established. The USGS Grand Canyon Monitoring and Research Center is a key component of the GCDAMP.

USGS **research efforts on migratory birds** are international in scope and are coordinated with the FWS, State and tribal wildlife agencies, and the Canadian and Mexican Federal wildlife agencies. Migratory bird research includes projects on individual species, communities, habitat relationships, and applied work for effectively managing bird populations. For example, USGS scientists have developed population models that are crucial for establishing annual harvest limits of gamebirds, such as waterfowl. The USGS is proposing a $1.0 million increase in 2009 to expand monitoring, partnerships, and studies of bird populations Nationwide in cooperation with the U.S. Fish and Wildlife Service (FWS).

The USGS has established a **National Phenology Network (NPN)**. Phenology is the study of periodic plant and animal lifecycle events that are influenced by environmental changes such as seasonal temperature and precipitation variations. This information is very useful in the development of ecological forecast models for agricultural production, invasive species management, and drought monitoring. The NPN will allow for effective input, reporting, and use of phenological observations on plants and animals for management decisions across the United States.

The USGS is proposing an increase in 2009 under the **Water for America** Initiative. Currently, the Biology Research subactivity conducts research on aquatic and riparian ecosystems, streamflow conditions, identification and estimation of ecological flows for aquatic organisms, and biological productivity of critical river systems to meet the restoration and protection goals of Reclamation and other DOI bureaus. This work will support USGS efforts with regard to the Water for America Initiative in 2009.

In addition, the Biological Research subactivity conducts research to enhance the understanding, use, conservation, and management of **ocean, coastal and Great Lakes** resources. Specific studies include coral reef health, coastal wetland change, and Great Lakes fish stock assessments.

The USGS national-level approach to managing biological and natural resource data and scientific information ensures the application of standards that foster opportunities for collaboration and cooperation. The USGS places a premium on partnerships at all levels of government and with nongovernmental entities, including the private sector. These partners use USGS-generated scientific data and information that contribute to the knowledge base, which then become available to Department land and resource managers, and others.

The USGS works closely with its partners and customers in defining priorities, developing science plans, and carrying out its biological research to support the needs of research management organizations. Key partners in many of these endeavors include Department bureaus, other Federal agencies, States, Tribes, and private organizations with regional and ecosystem-specific interests. Biological science supports informed decision-making by land and resource managers at Federal, State, and local levels; government program managers; industrial and agricultural corporations; scientists and academia; and the public.

> " The (U.S. Fish and Wildlife) Service and its scientists have benefited significantly from the partnership that Dale Hall and Mark Myers have helped cultivate. Scientific information that BRD continues to generate and make available has helped us manage fish and wildlife more effectively and has helped inform difficult management decisions, including ones associated with climate change and resource sustainability…."
>
> Bill Knapp
> Deputy Science Advisor to the Director, USFWS

An example of such a partnership is the Science Support Partnership (SSP) program that addresses the priority science needs of the FWS. Since 2001, the USGS has undertaken approximately 385 projects in support of FWS local, regional, and national programs such as:

- National Wildlife Refuge System management,
- Migratory bird management,
- Freshwater fisheries restoration,
- Fish and wildlife law enforcement,
- Coastal habitat conservation,

- Ecosystem-based management,
- Endangered species recovery,
- Molecular and biotechnology tools for management, and
- Functional models for adaptive management,

The SSP program has provided tremendous benefits to FWS efforts in conserving the Nation's fish and wildlife resources.

The following table displays program-funding estimates for three fiscal years for the BRM subactivity.

Biological Research and Monitoring Program Areas (Dollars in Millions)			
Program	2007 Actual	2008 Estimate	2009 Estimate
Status and Trends	20.6	21.6	26.3
Contaminant Biology	9.0	8.6	8.5
Fisheries: Aquatic and Endangered Resources	23.8	24.0	22.8
Wildlife: Terrestrial and Endangered Resources	42.4	43.7	43.7
Terrestrial, Freshwater, & Marine Ecosystems	32.0	32.7	33.3
Invasive Species	10.3	10.7	10.7
Total Biological Research & Monitoring	**138.1**	**141.3**	**145.3**

The following sections describe the BRM subactivity by program area of which all support the Department's Resource Protection strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary science.

Status and Trends of Biological Resources

(Estimates for FY 2007, $20.6 million; FY 2008, $21.6 million; FY 2009, $26.3 million)

To protect and conserve the living resources entrusted to their care, Federal land and resource managers must first understand the condition, or status, of those resources: what they are (inventory), where they are located (distribution), how many there are (abundance), and how they change over time (trend)—information only long-term, scientifically sound monitoring can produce. Long-term monitoring of the environment is fundamental to:

- Detecting changes that may signal degradation of natural systems,
- Assessing the effectiveness of management actions,
- Identifying new or emerging problems,
- Validating research results and models, and
- Promoting increased public understanding and appreciation of our living resources.

The USGS Status and Trends of Biological Resources program (for more information visit: *http://biology.usgs.gov/status_trends/* measures, predicts, assesses, and reports the status and trends of the Nation's biological resources to advance research, facilitate resource management and stewardship, and promote public understanding and appreciation of the Nation's living resources, with emphasis on Federal lands.

The Department relies upon biological monitoring information to achieve its mission, measure its success in responding to trust resource and other legislative mandates, and determine its progress toward meeting the Department's Resource Protection strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary science.

Program goals, as outlined in the program's 5-year plan, are to:

- Facilitate integrated monitoring from a variety of sources at multiple spatial and temporal scales to describe and track the abundance, distribution, productivity, and health of the Nation's plants, animals, and landscapes,
- Develop and evaluate inventory and monitoring methods, protocols, experimental designs, analytic tools, models, and technologies to measure biological status and trends,
- Collect, archive, and share critical, high-quality monitoring data in cooperation with partners to determine the status and trends of biological resources, and
- Produce and provide analyses and reports that synthesize information on the status and trends of the Nation's flora, fauna, and ecosystems and be responsive to the needs of the scientific community, land and resource managers, policymakers, and the public.

Adaptive Management — By tracking useful measures of system response, well designed monitoring programs facilitate evaluation and learning through adaptive management. Monitoring provides data for four key purposes: 1) to evaluate progress toward achieving objectives; 2) to determine resource status in order to identify appropriate management actions: 3) to understand resource dynamics by comparing predictions against survey data; and 4) to enhance and develop models of resource dynamics as needed and appropriate.

National Park Monitoring — USGS scientists assist national parks with inventory and monitoring protocol development and other monitoring-related research needs such as assistance with monitoring planning and design, statistical data analysis, and review/revision of existing protocols. USGS scientists and technical specialists address priority issues identified by the National Park Service (NPS) that typically involve and benefit several parks and require multiyear efforts.

Park-Oriented Biological Support —The USGS and the NPS, through the Natural Resource Preservation Program, jointly support biological projects that provide exploratory research and technical assistance to national parks.

National Wildlife Refuge Monitoring — The Status and Trends of Biological Resources program is partnering with the National Wildlife Refuge System of the FWS with the goal of improving science-based management on refuges. Initially this project is focusing on developing monitoring programs, national protocols, databases and adaptive management studies that address system-wide refuge needs.

Bird Banding Laboratory — Bird banding is a universal technique for studying the movement, survival, and behavior of birds. The Bird Banding Laboratory (BBL) provides high-quality banding data in a timely manner for use in developing effective bird conservation and management strategies throughout North America. A Federal Advisory Committee delivered a report to the Department and USGS with 2 programmatic recommendations, 23 objectives, and 58 specific recommendations to help the BBL achieve maximum success and to its banders and data users in the 21st century. This report will be used to guide the future direction of the BBL.

Breeding Bird Survey — The North American Breeding Bird Survey (BBS) was launched in 1966, utilizing 600 roadside routes to obtain range-wide population data on breeding birds in the United States and Canada east of the Mississippi River. Today, the BBS provides the foundation for non-game, land bird conservation in North America with over 3,200 skilled volunteer participants sampling 3,000 routes annually across the continental United States and southern Canada. In cooperation with the FWS, USGS is proposing a $1.0 million increase in 2009 for new/increased research and monitoring capacity to better understand large scale drivers of migratory bird population and habitat change. This initiative supports monitoring efforts in such activities as the BBS, Strategic Habitat Conservation, and other migratory bird monitoring activities that are critical to the FWS and other partners.

Great Lakes — In coordination with the Fisheries: Aquatic and Endangered Resources program, USGS scientists conduct a regional deepwater science, large vessel program that complements other Department activities with large-scale multiyear strategic investigations. The program provides long-term, consistent, lake-wide assessment of forage fish stocks that support sport and commercial fish species, monitor invasive species for protection and restoration of the Great Lakes, and provide scientific and technological monitoring tools for aquatic species assessment and conservation in the Great Lakes.

Standards and Protocols — USGS scientists develop statistically valid, efficient, and feasible protocols that are relevant to the needs of resource managers for monitoring the abundance, distribution, productivity, and health of the Nation's plants, animals, and ecosystems. The USGS has been an active participant in the development of and support for the Natural Resource Monitoring Partnership (NRMP), a collaborative effort by the natural resource management community to improve monitoring efforts to support effective evaluation and decision-making. Current participants include State, Federal, and Canadian natural resource management agencies, nongovernmental organizations, and academic institutions. To foster coordination and collaboration of monitoring efforts, the NRMP provides two collaborative, internet-based tools (*http://nrmp.nbii.gov/*):

- **Monitoring Protocol Library —** An internet-accessible, searchable database that provides information on monitoring protocols and resource assessment methodologies organized to facilitate reference and use.
- **Monitoring "Locator" —** An internet-based, GIS application that allows users to identify what natural resource monitoring is being conducted within a particular area (e.g., State, province, county or other selected geographical area).

Taxonomy, Systematics, and Museum Studies —The National Museum of Natural History is a major repository of scientific information used by USGS scientists to study natural variation in many groups of animals. Curation of North American vertebrate collections at the Smithsonian Institution provides stewardship of an important scientific database available to scientists from around the world. The USGS also maintains a biological collection at the Museum of

Southwestern Biology at the University of New Mexico. Scientists provide long-term care and management of this collection of Southwest vertebrates and guidance to Department customers and museum colleagues.

Contaminant Biology
(Estimates for FY 2007, $9.0 million; FY 2008, $8.6 million;
FY 2009, $8.5 million)

The Contaminant Biology program provides toxicological information on environmental contaminants in the Nation's biotic resources and, in particular, the trust resources of the Department. Toxicology and chemistry expertise, research, information, scientific assessments, monitoring tools, and models are used by the Department and other agencies to determine exposure and effects of emerging and legacy contaminants on fish and wildlife. This information helps managers to prevent contamination; manage, protect, and restore contaminated lands and trust resources of the Department; and fulfill recreational, statutory, and regulatory responsibilities. The program supports the Department's Resource Protection strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary science.

Endocrine, Immune, and Reproductive Effects - Scientists examine the exposure and effects of contaminants that affect immune response, alter reproduction, and influence the endocrine system of fish and wildlife. Such information also helps to inform human health issues.

Nanoparticles and Other Emerging Contaminants - The program has begun research on the environmental effects of nanoparticles and is developing a strategic initiative for this work in consultation with the National Nanotechnology Initiative and its member agencies.

Contaminated Lands and Waters - Contaminant Biology research enables Federal land managers to restore and assess damages on contaminated lands, by determining safe levels and documenting injury to Federal Trust species and Federal lands. Sites are contaminated with mine waste, pesticides, industrial chemicals, mercury and other substances. Improving scientific understanding of safe levels of contamination in the environment enables agencies to make more efficient use of limited resources for protecting trust species while establishing reasonable, realistic, and cost effective cleanup levels.

Imperiled Species -To protect and restore imperiled species, Contaminant Biology develops test methods for groups of species, such as mollusks, to determine their sensitivity to contaminants and to improve reliability of criteria and standards for protecting aquatic species of concern. Research on species-specific sensitivity to contaminants improves targeting of safety factors required to assess risk, choose restoration options, and assess factors that contribute to population declines.

Program goals, as outlined in Contaminant Biology's 5-year plan, are:

- Toxicology and Chemistry — Determine the causes, fate, exposure and effects of environmental contaminants. Develop and standardize biomarkers, molecular biology methods and techniques and other analytical and toxicological methods,
- Contaminated Habitats — Develop the scientific basis for assessment, restoration, and monitoring of habitats that are contaminated by mining, agriculture, urban wastewater, industry, and chemical control agents. Develop the toxicological basis to remediate and

prevent contamination effects of chemical controls for invasive species, fire, and other hazards, and

- Integration of Ecological Stressors — Improve the scientific basis for evaluating the effect of multiple stressors, at all levels of biological organization and at multiple temporal or spatial scales.

Fisheries: Aquatic and Endangered Resources
(Estimates for FY 2007, $23.8 million; FY 2008, $24.0 million;
FY 2009, $22.8 million)

Research conducted in the Fisheries: Aquatic and Endangered Resources (FAER) program centers on the determination of factors affecting the growth, health, diversity, and survival of fish and other native aquatic fauna, and aquatic community structure and function. Based on the genetics, life history, behavior, and habitat requirements of aquatic organisms, USGS scientists provide the scientific information needed by aquatic resource managers to develop and evaluate methods for restoring and managing aquatic populations. High quality scientific information about the distribution of species of concern and their habitats, and the biological integrity of multi-jurisdictional aquatic systems are provided to resource managers to support adaptive management of the Nation's aquatic species and habitats. High priority is given to studies that directly assist other Department agencies and national, international, State, and tribal efforts to manage inter-jurisdictional fishery and aquatic resources. USGS supports the National Fish Habitat Initiative, a multi-agency partnership whose goal is to protect, restore, and enhance the Nation's fish and aquatic communities through partnerships that foster fish habitat conservation and improve the quality of life for the American people. USGS expertise in genetics, fish health and diseases, aquatic animal drug and chemical research, native and endangered fishes, other freshwater organisms, and aquatic habitats provides long-term research support, quick response, and technical assistance in support of the Department's Resource Protection strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary science.

The FAER 5-year strategic plan has been developed through an extensive collaborative effort to predict and identify the aquatic biological information needs of our partners and customers, and to posture USGS science to respond to ongoing and future challenges. The plan describes the current and future roles of the FAER program and projected coordinated research with USGS disciplines and programs, Department partners, and other natural resource managers.

Program goals, as outlined in the program's 5-year plan, are to:

- Provide scientific information about the diversity, life history and species interactions that affect the condition and dynamics of aquatic communities,
- Provide scientific information about factors and processes that affect aquatic organism health in support of survival, protection, conservation and recovery,
- Quantify and describe functional relationships among aquatic species and habitats to provide information to conserve or restore aquatic community structure and function,
- Provide science support for natural resource managers by investigating the factors that contribute to the conservation and recovery of aquatic species at risk,
- Develop research and technology tools to provide the scientific basis for developing adaptive management strategies and evaluating their effectiveness for restoration efforts to sustain aquatic resources, and

- Provide research support and technical assistance to Department bureaus, other Federal and State government agencies, Tribes, and non-governmental organizations to support natural resource management problem solving and decision-making.

Reasons for aquatic species decline include health effects such as disease, changes in the availability and quality of water, habitat loss, invasive species, and contaminants. Restoration of declining populations depends on critical science information provided by an integrated program of research to determine the biology of individual aquatic species and the ecological relationships between those species and their habitats. The USGS is providing resource managers with science-based tools for addressing these issues through improved systematic analyses, data collection, analysis and modeling focused on linking biological, physical, and chemical factors with others contributing to alterations in species composition and health. Most USGS endangered species research supports recovery of species already having legal status under the Endangered Species Act of 1973, as amended. To help managers achieve the goals of recovery plans, USGS scientists investigate the life history requirements of listed species and factors limiting their populations. Better knowledge of both critical requirements and limiting factors is needed for managers to act effectively to promote restoration of populations.

USGS scientists investigate fish species and aquatic organism diversity in large freshwater lakes, large rivers and major tributaries, estuaries and nearshore areas. Important sport and commercial species such as salmon, steelhead, and sturgeon, as well as forage and prey species are studied to provide fishery managers with information to help mitigate the impact of aquatic diseases, barriers, and habitat loss. USGS scientists operate a Bio-Level III aquatics laboratory to investigate the heritability and spread of aquatic pathogens and diseases, such as Viral Hemorrhagic Septicemia (VHS). This unique capability allows scientists to study, develop, and use advanced genetic and molecular tools to detect and identify introduced or invasive aquatic diseases, fishes, or other aquatic organisms that imperil the Nation's aquatic resources. USGS scientists develop and adapt advanced research tools such as remote sensing, hydroacoustics and geospatial technologies to characterize aquatic populations and the community dynamics of large lakes, reservoirs, impounded and free-flowing stretches of major rivers, estuaries, and coastal areas.

Klamath Basin — Interdisciplinary research of the USGS Biological Resources and Water Resources disciplines in the Klamath Basin focuses on determining the effects of changing water availability, water quality, climate, and management actions on population dynamics and required aquatic habitat of important endangered fishes, and on ecological responses of wetlands and the watershed.

High Priority Fisheries Research for the U.S Fish and Wildlife Service — The USGS continues to address critical research needs of the FWS in support of imperiled and at-risk species, inventory and monitoring programs, the National Fish Habitat Initiative, fish passage programs, and fisheries and aquatic resources management. High priority fisheries research for the FWS provided in part by the science support partnership is determined annually by FWS science needs.

Fish Habitat Restoration – The USGS develops techniques to identify and understand the components necessary for healthy fisheries habitat, tools and approaches for protection and restoration of fisheries habitat, and techniques to monitor recovery of fisheries habitat.

Endangered Fish and Aquatic Species — USGS endangered species research provides biological information needed to restore currently listed populations, support delisting wherever

possible, or preclude future listings by clarifying species' status or suggesting timely preventive actions.

Fish and Aquatic Species at Risk — Species-at-Risk activities lead to conservation options and actions that reduce the need for listing species as threatened or endangered.

Fish Passage — Fish passage projects focuses on the physiological, behavioral, and hydraulic phenomena that determine the successful navigation of barriers by fish and other at-risk aquatic species and the efficiency of artificial structures designed to allow passage through or around obstacles.

Great Lakes — In coordination with the Status and Trend program, USGS scientific research, in support of interjurisdictional management of the Great Lakes fish and aquatic resources, facilitates information transfer across jurisdictional boundaries to promote ecosystem level adaptive management, conservation, and restoration in the Great Lakes basin. Studies focus on genetics, life history, trophic interactions, health, habitat requirements, and ecology of deepwater and near shore fisheries and aquatic resources in the Great Lakes and its tributaries.

Chemical and Drug Approval and Registration — The USGS collaborates with the FWS, the USDA Agricultural Research Service, the States acting through the International Association of Fish and Wildlife Agencies and private drug sponsors to conduct research required by the Federal Food and Drug Administration, Center for Veterinary Medicine to gain approval for fishery management drugs and chemicals.

Coastal Fisheries — USGS scientists study how coastal and estuarine fish and other aquatic species are affected by changes in their habitat and interactions with other resident and migratory species to provide aquatic resource managers with information needed to conserve and restore important aquatic resources.

Fish Biology — The USGS fishery research program examines the biology, genetic diversity, and health, all phases of the life cycles of fish and other aquatic organisms, and their habitat requirements to develop research to answer the science information needs of fishery managers to aid the development of techniques to restore fish populations.

Fish Genetics — Research in fish and aquatic organism genetics characterizes the diversity, variability, and taxonomic status of individuals, stocks, strains, and populations to provide natural resource managers with the ability to identify native, cultured, introduced, and invasive fish and aquatic organisms to provide information for the development of science-based conservation and restoration strategies for aquatic resources.

Fish Disease — Fish disease research focuses on development of new techniques for the detection and identification of emerging pathogens and causative agents, disease resistance and immunology, and understanding the role of stress and environmental factors upon disease outbreaks, severity, and cycles.

Native Mussels — USGS native mussels research activities determine their life histories, hosts, distribution and abundance, and identify how invasive species and environmental degradation of streams, rivers, and lakes are affecting mussel populations.

Large Rivers — USGS research related to water availability and the unique aquatic resources and conditions found in America's large rivers, such as the Colorado, Missouri, Mississippi, and

Columbia, is providing vital information on fish community structure and function, aquatic community dynamics and function, critical habitat, hydrology and hydraulics of the rivers, sediments, and water quality.

Wildlife: Terrestrial and Endangered Resources
(Estimates for FY 2007, $42.4 million; FY 2008, $43.7 million;
FY 2008, $43.7 million)

Research conducted in the Wildlife: Terrestrial and Endangered Resources program focuses on meeting the wildlife-related information needs of the Department's natural resource management bureaus and other partners as authorized by law. This program supports investigations to determine factors influencing the distribution, abundance, and condition of wildlife populations and communities. Studies also focus on developing the tools and methods needed to prevent and manage disease in free-ranging wildlife and to evaluate the effects of disease on wildlife populations. This program supports the Department's Resource Protection strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary science.

Program goals, as outlined in the program's 5-year plan, are to:

- Provide the scientific foundation for the conservation of terrestrial plants, wildlife, and habitats by developing the basic biological information that partners need to formulate adaptive management strategies,
- Provide tools and techniques for effective science-based management, such as predictive models, decision support systems, and expert systems,
- Identify the factors that contribute to and (or) limit the conservation and recovery efforts for terrestrial plant and wildlife species-at-risk,
- Institute an adaptive science approach to support the adaptive management of terrestrial plants and wildlife and provide technical assistance to natural resource managers, and
- Continue to build additional research capabilities, expertise, and to meet the emerging needs of USGS partners as wildlife issues take on new importance in today's society.

Reversing the rapid loss of biological diversity remains one of the greatest challenges to natural resource managers. The reasons for species decline are numerous and include habitat loss, habitat degradation, and competition with invasive species, environmental contaminants, and disease, among others. Restoring declining wildlife populations thus depends on an integrated program of research to develop critical information on the biology of individual species and the ecological relationships among those species, their communities, and their habitats. Through investigations that link physical, chemical, and biological factors impacting species composition and health, the USGS provides land and resource managers with the tools needed to address these issues.

Imperiled species research focuses on identifying factors responsible for the decline of threatened and endangered species populations, and assisting in the development of management plans and methods to restore depleted populations and to prevent further declines. USGS imperiled species research supports recovery of species already having legal status under the Endangered Species Act of 1973, as amended, as well as those in long-term population decline but not yet listed. To help managers achieve the goals of recovery plans, USGS scientists investigate the life requirements of imperiled species and factors limiting their

populations. Better knowledge of both requirements and limitations is needed for managers to act effectively to promote restoration of populations.

Cooperative studies among the USGS National Wildlife Health Center, other USGS science centers, the Southeastern Cooperative Wildlife Disease Study, State natural resource agencies, and the International Association of Fish and Wildlife Agencies are now underway to determine causes and impacts of wildlife diseases such as avian influenza, West Nile Virus, and chronic wasting disease. In addition, efforts have begun to examine interactions between wildlife and human diseases. This work is being conducted in partnership with other Federal agencies, such as the Department of Health and Human Services and the U.S. Department of Agriculture.

High Priority Wildlife Research for the U.S. Fish and Wildlife Service — The USGS develops tools and technologies to assist wildlife refuges to measure the effects of land management practices on habitats of declining and at-risk species, and to determine the needs for habitat conservation planning. The USGS also conducts two complementary subprograms to provide research or technical assistance support to the FWS on priority emergent issues. Studies undertaken by these subprograms involve short-term, scientific research and provide critical information required for making credible and effective resource management decisions:

- **FWS Science Support Partnership —** USGS Science Centers and Cooperative Research Units work collaboratively with the FWS to address FWS mission-critical science needs.
- **Quick Response Program —** This activity addresses short-term research and technical assistance needs requested by the FWS.

Endangered Wildlife and Terrestrial Species — USGS endangered species research provides biological information needed to restore currently listed populations, support delisting wherever possible, or preclude future listings by clarifying species' status or suggesting timely preventive actions.

Wildlife and Terrestrial Species at Risk — Species-at-Risk activities lead to conservation options and actions that reduce the need for listing species as threatened or endangered.

Migratory Birds — USGS research efforts on migratory birds are international in scope and are coordinated with the FWS, State and tribal wildlife agencies, and the Canadian and Mexican Federal wildlife agencies. Migratory bird research includes projects on individual species, communities, habitat relationships, and applied work for increasing the number and diversity of birds.

Natural Resource Preservation Program (NRPP) — USGS biologists conduct short-term, tactical research to meet the natural resource management needs of the NPS. NRPP funds help fill gaps in applied biological research in the Nation's national parks and allow the USGS to address research needs significant to park resource managers.

Wildlife Disease — Managing wildlife losses and minimizing disease outbreaks depends on effective diagnostic and technical support, knowledgeable guidance, and timely intervention. The USGS has a unique mission to provide information, technical assistance, and research on State, national, and international wildlife health issues on such diseases as highly pathogenic avian influenza, West Nile Virus, and chronic wasting disease. The infrastructure and interagency partnerships being developed and maintained through current USGS activities serve as a critical foundation and a template for emergency disease response activities for

future emerging zoonotic diseases of wildlife. The USGS will continue to work with its partners to develop appropriate strategies for protecting human, wildlife and domestic animal health.

- **Highly Pathogenic Avian Influenza —** In response to the growing threat to human health and wildlife populations presented by the highly pathogenic form of the avian influenza virus, the USGS has initiated an early detection effort in partnership with the FWS, the NPS, USDA Animal and Plant Health Inspection Service, the Centers for Disease Control and Prevention, and State agencies. The USGS conducts sampling of live birds, hunter-taken birds, and environmental materials for the virus, as well as increasing its response and analytical capability associated with migratory bird mortality events. At the request of the White House Policy Coordinating Committee for Pandemic Influenza Preparedness USGS, along with its partners, established the Highly Pathogenic Avian Influenza Early Detection Data System (HEDDS), a national database for use by all agencies, organizations and policy makers. HEDDS is being maintained by the Wildlife Disease Information Node, housed at the USGS National Wildlife Health Center. All of these activities are being conducted as part of a coordinated, interagency program to provide agricultural, wildlife, and human health officials with advance warning to the presence of highly pathogenic avian influenza in North American wild bird populations

- **West Nile Virus —** The USGS assists the Centers for Disease Control and Prevention and State and Federal agencies in the national West Nile Virus Surveillance program through viral testing of wildlife specimens, primarily birds, at diagnostic laboratories such as the USGS National Wildlife Health Center. The USGS also collaborates with these agencies to document the geographic spread of the virus across the United States and to increase the understanding of the U.S. epidemic since it was first discovered in New York City in 1999. USGS produces semiweekly maps documenting the number of cases or infections in people, wild birds, mosquitoes and domestic animals. Federal agencies use these maps for predicting disease outbreaks and developing mitigation strategies. Concurrently, the USGS is working cooperatively with State and Federal natural resource and wildlife agencies to investigate regional wildlife mortality events (die-offs) potentially associated with West Nile Virus.

- **Chronic Wasting Disease —** The USGS, along with the U.S. Department of Agriculture and a number of State and Federal agencies, is involved in critical research and information sharing on chronic wasting disease (CWD). CWD is a fatal disease affecting elk and deer and belongs to the same family as mad cow disease in cattle and scrapie in sheep. Originally observed in only captive animals, it has recently been discovered in wild deer populations in ten States. States are looking to the USGS to provide research, technical assistance, and other forms of support to combat CWD. To help meet the need, USGS scientists are investigating how CWD is transmitted, what conditions lead to disease outbreaks, and how to manage outbreaks once they occur. In addition, the Disease Information Node of National Biological Information Infrastructure has developed a CWD Data Clearinghouse that provides a means for State and Federal agencies to share CWD-related data quickly and securely.

Amphibian Research and Monitoring — The USGS leads a coordinated effort extending beyond Department bureaus to include other Federal, State, and academic partners, to determine the status of amphibian populations nationwide and investigate potential causative factors for their decline. Amphibians are sensitive to environmental changes, so changes to their populations can serve as “canaries in the mine” about ecological stressors that could

ultimately impact people, wildlife, and ecosystems. Scientists are conducting research on the impacts of climate change, effects of agricultural practices, invasive species, drought, and the pathogenic fungus (*Batrachochytrium dendrobatidis)* on amphibian populations on public lands.

Terrestrial, Freshwater, and Marine Ecosystems
(Estimates for FY 2007, $32.0 million; FY 2008, $32.7 million;
FY 2009, $33.3 million)

The USGS ecosystems research program is focused on understanding factors controlling the structure, function, composition, and condition of terrestrial, freshwater, and marine ecosystems; their variability in space and time; and the "ecosystem services" they provide to benefit human communities and economies. Scientists seek to understand and develop management alternatives for the ecological impacts of human and natural disturbances on ecosystems and their component biological species and processes. The most important of these disturbances are climate variability and change, natural hazards such as hurricanes and wildfire, and human management and land use practices. Research results provide the basis for the adaptive management of ecosystems and natural resources, development of forecasting models and decision support tools that integrate ecological knowledge with management options, and development of frameworks and approaches for restoring ecosystems impaired by natural hazards and human actions to sustainable levels. Research activities also focus on understanding ecosystem sensitivity to change and vulnerability to specific stressors, and providing information to mitigate adverse effects on ecosystems and biological communities.

Scientific approaches include studies of ecosystem productivity, food-web relationships and energy flow, cycling of nutrients and other biogeochemical processes, and the diversity of biological communities. Topical areas include the ecology of wetland, lake and river, forest, arid land, arctic, grassland, coral reef, and outer continental shelf ecosystems; disturbances and landscape ecology; modeling ecological systems and quantifying ecosystem services; restoration ecology; fire ecology; and global change. In addition to the scientific community, customers of USGS ecosystem science include land and resource managers and decision and policymakers within the Department and other Federal, State, and tribal land management and regulatory agencies, as well as NGOs and the public. This program supports the Department's Resource Protection strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary science.

The goals of the Ecosystems program are taken from the bureau-wide Ecosystems Team Report and based on the Bureau's Science Strategy. These will form the basis of the BRD ecosystems Strategy that will be completed in 2008. Goals encompass five areas of scientific activity:

- **Provide science to sustain and restore ecosystems.** In collaboration with others, USGS will quantify, map, and understand ecosystem components and processes, and functions that sustain and restore them across broad spatial and temporal scales.
- **Synthesize ecosystem information.** USGS will lead a National Ecosystems Information Advisory Group that will make existing data immediately accessible for adaptive management and forecasting.
- **Evaluate ecosystem status and trends.** Local and regional monitoring is essential for successful implementation of adaptive management. USGS scientists will strengthen that linkage by tying monitoring tools and efforts to management options and design.
- **Forecasting ecosystem change and its consequences.** Forecast ecosystem consequences of climate change, land-use change, chemical contamination, invasive

species, fire, altered disturbance regimes, hydrologic alteration, resource extraction, energy development, biodiversity change, and water availability and use.

- **Science support to resource management and planning.** USGS will develop tools, techniques and interpretive products for managers to protect, restore, evaluate and manage habitats and species using an adaptive approach.

The Ecosystems research program includes the following collaborative areas:

Science on the Landscape — The Science on the Landscape initiative continues to be a successful collaboration between each USGS region and regional Departmental offices. The Department's bureaus have collaborated with USGS in project planning and implementation by leveraging funds or in-kind services to make this venture a true partnership. Although issues vary among regions and Department bureaus, the common theme among all projects is recognition of the Department's priority needs and quick response in providing information to answer questions and issues posed by Departmental bureaus.

Priority Ecosystems — The overall goal of the Priority Ecosystem Science (PES) program is to provide integrated science support for adaptive management of priority ecosystems. This goal is accomplished through the application of an integrated science approach to provide stakeholders with science-based information for policy and management decision-making. In developing funding strategies and determining the level of science support within the PES program a balance is required among three strategic goals: 1) be responsive to stakeholders and resource management needs; 2) advance the scientific goals of the programs that contribute funds to PES; and 3) exercise USGS science leadership in the long-term resolution of the major restoration issues in each of the ecosystems being studied.

Climate Change — The USGS climate change program is an interdisciplinary research program that seeks to develop understanding of the consequences of global change, including climate change and variability, on ecosystems and their component biota and processes. Studies, funded for 3-5 years based on a competitive review process, seek to determine the response of ecosystems and their biological communities to climate change and to assess future global climate and the effects of climate change on ecosystem services.

Coastal Habitats, Wetlands, and Adjacent Uplands — USGS scientists conduct research to investigate coastal (including the Great Lakes) wetland structure and function to assess the resilience of wetland functions and the ecosystem services they provide to natural hazards and human activities, to predict changes in functions and ecosystem services in response to future environmental changes, to determine restoration and sustainable management practices for these systems, and to evaluate the effectiveness of current management actions.

Fire Ecology — The USGS conducts fire ecology research to understand the effects of wildland fire on ecosystem structure and function, and on other ecological attributes such as wildlife habitat. Research is also directed at understanding fire history and fire regimes; interactions of fire with invasive species (e.g., cheatgrass) and climate variability; fire relations with vegetation structure and effectiveness of fuels treatments; and development of guidelines for restoring and rehabilitating fire-impacted ecosystems and watersheds.

Outer Continental Shelf Marine Environmental Studies — USGS research supports the needs of the Minerals Management Service for information on long-term ecological effects of offshore oil and gas exploration and production, including effects of active and decommissioned production platforms, and of sand and gravel dredging activities for beach nourishment, on fish

and deep sea corals, and on the condition, composition, and vulnerability of biological communities in areas of potential or new production or dredging.

Coral Reefs — The USGS conducts research on issues facing resource managers, including understanding conditions needed for productive and healthy reef communities, effects of land use on reef health and disease in support of the Coral Reef Task Force, and evaluating management options for human activities and how they influence reef integrity and biodiversity.

Rangelands and Grasslands — The USGS conducts studies on native grasslands and managed rangelands to assess ecosystem condition, determine spatial patterns of rare plants, and evaluate native plant diversity and species richness as impacted by past management, invasive species, and climate change.

Deserts and Arid Lands — In the Southwest, USGS scientists are investigating the history and effects of changes in patterns of temperature and precipitation on desert grasslands and shrublands, and mountainous ecosystems. Investigations of the effects of natural and human disturbances on discrete soil units and the biota they support are studied in the context of current and predicted large-scale changes.

Prairie Wetlands — USGS researchers are investigating factors influencing the use of restored wetlands by birds, amphibians, and macroinvertebrates, and quantifying recovery of non-wildlife functions such as sedimentation, greenhouse gas emissions, and the role of prairie pothole wetlands in sequestering carbon. Research is also conducted at a landscape scale on wetland processes, including the interactions of wetland biota with hydrology, geochemistry, and sedimentation in fragmented grassland landscapes.

Forested Wetlands — USGS research focuses on wetland regeneration and restoration in the southeastern United States, including site selection and preparation; forest mix and biodiversity enhancements; planting and community structure; management procedures and monitoring providing information for managing forested wetland flora and fauna and to quantify the role forested wetlands play in nutrient cycling and retention and in carbon sequestration.

Forest Ecosystems in the Pacific Northwest — USGS research focuses on healthy forest management in the Pacific Northwest, including understanding forest systems, sustaining biodiversity and ecosystem function, developing resource management options, recovery of sensitive and status species, supporting management of aquatic forest habitats, conducting landscape scale assessments, and addressing forest stressors such as climate change, fire, and pathogens.

Invasive Species

(Estimates for FY 2007, $10.3 million; FY 2008, $10.7 million;
FY 2008, $10.7 million)

Non-indigenous invasive plants and animals cause increasing harm to native species and significant economic losses by reducing productivity and diminishing opportunities for beneficial uses of forests, croplands, rangelands, and aquatic resources. Many species introduced decades ago have begun to spread rapidly in U.S. ecosystems and pose increasing threats to lands and waters managed by the Department. They harm native ecosystems and are contributing factors in the listing of 40 percent of threatened and endangered species. The economic costs associated with invasive species exceed $100 billion per year. This program

supports the Department's Resource Protection strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary science.

The goals of the Invasive Species Program address:

- Prevention,
- Early detection and rapid assessment of new invaders,
- Monitoring and forecasting of established invaders,
- Effects of invasive species,
- Control and management, and
- Information systems (in cooperation with Biological Information Management and Delivery subactivity).

Program goals, as outlined in the program's 5-year plan, are to:

- Conduct research on priority pathways,
- Develop innovative control methods,
- Develop a national forecasting system for invasive species, and
- Maintain a National Invasive Species Information Network.

The Department is also continuing its participation in an interagency performance budget on invasive species that is coordinated through the National Invasive Species Council (NISC). The Department's bureaus work in partnership with other Federal agencies, State, local, and tribal governments, and private sources to perform the seven functions of invasive species management: prevention, early detection and rapid response, control and management, restoration, research, education and public awareness, and leadership and international cooperation.

The USGS plays an important role in Federal efforts to combat invasive species in natural and semi-natural areas through early detection and assessment of newly established invaders, monitoring of invading populations, improving understanding of the ecology of invaders and factors in the resistance of habitats to invasion, and development and testing of prevention and alternative management and control approaches. USGS research on invasive species includes all significant groups of invasive organisms in terrestrial and aquatic ecosystems.

The USGS plays a significant role in implementing the National Invasive Species Management Plan (Plan), developed by the NISC, as called for in the Presidential Executive Order on invasive species. To meet the goals of the Plan, the USGS Invasive Species program provides management-oriented research and delivers information needed to prevent, detect, control, and eradicate invasive species and to restore impaired ecosystems. Facilitating these efforts is the National Institute for Invasive Species Science, a growing consortium of partnerships between government and non-governmental organizations that is administratively housed in the USGS Fort Collins Science Center in Colorado. USGS researchers are leading or cooperating in efforts to integrate the capabilities of the USGS and partners, including Federal and State resource agencies, to help provide the information, methods, technologies, and technical assistance needed for effective responses to terrestrial and aquatic invaders threatening U.S. ecosystems and native species. An important focus is on developing models for predicting

the probable spread and impacts of invaders, in cooperation with NASA Goddard Space Flight Center, the USGS EROS, and others.

To ensure the strategic allocation of resources to combat invasive species, the NISC, co-chaired by the Secretary of the Interior, the Department of Agriculture, and the Department of Commerce, developed the first interagency example of a performance-based budget. Based on common goal statements, strategies, actions, and performance measures, the NISC selected priority topical and geographical areas of focus, and member agencies developed coordinated budget requests to address these. The Department participates in the development of this interagency performance budget on invasive species which links spending levels with levels of performance.

Hawaiian Invaders — USGS research focuses on the ecology and control of highly invasive plants (e.g., miconia, faya tree, strawberry guava, Kahili ginger), including exploration and testing for biological control agents; animals (e.g., Argentine ant, yellow jackets, brown tree snake on Guam); wildlife disease organisms; and methods for reducing the impacts of invasive species on the region's unique native flora and fauna.

Weeds in the West — The USGS is conducting a multiscale, integrative program for mapping infestations and accurately monitoring the spread of invasive plants (i.e., weeds) in western forests and rangelands, improving methods for predicting areas most vulnerable to invasions, and assessing the effects of management practices and natural disturbances on invasions. The USGS is assessing the effects of invasions on ecosystems and native species (e.g., fire ecologists are determining how invasive species alter the frequency and intensity of wild fires) and providing improved methods for reducing the adverse impacts of invasive weeds and for restoring public range lands affected by weed invasions.

Invasives in the East — The USGS conducts research on invasive species that threaten ecosystems and native species in the eastern United States including terrestrial and aquatic surveys of non-indigenous species in eastern parks and wildlife refuges, studies of pathways for establishment and spread of invasive species, research on the impacts of invasive species and factors in invasions, and development of methods to control or eliminate invasive species to promote healthy native communities that are resistant to invasion.

Great Lakes Invaders — USGS research supports cooperative efforts in the Great Lakes region to prevent and control the spread of invasive fish, such as the round goby and sea lamprey, reduce the pervasive impacts of zebra mussels on U.S. waterways, and manage or mitigate the adverse ecological and economic impacts of the invaders.

2009 Program Performance

The 2009 budget request for the BRM subactivity is $145,340,000 and 1,051 FTE, a net program change of +$7,056,000 and +35 FTE from the 2008 Enacted level.

The USGS serves the biological research needs of Department bureaus and others by providing scientific information through research, inventory, and monitoring investigations. Biological studies develop new methods and techniques to identify, observe, and manage fish and wildlife, including invasive species, and their habitats; inventory populations of animals, plants, and their habitats; and monitor changes in abundance, distribution, and health of biological resources through time.

The following 2008 and 2009 planned program activities listed below demonstrate the utility of systematic analyses and investigations delivered to customers, number of formal workshops or training provided to customers, and BRM PART measures:

The Breeding Bird Survey (BBS) — The BBS is a long-term, large-scale, international avian monitoring program initiated in 1966 to track the status and trends of North American bird populations. Both the USGS Patuxent Wildlife Research Center and the Canadian Wildlife Service, National Wildlife Research Center coordinate the BBS program. Each year during the height of the avian breeding season, June for most of the U.S. and Canada, participants skilled in avian identification collect bird population data along roadside survey routes. Each survey route is 24.5 miles long with stops at 0.5-mile intervals. At each stop, a 3-minute point count is conducted. During the count, every bird seen within a 0.25-mile radius or heard is recorded. Surveys start one-half hour before local sunrise and take about 5 hours to complete. Over 4100 survey routes are located across the continental U.S. and Canada.

Once analyzed, BBS data provide an index of population abundance that can be used to estimate population trends and relative abundances at various geographic scales. Trend estimates for more than 420 bird species and all *raw data* are currently available via the BBS web site www.pwrc.usgs.gov/BBS/.

The USGS proposes an increase of $1.0 million and 3 FTE in 2009 to support bird monitoring through the BBS. The FWS is also requesting new funds ($8.1 million) through the Birds Forever Initiative to address threats that have lead to rapid decline in the populations of many migratory bird species. The USGS request complements the FWS request by providing new/increased research and monitoring capacity to better understand large scale drivers of migratory bird population and habitat change such as global warming, deforestation, and urban development. The USGS initiative supports activities that are critical to the FWS' (and other partners) achievement of its migratory bird trust resource goals and objectives. This work will be completed through Status and Trends program.

Healthy Lands Initiative — The Healthy Lands Initiative promotes the concept of cooperative conservation; supports the Department's Resource Protection strategic goal of improving the health of watersheds, landscapes, and marine resources; and improves our understanding of national ecosystems and resources through integrated interdisciplinary science. The landscape and habitats of Wyoming's Green River Basin are undergoing rapid change in response to energy resource development. In 2008, the USGS will collaborate with the Bureau of Land Management, FWS, U.S. Forest Service, Wyoming State agencies, industry, and non-governmental organizations to build the geospatial framework for sharing information, assess the health of habitats and their resources, and monitor changes in landscape and habitats as energy development proceeds. In 2009, the USGS hopes to build upon the Wyoming studies on energy assessment, land use, vegetative mapping, and baseline monitoring in order to move this expertise to new priority areas, all to ensure the long-term viability and sustainability of wildlife and terrestrial and aquatic habitat in energy development areas. This work will be completed through the Terrestrial, Freshwater, and Marine Ecosystems program.

Contaminants — In FY 2008 and 2009, the Contaminant Biology program will continue research on the exposure and effects of contaminants on the nation's fish and wildlife. The Program will increase development of molecular biology techniques to understand how chemicals influence physiological processes in different species and for various chemical contaminant mixtures; research to support restoration of contaminated habitat; development of

predictive understanding and models of comparative toxicity among species of concern; understanding of the influence of contaminants amongst other stressors at multiple ecological levels; and toxicological and chemical data and methods for physiological effects and emerging contaminants.

National Fish Habitat Partnerships in Alaska — The USGS Alaska Science Center, through the Fisheries: Aquatic and Endangered Resources program, is providing multidisciplinary scientific expertise for conservation planning for National Fish Habitat Partnerships in Alaska. A focus on watershed and landscape descriptors of fish habitat such as rearing and spawning habitat will include stream reach and microhabitat scales. This approach will integrate various fisheries, geography and hydrology capacities of the Alaska Science Center informed by the basic geologic understanding of the region. The scientific information provided will support future Science and Data Strategies of the National Fish Habitat Action Plan by characterizing landscape-scaled processes that lead to habitat degradation and ultimate declines in important fish and other aquatic species. These efforts will be coordinated with State, Federal, and local agencies, as well as Native and non-governmental organizations.

Highly Pathogenic Avian Influenza — In 2008 and 2009, the USGS, through the Wildlife: Terrestrial and Endangered Resources program, will continue research on highly pathogenic avian influenza (HPAI) in wild birds in response to the growing threat to human health and wildlife populations. In 2006, at the urging of the Homeland Security Council, the USGS developed a partnership with the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS), FWS, NPS, and the States to create an "early warning system" for HPAI in wild birds. A deadly form of avian influenza swept across Asia and Europe in 2005, infecting nearly 100 people and causing millions of dollars in economic loss to those raising domestic chickens, ducks, and geese. The timing and direction of its movement led many in the scientific community to believe that migratory birds may have played a role in its spread. With 26 species of migratory birds moving regularly between Asia and North America, the possibility of wild birds introducing the virus to North America is very real. USGS and its partners quickly designed and implemented an HPAI early detection system to collect and analyze samples taken from live birds, hunter-killed birds, birds involved in natural mortality events, captive "sentinel" birds, and the environments in which these birds live. Within the first eight months of this effort, USGS and FWS biologists collected over 20,000 samples from live and hunted birds on lands managed by the Department in Alaska and the Pacific region. Specialists with the USGS National Wildlife Health Center have successfully analyzed each of these samples plus another 800 from wild bird mortality events for the presence of HPAI. In addition, USGS has developed a web-based avian information data system to manage the large volume of information pouring in from APHIS, USGS, and the States. This unified, interagency database will facilitate the analysis of sampling and laboratory results from across the country. As of this writing, approximately 45,000 detailed scientific records are now included in the database.

Refuge Cooperative Project — The USGS Wildlife: Terrestrial and Endangered Resources program and the FWS have entered into a partnership, the Refuge Cooperative Research Project, with the goal of improving science-based management on refuges. The initial project focus is on developing monitoring programs, national protocols, databases and adaptive management studies addressing System-wide refuge needs. A study initiated in 2007, *Directing Succession through Adaptive Management in National Wildlife Refuges: Reed Canary Grass (RCG) Control & Transition to Wetland Forests & Meadows,* will be completed in 2009, and will yield numerous valuable products including —

- A model that can be used by refuges to guide long-term RCG control,

- A final including long-term RCG management recommendations for each refuge,
- Protocols for data collection suitable as long-term monitoring protocols, and
- At least two publications in a peer-reviewed journal.

Integrated Landscape Monitoring — Through the Integrated Landscape Monitoring thrust (ILM), the USGS will be completing a series of pilot projects conducted with partner agencies in the Great Basin, Lower Mississippi Valley, Puget Sound, and Prairie Pothole region. Each ILM pilot will be completing a hypothesis-driven, interdisciplinary, qualitative and quantitative study to predict ecosystem responses to drivers of landscape change (natural e.g., flood, drought, etc., and human induced e.g., population growth, key management actions and policies). Key indicators, when monitored, will allow for the evaluation of management actions on ecological processes and functions at a landscape level in the face of natural variability and change. This work will be completed through the Terrestrial, Freshwater, and Marine Ecosystems program.

Invasive Species — In 2008 and 2009, the Invasive Species program will continue its efforts to address invasive species issues by conducting research to document and monitor the introduction and spread of invasive species, study the ecology of invaders and factors in the resistance of habitats to invasion, forecast probabilities and locations of future invasions, provide methods and information to assess and manage risks, and develop methods to prevent and control invasive species and minimize their environmental impacts. USGS researchers will also continue their efforts to develop an early detection/rapid assessment framework and incorporate pilot studies into a coordinated national early detection system.

Under the Resource Protection strategic goal, changes result from —

- Reduced funding in 2007 decreasing the number of systematic analyses or investigations delivered to customers in 2009 by 8.
- Proposed increases in 2009 for the Birds Forever and Healthy Lands Initiatives, and Priority Ecosystems increasing the number of systematic analyses and investigations by 25 in 2011 and the number of workshops and training provided to customers by 4 in 2009.
- Proposed increases in 2009 for the Birds Forever Initiative provide major advances in knowledge through research support for: (1) *the percent of North American migratory birds for which scientific information on their status (species distribution and number) and trend are available to inform and improve conservation,* (2) *increase long-term precision (decrease bias) for existing species monitored through the Breeding Bird Survey to enable a detection of 50% population decline of relevant species within 20 years by expanding the number of BBS routes surveyed annually and by evaluating and refining methodologies to decrease survey bias, and* (3) *the percent of focal migratory*

Workforce on the Landscape

The Western Fisheries Research Center (WFRC), Seattle, WA, is one of the USGS science centers that conduct fisheries research. The WFRC works from six laboratory locations in four western States. Activities include work in rivers, streams, lakes and estuaries. The WFRC helps in recovery of threatened and endangered species ranging from salmon to tiny fish living in desert springs. The WFRC scientists are concerned with fish diseases, and with the stresses imposed by human activities such as water and land development, grazing, mining, and harvest. The WFRC conducts aquatic invasive species research—that can take over habitats and harm native species populations. The WFRC invents better ways to manage hatcheries and care for wild fish populations, using state of the art approaches ranging from molecular genetics to decision support computer models. Their work involves many international collaborations, and our scientists are well known in the professional community.

bird populations for which scientific information is available to support resource management decisionmaking (USGS in coordination with FWS).

- A proposed Global Change budget restructure that adjusts the number of systematic analyses and investigations delivered by 28 and the number of workshops and training provided to customers by 3 in 2009.
- Proposed decreases in 2009 decreasing the number of systematic analyses and investigations provided to customers by 17 in 2009.

PART

In 2005, for the 2007 budget, the Administration reviewed the BRM program using the PART process. The program was found to be working effectively with partners and fulfilling its mission and rated the program moderately effective.

The PART also found:

- BRM has met program goals. For example, 96 percent of customers are satisfied with usefulness of scientific and technical products.
- BRM has made progress coordinating research, but could take steps to improve accessibility of research and monitoring products. While BRM works collaboratively with other organizations, more formal coordination is lacking with the Biological Information Management and Delivery program and other Department bureaus.
- BRM program reviews have not been adequate. While the program uses various methods for reviews, they have been by research area rather than biology-wide, and were not regularly implemented, or sufficiently independent.

The following recommendations were identified to improve the performance of BRM:

- Develop a plan with the Biological Informatics program to maximize access to research and data and provide timely reports on the status and trends of the Nation's biological resources.
- Implement regular, comprehensive, and independent reviews for all biological research, monitoring and information management activities.
- Develop performance measures with the FWS to improve coordination for conservation of fish and wildlife populations of management concern.

Each year, milestones and target dates are assigned to each of these three recommendations, also known as Improvement Plans. The milestones and target dates for each of the three Improvement Plans are approved by the Department and OMB and tracked in the Department's Management Initiatives Tracking System (MITS). All BRM milestones are on schedule. If milestones appear to be delayed for cause, these can be renegotiated with OMB and the Department and amended in MITS. The Department's quarterly reviews ensure accountability of PART programs, milestone progress explanation, and target delay explanations.

Activities resulting from the 2007 PART Improvement Plans included the following items:

- ***Action:*** *Identify barriers and pilot potential solutions as part of the plan to maximize access to research and data and provide timely reports on the status and trends of the nation's biological resources.*
  Status: BRD has identified important barriers to making data and information accessible in a timely manner, and has started to undertake potential solutions to these barriers. Activities included formal discussions to pinpoint existing obstacles and explore

strategies for overcoming them. A draft report integrating input from USGS Science Center directors and principal investigators on existing barriers to data management was developed and underwent review.

- ***Action:*** *Develop and provide access to a suite of data and information, including baseline state of knowledge indices, for FWS-designated focal species of management concern to improve coordination for conservation.*
  Status: BRD began to improve coordination for conservation by establishing baseline state of knowledge indices and outyear targets for the FWS-designated focal avian species of management concern based on action plans completed to date. The species include: American Oystercatcher, Marbled Godwit, American Woodcock, Common Eider (Pacific Population), and the Laysan Albatross/Blackfooted Albatross species. BRD also provided web-based access via the USGS NBII Network to existing data and information of interest on the original nine focal species selected by FWS. Users may now browse a range of information resources (websites, databases, publications, maps) on Distribution & Abundance, Natural History, Status & Trends, and Conservation (Inventory & Monitoring, Planning, Management & Protection, Law & Policy) for each of the original nine FWS-identified focal species, on the focal species website at http://focalbirds.nbii.gov.
- ***Action:*** *Conduct an alternatives analysis and establish approach for conducting comprehensive and independent reviews for all of the Biological research, monitoring, and information management activities.*
  Status: USGS BRD Executive members developed a conceptual plan to address OMB's PART recommendation to "implement regular, comprehensive, and independent reviews for all the Biological research, monitoring, and information management activities". Comments from both BRD headquarters and regional program staff were solicited and used in the development of the conceptual plan. The components of the Plan included: a vendor alternatives analysis, a plan of action, and a summary of five major programmatic cross-cutting themes to be considered in the independent and enterprise-level review of BRD. After OMB approved this plan in June 2007, BRD prepared and submitted a Request for Proposal (RFP) to the USGS contracting office to begin the formal solicitation process to solicit bids from independent, unbiased third parties. The RFP included a Statement of Work (SOW) and evaluation criteria for selecting the vendor to conduct the BRD programmatic evaluation.

The USGS has submitted a new PART Improvement Plan for 2008. As a result of PART recommendations and associated performance measures, the USGS is implementing actions in 2008, which include the following:

- Establish guidelines within the BRD Science Strategy to maximize access to USGS biological data research and data and to make the data publicly available.
- Continue to establish baseline state of knowledge indices for FWS designated focal avian species of management concern based on action plans completed to date to improve coordination for conservation of fish and wildlife populations.
- Select independent contractor to begin process for conducting the comprehensive and independent programmatic review of BRD.

Biological Research and Monitoring addresses the Department of the Interior Resource Protection strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment and by providing the science information that resource managers need. The following table highlights important performance measures for Biological Research and Monitoring:

Program Performance Overview

End Outcome Goal 1.4: Resource Protection: Improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 President's Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
End Outcome Goal 1.4: Resource Protection: Improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Measures									
% of targeted science products that are used by partners for land or resource management decision making **(SP)**	UNK	60%	86.9%	65%	90.4%	65%	67%	+2%	67%
Intermediate Outcome Measures and Bureau and PART Outcome Measures									
% of North American migratory birds for which scientific information on their status and trends are available **(SP) (PART) (BRM)**	UNK	26%	26%	26% (169/650)	26.6% (173/650)	26.6% (173/650)	27.13% (176/650)	+0.53%	27.1% (176/650)
Comments	Changes are due to major advances in knowledge through research support for major areas that include several species (Birds Forever Initiative).								
% of targeted fish and aquatic populations for which information is available regarding limiting factors **(SP) (PART) (BRM)**	UNK	31%	31%	37% (44/119)	38.66% (46/119)	41% (49/119)	45% (54/119)	+4%	51% (61/119)
Comments	Changes are due to major advances in knowledge through research support for major areas that include several species.								
X% of focal migratory bird populations for which scientific information is available to support resource management decisionmaking (USGS in coordination with FWS) **(PART) (BRM)**	A	UNK	56.88%	57.02%	57.02%	57.16%	57.22%	+0.06%	TBD

Program Performance Overview

End Outcome Goal 1.4: Resource Protection: Improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment

End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
Comments	Changes are due to major advances in knowledge through research support for major areas that include several species (Birds Forever Initiative).								
X% improvement in detectability limits for selected, high priority environmentally available chemical analyses **(PART) (BRM)**	UNK	UNK	6%	12%	12%	20%	37%	+17%	48%
Comments	Detectibility limits will be improved through development of ultraclean procedures with higher-quality reagents.								
Increase long-term trend precision (decrease bias) for existing species monitored through the Breeding Bird Survey to enable a detection of 50% population decline of relevant species within 20 years **(PART) (BRM)**	UNK	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0	0.0008
Comments									
% of studies validated through appropriate peer review or independent review **(SP)**	666/666 100%	1,314/1,314 100%	1,093/1,093 100%	865/865 100%	1,101/1,101 100%	869/869 100%	833/833 100%	--	880/880 100%
PART Efficiency and Other Output Measures									
Average cost per sample for selected, high priority environmentally available chemical analyses **(PART Eff Measure)**	UNK	$700	$680	$680	$680	$650	$643	-$7	$567
Total Projected Cost ($000)	UNK	UNK	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Projected Cost per sample (whole dollars)	UNK	700	680	680	680	650	643	-7	567
Comments	Average cost per sample decrease as a result of developing new methods for analysis, adoption of computerized chromatographic or other automated techniques, and improvements in instrumentation.								
# of systematic analyses & investigations delivered to customers	666	1,314	1,093	865	1,101	869	833	-36	880
Total Projected Cost ($000)	133,200	262,800	218,600	173,000	220,200	173,800	168,200	-5,600	177,000
Projected Cost per systematic analysis (whole dollars)	200,000	200,000	200,000	200,000	200,000	200,000	200,000	--	200,000

Program Performance Overview

End Outcome Goal 1.4: Resource Protection: Improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment

End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
Comments	Change in 2009 is a net result of (1) changes in 2007 decreasing the number of systematic analyses or investigations delivered to customers in 2009 by 8, and (2) a technical adjustment that reflects the proposed Global Change budget restructure (-28). Changes result from proposed increases in 2009 for Birds Forever, Healthy Lands, and Priority Ecosystems increasing the number of systematic analyses and investigations by 25 in 2011. Proposed reductions in 2009 result in -17 systematic analyses and investigations delivered in 2011. Systematic analyses, the product of research, require one to five years for completion. Some studies already underway in these areas will be completed in 2007 and 2008. The influx of new funding will accelerate completion of some research projects currently in progress as well as initiate other research projects that will conclude in the out-years. The USGS used an annual snapshot of the Resource Protection ABC research work activity cost data averaged over time as a surrogate cost per unit. To this the USGS added a proportional share of the cost derived for the Resource Protection science management activity. The average unit cost for systematic analyses is approximately $200,000 for the Resource Protection mission area which correlates to the average cost that the program had historically used before implementation of ABC.								
# of formal workshops or training provided to customers (instances/issues/events)	51	247	127	72	135	72	73	+1	69
Total Projected Cost ($000)	4,080	19,760	10,160	5,760	10,800	5,760	5,840	+80	5,520
Projected Cost per workshop (whole dollars)	80,000	80,000	80,000	80,000	80,000	80,000	80,000	--	80,000
Comments	Change in 2009 is a net result due to (1) a technical adjustment that reflects the proposed Global Change budget restructure (-3), and (2) proposed funding increases to Birds Forever, Healthy Lands, and Priority Ecosystems increasing the number of workshops and training provided to customers in 2009 by 4. For workshops, which support land managers in applying the science, and are a shorter term product, the USGS used the average unit cost of $80,000 based on the technical assistance and proportional share of the science management work activity for 2007 for the Resource Protection mission. Other Department goals will also accrue performance from workshops.								

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Activity: Biological Research

Subactivity: Biological Information Management and Delivery

Subactivity	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-)[a/]	2009 Program Changes (+/-) [b/]	2009 Budget Request	Change From 2008 (+/-)
Biological Information Management and Delivery ($000)	22,856	22,422	+174	-3,017	19,579	-2,843
Total FTE	*72*	*72*	*0*	*-18*	*54*	*-18*

a/ Fixed cost increases for this subactivity total $220, of which $174 is budgeted and $46 is absorbed.

b/ Changes for this subactivity include a reduction of -85 for travel. The impact of this change is described in the General Statement that begins on page A -1.

Summary of 2009 Program Changes for Biological Information Management and Delivery

Request Component	($000)	FTE
• National Biological Information Infrastructure	-2,932	-18
• Travel reduction	-85	0
TOTAL Program Changes	**-3,017**	**-18**

Justification of 2009 Program Changes

The 2009 budget request for the Biological Information Management and Delivery (BIMD) subactivity is $19,579,000 and 54 FTE, a net program change of -$3,017,000 and -18 FTE from the 2008 Enacted level.

National Biological Information Infrastructure (-2,932,000 / -18 FTE)

In 2009, the USGS proposes a reduction of $2.9 million to the National Biological Information Infrastructure (NBII). The infrastructure would be downsized to perform only basic information dissemination functions, for data and information currently available. This means that current data would be maintained and limited or no new data would be added to NBII focus areas. The proposed reduction would impact such programs as the Integrated Taxonomic Information System, Fire Research and Management Exchange System, National Resource Monitoring Partnership, Geospatial One-Stop, and Global Biodiversity Information Facility.

Program Performance Change

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 President's Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments								
Resource Protection: # of formal workshops and training provided to customers	23	23	19	19	19	8	-11	0
Total Projected Cost ($000)	104	104	86	86	86	40	-46	--
Projected Cost per workshop (whole dollars)	4,500	4,500	4,500	4,500	4,500	5,000	+500	--
Comments	Change results from a proposed decrease to the NBII in 2009. This measure encompassed both metadata training and a variety of workshops. The unit cost for these activities represented an average actual expenditure, for example, in 2007, of $4,500 per activity. The proposed 2009 reduction of $2.9 million to the NBII would likely curtail the need for the metadata training sessions typically conducted by NBII, which are very standardized and economical to provide. Therefore, in 2009, this measure will reflect only workshops, which tend to cost more and will result in a higher average per activity.							
X% of North American migratory birds for which scientific information on their status (species distribution and number) and trends are available in a standardized and exchangeable format, to improve conservation plans of federal and state agencies (BIMD PART)	20%	25%	30%	31%	36%	31%	-5.0%	0%
Comments	No increase due to budget reduction to NBII. Migratory bird focus would be FWS focal species currently online.							

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 President's Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
X% of North American amphibians and reptiles for which scientific information on their status (species distribution) are available in a standardized and exchangeable format, to improve conservation plans of federal and state agencies (BIMD PART)	90%	91%	92%	93%	93.5%	93%	-0.5%	0
Comments	No increase due to budget reduction to NBII. Planned new reptile work would not be added.							
X% of North American mammals for which scientific information on their status (species distribution) are available in a standardized and exchangeable format, to improve conservation plans of federal and state agencies (BIMD PART)	93%	94%	94%	95%	96%	95%	-1.0%	0
Comments	No increase due to budget reduction to NBII. Planned new mammal work would not be added.							
X% of US federally-listed threatened and endangered or indicator fish species for which scientific information on A species status is available in a standardized and exchangeable format to improve conservation plans of federal and state agencies (BIMD PART)	7.5%	12.4%	17.5%	20%	20.5%	20%	-0.5%	0
Comments	No increase due to budget reduction to NBI. Planned new fisheries projects with States would not be added.							

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 President's Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
Amount of fire-related data and information available online via the NBII, to assist land managers in fire management decision making (BIMD PART)	1.5gb	15.42gb	23.3gb	3.0gb	3.0gb	3.0gb	0	0
Comments	No increase due to budget reduction to NBII with minor emphasis on fire data.							
# of cumulative gigabytes managed (BIMD)	791.25	1,134.22	931	1,000	1,850	1,000	-850	0
Comments	Increase in gigabytes would diminish due to proposed NBII reduction.							

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent out-year.

Program Overview

The Biological Information Management and Delivery (BIMD) mission is to create the informatics framework, provide scientific content, and develop the public and private partnerships needed for the understanding and stewardship of our Nation's biological resources. BIMD provides access to data and information for science-based decisionmaking, particularly as it pertains to the conservation, management, and use of the Nation's natural resources. In addition, the program develops and makes available tools, models, visualizations, and applications to aid policy and resource managers in the analysis and synthesis of scientific data to support decisionmaking. The program works in cooperation with many organizations throughout the United States and the world to provide biological information to partners, stakeholders, customers, and the general public. Through electronic infrastructures, the program delivers relevant data and information faster and in more interoperable formats than in the past, leading to better stewardship of the Nation's natural resources.

This program addresses the Department of the Interior Resource Protection strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment. The USGS plays a vital role in making biological data and information more accessible and useable. Key indications of USGS performance are reflected in the intermediate outcome measures for ensuring availability of long-term environmental and natural resource information, data and systematic analyses needed by land and resource managers for informed decision making.

The USGS also tracks outputs including the number of systematic analyses and investigations delivered to customers and the number of workshops/training with USGS sponsorship or participation to transfer results to customers and partners.

In 2012, the USGS BIMD subactivity expects to deliver to its customers about 12 systematic analyses and investigations and 8 formal workshops and training.

The program's progress is assessed by metrics that are reported through the Government Performance and Results Act reporting structure, and within several executive level reporting and oversight strategies including the Administration's Program Assessment and Rating Tool (PART) and the Capital Asset Plan and Business Case (Exhibit 300). Tracked activities include efficiencies such as the cost per gigabyte managed, outputs such as the number of systematic analyses delivered to customers, and outcomes such as percent of U.S. land with land characterization and species distribution information available for resource management decision making updated in the last 5 years.

Program Components

The core and interdependent components of BIMD have been specifically designed to integrate information across geographic and political scales (local to global) and biological levels of organization (genomes to biomes).

The following are the core components of the Biological Information Management and Delivery subactivity.

- *Landscapes, Stewardship, and Species Distributions.* The Gap Analysis Program (GAP) generates databases on native vertebrate species distributions and natural land cover types to provide State, regional, and national conservation assessments. In addition, Vegetation Characterization activities are performed on public lands (national parks) using a consistent methodology supported by national standards.
- *Biosystematics and Nomenclature.* The Integrated Taxonomic Information System (ITIS) is under development to provide an authoritative source of species names and their hierarchical classification. The completed portions serve as a taxonomic standard for other program components and the global community, enabling the comparison of biodiversity data sets at all biological levels.
- *Genomes to Biomes.* The NBII continues development to provide the biological community and others with a fully digital, interactive, distributed system that provides scientifically reliable biological data and information and a suite of tools for analysis, synthesis, and forecasting. Network-wide methods and standards for organizing content to enhance the retrieval, integration, and use of information are key components of the NBII.

The program works collaboratively with others to ensure that it is building a store of high quality data and information that can be used to address resource management issues. To that end, the program engages USGS science centers and other USGS programs, non-governmental organizations, museums, universities, international organizations, and other partners in the creation of data content and resources to address resource management needs.

Program goals, as outlined in the program's 5-year plan (*http://internal-int.er.usgs.gov/director/planning/docs/BIO5yrPlan2005-2009.pdf*) are to:

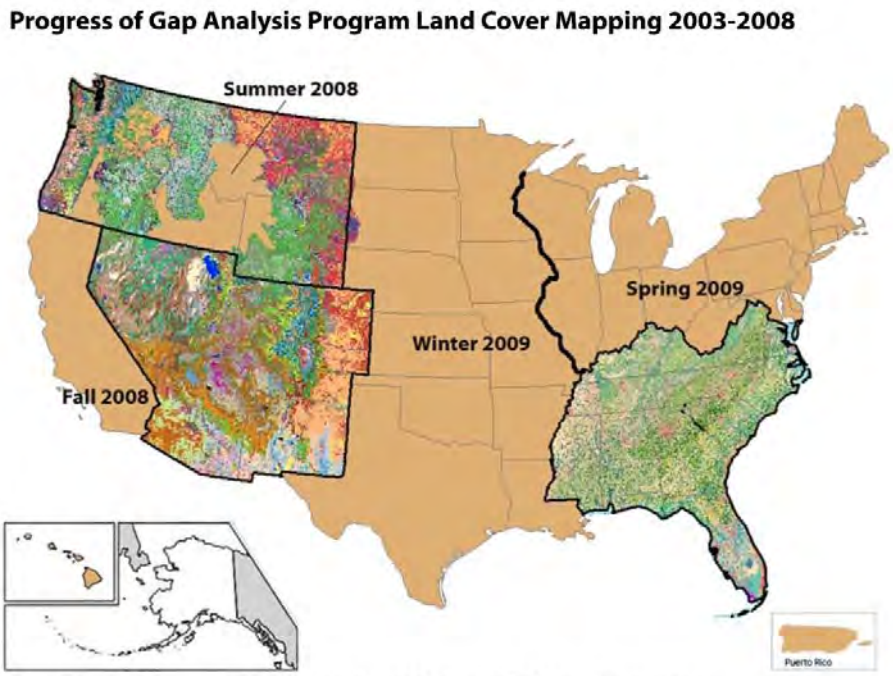
- Content: Increase the availability and usefulness of biological resources data and information,
- Tools: Implement technologies and tools to integrate, analyze, visualize, and apply biological information to natural resource issues,
- Infrastructure: Develop, apply, and promote the adoption of standard practices, protocols, and techniques to enhance knowledge discovery and retrieval from various resources,
- Research: Facilitate information science research that supports the advancement of biological informatics capabilities, and
- Customers: Apply innovative technologies and best practices to improve the development, description, and dissemination of biological information to customers.

Customers and Partners — The USGS national-level approach to managing biological and natural resource data and scientific information ensures the application of standards that foster opportunities for collaboration and cooperation. The USGS places a premium on partnerships at all levels of government and with nongovernmental entities, including the private sector. These partners use USGS-generated scientific data and information that contributes to the knowledge base, which then becomes available to Interior land and resource managers, and others.

For example, each focus area of the NBII is developed through the collaboration of the partners and customers involved with that area. All together, NBII has over 250 partner organizations and agencies that help define the direction both of individual focus areas and of the NBII as a whole.

Gap Analysis — The Gap Analysis Program (GAP) provides broad geographic information on the status of species and their habitats and identifies the degree to which native animal and plant species are represented in the present-day mix of conservation lands (those species not adequately represented constitute conservation "gaps"). Currently, GAP products are available for most of the country. These products include digital databases describing Statewide land-cover assemblages, distributions of mammals, birds, reptiles, and amphibians, and characterizations of land stewardship. The current emphasis of the program is on completing GAP projects in the few States where data are not available, updating selected regions of the country with state-of-the-art methods and technologies, and developing partnerships with data users to facilitate use of GAP information in land-management decisions.

The USGS continues to emphasize GAP research and the development of applications to better serve the needs of Interior's land management bureaus, including the U.S. Fish and Wildlife Service (FWS), the Bureau of Land Management (BLM), and other agencies such as the U.S. Forest Service (FS). New mechanisms being implemented to facilitate access to GAP products include regional views, species information at regional and national scales, and user-defined online mapping.



Vegetation Characterization — USGS scientists assist National Parks with inventorying and monitoring with efforts focused on creating national vegetation standards, technologies, and products. This activity enables delivery of national-scale descriptions of vegetation to meet specific information needs identified by the National Park Service (NPS) with additional cooperative projects for the FWS and BLM. Products are aimed at monitoring efforts such as planning and designing monitoring protocols, performing statistical data analyses, and achieving efficiencies such as dovetailing protocols for invasive species inventory and fire fuels related to vegetation to ensure integrated field data collection protocols.

Integrated Taxonomic Information System (ITIS) — The USGS leads and works with other Federal agencies (including the Environmental Protection Agency, USDA Agricultural Research Service, USDA Natural Resources Conservation Service, National Oceanic and Atmospheric Administration, Smithsonian Institution, National Science Foundation, Fish and Wildlife Service, and the National Park Service), organizations, institutions, and taxonomic specialists across the United States and internationally to develop and operate the largest taxonomic thesaurus and database of its kind in the world. ITIS provides an accepted scientific name (with a unique Taxonomic Serial Number) as the "common denominator" for accessing information on such topics as biodiversity, invasive species, declining amphibians, migratory birds, fishery stocks, pollinators, agricultural pests, and emerging diseases. The ITIS supports the development of the only comprehensive national taxonomic database that provides free access (directly over the Internet) to standard scientific names for all U.S. plant and animal species.

National Biological Information Infrastructure — The NBII is a tool for making biological data, information, and associated tools and technologies more accessible for customers and partners to use in making informed decisions regarding resource management, environmental considerations, disease vectors, control of invasive species, and other issues.

The NBII uses the capabilities of the Web and other advanced technologies to establish a distributed "federation" of biological data and information sources through which users can find biological information, retrieve it, and apply it to resource management questions. Partners and customers that take part in this effort include government agencies at all levels, private sector organizations, natural history museums, libraries, academic institutions, international scientific organizations, and the public.

> "NBII has forged partnerships with many leading scientific organizations, including AIBS [American Institute of Biological Sciences] member societies such as the Long-Term Ecological Research Network, Ecological Society of America, and the Natural Science Collections Alliance. Through these partnerships, NBII has worked with the scientific community to develop methods and protocols to ensure that scientific data are available for scientists and resource managers."
>
> Richard T. O'Grady,
> Executive Director
> American Institute of Biological Sciences
> November 8, 2007

The USGS works with many public and private partners in implementing the NBII to:

- Develop a nationwide network of NBII focus areas that are geographically and thematically targeted;
- Expand the overall content of the NBII, and
- Develop and apply new information tools and technologies.

The NBII is a networked series of regional and thematic focus areas. Regional focus areas provide services within a particular geographic area of the country. Within a region, activities address broad biological themes and issues that are high priority to stakeholders in that region. Currently, NBII has initiated eight regional focus areas.

The thematic focus areas of NBII are responsible for coordinating data and information within the scope of their assigned scientific themes at a national level. In doing so, they both initiate data gathering activities and coordinate relevant local data sets from the regions. They also place a high priority on developing tools to allow users to interact with data from diverse sources. Currently, NBII has initiated four thematic focus areas.

In addition to regional and thematic focus areas which approach the task of making data and information accessible from geographic and topical perspectives, effort also is aimed at developing the infrastructure that underlies the data and information network. This infrastructure consists not only of the hardware and software required to make the network run, it also consists of the standards that must be implemented to make network-wide interoperability possible. As this structure grows, a robust infrastructure becomes more and more critical so that necessary products and services may be provided to all focus areas and not duplicated at multiple locations. This infrastructure enables network-wide search, access, and retrieval, and sharing of tools.

> "I have been working with the NBII for nearly three years, am very satisfied with the outcomes of our collaboration and recommend this program to my peers. … Our partnership with NBII has been a productive, cost-effective, and mutually-beneficial collaboration. By supporting these two projects, the NBII program provides unparalleled access to data about the nation's fisheries."
>
> Gretchen Rupp, Director
> Montana University System Water Center
> September 18, 2007

2009 Program Performance

The 2009 budget request for the BIMD subactivity is $19,579,000 and 54 FTE, a net program change of -$3,017,000 and -18 FTE from the 2008 Enacted level.

Under the Resource Protection end outcome goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment, the Performance Table includes a cumulative metric that shows the number of gigabytes of data and information available through the NBII. This is a system-generated number that measures use of disk space. This trends toward rising, but sometimes fluctuates as duplicate files are discovered and eliminated, or better file compression technologies are implemented. Along with this metric, the USGS calculates the average cost per gigabyte. Previously, this was derived using the entire BIMD budget as a denominator. This has been changed to more accurately reflect only those portions of the BIMD budget that contribute to the addition of data and information content available through the NBII. Thus, the performance table shows a significant drop in the average cost per gigabyte due to the change in calculation method.

In 2009, BIMD expects to deliver to its customers 10 systematic analyses and investigations and 8 formal workshops or training courses.

BIMD provides access to data and information for science-based decisionmaking, particularly as it pertains to the conservation, management, and use of the Nation's natural resources. In addition, the program develops and makes available tools, models, visualizations, and applications to aid policy and resource managers in the analysis and synthesis of scientific data to support decisionmaking.

For instance, in 2008 and 2009, the USGS GAP program will continue updating land cover and species distribution data in two regions of the United States, the Northwest and Northeast. Characterization and mapping of vegetation types developed by GAP are used for conservation planning, reserve design, and species modeling. Species distribution data is needed for many species conservation efforts. The regional focus of the GAP will also allow State conservation and land management agencies and Federal land managers to better plan land use across State boundaries. This activity supports the program measure "% of U.S. land with land characterization and species distribution information available for resource management decision-making updated in the last 5 years."

In 2008 and 2009, the BIMD, through NBII, will continue to develop the Department of the Interior's national framework for invasive species early detection, rapid assessment and response (knows as “EDRR”) in a more limited capacity than in the past. From 2005 through 2007, this framework was created and elaborated in cooperation with other Federal agencies to respond to the growing threats and impacts of invasive species throughout the United States and to help identify and coordinate current efforts to combat invasions by non-native species into the United States. With the guidance and cooperation of the National Invasive Species Council, NBII has led efforts to coordinate Federal efforts toward the development of an EDRR Framework. Building on results of an extensive survey and workshop conducted by NBII in 2006 of Federal, State, academic, and nongovernmental organizations to determine what components of the developing framework are currently underserved, NBII and its partners have been developing tools to make existing resources in the framework more accessible to decision makers, and working toward integrating these tools into the framework. In 2009, NBII’s invasive species resources will be used to complete as many of the tools currently under development as possible, though planning and activities aimed at integrating content and tools into a cohesive EDRR Framework will cease due to the proposed reduction. No further efforts as coordinating Federal activities toward an EDRR are planned.

In 2007 and 2008, the NBII has been working with partners to help fill a critical void in access to data and information about North American bee species. Globally, many bee species are experiencing sharp population declines, significantly reducing pollination. Without bees, many of the world's plants and crops would simply disappear. In fact, more than 66 percent of the world's 1500 crop species require visits by bees (Roubik, 1995), and bees are in some way required for 15 to 30 percent of worldwide food production (McGregor, 1976). In North America, crop pollination is accomplished by managed honeybees, wild honeybees, and native bees (Michener, 2000; McGregor and Levin, 1970). Research in Europe and the Americas indicates that bee populations are declining, presaging a potentially disastrous situation, and concludes that more bee population monitoring data are needed. Bees are particularly difficult to monitor, however, being small and quick, and challenging to mark or tag and identify. Specifically, the NBII has partnered with others to help develop and make available online identification keys for 65 bee genera found east of the Mississippi River. Continuation of this important work in 2009 would continue at a reduced level due to the proposed budget reduction. Partners including the U.S. Fish and Wildlife Service, the Ambrose Monell Foundation, the Polistes Foundation, the North American Pollinator Protection Campaign, and bee taxonomists from throughout North America would be impacted by having to expend more resources and perform more work to fill the void in the role currently performed by NBII.

PART

In 2005, for the 2007 budget, the Administration reviewed the BIMD subactivity using the PART. The program was found to be working effectively with partners and fulfilling its mission and rated the program moderately effective.

Additionally, the PART found:

- The program has met program goals. For example, 96 percent of customers are satisfied with usefulness of scientific and technical products.
- BIMD has made progress coordinating research, but could take steps to improve accessibility of research and monitoring products. While BRM works collaboratively with other organizations, more formal coordination is lacking with the Biological Information Management and Delivery program and other Interior bureaus.
- BIMD program reviews have not been adequate. While the program uses various methods for reviews, they have been by research area rather than biology-wide, and were not regularly implemented, or sufficiently independent.

The 2008 Improvement Plans that address these recommendations are as follows:

- Develop a plan with BIMD to maximize access to research and data and provide timely reports on the status and trends of the nation's biological resources.
- Develop performance measures with the U.S. Fish and Wildlife Service to improve coordination for conservation of fish and wildlife populations of management concern.
- Implement comprehensive and independent programmatic reviews for all of biological research, monitoring, and management activities.

Milestones have been identified to continue addressing these recommendations, and measurable progress to-date has been achieved. Some sample BIMD milestones for 2008 include:

- Establish guidelines within the Biological Resources Discipline Science Strategy to make USGS biological data publicly available
- Upgrade the metadata clearinghouse search tool by updating the interface and improving search and retrieval capacity and accuracy.
- Provide focused Web-based access via the NBII network to existing data and information of interest for ten additional focal species of migratory birds identified by FWS as species of management concern.

USGS has developed action plans having milestones and targets in the Department's Management Initiatives Tracking System (MITS). All actions are on schedule or, when milestones appear to be delayed for cause, are renegotiated with OMB and the Department and amended in MITS. The Department quarterly reviews ensure accountability of PART programs, milestone progress explanation, target delay explanations, and any pertinent implementation impacts of Action Plan implementation.

Biological Information Management and Delivery addresses the Department of the Interior Resource Protection strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment and by providing the science information that resource managers need. The following table highlights important performance measures for Biological Information Management and Delivery:

Program Performance Overview									
End Outcome Goal 1.4: Resource Protection: Improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 President's Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
Intermediate Outcome Measures and Bureau and PART Outcome Measures									
X% of US land with land characterization and species distribution information available for resource management decision-making updated in the last 5 years **(BIMD PART)**	18.3%	23.3%	42.3%	34%	36.4%	37%	40%	+3%	50%
Comments	Anticipate early completion of a regional project and several States.								
X% of North American migratory birds for which scientific information on their status (species distribution and number) and trends are available in a standardized and exchangeable format, to improve conservation plans of federal and state agencies **(BIMD PART)**	15%	20%	25%	30%	30%	31%	31%	0%	31%
Comments	No increase due to budget reduction to NBII. Migratory bird focus would be FWS focal species currently online.								
X% of US federally-listed threatened and endangered or indicator fish species for which scientific information on A species status is available in a standardized and exchangeable format to improve conservation plans of federal and state agencies **(BIMD PART)**	2.6%	7.5%	12.4%	17.5%	17.5%	20%	20%	0%	21%
Comments	No increase due to budget reduction to NBI. Planned new fisheries projects with States will not be added.								
PART Efficiency and Other Output Measures									
# of formal workshops or training provided to customers (instances/issues/events) **(BIMD)**	22	23	23	19	19	19	8	-11	8
Total Projected Cost ($000)	UNK	UNK	UNK	86	86	86	40	-46	40
Projected Cost per workshop/training (whole dollars)	UNK	UNK	UNK	4,500	4,500	4,500	5,000	+500	5,000
Comments	Change results from a proposed decrease to the NBII in 2009.								

Program Performance Overview

End Outcome Goal 1.4: Resource Protection: Improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment

End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
	This measure encompassed both metadata training and a variety of workshops. The unit cost for these activities represented an average actual expenditure, for example, in 2007, of $4,500 per activity. The proposed 2009 reduction of $2.9 million to the NBII will likely curtail the need for the metadata training sessions typically conducted by NBII, which are very standardized and economical to provide. Therefore, in 2009, this measure will reflect only workshops, which tend to cost more and will result in a higher average per activity.								
# of cumulative gigabytes managed **(BIMD)**	360	791.25	1,134.22	820	931	1,000	1,000	0	1,210
Comments	Increase in gigabytes will diminish due to proposed NBII reduction.								
Average cost per gigabyte of data available through servers under Program control **(BIMD PART Eff Measure)** (whole dollars)	66,000	63,000	17,155	55,000	3,794	3,794	3,794	0	3,794
Comments	Significant drop in cost per gigabyte is due to a change in the calculation method.								

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Science Centers and Field Stations Summary

Center Name	Location	2007[1/] Estimate ($000)	2008[1/] Estimate ($000)	2009[1/] Estimate ($000)
Center for Biological Informatics	**Lakewood, CO**	**6,120**	**5,874**	**5,639**
Program Description: The Center facilitates access to and use of biological data and information through leadership in establishing standards, developing information products, and using information technologies. The Center supports such programs as GAP Analysis, the USGS/National Park Service Vegetation Mapping, and the National Biological Information Infrastructure.				
Upper Midwest Environmental Science Center	**LaCrosse, WI**	**3,638**	**3,638**	**3,638**
Program Description: The Center provides scientific leadership in a variety of areas including river ecology, restoration of degraded habitats, development of chemicals for fishery management, declining species, invasive aquatic species impacts and control, contaminants, and development of decision support models. The Center has lead responsibility for the Upper Midwest Amphibian Research and Monitoring Initiative and the Long Term Resource Monitoring Program on the Upper Mississippi River. Scientists at the Center anticipate emerging problems and information gaps and provide the leadership and the commitment to action needed for effective resource management.				
Field Stations: N/A				
Leetown Science Center	**Leetown, WV**	**7,773**	**7,773**	**7,773**
Program Description: The Center conducts research to provide land and resource managers information needed to restore, enhance, maintain, and protect biological resources and their supporting systems.				
Field Stations:				
Aquatic Ecology Laboratory	Leetown, WV	2,110	2,110	2,110
Fish Health Research Laboratory	Leetown, WV	1,506	1,506	1,506
Southern Appalachian Field Laboratory	Knoxville, TN	426	426	426
Great Smoky Mountain Field Station	Gatlinburg, TN	35	35	35
Northern Appalachian Research Laboratory	Wellsboro, PA	1,163	1,163	1,163
Conte Anadromous Fish Research Laboratory	Turners Falls, MA	1,687	1,687	1,687
Orono Field Station	Orono, ME	125	125	125
Columbus Field Station	Columbus, OH	147	147	147
Restoration Technology Laboratory	Leetown, WV	396	396	396
Directorate/Information Resources Management	Leetown, WV	178	178	178
National Wildlife Health Center	**Madison, WI**	**4,449**	**4,449**	**4,449**
Program Description: The Center provides national and international leadership for addressing health issues involving wildlife resources under Interior's stewardship and to foster partnerships with others to address wildlife health as a component of ecosystem health.				
Field Stations:				
Honolulu Field Station	Honolulu, HI	240	240	240

Center Name	Location	2007[1/] Estimate ($000)	2008[1/] Estimate ($000)	2009[1/] Estimate ($000)
Patuxent Wildlife Research Center	**Laurel, MD**	**13,301**	**13,301**	**13,301**
Program Description: The Center focuses on wildlife research and management, specializing in wildlife conservation, especially in such areas as waterfowl harvest management, wildlife habitat improvement, the effects of environmental contaminants, endangered species conservation, migratory bird management, and wildlife population analysis.				
Field Stations:				
Orono	Orono, ME	169	169	169
Athens	Athens, GA	966	966	966
Vicksburg	Vicksburg, MS	355	355	355
Narragansett	Narragansett, RI	507	507	507
Smithsonian	Washington, DC	1,515	1,515	1,515
Syracuse	Syracuse, NY	142	142	0
Blacksburg	Blacksburg, VA	164	164	164
Biological Science Office of the Florida Integrated Science Center (formerly the Florida Caribbean Science Center)	**Gainesville, FL**	**4,646**	**4,738**	**4,833**
Program Description: The Center provides natural resource managers with scientific information needed for effective conservation with emphasis on biological resources of the Florida peninsula, the Southeastern States, and the Caribbean region. The Center focuses on coastal and marine ecology, ecosystems restoration ecology, invasive species, and biological diversity.				
Field Stations:				
Northeast Laboratory	Gainesville, FL	0	0	0
South Florida Field Stations	Miami/Homestead/ Ochopee, FL	874	891	909
Virgin Islands Field Station	St. John, U.S. Virgin Islands	179	183	187
Center for Coastal Geology and Regional Marine Studies	St. Petersburg, FL	591	603	615
Great Lakes Science Center	**Ann Arbor, MI**	**8,001**	**8,001**	**8,001**
Program Description: The Center meets the Nation's need for scientific information for restoring, enhancing, managing, and protecting the living resources and their habitats in the Great Lakes Basin Ecosystem. This mission is accomplished with scientific knowledge gained through quality research, inventory and monitoring, and information transfer.				
Field Stations:				
Lake Superior Biological Station	Ashland, WI	906	906	906
Lake Ontario Biological Station	Oswego, NY	751	751	751
Lake Erie Biological Station	Sandusky, OH	469	469	469
Cheboygan Vessel Base	Cheboygan, MI	263	263	263
Munising Biological Station	Munising, MI	156	156	156
Lake Michigan Ecological Research Station	Porter, IN	362	362	362
Hammond Bay Biological Station	Hammond Bay, MI	38	38	38
Tunison Lab. of Aquatic Science	Cortland, NY	705	705	705

Center Name	Location	2007[1] Estimate ($000)	2008[1] Estimate ($000)	2009[1] Estimate ($000)
Fort Collins Science Center	**Fort Collins, CO**	**8,800**	**8,800**	**8,800**
Program Description: The Center conducts research and develops technical applications to assist land managers in understanding and managing biological resources, habitats and ecosystems. The Center is home to the National Institute of Invasive Species Science. The Center conducts research related to species & habitats, aquatic systems, riparian ecology, global change, fire ecology, and herbivore ecosystems in support of Department of the Interior bureaus and the International Center for Applied Ecology.				
Field Stations:				
Arid Lands Field Station	Albuquerque, NM	600	600	600
Jemez Mountain Field Station	Los Alamos, NM	154	160	160
Northern Prairie Wildlife Research Center	**Jamestown, ND**	**4,476**	**4,476**	**4,476**
Program Description: The Center develops research information on the quantitative ecological requirements for sustainable wildlife populations primarily in grasslands and wetlands, determines the distribution of flora and fauna, and identifies consequences of habitat loss, management, and restoration.				
Field Stations: N/A				
Columbia Environmental Research Center	**Columbia, MO**	**6,900**	**6,359**	**6,500**
Program Description: The Center provides scientific information and data needed to address national and international environmental contaminant issues, and effects of habitat alterations on aquatic and terrestrial ecosystems.				
Field Stations:				
Texas Gulf Coast	Corpus Christi, TX	406	419	431
Texas Gulf Coast	College Station, TX	142	0	0
Padre Island Field Station	Padre Island, TX	0	0	0
International Falls Field Station	International Falls, MN	98	0	0
Yankton Field Station	Yankton, SD	107	110	113
Jackson Field Station	Jackson, WY	133	137	141
National Wetlands Research Center	**Lafayette, LA**	**4,850**	**4,850**	**4,850**
Program Description: The Center conducts research to address loss of wetlands in coastal systems, the changes in fresh and estuarine systems because of changes in water quality, and the resulting effects on birds.				
Field Stations:				
Corpus Christi Field Station	Corpus Christi, TX	90	90	90
Baton Rouge Field Station	Baton Rouge, LA	106	106	106

Center Name	Location	2007[1] Estimate ($000)	2008[1] Estimate ($000)	2009[1] Estimate ($000)
Northern Rocky Mountain Science Center	**Bozeman, MT**	**2,776**	**2,595**	**2,624**
Program Description: The Center conducts research to provide land and resource managers information needed to restore, enhance, maintain, and protect natural resources of the Rocky Mountain ecosystems.				
Field Stations:				
Glacier Field Station	West Glacier, MT	630	612	392
Missoula Field Station	Missoula, MT	131	156	163
Western Fisheries Research Center	**Seattle, WA**	**3,706**	**3,706**	**3,818**
Program Description: The Center provides scientific research and technical assistance to support the best possible stewardship of the natural resources, emphasizing fish populations and aquatic ecosystems of the West.				
Field Stations:				
WFRC Seattle Lab	Seattle, WA	1,990	1,990	2,050
Columbia River Research Lab	Cook, WA	402	402	414
Reno Field Station	Reno, NV	327	327	337
Dixon Field Station	Dixon, CA	236	236	243
Klamath Falls Field Station	Klamath Falls, OR	552	595	613
Marrowstone Marine Station	Nordland, WA	156	156	161
Biological Science Office of the Alaska Science Center	**Anchorage, AK**	**6,533**	**6,555**	**6,620**
Program Description: The Center provides biological information and research findings to resource managers, policymakers, and the public to support sound management of biological resources and ecosystems in Alaska. The Center's research focuses on arctic and subarctic ecosystems, marine mammal ecology, migratory birds, and terrestrial mammal ecology. The Center has duty stations in various locations that do not have independent budgets.				
Pacific Island Ecosystems Research Center	**Honolulu, HI**	**3,000**	**3,000**	**3,000**
Program Description: The Center conducts research to provide managers of terrestrial and marine resources information needed to restore, enhance, maintain, and protect biological resources and their supporting ecosystems in the Pacific Basin.				
Field Stations:				
Kilauea Field Station	Hawaii National Park, Hawaii, HI	1,884	1,978	2,000
Haleakala Field Station	Makawao, Maui, HI	343	360	365
Manoa Field Station	Honolulu, Oahu, HI	48	50	52
Western Ecological Research Center	**Davis, CA**	**6,698**	**6,832**	**6,968**
Program Description: The Center provides biological information and research findings to resource managers, policymakers, and the public to support sound management of biological resources and ecosystems in California, Nevada, Arizona, and Utah. The Center's research focuses on work related to endangered species, waterfowl, amphibians, fire ecology, global change, and other ecological issues.				
Field Stations:				
Santa Cruz Field Station	Santa Cruz, CA	660	673	686
Dixon Field Station	Dixon, CA	843	860	877
Davis Station	Davis, CA	184	188	191

Center Name	Location	2007[1/] Estimate ($000)	2008[1/] Estimate ($000)	2009[1/] Estimate ($000)
Western Ecological Research Center Field Stations (continued):				
San Diego Field Station	San Diego, CA	1,237	1,262	1,287
Channel Island Field Station	Ventura, CA	287	293	298
Point Reyes Field Station	Point Reyes, CA	249	254	259
Redwood Field Station	Arcata, CA	153	156	159
Sequoia-Kings Station	Tree Rivers, CA	584	596	607
Yosemite Field Station	Portal, CA	385	393	400
San Francisco Bay Field Station	Vallejo, CA	460	469	478
Box Springs Field Station	Riverside, CA	214	218	222
Las Vegas Field Station	Las Vegas, NV	953	972	991
Forest and Rangeland Ecosystem Science Center	**Corvallis, OR**	**6,117**	**6,117**	**6,117**
Program Description: The Center provides scientific understanding and technology to support sound management and conservation of forest and rangeland ecosystems in the Pacific Northwest and Intermountain West.				
Field Stations:				
Regional Ecosystem Office	Portland, OR	0	0	0
Corvallis Research Group	Corvallis, OR	2,259	2,019	2,220
Olympic Field Station	Port Angeles, WA	606	468	515
Snake River Field Station	Boise, ID	1,468	1,828	2,011
University of Washington Field Station	Seattle, WA	135	183	201
Southwest Biological Science Center	**Flagstaff, AZ**	**2,066**	**2,128**	**2,234**
Program Description: The Center conducts research and provides technical support to assist land managers with resource management and stewardship throughout the Southwest. Research focuses on arid-lands ecology, invasive species, ecosystem restoration, climate change, endangered species, wildlife-human interactions, inventory and monitoring, and other ecological issues. The Center also includes the Grand Canyon Monitoring and Research Station, which studies the effects of the operation of Glen Canyon Dam on downstream resources within the Colorado River Ecosystem under the framework of adaptive management.				
Field Stations:				
Grand Canyon Monitoring and Research Center	Flagstaff, AZ	0 (funded by receipts from power revenue)	0 (funded by receipts from power revenue)	0 (funded by receipts from power revenue)
Sonoran Field Station	Tucson, AZ	631	650	650
Colorado Plateau Field Station	Flagstaff, AZ	821	846	846
Canyonlands Field Station	Moab, UT	614	632	632

[1]/ Science Center and Field Station funding are estimates and do not include cyclical funds.

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Activity: Biological Research

Subactivity: Cooperative Research Units

Subactivity	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-)[a/]	2009 Program Changes (+/-)[b/]	2009 Budget Request	Change From 2008 (+/-)
Cooperative Research Units ($000)	14,764	16,174	+275	-1,039	15,410	-764
Total FTE	*133*	*141*	*0*	*-8*	*133*	*-8*

a/ Fixed cost increases for this subactivity total $348, of which $275 is budgeted and $73 is absorbed.

b/ Changes for this subactivity include a reduction of -55 for travel. The impact of this change is described in the General Statement that begins on page A - 1.

Summary of 2009 Program Changes for Cooperative Research Units

Request Component	($000)	FTE
• Unrequested congressional action related to general program increase	-984	-8
• Travel reduction	-55	0
TOTAL Program Changes	**-1,039**	**-8**

Justification of 2009 Program Changes

The 2009 budget request for the Cooperative Research Units (CRU) subactivity is $15,410,000 and 133 FTE, a net program change of -$1,039,000 and -8 FTE from the 2008 Enacted level.

Unrequested Congressional Action (-984,000 / -8 FTE)

The USGS received an unrequested general increase of $1.0 million in the 2008 enacted budget for the CRUs. The USGS requests a decrease of $1.0 million in 2009 to maintain higher priority funding elsewhere in the USGS.

Program Performance Change

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 President's Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments								
Resource Protection: # of systematic analyses and investigations	236	517	249	205	205	195	-10	0
Comments	Proposed decrease for the Cooperative Research Units results in -10 systematic analyses delivered in 2009.							
Resource Protection: # of formal workshops and training provided to customers	25	41	25	13	13	10	-3	0
Comments	Proposed decrease for the Cooperative Research Units results in -3 workshops and training provided in 2009.							

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Outyear performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent out-year.

Program Overview

The CRU program is a unique cooperative partnership among Federal and State governments and universities providing one of the strongest partnerships between the USGS and Federal and State management agencies. The goals of the CRU program are to sustain and maintain:

- A cost-effective, national network of Federal, State, and university partnerships pursuant to the Cooperative Research Units Act, with a legislated mission of research, education, and technical assistance on issues related to fish, wildlife, ecology, and natural resources.
- A quality-driven, customer-oriented, network of expertise for research, teaching, and technical assistance that is responsive to the resource information needs of State resource agencies and host universities participating in the CRU program.
- Science capabilities that are responsive to the resource management information needs of bureaus in the Department of the Interior and provide Department bureaus with access to these capabilities.

- Science programs in the USGS that are enhanced and supported through partnership building and outreach to the natural resource management community.

This program addresses the Department of the Interior's Resource Protection strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment, by providing natural resource managers scientific information and trained personnel to inform management decisionmaking. Under Resource Protection, the USGS tracks outputs including the number of systematic analyses and investigations delivered to customers, and the number of workshops and training courses with USGS sponsorship or participation to transfer results to customers and partners.

In 2012, under the end outcome goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment, the CRU program expects to deliver to its customers about 205 systematic analyses and investigations and 15 formal workshops and training.

The CRU program is comprised of 40 Cooperative Research Units located at universities in 38 States, with a headquarters office in Reston, VA. The program is designed to leverage cooperative partnerships with Federal and State agencies to address mutual needs of all partners in a cost effective manner, by stationing Federal scientists at universities to: (1) help identify and respond to natural resource information needs through the pooling of resources among agencies; (2) participate in the advanced scientific training of university graduate students; and (3) provide Federal and other natural resource managers access to university expertise and facilities through geographically dispersed science organization of the CRUs. Federal support of the CRU is multiplied by State and university cooperator contributions of expertise, equipment, facilities, and project funding, thereby enhancing the program's cost-effectiveness. Through university affiliations, CRU scientists train future natural resource professionals and provide opportunities through graduate education to diversify the Federal workforce.

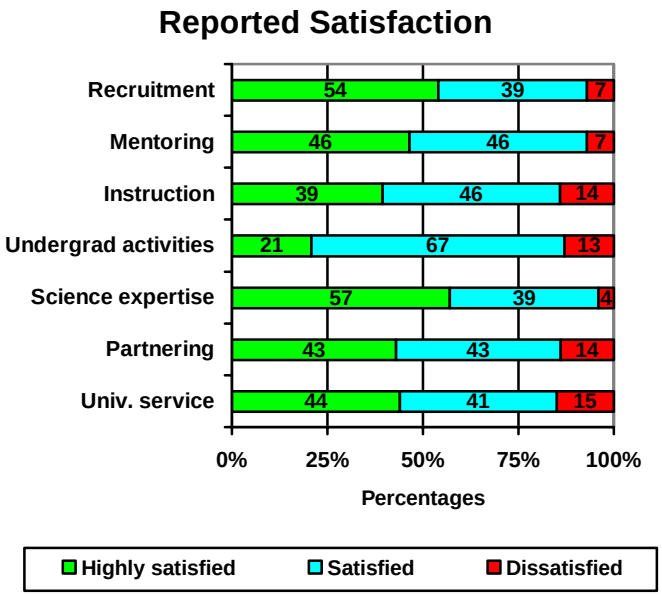
Each CRU is directed by a Coordinating Committee of Federal, State, university, and non-government representatives. Each Coordinating Committee establishes the goals and expectations for its Unit within the program's mission of research, education, and technical assistance. The mix of priorities is established locally and is updated annually based on the needs of the cooperators and the available funding from cooperators and program partners, including Interior bureaus. Program accountability measures, performance standards, and oversight of Federal scientists are used to ensure that research and the resulting scientific information products support the goals of the USGS as well as key Department of the Interior natural resource management bureaus.

The CRU program will continue to adapt its research, education, and assistance efforts to the realities of limited staffing. The combination of existing vacancies, natural attrition, and new vacancies to be created through planned management actions will leave the program with approximately 24 or more research scientist vacancies at the start of 2009, which represents nearly one-quarter of the CRU scientist workforce. However, university and State agency contributions to the program remain strong, as does Federal, State, and local government reimbursable funding for research and technical assistance. The program's appropriated dollars continue to be matched by State, university, and Federal partners, and other entities' contributions at a ratio of approximately three matching dollars to each appropriated dollar.

Given its broad geographic and scientific reach, the CRU program is uniquely positioned to support the Department of the Interior's strategic goal of linking science to decision-making through adaptive management. Program scientists provide ongoing consultative and technical services to its Cooperators and partners, with special emphasis on key elements identified in the Department's Adaptive Management Technical Guide (2007). These services include conducting primary research on intensively managed high priority species and populations, developing structured decision support models to minimize uncertainty in decision-making, and establishing new pathways for communications with partners. CRU scientists are directly involved in a variety of joint ventures involving research and management of natural resources (e.g., Lower Mississippi Valley Joint Venture Forest Resource Conservation Working Group (2007)). The use of science to improve the efficiency of decision-making to achieve measurable results is a hallmark of the adaptive management framework. The CRU program will continue to provide leadership to achieve the Secretary's vision for adaptive management in the Department of the Interior.

Use of Cost and Performance Information

In 2006, the Cooperative Research Units program instituted a program of customer surveys to support performance activities. In 2007, University Cooperators were surveyed regarding the contribution of Cooperative Research Unit scientists to each department's graduate education, training, and mentoring efforts. Overall survey data showed that as a whole, University cooperators were strongly satisfied with the Cooperative Research Units association and activities within their departments (see figure below). University cooperators also confirmed the important role the Units play in recruiting high quality graduate students, and the value-added Unit scientists bring to the graduate curriculum.



As part of the survey results, the program identified an opportunity to expand Units' efforts in developing undergraduate education and training opportunities. In 2007, the Cooperative Research Units program developed new guidance for Research Work Orders to enhance educational and training opportunities for undergraduates involved with federal research projects conducted at Units. The new guidance will provide for expanded opportunities for undergraduate technicians and assistants to engage more extensively with graduate students and postdoctoral researchers in learning key elements of the conduct of research and communicating results to partners.

The following table lists CRUs by State:

Cooperative Research Unit Locations

Alabama	Auburn University
Alaska	University of Alaska
Arizona	University of Arizona
Arkansas	University of Arkansas, Fayetteville
California	Humboldt State University
Colorado	Colorado State University
Florida	University of Florida
Georgia	University of Georgia
Hawaii	University of Hawaii
Idaho	University of Idaho
Iowa	Iowa State University
Kansas	Kansas State University
Louisiana	Louisiana State University
Maine	University of Maine
Maryland	University of Maryland, Eastern Shore
Massachusetts	University of Massachusetts
Minnesota	University of Minnesota
Mississippi	Mississippi State University
Missouri	University of Missouri
Montana	Montana State University (Fish Unit) University of Montana (Wildlife Unit)
Nebraska	University of Nebraska, Lincoln
New Mexico	New Mexico State University
New York	Cornell University
North Carolina	North Carolina University
Oklahoma	Okalahoma State University
Oregon	Oregon State University
Pennsylvania	Pennsylvania State University
South Carolina	Clemson University
South Dakota	South Dakota State University
Tennessee	Tennessee Tech University
Texas	Texas Tech University
Utah	Utah State University
Vermont	University of Vermont
Virginia	Virginia Polytechnic University
Washington	University of Washington
West Virginia	West Virginia University
Wisconsin	University of Wisconsin, Stevens Point (Fish Unit) University of Wisconsin, Madison (Wildlife Unit)
Wyoming	University of Wyoming

2009 Program Performance

The 2009 budget request for the CRUs subactivity is $15,410,000 and 133 FTE, a net program change of -$1,039,000 and -8 FTE from the 2008 Enacted level.

The CRU program will remain highly productive in science, education, and outreach, through the network of State, university, and Federal cooperators and partners associated with the CRUs. In 2009, under the end outcome goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment, the program expects to deliver to its customers about 195 systematic analyses and investigations and 10 formal workshops and training courses. Additionally, it expects to provide ongoing training for over 500 students, graduating about 90 students with advanced degrees in fish and wildlife conservation and natural resources science. The program will continue to sponsor undergraduate and graduate education programs for minorities that are underrepresented in the Federal workforce.

The CRU program will maintain a strong record of research services to State and Federal natural resource agencies. For 2007, over 1,000 research projects remained active representing a mix of research support to federal and state partners. This level of activity was slightly lower in than in previous years, because of reduced staffing levels. CRU scientists, affiliates, and students are expected to publish fewer papers and technical reports, provide a smaller number of workshops, and initiate 5-10 percent fewer new studies in 2009 relative to 2007 numbers.

In 2009, the CRUs will tap its existing scientific capacity to continue to lead in climate change research. The CRUs will play an explicit role in supporting the Department of the Interior's management bureaus in forecasting effects of climate change on trust species, such as migratory birds and threatened and endangered fish and wildlife. In 2008, CRU scientists worked with US Fish and Wildlife Service managers to evaluate effects of climate change on the National Wildlife Refuge System, and evaluate options for management adaptations. Climate change research and support will continue to be a program focus in 2009, as the Department of the Interior bureaus are confronted with interpreting complex information arising from multiple sources.

In 2009, the program will continue to provide leadership to achieve the Secretary's vision for adaptive management in the Department of the Interior. The program will provide technical support for the formalization of university-based training and educational programs in structured decision making and adaptive management as opportunities arise. CRU scientists across the country will continue to provide the key scientific interpretive services to management partners as they formulate realistic management options. Program scientists also will meet the demand for improved decision support by conducting new and innovative statistical and modeling research and developing decision analysis tools with higher resolution and greater capacity for predicting the impacts of management actions.

In 2007, the program made progress on several key elements of its Five Year Strategic Plan. These include finalizing a Graduate Student Safety and Orientation Manual in 2008, and making continued progress on providing project information on line through the program's web site. In 2009, the program will continue to conduct formal satisfaction surveys of research sponsors that were initiated in 2006, and continue to use these surveys to identify opportunities for

improvement in service to cooperators. Quarterly surveys show high satisfaction (>95%) with product quality, timeliness of delivery, and partner use of products in management decision making.

Education remains a key part of the program's mission. To date, a combined total of more than 7,000 MS and PhD degrees in the sciences have been awarded through the program. A draft report titled "Higher Education: Federal Science Technology, Engineering, and Mathematics Programs and Related Trends, GAO-05-887" reported significant reductions in MS (14 percent) and PhD (30 percent) students enrolled nationwide in biological and agricultural sciences when comparing the 1995-96 versus the 2003-2004 academic years. The number of CRU-enrolled MS and PhD students compared favorably to national trends in student numbers (CRU trends are 4.6 times better for MS students and 6 times better for PhD students) in advanced biological and agricultural training. Ninety-seven percent of the program's cooperators and partners viewed the students graduating from the program as either very competitive or competitive for positions within their agency, indicating the high value being placed on the graduates of the program. This high valuation of program students matches student placement data upon graduation. In 2009, graduate education and training will remain a key program focus.

The Cooperative Research Units addresses the Department of the Interior Resource Protection strategic goal of improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment and by providing the science information that resource managers need. The following table highlights important performance measures for the Cooperative Research Units:

Program Performance Overview									
End Outcome Goal 1.4: Resource Protection: Improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment									
End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 President's Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
Intermediate Outcome Measures and Bureau and PART Outcome Measures									
# of students complete degree requirements for MS, PhD, and post doctoral program under the direction and mentorship of Unit Scientists **(CRU) (BUR)**	106	100	103	95	95	90	90	0	90
Comments									
X% of CRU students that work on subsequent fish and wildlife science advance degrees or obtain employment in the fish and wildlife or other natural resources field, within targeted dates post-graduation **(CRU) (BUR)**	UNK	UNK	95%	95%	95%	95%	95%	0	95%
Comments	The 2012 target assumes full staffing for Cooperative Research Units; current staffing is 82 percent								
% of studies validated through appropriate peer review or independent review **(SP)**	100%	100%	100%	100%	100%	100%	100%	0	100%
PART Efficiency and Other Output Measures									
# of systematic analyses & investigations delivered to customers **(CRUs)**	293	236	517	225	249	205	195	-10	205
Comments	Proposed decrease in 2009 results in -10 systematic analyses and investigations delivered to customers. Funds appropriated to the Cooperative Research Unit program are used to staff, support, and manage USGS participation. In 2007, 96% of program dollars were allocated to staff salaries and benefits, a percentage well above the historical range of 89-91%. This percentage increase for salaries and benefits has occurred during a time when the number of funded science positions has decreased by 22 (18%) since 2002. Increased personnel costs led to a reduction in program support for Unit operations and Cooperator services in 2007. For example, long-standing support of diversity projects at the University of Arizona and at the University of Arkansas at Pine Bluff are now at minimum levels, and new diversity projects that were planned for 2006, 2007, and 2008 have been postponed. In addition to this, anticipated attrition and unfilled vacancies for Cooperative Research Units will reduce the number of systematic analyses delivered in 2008 by 44 from the 2007 actual and in 2009 by 10 from the 2008 enacted.								

Program Performance Overview

End Outcome Goal 1.4: Resource Protection: Improving the understanding of national ecosystems and resources through integrated interdisciplinary assessment

End Outcome Goal End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
# of formal workshops or training provided to customers (instances/issues/events)	21	25	41	15	25	13	10	-3	15
Comments	Proposed decrease in 2009 results in -3 workshops and training.								

Enterprise Information

Subactivity	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-)[a/]	2009 Program Changes (+/-)[b/]	2009 Budget Request	Change From 2008 (+/-)
Enterprise Information Security and Technology ($000)	26,061	24,514	+662	-145	25,031	+517
FTE	*100*	*90*	0	0	*90*	*0*
Enterprise Information Resources ($000)	17,030	16,775	+703	-50	17,428	+653
FTE	*127*	*124*	0	0	*124*	*0*
National Geospatial Program ($000)	68,691	69,082	+734	-154	69,662	+580
FTE	*296*	*251*	*0*	*0*	*251*	*0*
Total Requirements ($000)	**111,782**	**110,371**	**+2,099**	**-349**	**112,121**	**+1,750**
Total FTE	***523***	***465***	***0***	***0***	***465***	***0***

a/ Fixed cost increases for this activity total $576, of which $263 will be budgeted and $313 will be absorbed. A technical adjustment is proposed that moves funding for various Working Capital Fund items from or to Science Support from EI.

b/ Changes for this activity include a reduction of -$349 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Activity Summary

The 2009 budget request for the Enterprise Information Activity is $112,121,000 and 465 FTE, which is a net program change of -$349,000 and 0 FTE from the 2008 Enacted level. Additional information on program changes is provided in each subactivity of this document.

The Enterprise Information (EI) Activity serves as the focal point for the bureau's geospatial and information-related resources and activities; information technology infrastructures (networks, hardware and software); information and communications policies and standards; and information services (such as libraries, information centers, and the USGS presence on the Internet). A robust information architecture and comprehensive information security are key components of the integrated information environment. Diverse and distributed USGS databases, geospatial data assets, and information are accessed and used seamlessly by scientists, collaborators, customers, and the public to address complex natural science issues. The EI Activity strengthens scientific inquiry within USGS and the broader natural science community by having a more streamlined path to get relevant USGS information in all forms and enhanced access to services that deliver science information that can easily be understood, shared, and applied.

Use of Cost and Performance Information

Taxpayer Dollars Leveraged More Than Twofold by Partnering — The USGS saved Federal taxpayers over $18.0 million in 2007 by coordinating its purchase of high resolution imagery with 46 other government agencies. Instead of paying full price ($24.0 million) for high-resolution imagery over selected urban areas, USGS pooled its resources with others to jointly purchase the data for $5.8 million, enabling a 76 percent discount at USGS and similar savings at other agencies.

The EI Activity is responsible for planning and monitoring the bureau's investment in geospatial information and IT, information security and management, information policy and standards, and information science. The duties, functions, and responsibilities of a Chief Information Officer are fulfilled in USGS by the Geospatial Information Officer (GIO), who also serves administratively

as the Associate Director for Geospatial Information. The GIO is responsible for overall policy direction, management, and oversight of geospatial information, database, and coordination; computing systems acquisition, development, and integration; IT capital planning and investment management; information security; human capital for managing information resources; E-Government initiatives and innovation; strategic planning for information resources; enterprise architecture and advancing the Federal Enterprise Architecture (FEA); records management; privacy; and information collection, dissemination, access, and delivery. This suite of responsibilities is consistent with those of other Federal government agencies and leading private-sector entities in its comprehensive approach to information assets and is in accord with recommendations of the Government Accountability Office (GAO).

Geospatial Data Leadership — Through its National Geospatial Program, USGS provides national-level leadership for a comprehensive and integrated suite of geospatial data and technology activities. These include the development and operation of *The National Map* and the Geospatial One-Stop web portal, coordination and management for the Federal Geographic Data Committee and the National Spatial Data Infrastructure, and technical leadership for OMB's Federal Geospatial Line of Business. Joining USGS IT and geospatial assets into a single management portfolio led by the GIO has reaped several benefits: (1) It positions USGS as a national geospatial leader and knowledge broker in the National Spatial Data Infrastructure (NSDI); (2) New regional geospatial information offices have enabled a stronger customer-based focus; (3) Geospatial IT activities are better coordinated across a greater range of projects and expertise (such as development of the Geospatial Modernization Blueprint along with the geospatial profile document for FEA; and (4) Opportunities for geospatial data partnering with State and local agencies have been expanded by adding IT specialists in the local offices, enabling and supporting closer ties to State-based geographic information councils and leveraging and aligning Federal strategies, plans, and resources with comparable State resources. Effective stewardship of these USGS information assets has enabled citizens, agencies, and partners to tap reliable, timely, one-touch geographic display and access to a wealth of science knowledge, information, and data.

Integrated Information Environment — The GIO is responsible for leading a USGS-wide effort to develop a fully integrated science data environment that will improve the accessibility of science data and information within USGS, across Department, and with scientific partners and customers in other Federal agencies and the public. Development of the necessary infrastructure, tools, standards, and processes will enable customers to search across all USGS science data and information assets by topic, place, and time to find science data and information relevant to their needs. Development of this integrated science information environment will directly support achievement of the long-term science objectives outlined in the USGS Science Strategy.

EI Activity Support for Department Working Capital Funds — Each year the Department invests millions of dollars on enterprise IT initiatives that aim to improve network security and privacy and reduce costs. These initiatives are funded by a process in which Department collects bureau appropriated funds through centralized and directly billed accounts to manage enterprise-wide activities at the Department level. The following table shows USGS appropriated funds sent to Department Working Capital Fund accounts to manage enterprise IT operations on behalf of USGS:

(Dollars in Thousands)

Department WCF Acct.	2007 actual	2008 est.	2009 est. w/ Tech Adjust.
USGS Centralized Bill	6,407	5,961	8,114
USGS Direct Bill	6,173	4,888	4,977
Total	**12,580**	**10,849**	**13,091**

Technical Adjustment — A cost-neutral technical adjustment is proposed to move $2,313,800 for IT-related Department working capital fund centralized costs from Science Support to Enterprise Information and to move $478,100 for other Department WCF costs that are no longer linked to the EI Activity to Science Support. Refer to the discussion on page E-33 for details.

Program Assessment Rating Tool (PART) Evaluation

The Enterprise Information program has not undergone a PART review as a subactivity. However, as part of the Geography program in 2004, the National Geospatial Program was evaluated and received an "effective" rating when assessed with the Administrations Program Assessment and Rating Tool.

Workforce Planning

The EI Activity is undergoing extensive workforce re-engineering and analysis to identify and support future needs. It has conducted skills assessments and will continue to evaluate employee skills for geospatial data production and information management and technology. Voluntary Separation Incentive Payments, Voluntary Early Retirement Authority (VSIP/VERA) and competitive sourcing under OMB Circular A–76 guidelines are tools being used to implement these future needs.

Following the 2004 USGS mapping workforce restructure and decision to bring *The National Map* into the Enterprise Information Activity, USGS has embarked on further steps toward organizational transformation. Because mapping technology has significantly changed, a large, field-based operation is no longer cost effective for USGS to maintain. In 2005, the bureau created the National Geospatial Technical Operations Center (NGTOC), a single organization having a national capability and the opportunity to consolidate its mapping centers (Reston, VA; Rolla, MO; Lakewood, CO; and Menlo Park, CA). In June 2007, USGS concluded an A-76 competitive sourcing study, in which the bureau combined its mapping facilities from four to two sites. The A-76 study coupled with buyouts and early-outs enabled USGS to downsize its geospatial data production staff from 400 to less than 190 government positions to align with the strategic direction for future workforce balancing. In 2009, USGS will operate NGTOC from two sites – Rolla, MO and Lakewood, CO. The NGTOC supports all map production activities and technical services associated with NGP. The USGS has gained needed functional and salary flexibilities in the near term to position the workforce for the next 5-7 years.

From 2004 to 2007, USGS used the High Performing Organization model to significantly restructure its science publishing workforce and business processes into a regionally-based Enterprise Publishing Network (EPN). The Publications staff was reduced from 254 employees in 2004 down to 130 in 2007. The restructure achieved a unified bureau approach to publishing, streamlined the publishing technical and business functions to improve operational efficiencies

accompanied by reducing staff, and reduced the number of operating locations. To help ensure compliance with USGS Fundamental Science Practices, web-accessed databases have been developed to track information products as they move through the publication process. Groundwork has been laid to establish an enterprise publishing customer advisory group of scientists and managers. This has been accomplished while maintaining the competitive function and high quality of the scientific publications of USGS. The EPN helps ensure that the results of USGS science accurately and effectively reach those who need them. Science published is science known – getting USGS science into the hands of users is how our science lives beyond our organization, benefits society, and brings value to the public as a return on their investment of tax dollars.

Subactivity Overview

The Enterprise Information Activity comprises three subactivities:

Enterprise Information Security and Technology supports USGS information security and technology efforts. The information security component ensures compliance with all Federal information technology mandates and is responsible for the electronic security of and access to all USGS data and information assets. The telecommunications and computing infrastructure components support enterprise services network, directory services, technical support, enterprise architecture, email, and e-authentication. The bureau is proposing to shift the reimbursable-funded IT capital asset planning and investment control activities (CPIC) from Enterprise Information Resources into Enterprise Information Security and Technology's computing infrastructure component, to organizationally align with Enterprise Architecture activities.

Enterprise Information Resources guides and manages bureau-level systems and activities in information policy, information integration and delivery, and science education. The information integration and delivery component provides direction, coordination, and strategic planning of scientific data integration and management relating to Web-Internet services, science publishing, libraries, information centers, and enterprise-level coordination of educational activities and geographic information systems. The information resource management component supports compliance with statutory mandates and regulations for records archiving and management, privacy, Freedom of Information Act (FOIA), Section 508 of the Rehabilitation Act, E-Government Act, and OMB's Data Quality Guidelines and Peer Review Requirements. The information technology capital asset planning activities (such as CPIC), which are funded solely through bureau reimbursable customers, are proposed to be transferred from Enterprise Information Resources to Enterprise Information Security and Technology's computing infrastructure component. This adjustment aligns information technology asset planning into the correct budget component.

National Geospatial Program (NGP) coordinates and provides leadership in geospatial activities that ensure the development, maintenance, and availability of geospatial data and related geographic knowledge in support of *The National Map*, development and operation of Geospatial OneStop web portal, coordination and management for the FGDC and NSDI, and technical leadership for OMB's Federal Geospatial Line of Business. It also supports emergency response activities and products needed by local, State, and Federal emergency responders including the homeland security, homeland defense, law enforcement, and intelligence communities. NGP also conducts prospectus-based geographic information science research projects as part of the Center of Excellence for GIScience (CEGIS). Through

partnerships, NGP collaborates with a vast array of public sector partners throughout the country to leverage geospatial data investments to reduce duplication of effort and minimize expenditures.

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Activity: Enterprise Information

Subactivity: Enterprise Information Security and Technology

	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-)[a/]	2009 Program Changes (+/-)[b/]	2009 Budget Request	Change from 2008 (+/-)
Enterprise Information Security and Technology ($000)	26,061	24,514	+662	-145	25,031	+517
Total FTE	*100*	*90*	*0*	*0*	*90*	*0*

a/ Fixed cost increases for this activity total -$817, of which -$887 will be budgeted and $70 will be absorbed. A technical adjustment of +$1,549 is proposed that moves funding for various Working Capital Fund items from or to Science Support form EI.

b/ Changes for this activity include a reduction of -$145 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Summary of 2009 Program Changes for Enterprise Information Security and Technology

Request Component	($000)	FTE
Travel reduction	-145	0
TOTAL Program Changes	**-145**	**0**

Justification of 2009 Program Changes

The 2009 budget request for the Enterprise Information Security and Technology program is $25,031,000 and 90 FTE, a net program change of +$145,000 and 0 FTE from the 2008 Enacted level.

Program Performance Change

No current Enterprise Information GPRA metrics are impacted by the proposed program change.

Program Overview

This program addresses the Department of the Interior's strategic goal Management Excellence through Modernization. This goal is furthered by USGS achievements in:

- Increasing efficiency, consistency, and integration of Information Technology (IT) infrastructure and operations across the bureau,
- Facilitating greater oversight, accountability, transparency, and performance measurement relating to the management of the bureau's information investments,

- Enhancing data sharing and integration across USGS science disciplines and programs through greater reliance on common IT infrastructure and support services, and
- Increasing USGS's ability to respond quickly and comprehensively to new government-wide information directives and mandates (e.g., for information security).

The Enterprise Information Security and Technology (EIS&T) subactivity supports the USGS information security and technology efforts. The Information Security component ensures compliance with all Federal IT mandates and is responsible for the electronic security of and access to all USGS data and information assets. Components Telecommunications and Computing Infrastructure support directory services, technical support, enterprise architecture, email, e-authentication (smartcards), and the Department's Enterprise Services Network (ESN).

2009 Program Performance

The 2009 budget request for the Enterprise Information Security and Technology is $25,031,000 and 90 FTE.

Information Security
(Estimates for FY 2007, $6.4 million; FY 2008, $6.1 million; FY 2009, $6.1 million)

The Information Security component ensures compliance with all Federal IT mandates and regulatory requirements. Staff in this area are responsible for the electronic security of and access to all USGS data and information assets and see to the care and feeding of the USGS IT Security Program, including compliance with the Federal Information Security Management Act (FISMA) and other Federal laws directing IT security. It is responsible for IT security policy, compliance, and operations to ensure the confidentiality, integrity, and availability of USGS data and information assets.

The USGS IT Security Program is working to implement IT security through policy enforcement and implementation of technical controls. While there are several critical issues facing the USGS IT community, ensuring that USGS networks and systems are secure and protected from malicious attacks is a top priority. Two additional areas of emphasis are (1) a renewed focus on streamlining and maintaining certification and accreditation of critical information systems and (2) strengthening IT security operations.

A centralized approach to IT security management and operations is vital to enabling efficiencies and providing a robust security posture. By acquiring, managing, and overseeing evolving IT security technologies and procedures, the return on investment is high; however, escalating costs and operational difficulties in a dispersed IT environment such as that of USGS pose significant challenges. As a baseline for the IT security, the USGS will continue to maintain compliance with FISMA and other mandates for establishing and keeping the USGS's IT infrastructure secure and protected from inside and outside threats.

For the past several years, the USGS IT Security Steering Committee (ITSSC) has served as the central point for IT security activities. By overseeing policy review and development, the ITSSC has worked to ensure policies are consistently applied across the USGS IT environment. The ITSSC also makes certain that IT security mandates are applied in a manner to maintain a balance between IT security requirements and the technology needs of USGS science activities.

IT Security Certification and Accreditation — In 2009, certification and accreditation (C&A) activities, including system security plans and risk assessments, will be integrated into operations throughout USGS. Processes and procedures will be established that refine and simplify the National Institute of Standards and Technology (NIST) Special Publication 800-53, *Recommended Security Controls for Federal Information Systems*, security controls, including a plan for collapsing into fewer assets, and developing and applying new technologies and training methods to effectively lead and guide USGS system administrators and field managers throughout the C&A process. The long-term initiative will also include recommendations for eliminating deficiencies in the 800-53 controls. A team will review mission and science systems that have unique security needs and determine methods to effectively isolate these from other USGS systems, and document and accept the risks as appropriate. Security controls outlined in NIST SP 800-53, will be implemented. The C&A status of major systems will be maintained.

IT Security Operations — In 2009, USGS will continue to expand operational capability to identify and proactively address IT risks and threats through technical controls. Each Security Point of Contact will receive specialized training on the technical solution deployed for tracking and correcting IT system vulnerabilities. The Enterprise Symantec Anti Virus infrastructure will be upgraded to version 11 of the desktop client, providing additional protection against malware and spyware.

Security Technical Implementation Guides — In 2009, an enterprise technical solution and standard operating procedures for applying and tracking compliance with required Security Technical Implementation Guides (STIG) will be developed and implemented. STIG's are a critical component of operational IT security and will be implemented for IT systems and platforms based on categories in OMB policies.

Telecommunications

(Estimates for 2007, $11.0 million; FY 2008, $10.5 million; FY 2009, $9.5 million)

Enterprise Services Network — The Department's ESN consolidates data telecommunications networks into one integrated system for all Department bureaus. In 2009, USGS will continue its conversion to the eRemote Access Services (eRAS) with plans to complete the conversion for all remote users. By the end of 2009, all telecommuting travelers should be transitioned to the Department's eRAS. In parallel to this conversion, the USGS-provisioned remote access services will be dismantled. With the completion of the eRAS migration, all major milestones for using ESN will have been completed.

"Networx" Planning and Conversion — The replacement contract for the existing telecommunications services in the FTS2001 program is called "Networx." This new General Services Administration initiative is the largest IT contract awarded in history – over $30 billion in the 10-year contract life. There were two overall awards under Networx, one called "Universal" (awarded March 2007; it has three telecommunications carriers) and the other called "Enterprise" (awarded May 2007; it has five telecommunications carriers). The basic difference between these contracts is the need for Universal to serve far more sites than Enterprise and support legacy FTS2001 services. For USGS, the transition from FTS2001 to Networx will take at least 18 months with the actual deployment of new services not expected until sometime during 2009. The majority of USGS deployment will commence in early 2009 with plans for complete conversion to Networx in 2010. There will be concurrent costs during the Networx conversion and most of these costs should occur in 2009.

Voice Over IP — Since 2005, USGS has followed an informal program of replacing aging field phone systems (so-called, Private Branch eXchanges or PBX's) with Voice Over IP (VOIP) systems. The VOIP systems have the capability of integrating data and voice data on the same physical infrastructure. The VOIP systems require a robust Local Area Network as the new phone systems are acquired; the LAN's are enhanced with modern switches and new cabling to support VOIP systems. Long term, this approach lowers recurring operational costs while offering the newer telephony services to the customers. By early 2008, seven field locations had successfully implemented VOIP. In 2009, along with the continued field site VOIP replacements, USGS will institute an enterprise approach to PBX acquisition, management and support. This "ePBX" will regionalize phone system support and move USGS to a common PBX architecture and simplified management, and should ultimately lower voice and data costs.

Computing Infrastructure

(Estimates for FY 2007, $11.0 million; FY 2008, $10.5 million, FY 2009, $9.5 million)

IT Service Desk — The USGS IT Service Desk System serves as a single point of contact for all IT support to an expanding customer base. The continuing consolidation of USGS help desk functions provides improvements and efficiencies in response time, problem resolution, and quality of technical support, while also relieving individual offices from having to perform these functions independently. Efficiencies and savings are gained through increasing incident resolution during the initial call and by proactive support through on-line self-help tools and a searchable knowledge management system. The system, built upon specialized hardware and software (i.e., for call tracking, automated call distribution, knowledge management, and configuration management), consists of IT support personnel from across USGS who are formally linked together through organizational and matrix relationships to provide more consistent IT customer service. At the heart of this system is the IT Service Desk located in Denver, which provides a multi-channel (voice, email, web), single point of contact for all IT customer support. The service desk has primary responsibility for incident resolution, service request tracking, and customer satisfaction.

In 2009, USGS will continue to expand the IT Service Desk System to provide support for more IT services and will increase its capacity to support additional USGS offices. In addition, web-based support tools and Knowledge Centered Support (a best practices concept process endorsed by the Help Desk Institute) processes will be further refined to provide more consistent and effective customer support.

IT Infrastructure Developments with Department — USGS will work in partnership with the Department and its sister bureaus to plan, refine, and implement enterprise IT systems, services, and processes that are customer-focused, mission-oriented, and cost-effective. In 2009, USGS will actively participate with the Department on three projects:

- Department IT Roadmap, a portfolio of high priority, tactical IT projects,
- Department IT Modernization Blueprint, a strategic plan for providing effective and efficient IT services on an enterprise scale, and
- IT Infrastructure Line of Business (ITILoB), a government-wide initiative to improve delivery of standard IT services throughout the Federal Government.

E-Authentication — E-Authentication (logical access to IT systems) is one of three components of the Homeland Security Presidential Directive 12 (the others are access to Federal buildings and personal identification). In 2009, USGS will continue implementation of

single sign-on capabilities using smartcards for digital signatures and encryption. All publicly facing web-based applications requiring authentication of end users will have an updated E-Risk Assessment completed to determine the required Level of Authentication for achieving compliance with the federal E-Authentication Initiative.

Enterprise Architecture — In 2009, the USGS Enterprise Architecture project will be funded by the Enterprise Information Resources subactivity of the Enterprise Information Program. This change places the USGS Enterprise Architecture Program in better alignment with other USGS IRM activities.

Capital Asset Planning and Investment Control (CPIC) — In 2009, USGS proposes to align the reimbursable-funded capital asset planning activities with those of Enterprise Architecture, to improve the coordination and monitoring activities. The USGS continues to mature its CPIC processes and procedures for planning and managing IT projects based on the GAO IT Investment Management maturity model. These processes comply with the Clinger-Cohen Act of 1996 and OMB Circulars A–11 and A–130. The USGS Associate Director for Geospatial Information is responsible for developing Bureau-wide policies and procedures to continue to mature the CPIC process toward full compliance. The CPIC project ensures that the USGS IRB follows established processes for the selection of major IT investments (defined as costing more than $5 million per year or otherwise having far reaching program or policy significance), and for the control and evaluation phases, which include a regular cost, schedule, and performance review of all major IT projects and annual reviews of all non-major projects. Approved major IT investment business cases and approved non-major IT investments are critical documents for preparing the OMB Exhibit 53.

Program Performance Overview

The Enterprise Information and Security Technology Subactivity addresses the Department's strategic plan for Management Excellence:advance modernization/integration.

The following table highlights important performance measures for the Enterprise Information and Security Technology Subactivity. Since the program change only affects a small portion of the program and performance, cost data derived would not provide any analytical benefit.

End Outcome Goal 5.2 Management Excellence: Advance Modernization/Integration										
End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**Type**	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
End Outcome Measures										
Percent of systems and lines of business/functional areas associated with an approved blueprint that are managed consistent with that blueprint **(SP)**	F	UNK	UNK	UNK	UNK	UNK	Baseline	TBD	-	TBD
Percent of IT systems that have Certification and Accreditation (C&A) and are maintaining C&A status **(SP) (EIS&T)**	A	UNK	UNK	100%	100%	100%	100%	100%	0	100%
Intermediate Outcome Measures and Bureau and PART Outcome Measures E-Government and Information Technology Management										
Efficient IT Management: Score achieved on the OMB Enterprise Architecture Framework **(SP) (EIS&T)**	A	UNK	UNK	Level 3	Level 4	Level 4 – complete Level 3 – Use and Results	Level 4	Level 4	0	Level 5
Efficient IT Management: Stage achieved on the GAO IT Investment Management Framework **(SP) (EIS&T)**	F	UNK	UNK	63% stage 3	70% stage 3	74% stage 3	100% stage 3	100% stage 3	0	State 4 & 5 targets to be set by Department
Efficient IT Management: Score achieved on the NIST Federal IT Security Assessment Framework **(SP) (EIS&T)**	F	UNK	UNK	3.37	3.5	3.82	4.5	4.5	0	4.5

End Outcome Goal 5.2 Management Excellence: Advance Modernization/Integration										
End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**Type**	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
IT Investment Management Annual % of USGS IT investments reviewed, approved, and monitored through the CPIC process. **(BUR) (EIS&T)**	F	UNK	UNK	100%	100%	100%	100%	100%	0	100%
% of customers satisfied with service from USGS IT Service Desk **(BUR) (EIS&T)**	F	UNK	UNK	94%	94%	95.9%	94%	94%	0	97%
% of identified USGS security incidents that receive corrective action within timeframes required by the Department Incident Response Policy **(BUR) (EIS&T)**	F	25%	50%	75%	100%	95%	100%	100%	0	100%

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Activity: Enterprise Information

Subactivity: Enterprise Information Resources

	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-)[a/]	2009 Program Changes (+/-)[b/]	2009 Budget Request	Change From 2008 (+/-)
Enterprise Information Resources ($000)	17,030	16,775	+703	-50	17,428	+653
Total FTE	*127*	*124*	*0*	*0*	*124*	*0*

a/ Fixed cost increases for this activity total $466, of which $416 will be budgeted and $50 will be absorbed. A technical adjustment of +$287 is proposed that moves funding for various Working Capital Fund items from or to Science Support form EI.

b/ Changes for this activity include a reduction of -$-50 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Summary of 2009 Program Changes for Enterprise Information Resources

Request Component	($000)	FTE
• Travel reduction	-50	0
TOTAL Program Changes	**-50**	**0**

Justification of 2009 Program Changes

The 2009 budget request for the Enterprise Information Resources program is $17,428,000 and 124 FTE, a net program change of +$50,000 and 0 FTE from the 2008 Enacted level

Program Performance Change

No current Enterprise Information GPRA metrics are impacted by the proposed program change.

Program Overview

The Enterprise Information Resources (EIR) Subactivity guides and manages bureau-level systems and activities in information policy, information integration and delivery, and science education. The Information Integration and Delivery component provides direction, coordination, and strategic planning of scientific data integration and management relating to Web-Internet services, science publishing, libraries, information centers, and enterprise-level coordination of educational activities and geographic information systems. The Information Resource Management component supports compliance with statutes and regulations for records archiving, information management, and privacy, and investment technology capital asset planning.

The USGS is increasing efficiency and effectiveness of its scientific information integration and dissemination services through the Natural Science Network of integrated information, science, and knowledge to ensure that the latest USGS science data are easily and quickly available to citizens, agencies, academia, and the private sector in accessible formats. The bureau is optimizing customers' ability to "find, get, and use" USGS information and products tailored to their specific requirements.

The USGS continues to mature its procedures and processes for Capital Planning and Investment Control (CPIC), following Government Accountability Office's IT Investment Management Maturity Model. The objectives are to maintain compliance with CPIC requirements from OMB and the Department of Interior, to ensure that the bureau's overall IT investment portfolio supports USGS and Interior strategic goals and priorities, and to ensure that the USGS Investment Review Board (IRB) follows established, repeatable processes for major IT investment selection, control, and evaluation.

2009 Program Performance

The 2009 budget request for the Enterprise Information Resources is $17,428,000 and 124 FTE.

Information Integration and Delivery
(Estimates for FY 2007, $13.6 million; FY 2008, $13.9 million, FY 2009, $14.3 million)

Information Integration and Delivery activities transform existing functions and services to reflect the changing nature of USGS science and science products; achieve efficiencies in the accessibility, delivery, and integration of USGS information through enterprise-level approaches; employ innovative and cost-effective technologies; and use future skills planning and partnerships for a flexible and balanced workforce.

Information Services, Library, and Product Distribution — The USGS Library system is the world's largest earth science library. The bureau's information offices (previously called the Earth Science Information Centers or ESIC's) and library system provide scientific and product information and technical assistance to a wide range of internal and external customers and to the natural science community as a whole. These offices use a variety of tools and capabilities to provide access to USGS science and identify sources of scientific information outside of the Survey. They are also a conduit for feedback between customers of USGS data and information and the USGS scientific and technical community. Significant emphasis is placed on increasing digital library capabilities, including electronic library subscriptions and new technologies that enhance flexibility and accessibility to research information. Product distribution activities allow both hardcopy and electronic access to USGS map and book products.

Enterprise Publishing — Accurate, efficient, and timely reporting of reliable science information are key factors enabling USGS to fulfill the role of a world leader in the natural sciences through scientific excellence and responsiveness to society's needs. Enterprise Publishing develops policies, business practices, and procedures to maintain the USGS reputation for quality and unbiased published science. This includes updated, bureau-wide standards for peer and policy review of all information products. It assists the 8,700 employees of the USGS with their publication needs, as well as the many partners, suppliers, and

consumers of USGS data and information products and services. The actual printing of USGS publications is contracted out. Enterprise Publishing coordinates and develops internal data systems, provides guidance for the national publishing services, provides training and support for cooperative publishing activities with other agencies, and maintains the USGS Publications Warehouse. Three regional centers coordinate production support at smaller publishing service centers across USGS, ensuring workload balancing and optimizing network efficiencies.

Science Quality — The USGS scientific reputation for excellence, reliability, integrity, and objectivity is one of the Bureau's most important assets. This reputation brings authority to data and findings, creates and protects long-term credibility, and ensures that the public trust is met. The Science Quality activities of the USGS ensure compliance with existing Department and OMB requirements for peer review and information quality and monitor internal policies, practices, and procedures related to these efforts.

Enterprise Web — The USGS Enterprise Web (EWeb) project manages the USGS web presence to ensure customer-focus and consistency with all Federal requirements and policy. Through a network of people and resources, EWeb provides Web services, tools, and best practices that make it easy for customers and partners to find, get, and use USGS science information and products quickly and efficiently. It provides a secure and reliable hosting platform, guidance, contract mechanisms, web manager training, and support for the high level *www.USGS.gov* website as well as other websites on a case-by-case basis. It provides leadership for the USGS Web Advisory Group and advocates cross-bureau governance and core enterprise services needed to improve data integration and interoperability and to address unmet and future web needs.

Education — The USGS is engaged in a variety of educational activities over a range of instructional levels, in both formal and informal settings. This is accomplished by coordinating student internships, conducting workshops and presentations at national science and science education meetings, coordinating national earth science events, maintaining and expanding the Bureau's principal educational web site, and responding to the science education requests of USGS partners in professional science societies. In response to a number of legislative initiatives, including: American Competitive Initiative, National Competitiveness Investment Act and the reauthorization of the Elementary and Secondary Act, USGS Education will continue working closely with other Federal science agencies to maintain national science preeminence and workforce requirements in science and technology.

Enterprise Geographic Information Systems and Enterprise Applications — The USGS will continue to lead the Department of the Interior in administrative and technical management of geospatial technologies. Bureau-wide training and technical support will continue to be provided. Guidance and administrative policy will be developed for working with external web services and internet based geospatial technologies. USGS will continue to work closely with DOI on Enterprise License Agreement (ELA) methods and asset management along with administering the new DOI-wide Environmental Systems Research Institute, Inc. (ESRI) ELA.

Information Resource Management

(Estimates for FY 2007, $3.0 million, FY 2008, $3.1 million, FY 2009, $3.1 million)

Information Resource Management activities focus on establishing, monitoring, and directing policy that enables the USGS to fulfill statutory and regulatory information resource requirements.

Complying with Federal Mandates — Effective bureau compliance with Federal information mandates is important for ensuring the security and reliability of USGS science information assets. Using a single bureau-level point of coordination and oversight, USGS has established a robust, integrated, comprehensive, and dynamic compliance program. As a result, a unified approach establishes policies and practices for adhering to all information-related Federal mandates, particularly in the areas of records management (Federal Records Act), privacy (Privacy Act and the E-Government Act), information collection (Paperwork Reduction Act), Section 508 (Rehabilitation Act), and information requests (Freedom of Information Act). Information Resource Management activities focus on working with the Department to developing a pilot electronic record management system, on continuing scientific data rescue efforts, and on full compliance with privacy mandates.

Performance Overview

The Enterprise Information Resources Subactivity addresses the Department's strategic plan for Management Excellence: advance modernization/integration.

The following table highlights important performance measures for the Enterprise Information Resources Subactivity. Since the program change only affects a small portion of the program and performance, cost data derived would not provide any analytical benefit.

End Outcome Goal: 5.2: Management Excellence: Advance Modernization/Integration									
End Outcome Measures Intermediate or PART Measures/PART Efficiency or Other Outcome Measures	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
Intermediate Outcome Measures and Bureau and PART Outcome Measures E-Government and Information Technology Management									
Implement Records Management Strategy: % of all bureaus and offices developing consistent records management policy **(SP) (EIR)**	UNK	UNK	UNK	UNK	100%	100%	100%	0	100%
% of earth science instructors in the U.S., K-16, using USGS educational materials **(BUR) (EIR)**	UNK	UNK	UNK	UNK	UNK	Baseline	TBD	TBD	TBD
Total USGS public web content managed by the enterprise web infrastructure **(BUR) (EIR)**	UNK	UNK	UNK	UNK	UNK	Baseline	TBD	TBD	TBD
Total # of internships and fellowships supported and/or facilitated by the USGS educational program **(BUR) (EIR)**	18	22	30	65	70	55	55	0	55
PART Efficiency and Other Output Measures									
# of new and legacy information products added to the USGS publications database **(BUR) (EIR)**	UNK	UNK	70,351	71,000	71,717	67,500	67,500	0	All legacy completed, and all new added annually.
# of online bibliographic records **(BUR) (EIR)**	4,196	3,872	6,381	6,381	4,992	6,381	6,381	0	80,000

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Activity: Enterprise Information

Subactivity: National Geospatial Program

	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-)[a/]	2009 Program Changes (+/-)[b/]	2009 Budget Request	Change From 2008 (+/-)
National Geospatial Program ($000)	68,691	69,082	+734	-154	69,662	+580
Total FTE	*296*	*251*	*0*	*0*	*251*	*0*

a/ Fixed cost increases for this activity total $927 of which $734 will be budgeted and $193 will be absorbed.
b/ Changes for this activity include a reduction of -$154 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Summary of 2009 Program Changes for the National Geospatial Program

Request Component	($000)	FTE
• Travel reduction	-154	0
TOTAL Program Changes	**-154**	**0**

Justification of 2009 Program Changes

The 2009 budget request for the National Geospatial Program is $69,662,000 and 251 FTE, a net program change of +$154,000 and 0 FTE from the 2008 Enacted level.

Program Performance Change

No current Enterprise Information GPRA metrics are impacted by the proposed program change.

Program Overview

The National Geospatial Program (NGP) is an integrated approach to national geospatial coordination and standards, data discovery and access, and consistent and current framework data. The role of promoting and promulgating consistent data and metadata standards and system interoperability is that of the Federal Geographic Data Committee (FGDC), charged with facilitating the building of a National Spatial Data Infrastructure (NSDI). *The National Map* presents current, accurate, and consistent geospatial data online that describe the landscape of America and locate features that can be integrated and displayed represents the starting point—the basic framework—from which land and resource decisions and economic and environmental policies can be made. The Geospatial One-Stop (GOS) web portal is part of the President's management objectives to provide

collective access to and discovery of geospatial data to meet the science, land, and resource management needs of the Nation. Decision makers at all levels of government, land and resource managers, emergency responders, homeland security personnel, scientists in a variety of disciplines, and citizens rely on this geospatial information. Scientific and land management information are enriched as well when overlaid on a base topographic map. Building of partnerships, geospatial data and information support for emergency situations, and the research provided through the Center of Excellence for Geographic Information Science (CEGIS) are essential aspects of NGP.

Long-Term Goal 1: (Leadership) Providing leadership and guidance for key stakeholders

- Develop policy,
- Provide incentives to potential partners,
- Develop key standards and data models,
- Coordinate and facilitate the governance structure for NSDI,
- Negotiate collaborative agreements with partners,
- Develop a national geospatial enterprise architecture, and
- Provide a forum for technology transfer, best practices, and program guidance.

Long-term Goal 2: (Operations) Implementing key components of NSDI

- Host spatial datasets, Web sites, knowledge base, and tools for discovery and access,
- Provide data integration and quality assurance of spatial data,
- Staff enterprise architecture, governance body, and spatial operations,
- Conduct and sponsor research for geospatial information science,
- Provide contract management for operations,
- Conduct training, education, and consultation,
- Adopt a posture of being the data producer of last resort and
- Make map products accessible.

2009 Program Performance

The 2009 budget request for the National Geospatial Program is $69,662,000 million and 251 FTE.

Geospatial Coordination
(Estimates for FY 2007, $9.6 million; FY 2008, $10.0 million; FY 2009, $10.0 million)

Geospatial Coordination provides an integrated approach to national geospatial coordination and standards, Department of the Interior and government-wide Line of Business development, Emergency Operations, and related activities. The FGDC is charged with facilitating the building of NSDI through promoting and promulgating consistent data/metadata standards and system interoperability. To more fully engage all public and private geospatial information providers and participants from the State to local levels, FGDC instituted the Fifty States program aimed at building 50 State Spatial Data Infrastructures. In an effort to engage the same communities at the national level, new governance mechanisms are being instituted resulting in the creation of the National Geospatial Advisory Committee (NGAC).
To encourage responsible decision making in emergency situations, USGS Emergency Operations supports government and industry land and resource managers, emergency responders, homeland security personnel, scientists in a variety of disciplines, and others in

many walks of life by making critical geospatial information readily available in the most critical situations. The building of partnerships for leveraging funds, data, and capabilities is yet another major aspect of the Geospatial Coordination suite of activities.

Geospatial Line of Business

The Geospatial Line of Business (GeoLoB) was initiated by the Office of Management and Budget (OMB) in 2006 as a project of the President's EGov management objectives. The goal of GeoLoB is to develop a more strategic, coordinated, and leveraged approach to producing, maintaining, and using geospatial data and services across the Federal government. The vision is to serve vital national interests and the core missions of Federal agencies and their partners through the effective and efficient provision of geospatial data and services. This initiative is managed by the Department, includes 26 partner agencies, and has three primary areas of focus:

- Governance — Establishing governance mechanisms that foster collaboration across the public sector,
- Planning and Investment — Developing coordinated government-wide planning and investment strategies that maximize return on the taxpayer's investment, and
- Optimization — Optimizing and standardizing geospatial data and services to promote sharing and achieve cost economies.

To achieve these goals, USGS will develop an operating environment within the Federal government in which participating organizations, stakeholders, partners, and individuals interact with and manage geospatial assets to support business-driven requirements. This will begin in 2009 and last till 2012.

In 2009, USGS will begin to implement the objectives and strategies laid out in the GeoLoB 2008 draft strategic plan, scheduled to be released in March 2008. In addition to the GeoLoB, EI will also accomplish the following tasks:

- Review guidance governing FGDC to determine recommended changes to organizational structure and membership, roles and responsibilities, stewardship life cycle operating procedures, standards development, and related activities,
- Evaluate and define the nine stages of the geospatial data life cycle and identify common capabilities to allow cost-benefit Return on Investment initiatives (ROI) for shared services,
- Define and establish geospatial data steward life cycle responsibilities and performance measures for OMB Circular A-16 Framework data themes and Nationally Significant Data Themes, and
- Expand smart-buy and alternative efforts for geospatial data and technologies and consider shared licenses for smaller agencies which could be managed by a designated agency.

Fifty States Initiative

One of the goals of USGS is to engage all levels of geospatial data and information providers and practitioners in the creation of NSDI. The task of involving all State, county, and community governments as well as academia, non-government organizations (NGO), and industry is enormous and well beyond the capability of FGDC as originally configured. As such the 50

States Initiative is designed to involve all States in the task by asking them to take the leadership in engaging all geospatial users and providers within their respective States in the endeavor.

The initiative seeks to develop and implement statewide strategic and business plans that will facilitate the coordination of programs, policies, technologies, and resources that enable the coordination, collection, documentation, discovery, distribution, exchange and maintenance of geospatial information in support of NSDI. The FGDC Secretariat works closely with the National States Geographic Information Council (NSGIC) to advance this initiative.

In 2009, additional awards will be made and the partnership with NSGIC will continue. A review of completed projects will be used to help guide the Initiative. Several States, especially larger States, have expressed a need for additional planning funds to have robust strategic and business plans. USGS will continue working with States to advance NSDI through strategic and business plans.

National Spatial Data Infrastructure Cooperative Agreements Project

Since 1994, the NSDI Cooperative Agreements Project (CAP) continues to play a substantial role in promoting and disseminating the tenets of NSDI to thousands of NSDI advocates and practitioners. Essentially the program develops incentives for agencies and organizations to participate. To date, NSDI CAP awards have created collaborations at all levels of government, developed an understanding of geospatial information in organizations and disciplines new to NSDI, provided seed money to enable geospatial organizations to participate in the national effort to implement NSDI, promoted the development of standardized metadata in hundreds of organizations, and funded numerous implementations of Open Geospatial Consortium (OGC) Web Mapping Services and Web Feature Services.

The CAP Grant program, with consistent funding levels, will continue into 2009 and will focus on funding categories similar to the 2008 and 2007 categories.

National Geospatial Advisory Committee

The goal of FGDC is to facilitate collaboration among Federal geospatial user and provider partners. Every effort has been made to engage States, counties, communities, NGOs, academia, and industry in FGDC activities, but to date only the Federal partners have had a vote at the table. In order to engage partners at all levels in the decision-making and to build a truly national infrastructure, FGDC will define a new governance structure.

The NGAC is being created to advise the Federal government on the management of Federal geospatial programs, the development of NSDI, and the implementation of OMB Circular A-16. The NGAC is being sponsored by the Department under the Federal Advisory Committee Act (FACA). It will provide advice and recommendations to FGDC, through the FGDC Chair (the Secretary of the Interior or designee), on behalf of FGDC member agencies.

In 2009, NGAC will be fully operational with committees and working groups carrying out the charter. It will meet formally three or four times per year and will provide a forum to convey views representative of non-Federal partners in the geospatial community. The goal is to engage the local, academic and other NGOs, and industrial communities in arriving at consensus on issues related to standards adoption, common metadata development,

clearinghouse/portal design and operation, incentives for participation, and related matters in a participatory way toward the development of NSDI.

Emergency Operations

The focus of Emergency Operations is for USGS to provide coordination and support to geospatial information activities associated with homeland security, homeland defense, law enforcement, and the intelligence communities. A secondary role is to facilitate, where appropriate, the scientific analysis needs of these communities with other USGS science disciplines.

Emergency Operations promotes the adoption of USGS programs as the underpinning for Federal mapping activities and those of other public and private sector organizations with homeland security, homeland defense, law enforcement, and emergency management mission responsibilities. Emergency Operations supports a vision of comprehensive integration of *The National Map* and USGS Science activities as a key component of a National Geospatial Architecture and NSDI. Specific activities of the mission include partnership development, liaison and coordination, information requirements definition, inter-bureau and discipline coordination, geospatial applications development and support, support for USGS continuity of government and continuity of operations responsibilities, national security special events support, custom and special product generation, and provisioning of sensitive, proprietary, and classified information. These activities enable cross-purposing of government assets to improve the value of data and services to citizens. Key Federal partners and stakeholders include the Department of the Interior, Department of Homeland Security (DHS), United States Marshals Service, National Geospatial Intelligence Agency (NGA), and United States Northern Command.

In 2009, USGS will continue to coordinate with the United States Northern Command to provide expertise in the preparation of, and response to, natural and man-made disasters; coordinate with DHS and NGA to align NGP strategic goals and *The National Map* tactical plan, with the strategic priorities of DHS and NGA; provide support to the United States Marshals Service in the use of geospatial information and technologies; continue engagement with the Intelligence community to ensure continued coordination with National domestic geospatial activities; and provide Bureau-level geospatial coordination and operational support in emergency response situations.

Geospatial Integration

(Estimates for FY 2007, $45.6 million; FY 2008, $47.1 million; FY 2009, $46.0 million)

Geospatial Integration includes implementing *The National Map* (including the *National Atlas of the United States*®) and the GOS Web portal. These activities at USGS, or through organizations under contract to or in partnership with USGS, include converting, integrating, providing for quality control and assurance, managing, providing access to, archiving, applying, and acquiring base geospatial data for the United States, and providing tools for the discovery, access and sharing of geospatial resources.

The National Map

The National Map is one of the cornerstones of NGP. It provides base geospatial data to the Nation through a portfolio of products and services that focus on eight data themes: elevation, geographic names, hydrography, land cover, orthoimagery, boundaries, structures, and transportation. A consistent database, combining Federal, State, and local information,

provides a seamless, up-to-date mapping framework for multiple needs, including updating and maintaining the Nation's topographic maps.

Geospatial One-Stop

Under the President's Management Agenda, USGS instituted and manages GOS. The portal, located at *http://www.geodata.gov*, serves as the government's gateway for the discovery and access to the Nation's distributed geospatial resources from thousands of organizations across the country. These data sets, developed by local, Tribal, State, and Federal governmental organizations, academia and the private sector, as well as Internet mapping services, models, applications, and place based publications, can all be organized, discovered and accessed through the GOS portal.

In 2009, USGS will continue to enhance work flows between GOS and *The National Map* to incorporate data and services from Federal, State, local and Tribal sources; improve search to enhance the discovery of Agency "authoritative" data services; and support new International Organization for Standardization (ISO) and OGC standards.

Data Themes of *The National Map*: Base Layer Data to Meet Multiple Requirements

The NGP is responsible for four of the eight *The National Map* base data themes: orthoimagery, elevation, hydrography, and geographic names. (Land cover analysis remains the responsibility of the USGS Geographic Research, Investigations, and Remote Sensing Activity.) The data themes are grouped as priority data themes and secondary data themes (those for which the USGS depends on others for data: transportation, man-made structures, and boundaries). Most of the effort is devoted to acquiring and integrating geospatial data from a variety of sources and providing access to the resulting seamless coverage of geospatial data.

USGS efforts emphasize data themes that are available through *The National Map*, plus the development of topographic maps from *National Map* data. As a geospatial data broker, facilitator, and integrator of geographic knowledge, USGS coordinates the requirements of constituents, cooperators, and partners to set priorities for orthoimagery, elevation, hydrography, and geographic names data. Based on these customer needs, emphasis will be placed on extending and improving high-resolution coverages. Implementation is continuing for databases of transportation and boundary data from the Census Bureau, along with a database for man-made structures from Federal, State, and local government agencies.

Priority Data Themes (National Orthoimagery Dataset, National Elevation Dataset, National Hydrography Dataset, and Geographic Names)

National Orthoimagery — The USGS is the Federal agency responsible for digital orthoimagery, one of the OMB Circular A-16 framework data layers, and an essential dataset in enterprise geospatial databases in nearly all levels of government. The USGS orthoimagery nationwide activities update *The National Map*, and support natural hazards and emergency response activities, Department programs, science investigations, geographic analysis, land use planning, environmental impact statements and assessments, and commercial applications. In its Federal leadership role, USGS acquires, provides quality assurance, maintains, archives and distributes terabytes of public domain orthoimagery data.

The USGS collaborates with other government agencies at the Federal, State and regional levels to acquire orthoimagery, at various resolutions, in order to fulfill their missions. The bureau is one of the founding members of the National Digital Orthoimagery Program (NDOP),

a consortium of Federal and State agencies and, particularly in eastern States, participates in Statewide or regionally administered consortia. The USGS is also cooperating with the United States Department of Agriculture's Farm Service Agency (FSA) in a 5-year cyclical acquisition for 1-meter National Agriculture Imagery Program (NAIP) orthoimagery in 11 Western States. All funding for orthoimagery acquisition is leveraged with partners either through agreements with other partners for imagery data or contracts administered by the USGS Geospatial Products and Services Contract (GPSC).

For the Nation's urban areas, the orthoimagery has a 1-foot or better resolution and requires updating on a 2- to 4-year cycle. The 2009, focus is on 133 of the Nation's most populous and administratively important urban areas, and the data support a number of homeland security, public safety, emergency response, and other applications. State, regional, and local governments participate in the acquisition of these data (for example, in 2006 these partners funded 76 percent of the acquisition costs).

In 2009 USGS will acquire or update imagery over 10 percent of the Nation's surface area (1,377 quadrangles). Twenty percent of this will be high resolution orthoimagery (24-inch, 18-inch, 1-foot, 6-inch, and 3-inch) and the remaining 80 percent will be 1-meter resolution orthoimagery. In particular, USGS will acquire orthoimagery for Utah and Idaho. In other areas, particularly in eastern States, USGS participates in Statewide or regionally administered consortia and typically acquires imagery with a resolution finer than 1-meter, usually 1-foot natural color imagery.

National Elevation Dataset (NED) — USGS is the OMB-designated A-16 Federal agency lead for elevation data. *The National Map's* elevation data theme is focused on data acquisition and quality assurance activities, supporting emergency response activities, and other priority Department programs. Elevation data support modeling of drainage networks and geometric correction of remotely sensed data and are critical to various decision-support systems (e.g., flood mitigation and response, and wildfire behavior prediction). The growing demand for higher-resolution (3 meter or finer) elevation data over populated areas and flood plains drives current USGS investments in detailed elevation data.

The elevation project acquires best available data in cooperation with Federal, State, local, and private sector partners, quality assures that they meet USGS quality specifications, and archives and disseminates them to the public in the NED of *The National Map* and GOS.

Disseminating data from the NED occurs via the Seamless Data Distribution Service at the USGS EROS Data Center. All elevation data are offered to the public at no charge and are public domain data. The NED is updated on a quarterly basis as new source data become available, improving overall accuracy.

For 2009, the focus will be to continue to acquire 10-meter or finer elevation data over priority areas (see Table 1) to update the NED. Automated contouring for graphic support will also be a priority.

Status of Data in the NED	2007	2008	2009
NED 1 arc second	100%	100%	100%
NED 1/3 arc second	68%	80%	87%
NED 1/9 arc second*	5%	8%	13%

*The NED 1/9 arc second metrics may be impacted by the high level of interest and repeat production of data for some areas.

Table 1. Percentages of elevation data in the NED from source.

With complete coverage of high-resolution data, attention will shift in 2009 to the revision and maintenance of the NED and to more detailed resolutions. Training, tool development, and strategies for sharing updates among State, local and Federal agencies will be a major focus. Much of the work will shift to a process of data stewardship where the user community, organized largely on a State-by-State basis with Federal participation, will use its members' local knowledge to update the data.

National Hydrography Dataset (NHD) — This USGS-led multi-agency project is designed to build and maintain a comprehensive geospatial dataset of the Nation's surface water to provide state-of-the-art analysis in water science. The NHD provides a complete nationwide data coverage, eliminating duplication of effort, improving the sharing of scientific data, and standardizing the technology to greatly reduce the cost of the science.

Accessible via *The National Map* viewer and GOS, the NHD contains comprehensive and detailed data about America's surface waters. The NHD assigns unique identifiers for each surface water feature in the nation allowing all agencies to reference their water-related data to a common map base. The dataset is used by the Environmental Protection Agency as part of its Watershed Assessment, Tracking & Environmental Results system, by State agencies for meeting reporting requirements of the Clean Water Act, and the United States Forest Service in its Natural Resource Information System water module. The NHD also is used by the Census Bureau in its map modernization activities, the USGS in the StreamStats and SPARROW nutrient modeling projects, and ICWater from DHS to assess risks in the Nation's surface water.

In 2009, USGS plans to accomplish these NHD activities:

- Create and implement stewardship agreements will be in place and active for 35 States.
- Achieve an incremental improvement in data integrity for 40 percent of watershed sub-basins, and an additional level of improvement for 15 percent of the sub-basins.
- Improve data content for 25 percent of sub-basins.
- Make further progress to integrate hydrographic data with other hydrographic datasets (Watershed Boundary Dataset, National Wetlands Inventory, Digital Flood Insurance Rate Maps).

The USGS long-range strategy for NHD calls for:

- Stewardship agreements in place and active for all States and territories.
- An improvement in data integrity for all sub-basins.

- Data content improved for all sub-basins.
- Data integration with other hydrographic datasets complete for all sub-basins.

Geographic Names — The USGS Geographic Names Project is comprised of two functions: providing the Secretariat and staff for the United States Board on Geographic Names (BGN); and managing the Geographic Names information System (GNIS). The BGN is an interagency body consisting of representatives from various Federal departments and agencies, and is empowered by Public Law to issue standard geographic names for use on all material (maps, documents, reports, data files) published by the Federal Government and its contractors. Geographic names are a critical and important reference component for scientific investigations and emergency response, as well as for land and resource management operations throughout the Federal Government. A large number of local, State, and Tribal agencies adhere to the guidelines and policies of the BGN and participate actively in the standardization effort.

The BGN is also authorized to disseminate the official names and locative attributes of all cultural ("administrative") features, including schools, hospitals, and such emergency preparedness locations as police and fire stations.

GNIS is the authoritative database for all geographic names, all of which must conform to the BGN's principles, policies, and procedures. In addition to data developed from decisions made by the BGN, GNIS contains data received through partnerships with Federal agencies, State Names Authorities, State GIS offices, and Tribal authorities. GNIS serves as the names layer of *The National Map*, and is a major component of GOS. GNIS data elements are cited in the DHS Geospatial Data Model and the draft FGDC Address Standard.

In 2009, USGS will continue to perform the BGN Secretariat national leadership responsibilities, collaborate with related international authorities, and expand the Geographic Names data collection and stewardship of data through cooperative agreements with additional States and contracts.

Secondary Data Themes (Transportation, Man-Made Structures, and Boundaries):

Transportation — Transportation data are critical to most geospatial applications involving routing and navigation, disaster planning and response, traffic safety improvement, congestion mitigation, mapping, and environmental planning. The USGS involvement in transportation data development has been to address gaps in geospatial management of public domain transportation data at a national level.

In 2009, the USGS will continue to expand the scope of the transportation theme to support the inventory, integration and maintenance of additional types of high resolution data, including railroads, trails, airports, and potentially other miscellaneous transportation features. The USGS will continue to work with the Census Bureau to incorporate updates for initial National coverage of data by 2009, and build on pilots to update and improve base data developed with States through the Census Bureau's MAF/TIGER Accuracy Improvement Project (MTAIP) and *The National Map.* Additional States will be included, with the goal to have at least 20 percent of States cooperating in this shared maintenance model for roads data by 2009.

Man-Made Structures — The man-made structures data theme is comprised of buildings, industrial areas, facilities, and other features important to planners, land managers, utility companies, and the general public for a broad range of analyses and applications. This theme is the key concern for the locations of critical structures that are of vital interest to emergency

responders. The data include those from Federal partners including DHS and Defense, and State and local government agencies.

In 2009, USGS will complete updates to essential facilities for 100 percent coverage and will develop ways to collaboratively maintain the data. In cooperation with DHS, NGA, and others, the scope of the program will expand to include other critical infrastructure.

Boundaries — The boundary data theme depicts administrative and jurisdictional information critical to a broad range of applications, including those requiring legal and ownership information. The boundary theme relies on data from Federal partners such as the Census Bureau, other Federal agencies, and State and local agencies, and will be maintained through data stewardship agreements.

In 2009, USGS will complete the Federal and major State reservation boundary updates and will continue to process updates from the Census Bureau. The project emphasis will be on continued data maintenance through stewardship agreements where gaps exist in other data management efforts. In addition, USGS will work with Census Bureau, BLM, and other agencies towards improvements in the definition and representation of boundaries in relation to cadastral data.

Topographic Maps

The most widely known form of topographic information is the USGS primary series topographic map, which gives a complete and consistent picture of the Nation's lands. The 1:24,000-scale topographic map portrays data from *The National Map* such as contours, hydrography, transportation, Public Land Survey grids, man-made structures, geographic names, and land cover in the 7.5 minute by 7.5 minute tile-based format. The maps, complemented by digital forms of the mapped information and aerial and satellite imagery, support numerous government, commercial, educational, recreational, environmental, and conservation activities.

Once predominately a manual process from USGS-collected data, the new generation topographic map will be made using current Federal, State, local and Tribal data in addition to USGS data. The USGS has been establishing partnerships and transforming its internal processes to acquire the needed data to make updated digital maps using state-of-the-art commercial-off-the-shelf map-making software.

In 2009, the primary objective is for USGS to implement a web-based, automated, mapping capability to produce 1:24,000-scale topographic maps over lands where suitable data exists. For any given priority mapping project area where suitable topographic mapping data does not exist, an image map will be produced. Suitable geospatial data to make topographic maps will be available through *The National Map* and may be either national datasets that consistently portray features across the country or partners' data with appropriate content. The graphic will resemble, as closely as possible, the current USGS topographic maps.

With the transition to map generation using *The National Map* data, some differences will be apparent between the enhanced topographic quadrangles and the existing published maps. During this transition period USGS will solicit feedback to determine how close the workstation and ultimately the web-based produced maps meet user requirements.

In 2009, USGS will achieve these targets for topographic maps:

- Produce topographic maps in targeted areas of interest where there are suitable data (goal is to make 500 to 1,000 unique maps),
- Decrease image map production and shift resources to production of topographic maps. The image map will then be a layer in the topographic map,
- Continue collaboration and development work towards fully automating topographic map production,
- Continue to conduct customer research and analysis, data integration, and ongoing investigations to support the needs of the USGS topographic map user community, and
- Investigate derivative products and services.

Data Access

The USGS ensures that public domain geospatial data associated with the eight major themes and map products prepared from these data are freely accessible 24x7 to the public and available to partners. Access activities include coordinating the integration of national geospatial databases held by USGS, and other Federal, State, and local Agencies. To this end, the National Geospatial Program provides funds to EROS to provide access to and archive geospatial data, as does Geography.

The USGS provides public access to data and ensures that geospatial data and map products are accessible and available to partners and customers. Access activities include those to integrated national databases held by the USGS and a catalog of Web mapping services made available by partners. For national databases, the USGS focuses on providing around-the-clock, free, or low-cost access to elevation, hydrography, orthoimagery, transportation, boundaries, structures, land cover, and geographic names data. Users can browse, select, and retrieve geographic data and information for their area of interest. For data made available by partners, USGS provides means for viewing these data through *The National Map*.

In 2009, USGS will upgrade systems to enhance access to the seamless national databases at the EROS Center and web mapping services made available by partners.

Archive

The USGS provides for long term archive and retrieval of its geospatial data and metadata at the EROS Center. Procedures are developed to maintain original data sets such as high-resolution orthoimagery quadrangles, digital raster graphics, digital line graphs, and digital elevation information. The USGS makes current and historical information available through on-line methodologies in time frames that allow them to be used in emergency response activities as well as ensuring their long-term preservation.
In 2009, USGS will continue to maintain the archive of materials and support the growth of the archive with newly acquired NGP geospatial data.

National Geospatial Technical Operations Center (NGTOC)

A national capability of production activities and technical services associated with the NGP was created in 2005 from the consolidation of disparate mapping activities at four different production centers – Menlo Park, CA, Denver, CO, Rolla, MO, and Reston, VA. Called the

National Geospatial Technical Operations Center (NGTOC), the organization underwent significant reengineering and workforce restructure to position USGS for future demands.

In 2009, NGTOC will operate from two sites (Denver, CO, and Rolla, MO). The reengineered mapping workforce will be fully operational in early 2009. Various strategies, including succession planning, will be implemented to ensure critical skills are retained and new skills acquired in the core government workforce.

The Geospatial Products and Services contract, which is serviced out of the Rolla NGTOC, is available to all USGS disciplines, bureaus within the Department, and all partners at every level of government. Services and products provided by the USGS and approved vendors are available through this contract vehicle.

Enterprise Geographic Information Management (EGIM)

The USGS leads the Department's EGIM project which implements an enterprise approach for bureaus' missions involving GIS. It is a joint effort across all the bureaus to align geospatial data and services in support of the business needs of the Department.

Key focus areas of EGIM in 2009 will include:

- Continue implementation of Authoritative Data Sources (ADS) for key geospatial data layers in OMB Circular A-16 and "orphaned" data layers such as "Roads & Trails."
- Continue to reduce overall GIS training costs,
- Consolidate GIS software test lab functions,
- Enable more effective software release/update distribution mechanisms,
- provide easy access across bureaus to information on best management practices,
- Integrate GIS Help Desk support across USGS,
- Increase emphasis on cross-bureau sharing and reuse of GIS tools, techniques, and data through a shared knowledge base, and
- Accomplish prioritized tasks such as Data Life Cycle management and reporting, management dashboard development, and business requirements management.

National Atlas of the United States of America

The National Atlas features eight different products and services all designed to make geographic information more useful to a broad audience. For the public, the Atlas produces wall maps; polished page-size maps; multimedia articles on the Nation's natural and socioeconomic resources; dynamic maps that illustrate change over time; and an innovative and award-winning interactive map maker that includes more than 2,500 discreet map layers. For professional users, the National Atlas provides accurate, integrated geospatial data; full documentation for these data; and Web map services.

In 2009, USGS will finish integrating the hundreds of thematic map layers in the National Atlas to the new 1:1,000,000-scale national frameworks. It will harmonize these frameworks at borders with Mexico and Canada to create the first seamless, authoritative basic cartographic data sets for all of North America. The National Atlas will also return to producing more expository articles, including innovative multimedia elements.

Center of Excellence for Geographic Information Science

The USGS established CEGIS in February 2006 to conduct, sponsor, and collaborate in the research and innovative solutions required by *The National Map*, NSDI, and the emerging GeoSpatial Web.

To support the accomplishment of longer-term GIScience research projects recommended by the National Research Council, in 2009 CEGIS will begin staffing research scientists and developing relationships with academic and private industry researchers.

Partnership Implementation
(Estimates for FY 2007, $13.4 million; FY 2008, $13.7 million; FY 2009, $13.7 million)

Program Overview

Effective collaboration with the larger geospatial community is essential to NSDI and the Federal role of implementing *The National Map* and GOS. Federal, State, local, and Tribal entities produce and maintain a vast array of current, accurate geospatial data in response to their specific business needs. Within the Federal government, USGS provides the national leadership role to make these disparate datasets more broadly accessible and integrate them into a consistent framework for the Nation. Leveraging geospatial data and resources with partners ensures that Federal investments are maximized and that duplication of effort and expenditures are minimized. To this end, USGS collaborates with the range of partners nationally and across the regions and States for geospatial data acquisition, access, sharing and stewardship. The USGS partnership activities are the foundation for the development and maintenance of base geographic data consistent with national content specifications.

The Partnership Implementation component supports partnerships for *The National Map* and GOS initiatives of the NSDI by funding joint agreements with the partners together with the operations of the network of NSDI State Liaisons who develop the partnerships and long-term relationships. NSDI State Liaisons develop, coordinate, document, and maintain partnership agreements and assist partner organizations to make their web mapping services and data available through *The National Map* and GOS. They identify geospatial data needs of the broad communities within the States they represent, evaluate partner databases and web mapping services, participate in State and regional geospatial data councils, and provide for outreach to local communities of users. Liaisons develop the joint funding agreements with Federal, State, local and Tribal field office organizations to aid the development, stewardship, and application of geospatial data. Funding to partners may take the form of grants, cooperative agreements, work shares or other mechanisms that enable the USGS to leverage the resources of the partner to accomplish shared goals. Funds for partnership projects are allocated based on needs (such as lack of current data for urban areas), opportunities (such as the availability of technically capable partners and partnerships with high Return on Investment), and merit (projects are awarded on a competitive basis).

Federal/National-Level Partnerships

To address its mission to advance NSDI through *The National Map* and GOS, USGS seeks strategic partnerships with Federal and national organizations to leverage resources and strategize geospatial data and infrastructure development at the national level.

Urban Area Imagery: A Partnership across Levels of Government — In 2007, USGS continued its partnership with NGA to leverage funds to acquire high-resolution imagery and elevation data for the nation's largest 133 urban areas. NGA provided $4.6 million and the USGS funded an additional $2.1 million to collaborate with 55 partners, primarily local agencies, to leverage the acquisition of data. The data acquired through this process totaled an overall value of $25 million. In addition to supporting NGA needs, the resulting data are publicly accessible in *The National Map* and serve a myriad of uses in State and local government, as well as to fuel private sector applications such as Google Map and Google Earth.

The USGS also partners with public interest organizations such as NSGIC and the National Association of Counties (NACo) as a way to extend the Federal reach to new partners, customers and users. These organizations represent State and local government agencies and help coordinate a variety of issues with national program stewards for geospatial products

Statewide/Regional-Level Partnerships

The USGS has a long history of partnering at the State and regional level with the broad community of geospatial data producers and users, including State, local and Tribal agencies, Federal field offices, and other entities such as the private sector and academia. The USGS interacts with these organizations through its network of liaisons who participate in State and regional geospatial information coordination groups and develop agreements with partners to help build NSDI.

Collecting and preserving indigenous names for geographic features — In 2007, USGS partnered with the Coeur d' Alene Tribe of Northern Idaho to collect significant indigenous names for the nation's Geographic Names Information System (GNIS) and *The National Map*. Through this effort, the Tribe has successfully coordinated with other area tribes to create a data repository for indigenous names and is acting as the data steward. It has developed an easy-to-use methodology to collect and organize information about the named sites that can be utilized throughout the Tribal lands of the United States and beyond. The system allows users to view locations on a map, hear audio files, view photos, and also view videos of geographic features listed in the Native Names feature file of *The National Map*. This project directly benefits the Tribes and the public and partners who use *The National Map* by providing a reliably maintained database of indigenous geographic names and supporting a well organized methodology of collecting and preserving culturally significant data on geographic place names, native language, and history. The States have also benefited from Tribal participation in State boards of geographic names in the effort to replace offensive official geographic names in their respective States.

United States National Grid Polygon Layer — The United States Nation Grid (USNG) is a key reference in the National Search and Rescue Plan and provides a common reference system for national multi-environment disasters. It is of particular use when military forces respond in national emergencies and provides an unambiguous coordinate system when other points of reference like buildings or street signage have been compromised. The USGS and Delta State University, Mississippi entered into a cooperative agreement in 2007 whereby the University will develop USNG 1000-meter polygons covering the country for use in map grid coordinate referencing. The grid layer will be made available in the public domain in commonly used format so that it can be combined with all manner of geospatial data for display and printed products. Delta State will also create training materials and conduct a number of on-site training

sessions at geospatial meetings around the country to facilitate use of USNG and the national 1000-meter polygon dataset. The benefits of this partnership include not only making critical data available but also raising awareness of how to use these important data to prepare for and respond to emergencies.

2009 Program Performance

The 2009 budget request for the National Geospatial Programs is $69,662,000 and 251 FTE, a program change of +$580,000 and 0 FTE from the 2008 Enacted.

USGS will provide sufficient staffing to develop plans for all States to systematically develop data and stewardship agreements for the data themes of *The National Map*. Simultaneously, long-term State plans for developing *The National Map* data themes will be advanced and will link with 50 States Initiative's statewide strategic and business plans for States where they exist.

The Partnership program will expand efforts started in 2008 developing partnerships through formal mechanisms such as FGDC, PPWG of DHS, NGA and USGS; NDOP, NED, and BGN ; as well as through interactions with individual partner agencies. Examples include support for the Department's geospatial data needs; ongoing agreements with NGA to develop high-resolution imagery and elevation data over urban areas and to act as an intermediary with State and local governments; working with DHS to utilize geospatial techniques for events planning and for enhancing State homeland security plans; coordinating geospatial activities with FEMA to help mitigate, respond to, and recover from natural disasters; working with agencies in the USDA to coordinate the development of imagery, elevation, and hydrography data, topographic maps, and participation in *The National Map*; working with Census Bureau to prepare and exchange imagery, hydrography, road, and boundary data; and coordinating hydrographic data with the EPA and bathymetric data with NOAA.

USGS will further define its national partnership strategy by building on experience gained in working with NSGIC and NACo to work more closely with other public interest organizations such as the Urban and Regional Information Systems Association (URISA), the National Governors Association, the Western Governors Association, and the National League of Cities (NLC) and others expanding on the work of 2008.

Performance Overview

The National Geospatial Program addresses the Department's strategic plan for Resource Protection: Improve the understanding of the national Ecosystems and Resources through Integrated Interdisciplinary assessment.

The following table highlights important performance measures for the Enterprise Information Resources Subactivity. Since the program change only affects a small portion of the program and performance, cost data derived would not provide any analytical benefit.

End Outcome Goal 1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through Integrated Interdisciplinary assessment.										
End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**Type**	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
End Outcome Measures										
% of targeted science products that are used by partners for land or resource management decision making **(SP)**	A	85%	90%	93%	≥90%	93%	≥90%	≥90%	0	≥90%
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure availability of long-term environmental and natural resource information, data and systematic analyses needed by land and resource managers for informed decision making**										
% of surface area of the coterminous U.S. for which high-resolution geospatial datasets are cataloged, managed, and available through *The National Map* **(SP) (NGP)**	F	UNK	UNK	UNK	83% (581/700)	99.71% (698/700)	100% (700/700)	100% (700/700)	0	100% (700/700)
% of the area of 11 Western States for which orthoimagery have been acquired through a FSA/USGS partnership with other entities to achieve a 5-year cycle for 1-meter NAIP imagery **(BUR) (NGP)**	A	UNK	43%	23%	62%	100%	100%	100%	0	100%

End Outcome Goal 1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through Integrated Interdisciplinary assessment.										
End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**Type**	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
% of total cost FSA and USGS saved through partnering with other entities for imagery acquisition of 1-meter NAIP orthoimagery **(BUR) (NGP)**	A	UNK	44%	41%	36%	32%	36%	36%	0	36%
% of data acquisition costs for *The National Map* funded by partners **(RePART Eff. Measure) (NGP)**	F	45%	47%	74%	60%	59.3%	60%	60%	0	75%
% of customers that identify or indicate (via a survey) that USGS NGP Outreach materials and activities (information and publications, conferences, training and workshops) met their needs/requirements **(BUR) (NGP)**	F	UNK	UNK	UNK	UNK	UNK	Baseline	TBD	TBD	TBD
% of time that USGS managed geospatial data and information dissemination systems (i.e., Geospatial One-Stop Portal, *The National Map*, NSDI Clearinghouses) are accessible online to customers **(BUR) (NGP)**	F	UNK	UNK	UNK	UNK	UNK	Baseline	TBD	TBD	TBD
% of GIO partners reporting satisfaction with partnership agreements **(BUR) (NGP)**	F	UNK	UNK	UNK	UNK	UNK	Baseline	TBD	TBD	TBD
% of total cost of geospatial data and geospatial services saved through Geospatial Line of Business Joint Business Case **(BUR) (NGP)**	F	UNK	UNK	UNK	UNK	UNK	Baseline	TBD	TBD	TBD
% of nation's surface for which hydrology, elevation, and orthoimagery are available through the NSDI clearinghouse and funded through partnerships	C	62%	71%	99%	89%	100%	100%	100%	0	100%

End Outcome Goal 1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through Integrated Interdisciplinary assessment.										
End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	**Type**	**2004 Actual**	**2005 Actual**	**2006 Actual**	**2007 Plan**	**2007 Actual**	**2008 Plan**	**2009 Pres. Budget**	**Change from 2008 Plan to 2009**	**Long-term Target 2012**
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure the quality and relevance of science information and data to support decision making**										
% satisfaction with scientific and technical products and assistance for environment and natural resource decision making **(SP)**	A	90%	96%	91%	≥90%	90%	≥90%	≥90%	0	≥90%
PART Efficiency and Other Output Measures										
# of annual gigabytes of geospatial data collected **(BUR) (NGP)**	A	34,815	6,023	76,550	25,428	94,802	24,344	24,344	0	35,000
# of cumulative gigabytes of geospatial data managed **(BUR) (NGP)**	C	85,857	108,035	187,842	200,635	278,646	249,679	249,679	0	400,000
# of formal workshops or training provided to customers (instances/issues/events) (EI)	A	UNK	29	51	17	122	17	17	0	18
# of data standards used in implementing *The National Map* **(NGP PART)**	C	17	22	22	22	22	22	22	0	22

Global Change

Activity	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-)[a/]	2009 Program Changes (+/-)[b/]	2009 Budget Request	Change From 2008 (+/-)
Global Change ($000)	0	7,383	+21,664	-2,464	26,583	+19,200
Global Change over time	[21,708]	[28,674]			[26,583]	
Total FTE	*0*	*29*	*+164*	*-9*	*184*	*+155*

[a/]Fixed cost increases for this activity total $473, of which $373 is budgeted and $100 is absorbed. A technical adjustment of $21,291 is proposed as part of a budget restructure that moves funding for global change activity into a new integrated budget activity titled Global Change.
[b/]Changes for this activity include a reduction of -$81 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Summary of 2009 Program Changes for the Climate Change Initiative

Request Component	($000)	FTE
• Climate Change Science Strategy Initiative (see Section F)	+5,000	+20
• Global Change 2008 Unrequested Congressional Action	-7,383	-29
• Travel Reduction	-81	0
TOTAL (NET) Program Changes	**-2,464**	-9

Justification of 2009 Program Changes

The 2009 budget request for the Global Change is $26,583,000 and 184 FTEs, a net program change of -$2,464,000 and -9 FTE. The net change is a result of a new $5,000,000 initiative increase (see Section F), a reduction of -$7,383,000 for a 2008 unrequested increase in funding and a technical adjustment being proposed as part of a budget restructure that moves funding for Global Change activities into this new integrated budget activity titled Global Change. For the cross-walk from current programs to this structure, see section E. The funding reduction of -$2,464,000 eliminates one-time funding related to methodology formulation for capacity assessments for geologic carbon sequestration, and also reduces funding for hazards, carbon management and water availability activities.

The USGS contribution to the U.S. Climate Change Science Program (CCSP) is $31.4 million. The 2009 proposed activity will encompass $26.6 million of the contribution. An additional $3.7 million for the National Satellite Land Remote Sensing Data Archive (NSLRSDA) in the Land Remote Sensing sub-activity in Geography and $1.1 million in the Biological Research and Monitoring activity contributes to CCSP but are not included in the proposed new activity.

CLIMATE CHANGE SCIENCE PROGRAM
(in thousands of dollars)

	2007 Actual	2008 Enacted	2008 Enacted (w/ ATB)	2009 Realign to Global Change	2009 Changes	2009 Pres. Budget	2009 vs. 2008 Enacted
GLOBAL CHANGE							
USGS Global Change	[21,706]	[21,706]	[21,291]	21,291	292	21,583	292
Congressional Action for Climate Change			7,383		-2,383	5,000	-2,383
TOTAL, REALIGNED GLOBAL CHANGE	**0**	**0**	**7,383**	**21,291**	**-2,091**	**26,583**	**-2,091**
SUPPORTING ACTIVITIES - GLOBAL CHANGE							
Geographic Research, Investigations, & Remote Sensing							
Geographic Analysis and Monitoring	6,732	6,732	6,627	-2,886		3,741	0
Geolgoic Hazards, Resources, & Processes							
Geoloigc Landscapes & Coastal Assess/Earth Surface Dynamics	10,500	10,500	10,336	-10,336		0	0
Water Resources Investigations							0
Hydrologic Research & Development	2,294	2,294	2,202	-2,202		0	0
Hydrologic Networks & Analysis	896	896	860	-860		0	0
Biological Research							
Biological Research and Monitoring	6,186	6,186	6,089	-5,007		1,082	0
TOTAL, RESOURCES GLOBAL CHANGE	**26,608**	**26,608**	**26,115**	**-21,291**	**0**	**4,824**	**0**
CLIMATE CHANGE SCIENCE PROGRAM SUMMARY BY BUREAU							
U.S. Geological Survey	**26,608**	**26,608**	**33,498**	**0**	**-2,091**	**31,407**	**-2,091**
Change from 2007			**+6,890**			**+4,799**	

Climate Change (-$2,464,000 / -9 FTEs)

The Department of the Interior holds a natural leadership role in providing critical science, monitoring, and predictive modeling of information related to changes in climate. As steward of 507 million acres of Federal lands, a primary strategic goal of the Department is to improve the understanding of natural ecosystems and resources through interdisciplinary assessment.

It is generally thought that global warming trends over the last 100 years that have accelerated in the last 40 years will produce significant global changes affecting water supplies, plant and animal life, human infrastructure, and ecosystems on diverse landscapes. Changes may include differences in the amount and timing of precipitation, altered water temperatures and sea levels, and fluctuations in vegetation patterns and distribution of wildlife.

Changes in climate can lead to long- and short-term resource management challenges such as loss of storm water buffers for low-lying areas, reduced water flow, lower storage and underground water levels, disruptions of biological patterns and interactions between species and their habitat, and altered patterns for natural hazards such as storms, drought, fires, and insect outbreaks.

Work conducted within this Global Change activity provides critical science, monitoring, and predictive modeling of information related to our changing climate and its effects on the landscape and the Nation's resources. The knowledge and information that results from this program will help policymakers, resource managers, and citizens make informed decisions about the management of the landscapes for which they have responsibility and on which they live.

While knowledge related to climate change continues to increase, most current climate models provide insufficient information to stakeholders for effective resource or hazard management. Furthermore, information that is available in not always accessible to the managers that require it. While local and regional studies are helpful in understanding the processes and responses of physical and biological systems to climate change, it is not feasible to conduct detailed studies of this type for every square mile of the Nation. A more cost effective approach is to monitor and measure changes across the landscape at a broader scale and relate these observations to the results of more detailed studies using rigorous and reproducible methods.

Program Performance Change

(Climate Change Science Strategy and Adaptation)

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 President's Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments								
# of systematic analyses and investigations				7	81	86	+5	+16
Total actual/ projected cost ($000)				$1,750	$13,500	$14,750	+$1,250	+$4,000
Actual/projected cost per scientific report or other product (whole dollars)				$250,000	$250,000	$250,000	$250,000	$250,000
Comments	This measure includes decision support tools delivered to stakeholders. Costs of decision support tool development include baseline research, field testing and customer workshops to determine user needs and delivery requirements. Out-year costs per tool may decrease as knowledge base on customer requirements increases. Cost per unit is an average from the program contributing to the Global Change Activity. This measure combines outputs from several USGS programs into a new budget activity.							
# of workshops or training provided to customers *(annual)*				3	11	13	+2	+6
Total Projected Cost ($000)				$75	$275	$325	+$50	$150
Projected Cost per Workshop (whole dollars)				$25,000	$25,000	$25,000	+$25,000	+$25,000
# of annual gigabytes					2.8	2.8	0	+8.4
# of cumulative gigabytes managed					22.2	22.2	0	30.6

	2005 Actual	2006 Actual	2007 Actual	2008 Plan	2009 Base Budget (2008 Plan + Fixed Costs)	2009 President's Budget	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through interdisciplinary assessments								
% of surface area with temporal and spatial monitoring, research, and assessment/data coverage to meet land use planning and monitoring requirements (Global Change) (PART) (Number of completed eco-region assess-ments out of a total of 84 eco-regions).					78% (66/84)	87% (73/84)	+9%	Plan completion 2010

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Out-year performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent out-year.

Other Program Reviews

As part of its effort in conducting and evaluating the restructured of global change activities, USGS will conduct an external review of all programs affiliated with global change during 2008. This review will be conducted by an independent science agency such as the National Academy of Science or the American Association for the Advancement of Science.

Workforce Planning

Currently, global change activities are funded and managed under several management units within the bureau. This proposed restructure would consolidate the funding and facilitate the development of a single set of strategic science and management goals and their implementation, a cogent set of global change-specific performance measures that can be reliably measured and related budgetary and communication strategies focused on the goals and objectives of USGS' work within global change. 164 FTEs will be consolidated from four different science disciplines from throughout the bureau. USGS management will spend the first year identifying and evaluating the transferred personnel and their skill mix, review and revise work plans where necessary, and disperse the individuals to assignments that will support the global change goals and objectives. In addition, USGS will develop organization charts to help facilitate the staff's understanding of the new USGS Global Change management structure and responsibilities.

Program Overview

Climate Change Science Strategy

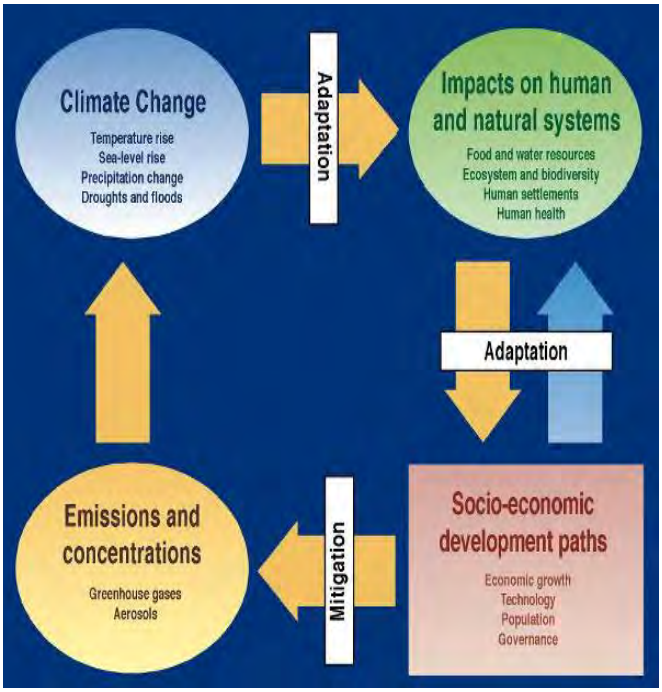
USGS continues to develop a National Climate Effects Research and Monitoring Network that provides the Department and other Federal, State, and local resource managers and decisonmakers the ability to proactively adapt to and mitigate the effects of climate change on managed resources. Through this network, USGS researchers and resource managers will track indicators of climate change and link them to climate change causes and effects. Data from the network supports the development of scenario and forecast-based, decision-support tools for Department resource and land managers and State and Federal policymakers. Additionally, funds within this subactivity are used to enhance existing work on climate change information delivery, assess wildlife and habitat response to climate change, potentially reduce vulnerability to natural hazards associated with climate change, and conduct research aimed at understanding the dynamics of carbon dioxide transport to and from the atmosphere. Data and information from this work will be made available by the USGS on the Web through a Global Change Information Management System that is planned for development when additional funds are procured in future fiscal years.

The research and monitoring network includes:

- focus areas where multi-disciplinary studies and long-term monitoring are used to determine the key processes controlling resource or ecosystem response to changes in climate
- a network of study sites designed to assess resource and ecosystem sensitivity to change across a range of climate conditions
- regional and national surveys of environmental-condition indicators to link understanding from the focus areas into the broader landscape
- expanded use of existing remote sensing systems and development of new remote-sensing tools for tracking environmental change from space

Climate Change Adaptation

The USGS Global Change effort provides decision support tools for resource managers and policy makers to assess our ability to cope with and adapt to the various effects of climate change. The principal objective of this effort is to develop and enhance adaptation and mitigation strategies related to the effects of climate change through the use of new and improved science-based decision support systems.



DOI Climate Change Leadership – Science Priorities for the DOI Task Force

The program will integrate climate- and environmental-change datasets with conceptual and digital models across all aspects of global change research including remote sensing, geography, geology, biology, and hydrology to better understand impacts to natural resources, agriculture, and human populations on decadal and regional time scales, local to global spatial scales, and weather to climate process scales. The ultimate use of this information will be for climate effects characterization and applications for decision support. The USGS is in a unique position in the Earth-science research and applications community with the ability to leverage and integrate research results across the Earth-system science disciplines with *in-situ* data, space-based and airborne observational data, high-end computing capabilities, data and information management systems, and decision support tool development.

Monitoring, understanding, assessing, and predicting climate changes and effects, and their relevance to decision-making has been at the core of recent efforts of individual USGS Projects such as the MIT-USGS Science Impact Collaborative and the Policy Analysis and Science Assistance Branch of the USGS' Fort Collins Science Center. In 2009, USGS will expand these

efforts and develop new projects to provide state of the art science applications to address resource and land management impacts from climate change.

2009 Program Performance

The effects of climate change on forest carbon storage—Forests are a globally significant store of carbon, which partially offsets increases in greenhouse gas that contribute to climate change. Understanding how forest carbon storage responds to climate change is therefore critical. In the Pacific Northwest, forests store more carbon than any other biome, anywhere on Earth. Carbon dynamics in these forests are especially sensitive to variations in rainfall and soil nitrogen availability, which interact to control forest productivity. USGS is studying the interactions between rainfall regimes, nitrogen dynamics, and plant and soil carbon storage across a wide precipitation gradient in old-growth Douglas-fir forests of the Olympic Peninsula. Preliminary results along this gradient indicate that forests currently receiving 2 meters rainfall annually have the highest tree productivity, coincident with highest soil nitrogen availability. Other experiments suggest that future increases in precipitation, particularly for wetter forests, could diminish soil nitrogen availability and reduce forest carbon storage. Upcoming work on this project in 2009 will incorporate results of field measurements and experiments into ecosystem simulation modeling, with the goal of predicting quantitatively how changing rainfall will affect forest carbon storage in the Pacific Northwest. These models will provide important information for predicting the impact of different management actions on Pacific Northwest forests in the face of climate change.

Mountain glaciers are indicators of climate change—They are freshwater reservoirs, and their long-term mass wastage is thought to have accounted for a significant part of the sea-level rise observed during the 20th Century. The USGS researches and reports on mountain glaciers and their effects on water resources to the world scientific community and to the Nation. In 2008, USGS will continue mass-balance and related research and reporting on South Cascade Glacier, a highly visible USGS benchmark glacier in Washington, and will publish a report on the status of and seasonal melt-water yield from a group of other glaciers in the Cascade Range. Also during 2008, USGS will be nearing completion of a multi-year, interdisciplinary investigation with BLM of the phenomenon and effects of the retreat of Bering Glacier, Alaska. This glacial work will complement the work that's performed in the Global Change activity.

National Geospatial Ecosystem Modeling—Ecosystems provide a framework for understanding the Earth's physical and biological processes that make life possible for all organisms, including humans. A comprehensive national ecosystem model will enable the economic and societal valuation of key ecosystem services like water production and quality, carbon sequestration, biodiversity, soil fertility, flood control. Quantifying the value of these services is increasingly becoming important to land management agencies, especially for BLM and USFS. The goal of this project is to provide both Federal and State land management agencies a standardized spatial framework for assessing and monitoring ecosystem services. In 2008, USGS will produce unique ecosystem footprints, which will subsequently be aggregated and labeled using an existing ecological systems classification developed by NatureServe. Moreover, collaboration between EPA and USGS will advance work on a National Atlas of Ecosystem Services, which will incorporate the ecosystem model, as well as other datasets. In 2009, the completed and validated National Ecosystems Model will be positioned for adoption by multiple agencies for use in resource management and conservation applications through workshops and the publication of a report describing the methodologies developed and possible applications.

Yukon River Basin — Recent climate warming has accelerated permafrost thawing throughout the Yukon River basin. Thawing is making vast stores of frozen organic material available for hydrologic export to the Bering Sea or for decomposition and subsequent emission of carbon dioxide and methane to the atmosphere. Continued studies in the Yukon basin will focus on the total input of dissolved organic carbon to the Arctic Ocean, which appears to be 5-20 percent greater than previously reported and about 2.5 times greater than temperate rivers with similar watershed sizes and water discharge. Planned USGS work will demonstrate that the ground-water contribution to total annual flow has shown an overall increase, while there has been minimal change in annual flow; new and planned work suggests that the increases in ground-water contributions may be largely due to enhanced infiltration brought about by permafrost thawing. The work in the Yukon River Basin, funded in the Hydrologic Research and Development program, will complement the work that is being proposed in the Global Change program in 2009.

Program Assessment Rating Tool (PART) Evaluation

The Global Change activity is comprised of existing USGS programs that underwent PART review between 2002 and 2005 with ratings of effective and moderately effective. The USGS programs that are being reprogrammed to the Global Change activity were evaluated under the following PART programs: Biological Research and Monitoring; Geographic Research, Investigations, and Remote Sensing; and Water Research.

In response to the PART recommendations, the follow-up actions proposed in 2008 include:

- Focus geographic research in the following high priority areas: Landscape status and trends, causes and consequences of landscape change, vulnerability and risk analysis, and vulnerability and risk reduction,
- Work with the National Academy to facilitate drafting of the first independent, holistic review of the Water Resources programs, and
- Develop a plan to maximize access to research and data and provide timely reports on the status and trends of the Nation's biological resources.

Program Performance Overview

The Global Change activity supports the Department's end outcome goal of Resource Protection to improve the understanding of national ecosystems and resources through integrated interdisciplinary assessment. To measure progress in achieving the intermediate outcome goal of ensuring the quality and relevance of science information and data to support decisionmaking, USGS tracks the "% of studies validated through appropriate peer or independent review" and "% satisfaction with scientific and technical products and assistance for environment and natural resource decisionmaking". In addition, USGS also tracks the following PART measures: number of annual gigabytes collected, number of cumulative gigabytes managed, number of systematic analyses and investigations delivered to customers, and number of formal workshops or training provided to customers.

End Outcome Goal 1.4 Resource Protection: Improve the understanding of National Ecosystems and Resources through Integrated Interdisciplinary assessment.

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
End Outcome Measures										
% of targeted science products that are used by partners for land or resource management decision making **(SP)**	A	85%	90%	93%	≥90%	93%	≥90%	≥90%	0	≥90%
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure availability of long-term environment and natural resource information, data and systematic analyses needed by land and resource managers for informed decisionmaking**										
% of surface area with temporal and spatial monitoring, research, and assessment/data coverage to meet land use planning and monitoring requirements (Geography) (PART) (Number of completed eco-region assessments out of a total of 84 eco-regions).								87% (73/84)	+9%	100% (2010) NA (≥2011)
Intermediate Outcome Measures and Bureau and PART Outcome Measures **Ensure the quality and relevance of science information and data to support decision making**										
% of studies validated through appropriate peer review or independent review **(SP)**	A	100%	100%	100%	100%	100%	100%	100%	0	100%

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	Type	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
% satisfaction with scientific and technical products and assistance for environment and natural resource decision making **(SP)**	A	90%	96%	91%	≥90%	90%	≥90%	≥90%	0	≥90%
PART Efficiency and Other Output Measures										
# of annual gigabytes collected (Global Change)		NA	NA	NA	NA	NA	NA	2.8	0	2.8
# of cumulative gigabytes managed (Global Change)		NA	NA	NA	NA	NA	NA	22.2	+2.8	30.6
# of systematic analyses & investigations delivered to customers (Global Change)	A	UNK	UNK	UNK	UNK	UNK	7	86	+79	+16
# of formal workshops or training provided to customers (instances/issues/events) (Global Change)	A	UNK	UNK	UNK	UNK	UNK	3	13	+10	+6

Science Support

Activity	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-)[a/]	2009 Program Changes (+/-)[b/]	2009 Budget Request	Change From 2008 (+/-)
Science Support ($000)	67,782	67,167	+263	-230	67,200	+33
DOI WCF from EI ($000)			[+478]			
DOI WCF to EI ($000)			[-2,314]			
Total FTE	***405***	***405***	***0***	***0***	***405***	***0***

a/ Fixed cost increases for this activity total $2,355, of which $2,099 is budgeted and $256 is absorbed. A technical adjustment is proposed in the amount of -$1,836 as described below.

b/ Changes for this activity include a reduction of $230 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Technical Adjustment

A technical adjustment is proposed to move $2,313,800 for Enterprise Information related costs, from Science Support to Enterprise Information and to move $478,100 from Enterprise Information to Science Support. This adjustment is being made to realign cost in the Departmental WCF Centralized Bill to the correct activity. The table shown below details the activities identified which are included in this adjustment and realigns the funding accordingly:

(Dollars in Thousands)

Current Activity	Transfer to	Project	2007 Actual	2008 Enacted	Amount to be transferred
Enterprise Information	Science Support	Enterprise Information	324.5	467.6	467.6
Enterprise Information	Science Support	FOIA Appeals	10.5	10.5	10.5
Total			**335.0**	**478.1**	**478.1**
Science Support	Enterprise Information	Fixed Costs for ESN (centrally billed)	1,098.0	1,098.0	1,098.0
Science Support	Enterprise Information	Information Technology Architecture	477.2	503.1	503.1
Science Support	Enterprise Information	Capital Planning	160.5	195.4	195.4
Science Support	Enterprise Information	Enterprise Resource Management	33.8	50.0	50.0
Science Support	Enterprise Information	Data Resource Management	22.1	22.1	22.1
Science Support	Enterprise Information	IT Security	262.9	266.6	266.6
Science Support	Enterprise Information	Frequency Management Support	103.1	99.1	99.1
Science Support	Enterprise Information	Web and Internal/External Communications	74.1	72.5	72.5

Science Support

Current Activity	Transfer to	Project	2007 Actual	2008 Enacted	Amount to be transferred
Science Support	Enterprise Information	GPEA	7.0	7.0	7.0
Total			**2,238.7**	**2,313.8**	**2,313.8**

Summary of 2009 Program Changes for Science Support

Request Component	($000)	FTE
• Travel reduction	-230	0
TOTAL Program Changes	**-230**	**0**

Justification of 2009 Program Changes

The 2009 budget request for Science Support is $67,200,000 and 405 FTE, a program change of -$230,000 and 0 FTE from the 2008 Enacted level.

Program Overview

Science Support funds the executive and managerial direction of the bureau, as well as bureau sustaining support services. Science Support has four components: leadership activities, the Office of Administrative Policy and Services, the Office of Human Capital, and bureauwide costs.

Leadership — The Director serves as Chief Executive of the USGS with ultimate authority for all strategy, policy, and program decisions. This includes direct involvement in program, budget, finance, and communications development. The Deputy Director serves as Chief Operating Officer supporting the Director in implementing policy decisions, with a focus on operational issues.

The Executive Leadership Team is composed of 15 senior policy-level leaders of the bureau including the Director and Deputy Director. It identifies issues of interest and concern to the USGS enterprise and functions as a senior advisory body to the Director and as the principal mechanism for building a bureau-centered culture.

Associate Directors have oversight of national programs, establish program direction and goals,

Use of Cost and Performance Information

The nature and demands of the projects performed by USGS are constantly changing. In recent years, USGS has been engaging multiple cooperators to help fund individual projects, and single projects are becoming smaller and shorter in duration. The net result is USGS is accountable to a larger customer base and needs to manage an ever increasing number of agreements to sustain its technical programs. The increasing number of cooperators and shorter project lifecycles translate into hundreds of agreements that the cost centers need to monitor. USGS created exception reports that identify the problem areas that Management needs to focus on. These financial management tools give front line, cost center, Regional, and Headquarters managers the ability to quickly and accurately track and forecast the financial status of individual projects, cost centers, and the programs. This information has proven to be essential in conducting quarterly project and annual cost center management reviews. Also, for the last three years USGS' outside auditors have relied exclusively on these exception reports and form the basis for their test work of USGS' reimbursable activity.

and serve as science advisors to the Director for their respective program areas. Regional Directors are responsible for meeting regional science and operational needs through integrated science centers and other means. The bureau uses regional science programs and integrated science centers as tools to effectively coordinate program activities in addressing regional and multi-disciplinary science issues.

The **Office of Budget and Performance** and the **Office of Communications** report to the Director and provide bureau-level advice and staff assistance to the Director and executive leadership. This advice includes bureauwide policy, guidance, and direction for:

- Budget formulation, execution, presentation, and advocacy with the Department, Office of Management and Budget, and Congressional Appropriations Committees,
- Strategic planning and performance management, and
- Communicating information about USGS research, programs, activities and products, and liaison and close coordination between USGS and the Congress, the Department, and other bureaus for congressional and public affairs matters.

The **Office of Administrative Policy and Services** provides bureau-level policy, program direction, and leadership for science support. These support services include accounting and fiscal management; general services and office support; security; safety, environmental protection, and occupational health; contract negotiation and administration; grant administration; technology transfer, facilities and property management; and business information systems management. The Associate Director for Administrative Policy and Services, also serves as the USGS Chief Financial Officer.

The **Office of Human Capital** provides bureau-level leadership, program direction, and staff support for human capital programs, including equal employment opportunity, diversity and affirmative employment programs, personnel management policy and operations; employee development, competency management and technical, managerial and leadership training and development.

Bureauwide Costs — Bureau sustaining costs are budgeted centrally. The budget for these costs is formulated annually based on past actual expenses and an estimate of future need. Certain essential program support costs are relatively uncontrollable by the USGS and, because of the nature of organization and billing arrangements, are more effectively and efficiently managed centrally (e.g., payments to the Department for services provided through the Departmental Working Capital Fund for departmentwide centralized services, payments to the Department's National Business Center (NBC) for administrative systems and automated data processing services provided through the NBC Working Capital Fund, and other costs, such as the Federal Lab Consortium and Flexibility Spending Account). Other bureau-level costs include payments to the Department of Labor for unemployment compensation and on-going injury compensation. The Science Support Activity also partners with other Interior bureaus and offices to provide shuttle service to and from the Main Interior Building to the Reston area.

2009 Program Performance

USGS activities in executive leadership and management and bureau-wide support services are tracked through efforts such as the PMA. Highlights of USGS efforts in 2009 on these initiatives and other bureau-level policy, program direction, and leadership activities of USGS follow:

The President's Management Agenda — Offices within the Science Support Activity manage and oversee bureauwide implementation of the President's Management Agenda (PMA) initiatives that are part of ongoing departmentwide and governmentwide efforts to implement innovative Federal programs that promote improved financial management, competitive sourcing, strategic management of human capital, expanded electronic Government, management of assets, transportation, and energy use, environmental stewardship, and budget and performance integration.

Financial Management Improvements (PMA) — In 2007 USGS was rated Green for improved Financial Management. The bureau is continuing to work with the Department and OMB to assist the Department in meeting the "getting to green" requirements by demonstrating successful usage of management reports for decision making purposes in the Cooperative Water Program. Additionally, USGS was able to report to the Department that USGS has effective internal control over financial reporting. USGS held a two-day meeting to prepare the guidance for the 2007 A-123 Internal Control Reviews Plan and developed its Risk Assessment Methodology to identify where future Internal Control Reviews will occur. USGS also developed a web-based system to track the location, progress, results and corrective action plans from all Internal Control reviews, Programs reviews, Inspector General reviews, outside auditor reviews, and audits. The USGS will continue to pursue excellence in financial management, identifying opportunities to streamline and automate functions, and improve internal controls. USGS has refined reporting to senior managers on financial progress in several areas to reflect the results down to the cost center level. These financial status reports include statistical results of internal audits on bankcard and invoice charges, travel and reimbursable agreements. The Bureau's financial managers use this information to identify problems and implement correct actions. The financial status reports will form the basis for USGS' 2008 Circular A-123 report to the Department that it has effective internal control over financial reporting. USGS will work with the Department to implement a new comprehensive, integrated, risk-based internal control program Department-wide in 2009.

During 2008 USGS formed a team to develop standardized financial training that will be offered on an annual basis to all cost centers in the Bureau. This training will be detailed and to the extent possible provide attendees with a "hands-on" experience. The first training sessions are scheduled for November 2007. The team is developing training for the following areas of responsibility:

- Beginner AO/Budget Analyst
- Advance AO/Budget Analyst
- Administrative Technician

The same level of effort will continue into 2009.

Strategic Management of Human Capital (PMA) — In 2009, the Office of Human Capital will continue focus on Organizational Performance. Research in 2006, 2007, and 2008 on the USGS Organizational Excellence Model provided a systemic way to understand the linkage between organizational dimensions (people, processes, structures, and leadership and management) and organizational performance. With this understanding of how these dimensions affect organizational performance, the Office of Human Capital will be addressing priority actions to increase performance by focusing on the most critical levers for success. The Office of Human Capital will continue to provide organization development consulting to assist in implementing strategic change and assess on-going organization performance at the bureau,

regional and center levels. Analysis of major demographic and organizational trends as part of the dashboard measures developed in 2007, in addition to information gained from the Organizational Excellence research, will drive implementation of management strategies to help employees and managers deal with the impact of organizational change brought about by competitive sourcing, workforce adjustments and restructuring activities, and provide managers with concrete information on how to increase organizational performance at all levels of the USGS.

In 2007 and 2008, the Human Capital Office developed a bureau-wide 5-year Workforce Plan. In 2008 and 2009 the focus will be on the evaluation of our workforce planning approach and the assessment, evaluation, and development of strategies and tools for succession planning, including the use of the mentoring program. Additionally, data from the competency management tool in the Exceed Module of the Learning Management System will be used to focus attention on mission critical occupation competencies and guide the development of strategic training and development plans in the USGS.

Leadership Development — The USGS will continue to develop leadership skills and behaviors at all levels of the organization in 2009, through its internal leadership training program, championed and participated in by USGS senior executives and augmented by online performance support tools and external leadership development resources. During 2008, the USGS will maintain its current program and longitudinal evaluation of that program, focus on identifying gaps in the leadership development pipeline, and experiment with additional training, coaching, or other performance support mechanisms to close those gaps.

Competency Management — In 2008 and 2009, the USGS will be placing major emphasis on ensuring that the USGS is using competencies in the management of human capital operations.

- **Mission Critical Competency Management —** In 2008 and 2009, the USGS will continue to work with the Department toward implementation of DOILearn. In addition, the USGS will work with DOILearn team members to refine information reporting capabilities, link identified skill needs to course listings, and other developmental opportunities, and help managers use this information to strategically plan for the use of training and development dollars for high priority skill development needs.
- **Core Competencies for Managers —** The USGS will use the Core Competencies for Managers Model to develop structured interview questions and input to the On-line Recruitment System for hiring into supervisory and managerial positions, use assessment of supervisory and managerial competencies to set priorities for supervisory and managerial training and development to increase supervisory and managerial performance at all levels. In 2008 and 2009 the USGS will continue to implement core competencies for managers and supervisors, placing additional emphasis on the performance management and partnership and collaboration skills.
- **Partnership and Collaboration Competencies —** In 2007, the USGS supported performance in partnership and collaboration competencies by providing a workshop on collaboration and partnering for business and science leaders and by developing and supporting a community of practice on partnering and collaboration to provide on-going support for development of these critical competencies. In 2008 and 2009, the USGS will continue to build on these competencies by incorporating the topic into future training courses. In addition, the USGS will be focusing on partnership and collaboration competencies for the Department of the Interior's Mission Critical Occupations of hydrologists and geologists. The Human Capital Office will be identifying the

competencies, conducting a gap analysis, developing and implementing a plan to close the gaps, and measuring the results.

- **Tools for Managers —** In 2009, the USGS will continue to support managers in the use of on-line tools provided through DOILearn to assess skills and workforce competencies; to develop succession strategies, to prioritize and deliver training, and development; and to develop technology enabled learning to meet high priority dispersed training needs.

Workforce Diversity — Improving workforce diversity is a priority for the USGS and a significant workforce planning issue. During 2008 and 2009 the USGS will continue to implement strategies to comply with the requirements of the Equal Employment Opportunity Commission's (EEOC) Management Directive (MD)–715, particularly with regard to the identification of barriers that prevent the accomplishment of diversity and affirmative employment goals. The USGS Office of Equal Opportunity will continue posting workforce demographic information that will assist Human Resource (HR) and line managers with identifying trends and recruitment opportunities. The USGS will use the USGS Diversity Council to help identify barriers to diversity and recommend solutions to management. The USGS will direct its recruitment efforts to provide our regions with additional fiscal resources to establish relationships with local colleges and universities with majors in the USGS programs and with high enrollments of minority students. The USGS will continue implementing the Department's Workforce Diversity Plan and focus on goals measured by outcomes in recruitment, retention, zero tolerance and accountability.

Competitive Sourcing (PMA) — USGS performs scientific and support activities through a combination of Federal employees and external capabilities and staff. Maintaining an effective workforce balance for all scientific and administrative activities is crucial to our continued mission success and is represented in our commitment to accurate reporting in the Federal Activities Inventory Reform Act.

In 2007, USGS completed its execution of its Business Strategy Review process, outlined in the USGS Competitive Sourcing Green Plan 2005–08. All FTE positions have been grouped into nine functional business areas. Information Technology was the last to be completed accounting for approximately 700 FTE. In 2007, USGS completed the standard study for functions at the National Water Quality Laboratory, accounting for approximately 112 FTE, resulting in selection of the in-house Most Efficient Organization (MEO) as service provider. Transition and full Implementation of the MEO will occur in early 2008. In 2008 and 2009, USGS will continue to support OMB and Department of the Interior objectives for Competitive Sourcing as they are defined.

Performance Improvement (PMA) — A continuous plan for program improvement includes internal program and administrative reviews, external reviews by organizations such as the National Research Council, internal and OMB reviews of program improvement plans building on the results of OMB's evaluations using the Program Assessment Rating Tool (PART), ABC/M, and Organizational Assessments. All are fundamental to an integrated program- and budget-planning process that ensures that the management of programs and funding is handled appropriately and uniformly at local, regional, and national levels. General ABC reports and data can be extracted by all managers at all levels on a daily basis for verifying and validating, and for performing analyses for decisionmaking.

The USGS continues to implement the Department's Strategic Plan as an integrating framework for budget and performance. Specific measures tied to departmental priorities are used in SES

performance plans and are cascaded to all employees. USGS implements ABC/M objectives, through a distributed planning and budgeting system that uses ABC/M data and interfaces with the financial system to provide budget and program managers financial information to support the development of annual budgets. Capturing cost of work helps USGS better document the basis for cost-share projects, assessment, and cost recovery. USGS implemented a database that contains all USGS performance commitments including GPRA; PART; congressional directives; OMB directives, ABC/M and program internal controls. Collectively, these represent the Bureau's overall organizational commitments and the database enables us to better develop individual performance plans that are aligned with organizational commitments and easily cascaded into the bureau as well as facilitate completion of a robust Organizational Assessment for appraisals.

ABC data were realigned to the revised Strategic Plan and ABC costs were mapped to key reference or end outcome measures within the revised Strategic Plan and reported in the 2007 Interior Performance and Accountability Report. The USGS reported the full cost of delivering science against the end outcome – science used – for Resource Protection, Resource Use and Serving Communities mission areas. The Secretary stated "By integrating performance and costs, we are providing an unprecedented level of government transparency. This offers a more accessible and understandable analysis to the American people -- to whom we are ultimately responsible." This practice is continuing and efforts are underway to refine this process and address costing of intermediate measures.

For the 2009 Budget process, USGS documented full cost of achieving performance goals, demonstrated the costing relationship of intermediate and outcome measures, and cited marginal cost and incremental performance in program initiative funding requests.

Asset Management (PMA) — As measured in the PMA Scorecard for Real Property, improving policy and guidance and updating planning is significant for providing the management processes, tools, concepts, and context for improving asset management and setting the foundation to realize results. To achieve this outcome, in 2009 the USGS is updating the bureau Asset Management Plan to align it with the regional and science center Site Specific Asset Business Plans that were updated in 2008, and conducting formal reviews of other Asset Management policies and guidance. These policy documents are being updated and supplemental guidance is provided as necessary. To assist managers in making informed investment decisions, the bureau has established targets for improving our asset management performance and will incorporate these into the bureau Asset Management Plan. A key performance measure will be the reduction of unneeded assets.

Transportation Management (PMA) — USGS will continue to work towards meeting the transportation management goals outlined by the PMA Scorecard for Transportation Management, which includes goals for meeting the requirements of EO13149. Information obtained from the 2007 Fleet Inventory and Utilization Data Validation effort will be analyzed so we can provide recommendations to Cost Center Managers to help optimize the placement of vehicles to increase vehicle sharing and the use of alternative fuels. The USGS will work to implement the long term goals of the Fleet Management Strategic Plan. A Fleet Acquisition and Replacement Plan will be implemented as a strategy for acquiring higher fuel economy vehicles.

Energy Management (PMA) — USGS will continue to work to achieve the goals of the Energy Independence and Security Act of 2007, and EO 13423, as measured by the PMA Scorecard for Energy Management. USGS will sustain the current reduction of 15 percent in energy intensity at all facilities compared with the 2003 baseline established by EPAct 2005; this

reduction exceeds the scorecard target. To the extent practical and technically feasible, the USGS will seek to obtain a minimum of 2.5 percent of our electricity from renewable sources. The USGS continues a quarterly review of the metering implementation plan. To ensure that metering is installed at all facilities where it's feasible, the USGS will continue to update the plan.

Environmental Management (PMA) — USGS will continue to work to achieve the goals of the environmental management scorecard and the new executive order (EO) expected to be finalized in 2008. The new Executive Order 13423 released from EPA and the Office of the Federal Environmental Executive presents the USGS with implementation challenges. Goals and reporting requirements are more stringent and more difficult to achieve at current resource levels. However, USGS is making every effort to meet the new requirements and maintain the green scorecard rating.

USGS will implement mission-focused environmental management systems at appropriate organizational levels by 2009 and use these tools to support attaining our strategic goals by 2012. We will systematically manage environmental risks while minimizing cost, improve performance and enhance cooperation with our many stakeholders, partners and the public. We will work to spread best business practices across the Department, advancing the President's Management Agenda.

Financial and Business Management System — USGS continues to dedicate significant resources to the development of the Department’s new Financial and Business Management System (FBMS). Interior began work with a new integrator, IBM, during March 2006 and successfully implemented two bureaus in November 2006 with core finance and limited executive management information system functionality.

The scope of the project is to provide a Department-wide solution that significantly improves access to reliable, accurate, current, and complete financial and business management information to support the decision-making process throughout all levels of the Department, affecting all employees and operations. FBMS will replace current systems for budget formulation, core finance, personal and real property, financial assistance, acquisition, fleet management, and the executive management information system. High level functionality for budget formulation and project planning will also be replaced.

The Department revised the implementation schedule for out-year bureaus. The changes to the new schedule include bringing up all functional areas in deployments beginning in 2009 and advancing USGS on the FBMS conversion schedule from 2011 to 2010.

Workforce Adjustments — In 2008 and 2009, the USGS will continue its workforce planning efforts to assess the impacts of competitive sourcing initiatives, Voluntary Early Retirement Authority/Voluntary Separation Incentive Payments (VERA/VSIP), and other workforce strategies that will shift the numbers and balance of USGS employees and skills. These efforts will include the pursuit of additional authorities for VERA/VSIP from OPM and OMB. In 2007 and 2008, the Human Capital Office developed a bureau-wide 5-year Workforce Plan. In 2008 and 2009 the focus will be on the evaluation of our workforce planning approach and the assessment, evaluation, and development of strategies and tools for succession planning.

Technology Transfer — The Federal Technology Transfer Act, 15 USC 3710 as amended, requires each Federal laboratory having 200 or more full-time scientific, engineering and related technical positions to establish a research and technology application function. Within USGS

this function is housed in the Office of Policy and Analysis where two FTE's service USGS Science Centers and offices throughout the country.

As part of their duties the team negotiates and drafts Cooperative Research and Development Agreements (CRADAs); Technical Assistance Agreements, Facility Use Agreements, and Patent Licenses. It also manages the USGS intellectual property and inventions program; markets USGS technology opportunities and assistance to industry, non-profits, academic institutions, and State agencies; and provides training to USGS personnel on technology transfer and intellectual property protection. USGS has a total of 53 current patents. During 2007, the U.S. Patent and Trademark Office accepted filings for 3 new USGS patent applications and issued 6 patents to USGS. The table below summarizes the number of completed projects in 2007. The 75 agreements completed in 2007 represent a 23 percent increase over the number of agreements concluded in 2006, and an increase of 28 percent in partner contributions.

(Dollars in Thousands)

Technology Transfer 2007	Total Number	Private/ Small Businesses	Non-Profits / Academic Institutions	Government/ International Entities	Partner Contributions	USGS In-Kind Contribution
CRADAS	13	8 / 2	0 / 0	2 / 1	$1,624	$650
Other Agreements	62	24 / 2	14 / 9	10 / 3	$2,731	$371
Patent Licenses	16	0 / 13	0 / 3	0 / 0	$56	$0

USGS science and research contributes to a broad range of collaborative projects in the private and academic sector. Highlights of 2007 included a series of six Technical Assistance Agreements with multiple private sector analytical companies to evaluate and contrast their respective signature geochemical methods for identifying mineral deposits (e.g., gold) in covered terrains; partnerships with small businesses to validate new bioassays for Botulinum Neurotoxin Detection and Antagonists; agreements to test new diagnostic health care products for use with wildlife populations; and pilot testing of two remediation technologies for use in areas where contaminated groundwater discharges to wetlands.

Program Performance Overview

The Science Support Activity promotes the orderly and efficient conduct of USGS programs through organizational leadership, shared administrative support services, and promotion of common business practices. This activity supports the Department's management excellence goal. Key indications of USGS performance are reflected in the end outcome goals for increasing accountability, and advancing modernization/integration. To measure progress in achieving the intermediate outcome goals of improving financial management, human capital management, organizational reviews and acquisition, USGS tracks intermediate measures such as obtain unqualified audit, percent of material weaknesses and material non-compliance issues that are corrected on schedule, number of MD-715 identified deficiencies that have been corrected, number of employees trained in collaboration and partnering competencies, and the number of FTE in competitive sourcing studies completed during the fiscal year.

End Outcome Goal: 5.1: Management Excellence: Increase Accountability

End Outcome Measures Intermediate or PART Measures/PART Efficiency or Other Outcome Measures	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
GPRA End Outcome Measures									
Obtain unqualified audit **(SP)**	Unqualified Opinion	Unqualified Opinion	Unqualified Opinion	Unqualified Opinion	Unqualified Opinion	Unqualified Opinion	Unqualified Opinion	**0**	Unqualified Opinion
Intermediate Outcome Measures and Bureau and PART Outcome Measures Improved Financial Management									
Corrective actions: Percent of material weaknesses and material non-compliance issues that are corrected on schedule **(SP)**	UNK	UNK	100%	100%	100%	100%	100%	0	100%

End Outcome Goal: 5.2: Management Excellence: Advance Modernization/Integration

Intermediate Outcome Measures and Bureau and PART Outcome Measures Human Capital Management									
Diversity: The # of MD-715 identified deficiencies that have been corrected **(SP)**	UNK	UNK	UNK	2	3	3	5	+2	TBD
Cooperative Conservation Internal Capacity: # of employees trained in collaboration and partnering competencies **(SP)**	UNK	UNK	UNK	150 FTE	150 FTE	4,339 FTE	5,207 FTE	+868 FTE	7,810 FTE
Intermediate Outcome Measures and Bureau and PART Outcome Measures Organizational Reviews and Acquisitions									
Competition: Number of full time equivalent (FTE) in competitive sourcing studies completed during the fiscal year **(SP)**	0 FTE	0 FTE	70 FTE	512 FTE	112 FTE	TBD (Unknown until Business Strategy Reviews complete.)	TBD (Unknown until Business Strategy Reviews complete.)	TBD	TBD (Unknown until Business Strategy Reviews complete.)

Facilities

Subactivity	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-) [a/]	2009 Program Changes (+/-) [b/]	2009 Budget Request	Change From 2008 (+/-)
Rental Payments and Operations and Maintenance ($000)	0	0	+94,812	-10	94,802	94,802
FTE	*0*	*0*	*+52*	*0*	*52*	*+52*
Rental Payments ($000)	72,428	72,479	-72,479	0	0	-72,479
FTE	*0*	*0*	*0*	*0*	*0*	*0*
Operations and Maintenance ($000)	19,634	19,592	-19,592	0	0	-19,592
FTE	*52*	*52*	*-52*	*0*	*0*	*-52*
Deferred Maintenance Capital Improvements ($000)	3,373	7,898	0	-4,577	3,321	-4,577
FTE	*0*	*0*	*0*	*0*	*0*	*0*
Maintaining America's Heritage [c/] ($000)	[32,629]	[37,455]	0	[-4,577]	[32,881]	[-4,577]
FTE	*0*	*0*	*0*	*0*	*0*	*0*
Total Requirements ($000)	**95,435**	**99,969**	**2,741**	**-4,587**	**98,123**	**-1,846**
Total FTE	***52***	***52***	***0***	***0***	***52***	***0***

[a/] Fixed cost increases for this activity total $2,761, of which $2,741 will be funded and $20 is absorbed. A technical adjustment in the amount of $94,812 as described on Page E-33.

[b/] Changes for this activity include a reduction of -$10 for travel. The impact of this change is described in the General Statement that begins on page A-1.

[c/] Maintaining America's Heritage – The numbers included in Maintaining America's Heritage are: $3,321 for Deferred Maintenance including Facilities, Equipment, Maintenance Management System, Condition Assessment, and Project Planning; $9,965 is the estimated amount spent from discipline program dollars for facilities equipment maintenance needed for Hazards Networks, Cableways, Wells and Streamgages; and $19,668 for Operations and Maintenance.

Activity Summary

The 2009 budget request for the Facilities Activity is $98,123,000 and 52 FTE, which is a net program change of -$4,587 and 0 FTE from the 2008 Enacted level. Additional information on the technical adjustment is provided in the Rental Payments and Operations and Maintenance subactivity section and section E.

Facilities are defined by the Department of the Interior as a separate and individual building, structure, or other constructed real property improvement. USGS further defines facilities to include all locations where USGS resources are housed in the performance of mission related work, including office space, laboratory space, warehouse space, and related parking and common space, and large research vessels. The USGS has classified large (greater than 45 feet in length) research vessels as facilities. An installation is an operational unit comprised of one of more facilities and the associated land (for example, the EROS Data Center in Sioux Falls, SD, is an installation).

Activity Summary

Funds for this activity provide safe, functional workspace and facilities for accomplishing the bureau's scientific mission. The appropriated funds included in this activity cover approximately 76 percent of recurring USGS facilities costs. Customers, through reimbursable funding provide approximately 21 percent, and USGS science programs provide the remaining funds.

This activity supports the Department of the Interior's Management Excellence goal of Advance Modernization/Integration through the intermediate outcome goal of Facilities Improvement. This activity tracks outcomes such as; overall condition of building and structures; percent change in the operating costs per square foot of buildings that are "not-mission dependent" as reported in Federal Real Property Profile (FRPP) in the current fiscal year compared to the previous fiscal year; percent change in the total number of buildings reported as "under utilized" or "not utilized" in the FRPP; and the percent of assets targeted for disposal that were disposed. This activity also tracks outputs including "number of bureau condition assessments completed" (within a 5-year cycle), "number of deferred maintenance and capital improvements, and new Capital Improvement Projects."

Use of Cost and Performance Information

In 2007, USGS completed its third update to the bureau Asset Management Plan (AMP) based on feedback from the Department's Asset Management Program Review and in accordance with the Department's AMP. The AMP articulates the bureau's strategy and plan for improving the management and condition of the bureau's asset inventory. The AMP also describes the bureau's strategy and process for managing the total cost of asset ownership and serves as a framework to guide asset investment decisions, including operations, preventive maintenance, component renewal, repair and construction. The document reflects the information gathered through the Site Specific Asset Business Plans (ABPs) completed at the science centers and the regional levels. Through analysis of the ABPs the AMP reflects the current condition of the real property portfolio and the direction USGS is taking to improve performance metrics associated with those assets.

The bureau updated the Site Specific ABP in 2007. The ABPs are a 5 to 10 year strategic plan addressing facility needs at a science center, campus, or region. The ABPs were completed by the cost center managers who have a greater understanding of the current and future needs of their science center. The new version of the ABPs includes greater detail on such topics as operations and maintenance, project planning, asset prioritization, and deferred maintenance backlog. The new format provides a more in-depth 5 and 10 year strategic focus on projected changes in staffing, funding and mission that will impact the facilities.

The goal for the facilities program is to meet bureau science needs while optimizing facilities location, distribution, and use to control or reduce costs. Objectives for meeting this goal include:

- Coordinate facility planning with science planning to provide safe, high-quality workspace aligned with science needs,
- Development of Asset Business Plans to meet assessment management goals,
- Meet performance targets by improving space utilization, controlling rent and operating costs, and releasing unneeded space,
- Reduce the deferred maintenance backlog,
- Establish an effective maintenance program at each owned facility to meet industry best practices, and
- Increase co-location consistent with science program objectives.

Facility Planning — The bureau updated its Site-Specific Asset Business Plans (ABP) to further support the bureau's Asset Management Plan (AMP). The ABPs are 5-to-10 year plans addressing specific needs of a field unit, campus, or region covering all assets reported in the FRPP. The USGS ABPs effectively address and articulate the life cycle issues and characteristics of a site's real property assets. These plans, prepared by local managers, provide

facility and regional managers throughout the organization a micro-level view of these assets. The performance metrics and substantial inventory data included in ABPs are used by local managers to aid daily decision-making. They are also used as annual action plans to direct bureau and regional resources where they are most needed in support of the USGS mission.

Bureau Systems — Web-based facilities information systems continue to streamline the budget data collection process for facilities and increase the availability of much-needed management information on bureau real property holdings. Comprehensive facility condition assessments continue to identify deficiencies that need priority attention, creating an information base that promotes effective stewardship and a more informed asset investment process. The implementation of Interior's standard facilities maintenance management system provides the capability for the USGS to report our operations and maintenance consistently across the bureau.

Maintaining America's Heritage — The Department of Interior is committed to preserving and maintaining operational facilities and major equipment investments as well as responsible stewardship of Interior's managed natural and cultural treasures. The 2009 USGS budget request includes an estimated $33.0 million for facilities and equipment maintenance and deferred maintenance under the Maintaining America's Heritage initiative. The Operations and Maintenance and the Deferred Maintenance and Capital Improvements subactivity descriptions provide details on the immediate and long-term maintenance projects underway and planned for the next 5 years to ensure that facilities and equipment are functional, safe, and useful to the fullest extent of their lifecycle.

USGS continues to work collaboratively with FWS to address the real property asset issues at the Patuxent Wildlife Research Center. The joint FWS-USGS plan for improving DOI assets at the Patuxent Research Refuge and Patuxent Wildlife Research Center proposes a multi-phase effort to upgrade and modernize the utility infrastructure and facilities at Patuxent. In 2008 USGS was appropriated $4.577 million for the initial phase of the Patuxent renovation. Efforts in 2008 will focus on the utility infrastructure, i.e., water, sewer, and electrical systems. The USGS utility projects will be concentrated in the Refuge’s animal research area, and will encompass water supply, electrical systems and power supply lines, animal waste management systems, and storm water drainage.

Additional information regarding the 2008 funding and 2009 joint plan are provided in the Deferred Maintenance and Capital Improvement subactivity.

Subactivity Overview

The Facilities Activity comprises two subactivities:

The **Rental Payments and Operations and Maintenance** subactivity provides for rental payments to the General Services Administration (GSA), to other Federal agencies, to private lessors, and to cooperators for space holdings nationwide. It includes the recurring costs of providing for the basic operations and maintenance, security costs, and upkeep of facilities to ensure that they are maintained in compliance with applicable safety and other standards. The USGS occupies a total of 4.3 million square feet of rentable space in about 189 GSA buildings nationwide, making USGS one of the largest users of GSA space within the Department. The USGS acquires space directly at over 100 other sites. The USGS has 34 owned installations with 283 owned buildings on approximately 2,100 acres. This includes 9 biological science centers, 8 biological field and research stations, the National Center for Earth Resources Observation

Systems (EROS), 9 geomagnetic, seismic and volcano observatories, and 7 other miscellaneous owned properties, such as gauging stations, storage annex, and warehouses. The USGS also owns 8 large research vessels.

The **Deferred Maintenance and Capital Improvement** subactivity funds are used to address the highest priority USGS facility and equipment needs to conform to safety and environmental standards. The current funding level provides for approximately 2.7 percent of the facilities Deferred Maintenance backlog. The condition assessment program includes annual surveys and a cyclic process for comprehensive onsite inspections to document deferred maintenance.

Activity: Facilities

Subactivity: Rental Payments and Operations and Maintenance

Subactivity	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-) [a/]	2009 Program Changes (+/-) [b/]	2009 Budget Request	Change From 2008 (+/-)
Rental Payments and Operations and Maintenance ($000)	0	0	+94,812	-10	94,802	94,802
FTE	*0*	*0*	*+52*	*0*	*52*	*+52*
Rental Payments ($000)	72,428	72,479	-72,479	0	0	-72,479
FTE	*0*	*0*	*0*	*0*	*0*	*0*
Operations and Maintenance ($000)	19,634	19,592	-19,592	0	0	-19,592
FTE	*52*	*52*	*-52*	*0*	*0*	*-52*
Total Requirements ($000)	**95,435**	**99,969**	**2,741**	**-10**	**94,802**	**-2,731**
Total FTE	***52***	***52***	***0***	***0***	***52***	***0***

[a/] Fixed cost increases for this activity total $2,761, of which $2,741 is funded and $20 is absorbed. A technical adjustment is proposed to combining the Rental Payments component and Operations and Maintenance component as described in section E-33.

[b/] Changes for this activity include a reduction of -$10 for travel. The impact of this change is described in the General Statement that begins on page A-1.

Summary of 2009 Program Changes for the Facilities Program

Request Component	($000)	FTE
• Travel reduction	-10	0
TOTAL Program Changes	**-10**	**0**

Justification of 2009 Program Changes

The 2009 budget request for the Rental Payments and Operations and Maintenance Program is $94,802,000 and 52 FTE, a net program change of -$2,731 and 0 FTE from the 2008 Enacted level.

Program Overview

The combined Rental Payments and Operations and Maintenance subactivity will provide the USGS with funding flexibility that is needed to meet asset management goals and carry out Executive Order 13327. This subactivity includes the recurring costs of providing for the basic operations and upkeep of facilities and ensuring they are maintained in compliance with Federal, State, and local standards and to ensure that facilities remain safe for USGS employees working at the facilities, as well as partners and customers visiting the facilities. This is the operations and maintenance (O&M) costs component. The subactivity also funds payments to General Services Administration (GSA), other Federal sources, private lessors, and cooperators for space occupied by the USGS nationwide. The USGS has unique facility requirements necessary to support science functions and relies heavily on GSA to meet needs such as providing modern laboratory and other support space. The USGS occupies a total of 4.3 million square feet of rentable space in about 189 GSA buildings nationwide, making USGS one of the largest users of GSA space within the Department. Approximately 90 percent of USGS rental costs for space holdings are provided through GSA, 7 percent for cooperative space arrangements, and the remaining rental costs are for other Federal agencies and private lessors. This is the rent costs component.

Use of Cost and Performance Information

The bureau's Facility Energy Program supports the USGS mission by providing leadership, information, support, data analysis, and access to resources to assist in the economical and environmentally sound purchase, use, storage, and control of the energy and water resources at all USGS installations. Executive Order (EO) 13423, “Strengthening Federal Environmental, Energy, and Transportation Management,” signed by the President on January 24, 2007, established new energy efficiency goals. The USGS 2007 energy consumption is 25 percent below the 2003 baseline well ahead of the goal scheduled to reach 30 percent reduction by 2015. Energy consumption was reduced through both more efficient equipment operation as well as installation of new energy efficient equipment. To improve the accuracy and consistency of our energy cost and consumption data, the USGS is expanding to bureau-wide our current utility bill analysis contract. This contract provides us detailed energy information via a web-based database. Through the efficient management of energy, the USGS reduces the impact facilities have on the environment. These practices promote responsible use, ensure optimal value, improve operational efficiencies, set a good example for the public, and ensure energy expenditures are optimized.

USGS spends approximately $127 million annually on Facilities. Only 76 percent of those costs are funded through the Facilities Activity. The remaining comes from reimbursable partners (21 percent) and science funding (3 percent). The largest expenditure in 2007 Facilities was rent, $96.1 million. Deferred Maintenance and Capital Improvements were $3.4 million. Rented space provides the greatest opportunity for savings, a point emphasized by Booz Allen Hamilton in a Strategic Facilities Master Plan, prepared for USGS in 2005.

Although only 25 percent of Facilities funds are spent on owned properties, these assets are the most unique and mission critical in the USGS portfolio. As part of the Strategic Facilities Master Plan, USGS facilities were ranked in terms of their mission dependency using a tool called the Asset Priority Index. Despite the fact that the largest concentrations of employees are in GSA space at national and regional headquarters in Reston, VA, Denver, CO, and Menlo Park, CA, 15 of the top 20 mission critical assets are owned assets. These owned assets have unique capabilities or are uniquely positioned on the landscape for the science conducted.

As of 2007, the overall Facility Condition Index for USGS owned assets is 0.153, which is poor and the deferred maintenance backlog is $65 million. USGS has started modeling exercises to project the appropriate sustainment level of operations and maintenance funding that will allow

identification of critical cyclical and preventive maintenance that is currently not being done. To eliminate the deferred maintenance backlog, this routine maintenance must be completed first.

Annually the USGS receives fixed cost increases for the Rent component. This has allowed Rent to keep pace with inflation and uncontrollable escalations in rent costs. However, the opposite has occurred with the O&M component. Each year rising costs related to energy, fossil fuel, equipment and maintenance, coupled with across-the-board reductions in appropriated funding have significantly reduced the purchasing power of our O&M dollars. Science program dollars are being used to fund maintenance or the maintenance is being deferred and added to the backlog.

The restructure provides flexibility in the fiscal management of the funding to better manage facilities to meet the asset management goal of Executive Order 13327. Uncertainty of reimbursable funding income adds to the complexity the USGS cost centers face in managing rent and O&M. Currently, the USGS cost centers charge an overhead rate on all reimbursable funding for their share of facilities costs. At the beginning of each fiscal year, facilities overhead rates are set based on estimates of rent and O&M costs versus projected appropriated and reimbursable income. Based on these estimates, funds are allocated on a “fair share” basis for the Federal portion of the facilities costs and a projection is made on the reimbursable income assessments. Once the reimbursable facilities assessment income is earned, it is then split in proportion to estimated rent and O&M costs. Facilities assessments are not earned until expenses have been incurred. Therefore, facilities cost are incrementally funded throughout the year for the reimbursable portion.

Routine operations and maintenance of owned USGS facilities is currently under-funded which results in continued growth to the deferred maintenance backlog and continued degradation of facility condition. Given current budget constraints, USGS proposed to address this issue internally by downsizing rented space and using the savings to support operations and maintenance.

Among our key asset management goals is improving the condition of owned facilities. Operations and maintenance functions include ongoing facility support that sustains day-to-day USGS scientific activities at 34 owned installations ranging from major science centers with complex facilities such as laboratories and chemical storage to offices, garages, residences, and other buildings. This includes 9 biological science centers, 8 biological field and research stations, 9 geomagnetic, seismic and volcano observatories, and 7 other miscellaneous owned properties, such as stream gaging stations, storage annex, and warehouses totaling about 283 owned buildings on approximately 2,100 acres. The USGS also owns 8 large research vessels. These large research vessels have characteristics, costs, and operations and maintenance features that coincide with those of USGS facilities. These vessels are mobile installations, meeting the criteria for the Comprehensive Condition Assessment. Vessels must exceed 45 feet in length and perform overnight field research to be classified as facilities. These vessels support biology research, water resources investigations, and marine geology research; five on the Great Lakes, two in California, and one in Alaska.

Operational costs at USGS owned and some leased facilities include

- Electricity, water, and sewage;
- Fuel: gasoline, propane (vehicles, vessels, and heating), natural gas, diesel, and oil (heating);

- Janitorial services: window cleaning and carpet cleaning;
- Upkeep of grounds: grass mowing, snowplowing, and grounds irrigation;
- Waste management/disposal: refuse collection and sewage effluent pumping;
- Vehicles: tractors and trucks solely operated in direct support of operating the facility (includes rented vehicles, vehicles and owned and leased from GSA);
- Vessels: safe and effective operations and maintenance, apply upkeep standards necessary to realize the anticipated useful life of the fixed asset, provide for salaries and benefits of marine professionals operating the vessel, fuel, docking fees, inspections, minor repairs, cyclic maintenance, and at least one vessel haulout a year; and
- Annual certification for facility systems, such as fire systems, fire extinguishers, back flow preventers, and fume hoods.

Maintenance of facilities involves the upkeep of constructed USGS-owned facilities and structures and capitalized equipment necessary to maintain the useful life of the asset. This includes preventive maintenance; cyclic maintenance; repairs; rehabilitation; replacement of parts, components, or items of equipment associated with the facility; adjustment, lubrication, and cleaning (non-janitorial) of equipment associated with the facility; periodic inspection; painting; re-roofing; resurfacing. Also included are special safety inspections and other actions to assure continuing service and to prevent breakdown; scheduled servicing of equipment (such as heating, ventilation, and air conditioning equipment); and maintenance for owned facility-related vehicles.

In addition to maintenance cost, salary costs associated with staff that perform operations and maintenance activities are also cost incurred to the subactiviy. USGS staff that perform operations and maintenance are located at the facility they are operating and maintaining. These are primarily USGS-owned facilities, but also include GSA-owned facilities for which GSA has delegated operations and maintenance authority to the USGS (e.g., the National Center, in Reston, Va.) and facilities owned by other agencies or organizations for which the USGS has agreed to cover operations and maintenance expenses in exchange for use of the space (e.g., Patuxent, MD.). Staff at these facilities are responsible for the day-to-day operations of the facility and for maintaining it in operating order. This includes such operations as janitorial services, landscaping, snow removal, operation of the heating and air conditioning system, plumbing, electrical, elevator operations, fire alarm systems, fume hood operations, storage, and removal of hazardous materials, etc. Depending upon the location, some of these functions are carried out by government employees and some via contract.

Staff associated with operations and maintenance program management at the regions and headquarters are funded by the Science Support Activity. Bureau policy for facilities operation and maintenance is established at headquarters. Staff at the regional and headquarters level who perform operations and maintenance program management establish standards for operations and maintenance, develop and implement plans for bureauwide systems (e.g., MAXIMO), develop deferred maintenance plans, develop contracts for Operation and Maintenance services and cost modeling, formulate regional and bureauwide operation and maintenance budgets, respond to departmental and OMB reporting requirements, etc.

Use of the USGS Investment Review Board (IRB) — The USGS IRB reviews major information technology investments. The IRB is chaired by the Deputy Director, and members include an Associate Director, Regional Director, Chief Information Officer, Director of the Office

of Budget and Performance, and Chief Financial Officer. In addition to proposed construction investments with a life cycle cost of $2 million or more, the IRB reviews all space transactions (occupancy agreements, leases, etx.) with a life cycle cost of $5 million or more. Regional boards review transactions below this threshold.

Program Performance — The program contributes to the strategic goals of Management Excellence, Advance Modernization and Integration.

2009 Program Performance

Space Savings — The Alabama Water Science Center will be relocating from their existing leased space to the new Federal Building in Tuscaloosa, Alabama during the second quarter of 2008. The GSA-leased space rental rate in the new space will be lower. The Center will also downsize the office space requirements from approximately 5,800 square feet to 1,200 square feet. The reduction in space and reduced rental rate will decrease the rent from $52,000 to approximately $37,000.

The Rhode Island Water Science Center will relocate from their existing leased space to new space in Providence, during the second quarter of 2008. The rent cost at the existing space had increased substantially. The rent will decrease from $153,000 to approximately $85,000 when the Center moves to the new space, a significant cost savings for the Center.

Space Management — The USGS 5-Year Space Management Plan was updated in September 2007. The plan supports the bureau's Asset Management Plan and Site Specific Asset Business Plans and provides a framework, strategic vision, and plan of action for effective bureau space management of GSA-provided space, USGS direct leases, and owned property. It is used by USGS management to implement bureau space goals, including consolidation, collocation, and disposal. Information contained in the Plan is focused on mission dependency and program requirements for space.

In 2009, USGS will continue developing planning requirements outlined in the Department's Asset Management rolling 3-year timeline. These include establishing targets for meeting performance metrics identified by the FRPC; reporting accomplishments in asset performance; and implementing a standardized practice for calculating the current replacement value of facilities and repair projects.

Facility Maintenance Management System (FMMS) — FMMS assists the USGS facility managers in efficiently operating and maintaining various facilities by providing them with accurate facility information at the local, regional, and national level. It supports the development of facility budgets, creation of the Deferred Maintenance Capital Improvement 5-year plan, and the implementation of the USGS Asset Management Plan (AMP). FMMS standardizes the various business processes, creates an inventory of the building equipment, and helps in tracking and reporting on the facility related maintenance information and data. It also helps in the development of the necessary AMP components that assist in the budgeting and the five-year planning process.

MAXIMO — MAXIMO is a maintenance management system used for tracking the operations and maintenance of facilities assets and their components. The system not only provides a mechanism to track the day-to-day operation and maintenance of facilities assets, but also

provides a planning tool to schedule and assign preventive maintenance. MAXIMO is implemented at NPS, BLM, BVIA, FWS and BOR. In 2007, a contract was awarded to upgrade MAXIMO to v6.2. This upgrade will meet the Department of Interior's requirement for a Single Platform MAXIMO (SPM). In 2008, the USGS deployed the MAXIMO v6.2 at all 14 major USGS sites. In 2009, a condition assessment module will be developed to include the utilization of the facility condition index (FCI) and the asset priority index (API).

Operations and Maintenance Cost Modeling — Operations and maintenance (O&M) cost modeling is the use of a representative amount of data to predict the outcome for a large amount of data. In 2007, a contract was awarded to create O&M cost models utilizing O&M industry-wide standards for two major sites – Wisconsin and Michigan. In 2008, the cost models from the two sites will be to ensure compliance with Federal accounting standards for auditing purposes. In 2009, utilization of the newly developed O&M cost model will be implemented at all USGS sites.

Energy Management — The USGS is dedicated to achieving the energy and water reduction and renewable energy consumption goals set forth in the Energy Policy Act of 2005 (EPAct 2005) and EO 13423, "Strengthening Federal Environmental, Energy, and Transportation Management". The USGS implemented an energy management plan to guide programs toward meeting the mandated goals.

USGS will continue to work to achieve the goals of the Energy Policy Act of 2005 (EPAct 2005), as measured by the President's Management Agenda Scorecard for Energy Management. USGS will sustain the current reduction of 25 percent in energy intensity at all facilities compared with the 2003 baseline established by EPAct 2005. This reduction exceeds the target of a 9 percent reduction in energy consumption by the end of 2008. To the extent practical and technically feasible, the USGS will seek to obtain a minimum of 3 percent of our electricity from renewable sources. The USGS continues a quarterly review of the advance metering implementation plan and installed advance metering at all facilities where it is feasible. USGS will continue to update the plan.

In 2007, a contract for a Web-based system to capture, store, and analyze utility cost and consumption data was initiated for a 2008 award. The contract requires the vendor to collect energy data from all USGS facilities that pay utility companies directly. Regional Energy Managers were identified and energy management meetings were held monthly. Energy management strategies shared during these meetings included implementation of a bureau metering plan, training for energy and facility managers, and Energy Conserving Opportunities (ECOs), in-place or planned, across the bureau. ECOs for 2007 included the installation of a duel-fuel summer boiler at the John W. Powell Building, Reston, Va., to reduce facility fuel consumption and emissions. In 2008 and 2009, USGS will continue efforts begun in 2007. In 2009, additional funding will be used for energy audits, the implementation of the bureau metering plan, and to initiate work on new ECOs. Planned ECOs include energy efficient lighting retrofits, heating, ventilation, and air conditioning improvements and replacements, and building envelope enhancements. This funding will support additional improvements in the overall energy management program and will help further reduce the bureau's energy consumption and help maintain green on the scorecard.

Program Performance Overview

End Outcome Goal 5.2 Management Excellence: Advance Modernization/Integration

End Outcome Measure/Intermediate or PART Measure/PART Efficiency or other Outcome Measure	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
Intermediate Outcome Measures and Bureau and PART Outcome Measures Facilities Improvement									
Overall condition of buildings and of structures, as measured by the Facilities Condition Index (FCI) that are mission critical and mission dependent, as measured by the Asset Priority Index (API) with emphasis on improving the condition of assets with critical health and safety needs **(SP)**	UNK	UNK	UNK	UNK	0.124	0.115	0.133	-0.18	0.095
Percent change in the Operating Costs (operations and maintenance costs) per square foot of buildings that are "Not-Mission Dependent" as reported in the Federal Real Property Profile (FRPP) in the current fiscal year compared to the previous fiscal year. **(SP)**	UNK	UNK	UNK	UNK	-1.6%	-3%	-3%	0%	-5%
Percent change in the total number of buildings (office, warehouse, laboratory, and housing) reported as "Under Utilized" or "Not Utilized" in the Federal Real Property Profile (FRPP) in the current fiscal year compared to the previous fiscal year **(SP)**	UNK	UNK	UNK	UNK	83%	-5%	-5%	0	-5%
Comments:	In 2007 eleven additional warehouse buildings were identified as "Under Utilized" or "Not Utilized" resulting in the percentage of 83 when comparing to 2006 data.								
Percent of assets targeted for disposal that were disposed **(SP)**	UNK	UNK	UNK	UNK	26%	100%	100%	0	100%

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Activity: Facilities

Subactivity: Deferred Maintenance and Capital Improvements

Subactivity	2007 Actual	2008 Enacted	2009 Fixed Costs & Related Changes (+/-)	2009 Program Changes (+/-)	2009 Budget Request	Change From 2008 (+/-)
Deferred Maintenance and Capital Improvements ($000)	3,373	7,898	0	-4,577	3,321	-4,577
FTE	*0*	*0*	*0*	*0*	*0*	*0*
Maintaining America's Heritage ($000)	[32,629]	[37,455]	0	[-4,577]	[32,881]	[-4,577]
FTE	*0*	*0*	*0*	*0*	*0*	*0*
Total Requirements ($000)	**3,373**	**7,898**	**0**	**-4,577**	**3,321**	**-4,577**
Total FTE	***0***	***0***	***0***	***0***	***0***	***0***

Summary of 2009 Program Changes for Deferred Maintenance and Capital Improvements

Request Component	($000)	FTE
• Patuxent Wildlife Research Center Capital Improvement	-4,577	0
TOTAL Program Changes	**-4,577**	**0**

Justification of 2009 Program Changes

The 2009 budget request for the Deferred Maintenance and Capital Improvements (DMCI) is $3,321,000 and 0 FTE, a net program change of -$4,577,000 and 0 FTE from 2008 Enacted level.

Patuxent Wildlife Research Center (-$4,577,000 / 0 FTE)

The 2009 budget proposes to decrease the DMCI Subactivity by $4,577,000 and 0 FTE. The increase in 2008 was a one-time increase to address infrastructure needs. USGS and the FWS jointly proposed to fund, on a roughly equal basis, critical utility infrastructure replacement for their collocated facilities on the Patuxent Research Refuge, Laurel, MD.

The Patuxent Wildlife Research Center (PWRC), located between Baltimore and Washington, D.C. has been in operation since 1936. Prior to the creation of the National Biological Survey (NBS) in 1993, the PWRC and the Patuxent Research Refuge (PRR) were within the FWS. During the existence of the NBS, the PWRC and PRR remained closely aligned. After the transfer of the NBS to the USGS in 1996, the bureaus agreed in a Memorandum of Agreement to institutionalize their joint commitment to maintain the science and management partnership by building upon their collocation.

In 2008, the USGS plans to begin renovation of the utilities systems that support animal research at the Center, in conjunction with planned FWS utilities renovations. Utilities that will

be upgraded include: domestic and research water collection, treatment, and distribution systems; wastewater collection and treatment systems; and storm drainage systems.

Program Performance Change

	2005 Actual	2006 Actual	2007 Plan	2008 Plan	2009 Base Budget (2008 Plan+ fixed costs)	2009 Request	Program Change Accruing in 2009	Program Change Accruing in Out-years
					A	B=A+C	C	D
End Outcome Goal 5.2 Management Excellence: Advance Modernization/Integration								
New Capital Improvements Facilities	0	0	0	1	1	0	-1	0
Total Projected Cost ($000)	0	0	0	4,577	4,577	-4,577	-4,577	0
Projected cost per capital improvement project (whole dollars)	0	0	0	4,577,000	4,577,000	-4,577,000	-4,577,000	0
Comments	The increase in 2008 was a response to language in the House appropriations Committee Report for 2006. USGS and the FWS jointly proposed to fund, on a roughly equal basis, critical utility infrastructure replacement for their collocated facilities on the Patuxent Research Refuge, Laurel, MD. All necessary Capital Improvement funding for this project was requested 2008. The requested 2009 decrease would result in one less Capital Improvement.							

Note: Projected costs may not equal program change as these are full costs, which may include funds from other sources and (or) use averages.

Column A: The level of performance and costs expected in 2009 at the 2008 level plus funded fixed costs. Reflects the impact of prior year funding changes, management efficiencies, absorption of prior year fixed costs, and trend impacts, but does not reflect the proposed program change.

Column D: Out-year performance beyond 2009 addresses lagging performance — those changes occurring as a result of the program change (not total budget) requested in 2009. It does not include the impact of receiving the program change again in a subsequent out-year.

Program Overview

The DMCI Subactivity funds are used to address the highest priority USGS facility and equipment needs to conform to safety and environmental standards. The current funding level provides for approximately 2.7 percent of the facilities Deferred Maintenance backlog. The condition assessment program includes annual surveys and a cyclic process for comprehensive onsite inspections to document deferred maintenance.

The USGS is committed to the continual improvement of the stewardship of our assets. The primary goal is to support Management Excellence for the USGS mission delivered through Interior's Resource Protection, Resource Use, and Serving Communities mission areas providing a safe, comfortable, environment for the employee, visitors and contractors at USGS facilities. Improving the maintenance of existing facilities and equipment ensures the health and safety of the public and employees, protects the asset, and ensures compliance with building

codes and standards. This program tracks the Facilities Condition, as measured by the Facilities Condition Index (FCI).

Facilities projects reflect the results of comprehensive evaluations conducted by independent architect and engineer firms. These installation-wide assessments are key to establishing and core data on the condition of the USGS constructed assets.

The USGS has stewardship responsibility for unique mission equipment assets such as hazard-warning networks, river cableways, and stream gaging stations. These require effective maintenance and capital investments to preserve functionality. Projects addressing these assets are included under the Equipment Section of the 5-Year DMCI Plans and Health. These assets are evaluated using the same safety criteria as our constructed real property assets.

For 2009, remediation of the most critical health, safety, and resource-protection deficiencies is again the focus of the priority facility projects. On average 10 deferred maintenance projects are addressed each year.

2009 Program Performance

The total deferred maintenance needs is approximately $65 million. The USGS addresses the most critical maintenance and capital improvement needs prioritized according to Department's guidelines. The 2009 budget request includes a Maintenance and Construction Plan for 2009-2013 that list the USGS priority deferred maintenance and capital improvement projects. This plan is subject to adjustments in outyears due to funding changes and revised priorities based on comprehensive facility condition assessments, annual condition surveys, and emergency needs.

FY 2009 Deferred Maintenance and Construction Plan

The following table lists, in priority order, the proposed projects and equipment to be addressed by DMCI in 2009.

FY 2009 Facility Projects

Fish Health Lab **$343,000**	**Replace Sewage Treatment Facility (B20010015) —** This project provides for the existing building to be demolished and reconstructed. The building, constructed in 1950, has far exceeded its life expectancy and is in extremely poor condition. Repair costs would exceed replacement costs. The condition of sumps and covers pose both an environmental and safety/health hazard. Electrical system has reached the end of its life. The system is not UL labeled and has no main disconnect. All conduit and enclosures are rusted and corroded. Receptacles are in a wet location and are not GFI protected. In addition, the concrete structures (lift station, sump pits, and new controls and panels have been installed to remediate existing conditions until the building is replaced. Suggest that Bureau fund the design phase 2 years in advance to identify project requirements and construction phase cost estimate for subsequent fiscal years budget submission.

R/V Grayling **$100,000**	**Install Chemical Alarm System and ID (B2007GLR03)** The R/V Grayling is used for science related cruises on Lake Ontario, where the duration of a cruise can be from one day to several weeks at a time. During the cruises, the crew and passengers are living and working on the vessel for the cruise duration. The following items require design, installation or upgrade to ensure safe operation of the vessel. The vessel lacks industry standard emergency/alarm system and an automatic ID system. Although the existing fire and smoke alarm systems works, the system requires replacement to ensure that the appropriate type of system is installed in certain areas (engine room, crew quarters, or other areas). An automatic ID system will be installed to transponder information regarding location of the vessel for safe passage on the lake. In addition, a chemical alarm detector system will be installed to monitor air quality for hazardous substances that could pose a serious threat, and to warn persons on board of unsafe conditions.
R/V Musky II **$75,000**	**Install Chemical Alarm System and ID (B2007GLSCRV03)** The R/V Musky II is used for science related cruises on Lake Ontario, where the duration of a cruise can be from one day to several weeks at a time. During the cruises, the crew and passengers are living and working on the vessel for the cruise duration. The following items require design, installation or upgrade to ensure safe operation of the vessel. The vessel lacks industry standard emergency fire and chemical alarm systems and an automatic ID system. Although the existing fire and smoke alarm systems works, the system requires replacement to ensure that the appropriate type of system is installed in certain areas (engine room, crew quarters, or other areas). An automatic ID system will be installed to transponder information regarding location of the vessel for safe passage on the lake. In addition, a chemical alarm detector system will be installed to monitor air quality for hazardous substances that could pose a serious threat, and to warn persons on board of unsafe conditions.
CERC-Tech Center **$130,000**	**Install Fire Suppression System (B20070007)** The Environmental Technology Center Building is a 9,960 square foot building with an elevator and partial basement. The center is comprised of office space and the station's computer and communications network hub. The building does not have a fire sprinkler system. NFPA Uniform Fire Code, NFPA-1, section 13 requires automatic fire sprinkler system coverage.
SO Conte – Fish Passage Complex **$128,000**	**Add/Replace/Relocate Dust Collection System (B2003CAF09C)** Install new dust collection system to tools used in the vehicular storage building, and relocate the existing dust collector to the Fish Passage Complex located in an outside area. The lack of a dust collection system is a fire hazard in the vehicular storage building. The location of the dust collector in the Fish Passage Complex is also a fire hazard, and must be moved to an outside area. CA item: Proc C item D2, Prop B item D3. Contingency $11K
EROS Data Center **$79,000**	**Add Vehicle Exhaust and Make-up Air System in the Heavy Equipment Building (M2007HEBD1**) Provide mechanical ventilation system including exhaust air and heated make-up air required for motor vehicle indoor maintenance in the heavy equipment building. Mechanical ventilation system shall operate based on the detection or carbon monoxide at a minimum concentration of 25 parts per million.
Fish Health Laboratory **$44,000**	**Replace Fume Hoods (B2005LSC003)** Three fume hoods in the Fish Health Laboratory require replacement. The hoods were installed in the 70's. They contain asbestos in the panels and no longer meet present laboratory standards. The older hoods do not have filters which would allow fibers to be released into the open air environment during operation. The fume hoods are stand alone units that operate independently of the HVAC system. If a panel were to chip, crack, or break, asbestos fibers would be introduced into the environment. Since the hoods do not run continuously, the asbestos could enter the laboratory areas and be discharged to the open air environment. Recent findings in the design of the fume hoods exhaust system identified that the fume hood units require replacement. This project would replace the fume hoods and reconnect to the existing duct and fans.

Barrow Observatory $120,000	**General Repair of the Barrow Absolutes and Sensor Buildings (G2001001BSO)** We need to do extensive re-wiring for all structures both within individuals structures and between all structures on-site. Current conditions are unsafe due to frayed wires and deteriorating infrastructure. Update 2007: Internal wiring replacement was mostly completed in the electronics and absolutes building, but the variations building still needs new wiring. Also, the external wiring still needs to be addressed for all of the buildings at the Obs. We have talked with other agencies who occupy the site and there is a great need to completely replace the electrical infrastructure at Barrow - (new transformers, new power lines, etc). If they contribute, it will be documented on the Funding Log. Two of the buildings have been re-roofed, however; the sensor building still needs re-roofing.
San Juan Observatory $50,000	**Upgrade Interior Electrical Systems in all Buildings (G200300S1C)** The existing electrical system is outdated and in need of replacement. The project includes replacing outlets with GFI where required for safety purposes, upgrading electrical panels, cleaning up wiring (trays and conduits), installing new switches and replacing lighting fixtures. This project will apply to most of the buildings at the center and are specifically shown in the Condition Assessment (CA). CA Items: 07000355 G1-3. 56 G1-3, 57 G1, 58 G1, 61 G1, 63 G1, 64 G1, 65 G1-2, 66 G-12, 67 G1. Design: $4K, Contingency: $4K New Project 04/03; no inflation applied to date (04/2005).
NWRC – Office/Lab Building $902,000	**Replace HVAC Duct Work in Main Building (NWRC50106**) The existing HVAC ductwork in the main building has fiberglass insulation walls and holds dirt mold, and moisture. Elevated mold counts have been found throughout the HVAC ductwork and during periods of high humidity and/or extreme temperature changes lining of the ductwork will blow into the laboratory and office work areas. This presents a real problem when the insulation containing elevated levels of molds and dirt are exposed to staff. Staff with compromised or weak immune systems are particularly at risk.

FY 2009 Equipment Projects

600 sites nationwide $240,000	**Repair or Replace Cablecars (W1998A10000) —** Revised load tests reveal that the 600 cablecars in active use nationwide could fail under adverse field conditions such as snagged cables during flood conditions. Depending on their design and condition, remediation will require partial or total replacement of the cablecars. Interim actions have begun where risk is the highest, but all 600 cars will require either retrofit or replacement.
Northern California Seismic Network $200,000	**Replace Network Analog and Microwave Stations (G987160001) —** Replace earthquake network stations that provide seismic monitoring and (or) warning for large metropolitan areas. The requested funds would be used to replace existing equipment that has exceeded its expected life and that cannot be expected to operate continuously without increased failure rates. The current equipment, which supports the network, may fail during an emergency, which would limit or possibly prevent adequate response to other Federal agencies, local governments, the private sector, and public needs.
Condition Assessments $210,000	**Condition Assessments/Engineering Support —** Funding is proposed to complete condition assessments for the identification of maintenance and capital improvement needs and to provide engineering services support for funded facility projects.
Maintenance Management System $500,000	**Maintenance Management System —** Funding is proposed to implement and maintain a maintenance management system that meets bureau reporting and oversight requirements.
Project Planning $200,000	Funding will be applied toward contract architectural, engineering and design services for complex projects particularly for developing project requirements and budget estimates.

Program Performance Overview

The Deferred Maintenance Subactivity addresses the Department of the Interior strategic goal of Management Excellence (Modernization).

End Outcome Goal 5.2 Management Excellence: Advance Modernization/Integration

End Outcome Measure / Intermediate or PART Measure / PART Efficiency or other Outcome Measure	2004 Actual	2005 Actual	2006 Actual	2007 Plan	2007 Actual	2008 Plan	2009 President's Budget	Change from 2008 Plan to 2009	Long-term Target 2012
Intermediate Outcome Measures and Bureau and PART Outcome Measures Facilities Improvement									
Overall condition of buildings and of structures (as measured by the FCI) that are mission critical and mission dependent (as measured by the API), with emphasis on improving the condition of assets with critical health and safety needs **(SP)**	UNK	UNK	UNK	UNK	0.124	0.115	0.133	-0.18	0.095
PART Efficiency and Other Output Measures									
# of bureau condition assessments in progress or completed (within a 5-year cycle **(Facilities)**	41	9	14	+10 (cum 24)	9 (cum 23)	9 (cum 32)	12 (cum 44)	12	NA (new 5-year cycle)
# of deferred maintenance and capital improvements (cumulative) **(Facilities)**	36	53	63	74	70	80	87	+7	98
New Capital Improvements Project (**Facilities)**	UNK	UNK	UNK	NA	NA	1	0	-1	1

Working Capital Fund Overview

The USGS Working Capital Fund (WCF) was established to allow for the efficient financial management of the components listed below. The WCF was made available for expenses necessary for furnishing materials, supplies, equipment, work, and services in support of USGS programs, and as authorized by law, to agencies of the Federal Government and others. The WCF consists of both investment components and fee-for-service components, as follows:

Investment Components

- **Telecommunications Investment —** This component is used for telecommunication hardware, software, facilities, and services. Examples include replacement or expansion of automatic exchange systems and computerized network equipment such as switches, routers, and monitoring systems.

- **Equipment Investment —** This component is used for the acquisition, replacement, and expansion of equipment for USGS programs. Equipment may include, but is not limited to, hydrologic, geologic, and cartographic instruments; laboratory equipment; and computer hardware and software.

- **Facilities Investment —** This component supports facility and space management investment expenses for USGS real property, including owned and leased space. Authorized investment expenses include nonrecurring and emergency repair, relocation of a facility, and facility modernization. The component does not include annual expenses such as rent, day-to-day operating expenses, recurring maintenance, or utilities. The investment component is not used to fund construction of buildings.

- **Publications Investment —** This component is used for the preparation and production of technical publications reporting on the results of scientific data and research. Research projects typically are 3 to 5 years in duration, and planning the medium in which to report results occurs over the life of the project. The Publications Investment Component provides a mechanism for establishing an efficient, effective, and economical means of funding publications costs over the long term.

Fee-for-Service Components

- **National Water Quality Laboratory (NWQL) —** The NWQL is a Fee-for-Service component, conducting chemical analyses of water, sediments, and aquatic tissue for all USGS water district offices and other customers, including other USGS disciplines, other Interior bureaus, and government agencies. The NWQL also does biological classification for these customers. NWQL analysis services are provided on a reimbursable basis, with the price of services calculated to cover direct and indirect costs.

- **USGS Hydrologic Instrumentation Facility (HIF) —** The HIF provides hydrologic instrumentation on a fee-for-service basis. The facility provides its customers with hydrologic instruments that can be rented or purchased, maintains a technical expertise on instrumentation, and tests and evaluates instruments as they become available in the marketplace.

- **Bureau Laboratories —** This component currently includes three laboratories in Eastern Region Water Research that perform gaseous dissolved chlorofluorocarbon measurements, environmental microbiology analyses and isotope-ratio measurements of water, sediments, rocks, and gases for all WRD district offices, other USGS disciplines, and other Federal agencies.

- **National Training Center —** This component conducts fee-for-service USGS training programs. These programs include, but are not limited to, specialized training for USGS employees, cooperators, and international participants in many facets of hydrology, hydraulics, and water resources investigations, as well as computer applications, management and leadership seminars, and various workshops.

- **Drilling —** This component provides drilling services to conduct exploratory drilling for obtaining geologic samples and cores in difficult hydrogeologic environments and the emplacement of sampling devices and sub-surface sensors for hydrologic investigations.

- **GSA Delegated Buildings —** This component is used to manage funds received under the delegated authority for the J.W. Powell Building and Advanced Systems Center in Reston, VA, as provided by section 205(d) of the Federal Property and Administrative Services Act of 1949, as amended. Delegated functions include building operations, maintenance, recurring repairs, minor alterations, historic preservation, concessions, and energy management. Because of the size of the Reston buildings and the need to expend the facility funds in a manner corresponding to GSA's no-year funding (Federal Buildings Fund) mechanisms and the GSA National Capital Region long-range capital improvement plan, no-year funding is a prerequisite to administering the delegation. Public Law 104–208, Section 611, provides that, for the fiscal year ending September 30, 1997, and thereafter, any department or agency that has delegated authority shall retain that portion of the GSA rental payment available for operation, maintenance, and repair of the building and the funds shall remain available until expended. This WCF component was established to provide USGS with this no-year flexibility.

The WCF Investment Components provide a mechanism to assist USGS managers in planning for and acquiring goods and services that are too costly to acquire in a single fiscal year or that, due to the nature of services provided must operate in a multi- as opposed to a single-year basis of funding. Investments are supported by documented investment plans that include estimated acquisition/replacement costs, a schedule of deposits, and approval of the plans, deposits and expenditures by designated USGS officials. WCF Fee-for-Service Components provide a continuous cycle of client services for fees established in a rate-setting process and, in some cases, with funding provided by appropriated funds. Fees are predicated upon both direct and indirect costs associated with providing the services, including amortization of equipment required to provide the services.

Appropriation Language and Citations

Permanent authority:

1. Provided further, That in fiscal year 1986, and thereafter, all amortization fees resulting from the Geological Survey providing telecommunications services shall be deposited in a special fund to be established on the books of the Treasury and be immediately available for payment of replacement or expansion of telecommunications services, to remain available until expended.

   - **43 U.S.C.50a** This authority established the Telecommunications Amortization Fund, which was displayed as part of the Surveys, Investigations and Research appropriation from 1986 through 1990. Beginning in 1991, the Telecommunications Amortization Fund was merged into the WCF described in the next citation.

2. There is hereby established in the Treasury of the United States a working capital fund to assist in the management of certain support activities of the United States Geological Survey (hereafter referred to as the "Survey"), Department of the Interior. The fund shall be available on and after November 5, 1990, without fiscal year limitation for expenses necessary for furnishing materials, supplies, equipment, work, facilities, and services in support of Survey programs, and, as authorized by law, to agencies of the Federal Government and others. Such expenses may include laboratory modernization and equipment replacement, computer operations, maintenance, and telecommunications services; requirements definition, systems analysis, and design services; acquisition or development of software; systems support services such as implementation assistance, training, and maintenance; acquisition and replacement of computer, publications and scientific instrumentation, telecommunications, and related automatic data processing equipment; and, such other activities as may be approved by the Secretary of the Interior.

   There are authorized to be transferred to the fund, at fair and reasonable values at the time of transfer, inventories, equipment, receivables, and other assets, less liabilities, related to the functions to be financed by the fund as determined by the Secretary of the Interior. Provided, That the fund shall be credited with appropriations and other funds of the Survey, and other agencies of the Department of the Interior, other Federal agencies, and other sources, for providing materials, supplies, equipment, work, and other services as authorized by law and such payments may be made in advance or upon performance: Provided further, That charges to users will be at rates approximately equal to the costs of furnishing the materials, supplies, equipment, facilities, and services, including such items as depreciation of equipment and facilities, and accrued annual leave: Provided further, That all existing balances as of November 5, 1990, from amortization fees resulting from the Survey providing telecommunications services and deposited in a special fund established on the books of the Treasury and available for payment of replacement or expansion of telecommunications services as authorized by Public Law 99-190, are hereby transferred to and merged with the working capital fund, to be used for the same purposes as originally authorized. Provided further, That funds that are not necessary to carry out the activities to be financed by the fund, as determined by the Secretary, shall be covered into miscellaneous receipts of the Treasury.

P.L. 101-512 Department of the Interior and Related Agencies Appropriations Act, 1991 This authority established a Working Capital Fund account in 1991. The Telecommunications Amortization Fund was included as part of the WCF and all balances of the Telecommunications Amortization Fund existing at the end of 1990 were transferred to the WCF. These balances were to be used for the same purposes as originally authorized.

P.L. 103-332 Department of the Interior and Related Agencies Appropriations Act, 1995 The amendments that were made in this appropriations act are shown in underline in the second citation shown above. This authority expanded the use of the Working Capital Fund to partially fund laboratory operations and facilities improvements and to acquire and replace publication and scientific instrumentation and laboratory equipment.

United States Geological Survey

Federal Funds

General and special funds:

WORKING CAPITAL FUND

Program and Financing

(in millions of dollars)

Identification Code 14-4556-0-4-306		2007 Actual	2008 Estimate	2009 Estimate
	Obligations by program activity:			
09.01	Working Capital Fund	59	75	70
10.00	Total new obligations	59	75	70
	Budgetary resources available for obligation:			
21.40	Unobligated balance carried forward, start of year	72	85	80
22.00	New budget authority (gross)	71	70	55
22.10	Resources available from recoveries of prior year Obligations	1	0	0
23.90	Total budgetary resources available for obligation	144	155	135
23.95	Total new obligations	-59	-75	-70
24.40	Unobligated balance carried forward, end of year	85	80	65
	New budget authority (gross), detail			
	Mandatory:			
69.00	Offsetting collections (cash)	71	70	55
	Change in obligated balances:			
72.40	Obligated balance, start of year	15	13	17
73.10	Total new obligations	59	75	70
73.20	Total outlays (gross)	-60	-71	-66
73.45	Recoveries of prior year obligations	-1	0	0
74.40	Obligated balance, end of year	13	17	21
	Outlays (gross), detail:			
86.97	Outlays from new mandatory authority	30	32	25
86.98	Outlays from mandatory balances	30	39	41
87.00	Total outlays (gross)	60	71	66
	Offsets:			
	Against gross budget authority and outlays:			
88.00	Offsetting collections (cash) from:			
	Federal sources	71	70	55
	Net budget authority and outlays:			
89.00	Budget authority	0	0	0
90.00	Outlays	-11	1	11

WORKING CAPITAL FUND

Balance Sheet

(in millions of dollars)

Identification Code 14-4556-0-4-306		2006 Actual	2007 Actual
	ASSETS:		
	Federal assets:		
1101	Fund balances with Treasury	87	98
	Investments in U.S. securities:		
1106	Receivables, net		
1803	Other Federal assets: Property, plant and equipment, net	11	13
1999	Total assets	98	111
	LIABILITIES:		
2101	Federal liabilities: Accounts payable		
2201	Non-Federal liabilities: Accounts payable	3	3
2999	Total liabilities	3	3
	NET POSITION:		
3300	Cumulative results of operations	95	108
3999	Total net position	95	108
4999	Total liabilities and net position	98	111

WORKING CAPITAL FUND

Object Classification

(in millions of dollars)

Identification Code 14-4556-0-4-306		2007 Actual	2008 Estimate	2009 Estimate
	Reimbursable obligations:			
	Personnel compensation:			
11.1	Full-time permanent	10	9	10
11.3	Other than full-time permanent	1	1	1
11.5	Other personnel compensation	0	1	0
11.9	Total personnel compensation	11	11	11
12.1	Civilian personnel benefits	3	3	3
21.0	Travel and transportation of persons	1	1	1
23.1	Rental payments to GSA	2	2	2
23.2	Rental payments to others	0	1	1
23.3	Communications, utilities, and miscellaneous charges	1	2	1
24.0	Printing and reproduction	1	1	1
25.2	Other services	6	12	10
25.3	Other purchases of goods and services from Government Accounts	3	4	4
25.4	Operation and maintenance of facilities	5	5	5
25.7	Operation and maintenance of equipment	2	1	1
26.0	Supplies and materials	4	4	4
31.0	Equipment	20	28	26
99.0	Reimbursable obligations	59	75	70
99.9	Total new obligations	59	75	70

WORKING CAPITAL FUND

Employment Summary

Identification Code 14-4556-0-4-306		2007 Actual	2008 Estimate	2009 Estimate
	Reimbursable:			
2001	Civilian full-time equivalent employment	154	152	152

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SURVEYS, INVESTIGATIONS, AND RESEARCH

Summary of Requirements by Object Class

(Millions of Dollars)

Appropriation: Surveys, Investigations, and Research		2008 Estimate		Fixed Costs & Related Changes		Program Changes		2009 Request	
Object Class		**FTE**	**Amount**	**FTE**	**Amount**	**FTE**	**Amount**	**FTE**	**Amount**
	Personnel compensation								
11.1	Full-time permanent		409		8		-27		390
11.3	Other than full-time permanent		32		1		-2		31
11.5	Other personnel compensation		12		0		0		12
	Total personnel compensation	5,462	453	0	9	-300	-29	5,162	433
12.1	Civilian personnel benefits		119		3		-8		114
13.0	Benefits for former personnel		2		0		0		2
21.0	Travel and transportation of persons		24		0		-2		22
22.0	Transportation of things		5		0		0		5
23.1	Rental payment to GSA		55		3		0		58
23.2	Rental payments to others		5		0		0		5
23.3	Comm., utilities and misc. charges		13		0		0		13
24.0	Printing and reproduction		14		0		1		15
25.1	Advisory and assistance services		10		0		3		13
25.2	Other services		122		0		-17		105
25.3	Other purchases of goods and services from Government accounts		46		0		0		46
25.4	Operation and maintenance of Facilities		5		0		0		5
25.7	Operation and maintenance of Equipment		8		0		0		8
26.0	Supplies and materials		23		0		0		23
31.0	Equipment		37		0		0		37
32.0	Land and structures		1		0		0		1
41.0	Grants, subsidies, and contributions		64		0		0		64
	Total requirements		**1,006**		**15**		**-52**		**969**

Note: After the development of the account level FTEs for FY 2009 for the President's Budget Appendix, further refinements to the estimates were made. As a result, the FY 2009 direct FTE level in this presentation does not match and is lower than the direct FTE level in the Budget Appendix.

This information is displayed in budget authority (not obligations) by object class.

SURVEYS, INVESTIGATIONS, AND RESEARCH

Summary of Requirements by Object Class cont'd

(Millions of Dollars)

Appropriation: Surveys, Investigations, and Research Reimbursable Obligations		2008 Estimate FTE	2008 Estimate Amount	2009 Request FTE	2009 Request Amount	Increase or Decrease FTE	Increase or Decrease Amount
	Personnel compensation						
11.1	Full-time permanent		157		162		5
11.3	Other than full-time permanent		23		23		0
11.5	Other personnel compensation		5		5		0
	Total personnel compensation	2,694	185	2,694	190	0	5
12.1	Civilian personnel benefits		46		47		1
21.0	Travel and transportation of persons		11		11		0
22.0	Transportation of things		5		5		0
23.1	Rental payments to GSA		15		15		0
23.2	Rental payments to others		1		1		0
23.3	Communications, utilities and miscellaneous charges		4		4		0
24.0	Printing and reproduction		6		6		0
25.1	Advisory and assistance services		2		2		0
25.2	Other services		61		58		-3
25.3	Other purchases of goods and services from Government accounts		48		46		-2
25.4	Operation and maintenance of facilities		1		1		0
25.7	Operation and maintenance of equipment		3		3		0
26.0	Supplies and materials		12		12		0
31.0	Equipment		11		10		-1
41.0	Grants, subsidies, and contributions		30		30		0
	Total requirements		**441**		**441**		**0**

United States Geological Survey

Federal Funds

General and special funds:

SURVEYS, INVESTIGATIONS, AND RESEARCH

Program and Financing

(Millions of Dollars)

Identification Code 14-0804-0-1-306		2007 Actual	2008 Estimate	2009 Estimate
	Obligations by program activity:			
	Direct program:			
00.01	Geographic research, investigations, and remote sensing	80	75	76
00.02	Geologic hazards, resources, and processes	238	239	221
00.03	Water resources investigations	217	212	214
00.04	Biological research	181	181	180
00.05	Enterprise information	112	104	118
00.06	Global change	0	7	27
00.07	Science support	68	64	70
00.08	Facilities	95	93	106
09.01	Reimbursable program	432	441	441
10.00	Total new obligations	1,423	1,416	1,453
	Budgetary resources available for obligation:			
21.40	Unobligated balance carried forward, start of year	27	29	60
22.00	New budget authority (gross)	1,426	1,447	1,410
23.90	Total budgetary resources available for obligation	1,453	1,476	1,470
23.95	Total new obligations	-1,423	-1,416	-1,453
23.98	Unobligated balance expiring or withdrawn	-1	0	0
24.40	Unobligated balance carried forward, end of year	29	60	17
	New budget authority (gross), detail:			
	Discretionary:			
40.00	Appropriation	983	1,022	969
40.00	Appropriation – Avian Influenza supplemental	5	0	0
40.33	Appropriation permanently reduced (H.R. 2764)	0	-16	0
43.00	Appropriation (total discretionary)	988	1,006	969
	Spending authority from offsetting collections:			
58.00	Offsetting collections (cash)	323	441	441
58.10	Change in uncollected customer payments from Federal sources (unexpired)	109	0	0
58.90	Spending authority from offsetting collections (total discretionary)	432	441	441
	Mandatory:			
62.00	Transferred from other accounts	6	0	0
70.00	Total new budget authority (gross)	1,426	1,447	1,410

SURVEYS, INVESTIGATIONS, AND RESEARCH

Program and Financing cont'd

(Millions of Dollars)

Identification Code 14-0804-0-1-306		2007 Actual	2008 Estimate	2009 Estimate
	Change in obligated balances:			
72.40	Obligated balance, start of year	109	138	154
73.10	Total new obligations	1,423	1,416	1,453
73.20	Total outlays (gross)	-1,410	-1,400	-1,412
73.40	Adjustments in expired accounts (net)	-4	0	0
74.00	Change in uncollected customer payments from Federal sources (unexpired)	-109	0	0
74.10	Change in uncollected customer payments from Federal Sources (expired)	129	0	0
74.40	Obligated balance, end of year	138	154	195
	Outlays (gross), detail:			
86.90	Outlays from new discretionary authority	1,165	1,274	1,241
86.93	Outlays from discretionary balances	245	121	170
86.97	Outlays from new mandatory authority	0	5	1
87.00	Total outlays (gross)	1,410	1,400	1,412
	Offsets:			
	Against gross budget authority and outlays:			
	Offsetting collections (cash) from:			
88.00	Federal sources	-237	-234	-234
88.40	Non-Federal sources	-213	-207	-207
88.90	Total, offsetting collections (cash)	-450	-441	-441
	Against gross budget authority only:			
88.95	Change in uncollected customer payments from Federal sources (unexpired)	-109	0	0
88.96	Portion of offsetting collections (cash) credited to expired account	127	0	0
	Net budget authority and outlays:			
89.00	Budget authority	994	1,006	969
90.00	Outlays	960	959	971
95.02	Unpaid obligation, end of year	299		

SURVEYS, INVESTIGATIONS, AND RESEARCH

Object Classification

(Millions of Dollars)

Identification Code 14-0804-0-1-306		2007 Actual	2008 Estimate	2009 Estimate
	Direct obligations:			
	Personnel compensation:			
11.1	Full-time permanent	395	409	390
11.3	Other than full-time permanent	31	32	31
11.5	Other personnel compensation	12	12	12
11.9	Total personnel compensation	438	453	433
12.1	Civilian personnel benefits	113	119	114
13.0	Benefits for former personnel	2	2	2
21.0	Travel and transportation of persons	25	24	22
22.0	Transportation of things	5	5	5
23.1	Rental payments to GSA	54	55	58
23.2	Rental payment to others	5	5	5
23.3	Comm., utilities, and miscellaneous charges	12	13	13
24.0	Printing and reproduction	15	14	15
25.1	Advisory and assistance services	13	10	13
25.2	Other services	125	105	142
25.3	Other purchases of goods and services from Government Accounts	46	41	46
25.4	Operation and maintenance of facilities	5	5	5
25.7	Operation and maintenance of equipment	8	8	8
26.0	Supplies and materials	23	20	26
31.0	Equipment	37	32	40
32.0	Land and structures	1	1	1
41.0	Grants, subsidies, and contributions	64	63	64
99.0	Direct obligations	991	975	1,012

SURVEYS, INVESTIGATIONS, AND RESEARCH

Object Classification cont'd

(Millions of Dollars)

Identification Code 14-0804-0-1-306		2007 Actual	2008 Estimate	2009 Estimate
	Reimbursable obligations:			
	Personnel compensation:			
11.1	Full-time permanent	153	157	162
11.3	Other than full-time permanent	22	23	23
11.5	Other personnel compensation	5	5	5
11.9	Total personnel compensation	180	185	190
12.1	Civilian personnel benefits	45	46	47
21.0	Travel and transportation of persons	10	11	11
22.0	Transportation of things	5	5	5
23.1	Rental payments to GSA	15	15	15
23.2	Rental payments to others	1	1	1
23.3	Comm., utilities, and miscellaneous charges	4	4	4
24.0	Printing and reproduction	6	6	6
25.1	Advisory and assistance services	2	2	2
25.2	Other services	61	61	58
25.3	Other purchases of goods and services from Government accounts	48	48	46
25.4	Operation and maintenance of facilities	1	1	1
25.7	Operation and maintenance of equipment	3	3	3
26.0	Supplies and materials	11	12	12
31.0	Equipment	10	11	10
41.0	Grants, subsidies, and contributions	30	30	30
99.0	Reimbursable obligations	432	441	441
99.9	Total new obligations	1,423	1,416	1,453

SURVEYS, INVESTIGATIONS, AND RESEARCH

Employment Summary

Identification Code 14-0804-0-1-306		2007 Actual	2008 Estimate	2009 Estimate
	Direct:			
1001	Civilian full-time equivalent employment	5,487	5,462	5,176
	Reimbursable:			
2001	Civilian full-time equivalent employment	2,704	2,694	2,694

Note: The FY 2009 FTEs depicted above are a replication of the FTEs shown in the FY 2009 President's Budget Appendix. After the development of the account level FTEs for FY 2009 for the President's Budget Appendix, further refinements to the estimates were made. As a result, the FY 2009 direct FTE level that appears in other portions of this presentation do not match and are lower than the FTE level in the Budget Appendix.

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Funding of U.S. Geological Survey Programs
(Obligations)
(Thousands of Dollars)

	2007 Actual	2008 Estimate	2009 Estimate
Surveys, Investigations, and Research (SIR)			
Geographic Research, Investigations, and Remote Sensing			
Annual appropriation	72,226	0	65,118
Multi-Year appropriation	0	36,200	2,000
No-Year appropriation	8,365	38,963	9,000
Subtotal (appropriation)	80,591	75,163	76,118
Non-Federal (Domestic) sources			
Sale of photos, reproductions, and digital products	5,321	4,088	4,088
Optical calibration	641	600	600
Miscellaneous	212	160	160
Subtotal (non-Federal domestic sources)	6,174	4,848	4,848
Non-Federal (Foreign) sources			
Landsat International Ground Station Fees	1,615	1,474	1,474
Miscellaneous	399	207	207
Subtotal (non-Federal foreign sources)	2,014	1,681	1,681
State and local sources			
Matched	343	343	343
Unmatched	402	326	332
Subtotal (State and local sources)	745	669	675
Federal sources			
Agency for International Development	2,750	2,189	2,189
Department of Agriculture	503	629	629
Department of Commerce			
Nat'l Oceanic & Atmospheric Admin	73	67	67
Department of Defense			
Corps of Engineers	60	3	3
National Geospatial-Intelligence Agency	364	152	152
Other	262	38	38
Department of Homeland Security	503	503	503
Department of the Interior			
Bureau of Land Management	464	526	485
Bureau of Reclamation	363	525	363
Fish and Wildlife Service	20	72	32
National Park Service	1,060	1,054	1,057
Office of Secretary	2,537	3,736	2,687
Environmental Protection Agency	375	397	397

	2007 Actual	2008 Estimate	2009 Estimate
Health and Human Services	106	106	106
National Aeronautics and Space Administration	10,706	10,521	7,925
National Science Foundation	203	125	125
Sale of maps, photos, reproductions, and digital products	1,736	1,362	1,362
Optical calibration	7	0	0
Remote sensing data purchases	117	200	200
Subtotal (Federal sources)	22,209	22,205	18,320
Total: Geographic Research, Investigations, and Remote Sensing	**111,733**	**104,566**	**101,642**

	2007 Actual	2008 Estimate	2009 Estimate
Surveys, Investigations, and Research (SIR)			
Geologic Hazards, Resources, and Processes:			
Annual appropriation	236,763	0	208,015
Multi-Year appropriation	0	231,476	12,000
No-Year appropriation	958	1,367	1,000
Subtotal (appropriation)	237,721	232,843 *	221,015
Non-Federal (Domestic) sources			
Permittees & licensees of the Fed Energy Regulatory Commission	88	90	92
Technology transfer	667	1,172	1,189
Miscellaneous	1,174	1,174	1,174
Subtotal (non-Federal domestic sources)	1,929	2,436	2,455
Non-Federal (Foreign) sources			
Miscellaneous	2,201	2,194	2,181
Subtotal (non-Federal foreign sources*)*	2,201	2,194	2,181
State and local sources			
Unmatched	5,870	5,963	6,048
Subtotal *(*State and local sources*)*	5,870	5,963	6,048
Federal sources			
Agency for International Development	653	928	906
Department of Agriculture	37	38	39
Department of Commerce			
National Oceanic and Atmospheric Administration	436	2,427	3,434
Department of Defense			
Corps of Engineers	1,795	1,731	1,738
Other	1,697	1,624	1,630
Department of Energy	1,260	1,210	1,169
Department of the Interior			
Bureau of Indian Affairs	76	77	78
Bureau of Land Management	575	558	565
Bureau of Reclamation	443	434	441
Minerals Management Service	142	136	141
National Park Service	324	310	312
Office of Surface Mining	2	2	2
U.S. Geological Survey			
Mineral Commodity Survey - MEO	1,071	1,023	1,023
Department of State	3,212	2,778	2,708
Department of Veterans Affairs	36	37	38
Environmental Protection Agency	558	537	540
General Services Administration	12	12	12
National Aeronautics and Space Administration	5,053	4,933	5,024
National Science Foundation	1,135	1,142	1,114

	2007 Actual	2008 Estimate	2009 Estimate
Nuclear Regulatory Commission	507	485	487
Miscellaneous agencies	76	1	40
Subtotal (Federal sources)	19,100	20,423	21,441
Total: Geologic Hazards, Resources, and Processes	**266,821**	**263,859**	**253,140**

* FY 2008 does not include $5,830 in obligations for Spectrum Relocation Fund, since it is a mandatory fund. MAX obligations do include the Spectrum Relocation Fund.

	2007 Actual	2008 Estimate	2009 Estimate
Surveys, Investigations, and Research (SIR)			
Water Resources Investigations:			
Annual appropriation	214,561	0	203,027
Multi-Year appropriation	0	209,520	11,000
No-Year appropriation	2,247	1,920	0
Subtotal (appropriation)	216,808	211,440	214,027
Non-Federal (Domestic) sources			
Permittees & licensees of the Federal Energy Regulatory Commission	4,165	4,473	4,828
Technology Transfer	41	45	47
Miscellaneous	728	701	622
Subtotal (non-Federal domestic sources)	4,934	5,219	5,497
Non-Federal (Foreign) sources			
Miscellaneous	865	821	817
Subtotal (non-Federal foreign sources)	865	821	817
State and local sources			
Matched	64,345	62,849	62,285
Matched (In-Kind Services – NON ADD)	433	433	433
Unmatched	99,078	103,288	107,448
Subtotal (State and local sources)	163,423	166,137	169,733
Federal sources			
Agency for International Development	814	639	639
Central Intelligence Agency	26	0	0
Department of Agriculture	2,301	2,139	2,077
Department of Commerce			
National Oceanic and Atmospheric Administration	1,395	996	998
Other	59	59	59
Department of Defense			
Corps of Engineers	21,571	22,129	22,308
National Geospatial-Intelligence Agency	0	477	0
Other	10,190	10,221	10,637
Department of Energy			
Bonneville Power Administration	59	59	59
Other	13,772	13,549	14,023
Department of Homeland Security			
Federal Emergency Management Agency	1,179	1,192	1,187
Department of the Interior			
Bureau of Indian Affairs	473	417	351
Bureau of Land Management	4,471	5,182	5,781
Bureau of Reclamation	10,957	10,966	11,006
Fish and Wildlife Service	781	915	775
National Park Service	3,290	2,977	2,706
Office of Secretary	151	140	140
Office of Surface Mining	16	16	16
Department of Justice	65	65	65
Department of State	572	573	573

	2007 Actual	2008 Estimate	2009 Estimate
Environmental Protection Agency	8,604	8,803	9,025
Health and Human Services	348	348	348
National Aeronautics and Space Administration	621	576	587
National Science Foundation	84	237	237
Nuclear Regulatory Commission	7,734	7,831	7,831
Tennessee Valley Authority	220	220	220
Miscellaneous agencies	216	221	227
Subtotal (Federal sources)	89,969	90,947	91,875
Total: Water Resources Investigations	**475,999**	**474,564**	**481,949**

	2007 Actual	2008 Estimate	2009 Estimate
Surveys, Investigations, and Research (SIR)			
Biological Research:			
Multi-Year appropriation	180,317	180,522	180,329
No-Year appropriation	1,154	438	0
Subtotal (appropriation)	181,471	180,960	180,329
Non-Federal (Domestic) sources			
Technology Transfer	32	33	34
Miscellaneous	519	521	523
Subtotal (non-Federal domestic sources)	551	554	557
Non-Federal (Foreign) sources			
Miscellaneous	6	6	6
Subtotal (non-Federal foreign sources)	6	6	6
State and local sources			
Matched	207	207	169
Unmatched	6,007	6,088	6,171
Subtotal (State and local sources)	6,214	6,295	6,340
Federal sources			
Department of Agriculture	1,534	1,411	1,416
Department of Commerce			
National Oceanic and Atmospheric Administration	1,041	1,064	1,070
Department of Defense			
Corps of Engineers	22,652	22,986	23,033
Other	7,204	7,495	7,701
Department of Energy			
Bonneville Power Administration	1,100	1,149	1,184
Other	170	175	181
Department of the Interior			
Bureau of Land Management	4,409	4,569	4,687
Bureau of Reclamation	11,174	11,611	11,921
Fish & Wildlife Service	8,883	9,371	9,166
Minerals Management Service	21	21	21
National Park Service	3,073	3,324	3,362
Office of the Secretary	1,371	1,392	1,396
Department of Justice	19	19	19
Department of Transportation	145	149	153
Environmental Protection Agency	2,106	2,165	2,171
Health and Human Services	60	40	40
National Aeronautics and Space Administration	28	28	28
Miscellaneous	0	288	288
Subtotal (Federal sources)	64,990	67,257	67,837
Total: Biological Research	**253,232**	**255,072**	**255,069**

	2007 Actual	2008 Estimate	2009 Estimate
Surveys, Investigations, and Research (SIR)			
Enterprise Information:			
Annual appropriation	111,659	0	112,093
Multi-Year appropriation	0	104,371	6,000
Subtotal (appropriation)	111,659	104,371	118,093
Non-Federal (Domestic) sources			
Map receipts	3,174	3,179	3,129
Miscellaneous	170	170	170
Subtotal (non-Federal domestic sources)	3,344	3,349	3,299
State and local sources			
Unmatched	520	520	520
Subtotal (State and local sources)	520	520	520
Federal sources			
Department of Agriculture			
Department of Commerce	512	478	366
National Oceanic and Atmospheric Administration			
Department of Defense	150	162	0
Corps of Engineers	0	114	0
National Geospatial-Intelligence Agency	8,363	7,565	7,475
Other	244	244	40
Department of Education	15	15	0
Department of Energy	0	84	0
Department of Homeland Security			
Federal Emergency Management Agency	2,129	2,042	2,042
Other	147	147	85
Department of the Interior			
Bureau of Indian Affairs	0	357	357
Bureau of Land Management	214	2,242	2,242
Bureau of Reclamation	0	166	166
Fish and Wildlife Service	0	561	561
Minerals Management Service	3	80	80
National Park Service	73	609	609
Office of Secretary	405	1,285	222
Office of Surface Mining	3	80	80
U.S. Geological Survey			
Enterprise Publishing Network	17,002	16,328	16,328
Department of Justice	0	124	0
Department of Labor	15	15	0
Department of State	55	55	20
Department of Transportation	62	62	0
Department of Treasury	15	15	0
Department of Veterans Affairs	15	15	0
Environmental Protection Agency	391	264	180
General Services Administration	44	44	9

	2007 Actual	2008 Estimate	2009 Estimate
Health and Human Services	62	62	0
Housing and Urban Development	35	35	0
National Aeronautics and Space Administration	753	680	650
National Science Foundation	0	30	0
Sale of maps, photos, reproductions, and digital products	1,544	1,482	1,482
Miscellaneous agencies	45	45	0
Subtotal (Federal sources)	32,296	35,487	32,994
Total: Enterprise Information	**147,819**	**143,727**	**154,906**

	2007 Actual	2008 Estimate	2009 Estimate
Surveys, Investigations, and Research (SIR)			
Global Change:			
Annual appropriation	0	0	26,583
Multi-Year appropriation	0	7,383	0
Subtotal (appropriation)	0	7,383	26,583
Non-Federal (Domestic) sources			
Miscellaneous	0	0	24
Subtotal (non-Federal domestic sources)	0	0	24
Federal sources			
Department of Interior			
National Park Service	0	0	50
Subtotal (Federal sources)	0	0	50
Total: Global Change	**0**	**7,383**	**26,657**

	2007 Actual	2008 Estimate	2009 Estimate
Surveys, Investigations, and Research (SIR)			
Science Support:			
Annual appropriation	67,667	0	67,228
Multi-Year appropriation	0	64,167	3,000
Subtotal (appropriation)	67,667	64,167	70,228
Non-Federal (Domestic) sources			
Technology Transfer	41	44	47
Subtotal (non-Federal domestic sources)	41	44	47
Federal sources			
Department of Defense			
Corps of Engineers	469	420	420
Other	164	195	195
Department of Homeland Security	177	200	200
Department of Interior			
Bureau of Indian Affairs	84	60	60
Bureau of Land Management	61	54	54
Bureau of Reclamation	350	755	500
Fish and Wildlife Service	150	136	136
Minerals Management Service	77	0	0
Office of Secretary			
National Business Center	80	77	88
Other	1,647	800	847
Office of Surface Mining	103	0	0
Miscellaneous	79	90	95
Subtotal (Federal sources)	3,441	2,787	2,595
Total: Science Support	**71,149**	**66,998**	**72,870**

	2007 Actual	2008 Estimate	2009 Estimate
Surveys, Investigations, and Research (SIR)			
Facilities:			
Annual appropriation	72,178	0	75,210
Multi-Year appropriation	21,754	87,133	25,913
No-Year appropriation	1,143	5,967	5,000
Subtotal (appropriation)	95,075	93,100	106,123
Federal sources			
Central Intelligence Agency	291	302	305
Department of Interior			
Office of Secretary			
National Business Center	6	0	0
Other	329	406	453
Subtotal (Federal sources)	626	708	758
Total: Facilities	**95,701**	**93,808**	**106,881**
SIR Summary:			
Annual appropriation	775,054	0	757,274
Multi-Year appropriation	202,071	920,772	240,242
No-Year appropriation	13,867	48,655	15,000
Non-Federal sources			
Map receipts	3,174	3,179	3,129
Domestic	13,799	13,271	13,598
Foreign	5,086	4,702	4,685
State and local sources	176,772	179,584	183,316
Federal sources	232,631	239,814	235,870
Total: SIR	**1,422,454**	**1,409,977 ***	**1,453,114**

* 2008 does not include $5,830 in obligations for Spectrum Relocation Fund, since it is a mandatory fund. MAX obligations do include the Spectrum Relocation Fund.

	2007 Actual	2008 Estimate	2009 Estimate
Surveys, Investigations, and Research (SIR)			
Contributed Funds:			
Permanent, indefinite appropriation:			
Geographic Research, Investigations, and Remote Sensing	1	9	5
Geologic Hazards, Resources, and Processes	473	486	45
Water Resources Investigations	425	127	20
Biological Research	2,226	232	538
Science Support	0	11	12
Total: Contributed Funds	**3,125**	**865**	**620**
Operation and Maintenance of Quarters:			
Permanent, indefinite appropriation:			
Geologic Hazards, Resources, and Processes	11	35	34
Biological Research	81	62	38
Total: Operation and Maintenance of Quarters	**92**	**97**	**72**
Working Capital Fund:			
National Water Quality Lab	15,471	14,999	15,500
Hydrologic Instrumentation Facility	17,532	18,033	18,964
Other	26,244	42,356	35,648
Total: Working Capital Fund	**59,247**	**75,388**	**70,112**
Allocations from other Federal Agencies: *			
Department of the Interior: Departmental Offices			
Natural Resource Damage Assessment	1,824	1,500	1,500
US Agency for International Development: Development Assistance	5,000	5,000	5,000
Total: Allocations	**6,824**	**6,500**	**6,500**

* Allocations are shown in the year they are received, not when they are obligated.

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United States Geological Survey

Trust Funds

CONTRIBUTED FUNDS

Special and Trust Fund Receipts

(Millions of Dollars)

Identification Code 14-8562-0-7-306		2007 Actual	2008 Estimate	2009 Estimate
01.00	Balance, start of year	0	0	0
01.99	Balance, start of year	0	0	0
	Receipts:			
02.20	Contributed funds, Geological Survey	3	1	1
04.00	Total: Balances and collections	3	1	1
	Appropriations:			
05.00	Contributed funds	-3	-1	-1
07.99	Balance, end of year	0	0	0

Program and Financing

(Millions of Dollars)

Identification Code 14-8562-0-7-306		2007 Actual	2008 Estimate	2009 Estimate
	Obligations by program activity:			
09.01	Donations and contributed funds	3	1	1
10.00	Total new obligations	3	1	1
	Budgetary resources available for obligation:			
21.40	Unobligated balance carried forward, start of year	1	1	1
22.00	New budget authority (gross)	3	1	1
23.90	Total budgetary resources available for obligation	4	2	2
23.95	Total new obligations	-3	-1	-1
24.40	Unobligated balance carried forward, end of year	1	1	1
	New budget authority (gross), detail:			
	Mandatory:			
60.26	Appropriation (trust fund)	3	1	1

CONTRIBUTED FUNDS

Program and Financing cont'd

(Millions of Dollars)

Identification Code 14-8562-0-7-306		2007 Actual	2008 Estimate	2009 Estimate
	Change in obligated balances:			
73.10	Total new obligations	3	1	1
73.20	Total outlays (gross)	-3	-1	-1
74.40	Obligated balance, end of year	0	0	0
	Outlays (gross), detail:			
86.97	Outlays from new mandatory authority	2	1	1
86.98	Outlays from mandatory balances	1	0	0
87.00	Total outlays (gross)	3	1	1
	Net budget authority and outlays:			
89.00	Budget authority	3	1	1
90.00	Outlays	3	1	1
95.02	Unpaid obligation, end of year	1	0	0

Object Classification

(Millions of Dollars)

Identification Code 14-8562-0-7-306		2007 Actual	2008 Estimate	2009 Estimate
	Direct obligations:			
	Personnel compensation:			
11.1	Full-time permanent	1	0	0
11.3	Other than full-time permanent	1	0	0
11.9	Total personnel compensation	2	0	0
99.5	Below reporting threshold	1	1	1
99.9	Total new obligations	3	1	1

CONTRIBUTED FUNDS

Employment Summary

Identification Code 14-8562-0-7-306		2007 Actual	2008 Estimate	2009 Estimate
	Direct:			
1001	Civilian full-time equivalent employment	23	0	0

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Employee Count by Grade
(Total Employment)

	2007 Actual	2008 Estimate	2009 Estimate
Executive Level V	1	1	1
SES	26	29	29
Subtotal	27	30	30
SL – 00	10	11	12
ST – 00	32	40	40
Subtotal	42	51	52
GS/GM -15	562	554	534
GS/GM -14	788	776	749
GS/GM -13	1,314	1,295	1,248
GS -12	1,531	1,508	1,453
GS -11	1,306	1,287	1,241
GS -10	19	19	18
GS – 9	1,000	985	950
GS – 8	262	258	249
GS -7	619	610	588
GS – 6	220	217	209
GS – 5	304	299	289
GS – 4	237	233	225
GS – 3	128	126	122
GS – 2	56	55	53
GS -1	17	17	16
Subtotal	8,363	8,239	7,944
Other Pay Schedule Systems	237	237	237
Total employment (actual/estimate)	8,669	8,557	8,263

Mandatory Budget and Offsetting Collection Proposals

The USGS does not have any legislative proposals in the 2009 President's budget that impact receipts or mandatory spending levels.

Program/Project Support of Bureau, Department, and Governmentwide Costs

External Administrative Costs

The Department's Working Capital Fund was established pursuant to 43 U.S.C. 1467, to provide common administrative and support services efficiently and economically at cost. The Fund is a revolving fund, whereby capital is expended to provide services for customers who pay for the services. Customers consist of the Department's bureaus and offices, as well as other Federal agencies. Through the use of centrally provided services, the Department standardized key administrative areas, such as commonly used administrative systems, support services for those located in and around the Main and South Interior building complex, and centrally managed departmental operations that are beneficial to the bureaus and offices.

Centralized billing is used whenever the product or service being provided is not severable or it is inefficient to bill for the exact amount of product or service being procured. Customers are billed each year using a pre-established basis that is adjusted annually to reflect change over time. The following table provides the actual centralized billing to the USGS for 2007 and estimates for 2008 and 2009. The change between 2008 and 2009 is fully funded through a mixture of uncontrollable and program changes.

2009 WORKING CAPITAL FUND
CENTRALIZED BILLING
U.S. GEOLOGICAL SURVEY

(Dollars in Thousands)

Activity/Office	2007 Actual	2008 Estimate	2009 Estimate
Other OS Activities			
Invasive Species Program	195.9	206.6	218.9
Invasive Species DOI Coordinator	32.4	34.6	35.6
Secretary's Immediate Office	228.3	241.2	254.6
Document Management Unit	20.7	0.1	8.1
Electronic Records Management	0.0	139.8	162.0
Office of the Executive Secretariat	20.7	139.9	170.1
Alaska Field Office	11.1	11.8	12.3
Alaska Resources Library and Information Services	166.4	166.4	166.4
Secretary's Immediate Office	177.5	178.2	178.6
Departmental Communications Office	95.0	89.3	92.1
Office of Communications	95.0	89.3	92.1
Southern Nevada Water Coordinator	43.2	39.0	39.9
Conservation Partnerships and Management Policy	12.7	30.0	30.3
Policy, Management and Budget	55.9	69.0	70.2
CPIC	14.8	16.1	19.5
Office of the Chief Information Officer	14.8	16.1	19.5
Financial Management Training	30.2	0.0	0.0
Activity Based Costing/Management	141.6	127.3	123.0
Travel Management Center	45.6	48.7	51.0
e-Gov Travel	0.0	182.2	364.3
Office of Financial Management	217.4	358.1	538.3
Quarters Program	2.3	2.4	2.5
Interior Collections Management System (ICMS)	3.0	2.5	2.5
Space Management Initiative	31.5	32.9	37.2
Renewable Energy Certificates	0.0	23.7	22.9
Office of Property and Acquisition Management	36.8	61.6	65.2
SBA Certifications	0.5	0.9	0.9
Small & Disadvantaged Business Utilization	0.5	0.9	0.9
Planning and Performance Management	177.9	145.5	146.5
Office of Planning and Performance Management	177.9	145.5	146.5
Alternative Dispute Resolution Training	0.0	0.0	12.0
Office of Collaborative Action and Dispute Resolution	0.0	0.0	12.0
Center for Competitive Sourcing Excellence	62.6	78.6	79.7
Office of Competitive Sourcing	62.6	78.6	79.7
HSPD-12	125.8	125.8	107.4
Department-wide OWCP Coordination	9.1	9.3	28.4
Accountability Team	0.0	0.0	52.0
e-Training (DOI LEARN)	0.0	22.5	97.0
CLC – Human Resources	5.0	4.2	0.0
OPM Federal Employment Services	51.9	51.9	68.4
Office of Human Resources	191.9	213.8	353.2
EEO Complaints Tracking System	0.0	3.0	3.5
Special Emphasis Program	4.9	4.9	5.9
Accessible Technology Center	0.0	36.9	36.4
Office of Civil Rights	4.9	44.8	45.8
Occupational Health and Safety	105.7	105.9	107.5
Health & Safety Training initiative	25.5	24.1	23.8
Safety Management Information System	74.2	73.6	75.2
Office of Occupational Health and Safety	205.4	203.6	206.5

2009 WORKING CAPITAL FUND
CENTRALIZED BILLING
U.S. GEOLOGICAL SURVEY

(Dollars in Thousands)

Activity/Office	2007 Actual	2008 Estimate	2009 Estimate
Other OS Activities – Cont'd			
Security (Classified Information Facility)	66.3	39.5	40.0
Watch Office	144.6	146.7	186.3
Emergency Preparedness	126.1	162.1	159.4
Law Enforcement Coordination and Training	47.1	68.1	68.1
Office of Law Enforcement, Security and Emergency Mgmt.	384.2	416.4	453.9
Enterprise Services Network	5,255.2	4,656.2	3,251.3
Web & Internal/External Comm	74.1	72.5	70.5
Messaging	326.1	0.0	0.0
Information Technology Architecture	477.2	503.1	569.2
FOIA Tracking & Reporting System	8.5	9.3	15.6
Frequency Management Support	103.1	99.1	111.4
IT Security	262.9	266.6	312.2
Capital Planning	160.5	195.4	385.0
Government Paperwork Elimination Act	7.0	7.0	32.4
Data Resource Management Program	22.1	22.1	27.8
IT Security Certification & Accreditation	430.6	430.6	430.6
Active Directory	153.4	162.4	150.3
Enterprise Resource Management	33.8	50.0	52.0
e-Authentication	0.0	0.0	39.0
NTIA Spectrum Management	191.2	190.2	164.7
Chief Technology Officer Support	0.0	0.0	103.7
Office of the Chief Information Officer	7,505.8	6,664.9	5,715.7
Contingency Reserve	9.4	18.7	18.1
Cooperative Ecosystem Study Units	73.4	73.4	75.2
CFO Financial Statement Audit	597.9	558.6	565.6
Glen Canyon Adaptive Management Plan	99.7	95.5	95.5
Enterprise Geospatial Information Management	230.8	224.0	224.0
Departmentwide Activities	1,011.2	970.2	978.4
e-Government Initiatives	369.2	438.0	531.2
Volunteer.gov	13.1	13.1	13.1
Department-wide Activities	382.3	451.0	544.3
Ethics Training	6.6	6.1	29.4
ALLEX Database	3.0	3.0	3.0
FOIA Appeals	10.5	10.5	8.1
Office of the Solicitor	20.2	19.6	40.5
Subtotal Other OS Activities	10,793.3	10,362.5	9,966.0

2009 WORKING CAPITAL FUND
CENTRALIZED BILLING
U.S. GEOLOGICAL SURVEY

(Dollars in Thousands)

Activity/Office	2007 Actual	2008 Estimate	2009 Estimate
National Business Center			
Learning and Performance Center Management	81.3	80.5	80.2
Washington Learning & Performance Center	63.1	75.5	77.2
Albuquerque Learning & Performance Center	7.0	6.5	7.4
Anchorage Learning & Performance Center	8.9	8.3	11.8
Denver Learning & Performance Center	81.5	82.1	57.9
Partnership Schools & Commemorative Programs	3.7	3.8	3.9
Financial Management Training	0.0	31.7	33.2
SESCDP & Other Leadership Programs	24.9	24.0	23.5
Online Learning	58.4	48.7	62.1
Cultural Resources & Events Management	58.9	57.9	57.6
Departmental Museum	187.2	190.2	184.8
Departmental Library	329.5	337.2	354.8
NBC Human Capital Directorate	904.3	946.4	954.2
Desktop Services	21.3	22.1	0.0
Telecommunications Services	7.4	7.7	9.2
Voice/data switching	1.8	1.9	2.2
Integrated Digital Voice Communications System	2.8	3.4	4.9
ADP Operations	0.0	0.0	116.7
Information Mgt. – FOIA and Records Management	59.6	61.7	1.4
NBC IT Security Improvement Plan	381.5	311.2	311.2
Audio Visual Services	0.0	0.0	1.7
SIB Cabling	0.0	0.0	2.4
NBC – CIO	474.5	407.9	449.8
FPPS/Employee Express – O&M	1,895.4	1,980.6	2,019.2
HR LOB W2 Surcharge	0.0	115.3	127.4
NBC FPPS Directorate	1,895.4	2,095.9	2,146.6
Interior Complex Management and Services	3.1	3.3	3.9
Family Support Room	0.1	0.1	0.1
Moving Services	0.7	0.7	0.9
Shipping and Receiving	1.6	1.6	2.0
Space Management Services	0.7	0.8	1.3
Health Unit	1.0	1.1	1.3
Security	21.0	22.7	27.7
Mail and Messenger Services	78.2	15.1	15.6
Mail Policy	41.4	41.2	41.5
Federal Executive Board	32.8	32.6	32.8
Blue Pages	87.3	97.4	104.7
Drug Testing	3.4	8.4	8.7
Special Events Services	7.3	7.5	7.4
Accessible Technology Center	40.7	0.0	0.0
NBC Administrative Operations Directorate	319.3	232.7	247.8
Financial Systems (inc Hyperion)	2464.5	2537.5	2655.6
IDEAS	378.2	374.2	384.8
Quarters Program	0.8	0.9	1.1
NBC Budget and Finance	2,843.5	2,912.6	3,041.6
Aviation Management	164.5	84.7	268.3
NBC – Aircraft Management	164.5	84.7	268.3
Subtotal National Business Center	6,601.6	6,680.1	7,108.2
TOTAL	17,395.0	17,042.6	17,074.2

Direct billing is used whenever the product or service provided is again severable, but is sold through a time and materials reimbursable support agreement or similar contractual arrangement. The following tables provide the actual direct and reimbursable collections from USGS for 2007, and estimated billings and collections for 2008 and 2009.

2009 WORKING CAPITAL FUND
DIRECT BILLING
U.S. GEOLOGICAL SURVEY

(Dollars in Thousands)

Activity/Office	2007 Actual	2008 PY Collections	2008 Estimate	2009 Estimate
Other OS Activities				
Adaptive Management Guides	0.0	3.9	0.0	0.0
Secretary's Immediate Office	0.0	3.9	0.0	0.0
Preserve America	0.00	20.0	0.0	0.0
Conservation and Partnerships (Ferrier Travel)	1.2		0.0	0.0
Policy, Management and Budget	1.2	20.0	0.0	0.0
OEPC – 516 DM Chapters	0.0		20.0	0.0
Office of Environmental Policy and Compliance	0.0		20.0	0.0
Census – Single Audit Clearing House	0.9		1.0	1.0
Office of Financial Management	0.9		1.0	1.0
Census – Federal Assistance Award Data System	0.0		3.7	3.7
Office of Acquisition and Property Management	0.0		3.7	3.7
FBMS Change Order Funding	0.0		180.0	0.0
Financial and Business Management System (FBMS)	0.0		180.0	0.0
OPM Leadership 360 Assessment	0.0		7.8	0.0
Human Capital Conference	13.6		17.5	0.0
DOI LEARN	86.5		52.0	52.0
HSPD-12	633.0		750.1	635.1
SES Conference	20.1		20.1	0.0
Workforce Planning Satellite Broadcast	0.7		0.7	0.0
Departmental Medals	14.1		16.7	16.7
Office of Human Resources	767.9		864.8	703.8
EEO Training	0.6		0.8	0.8
EEO Investigations	12.1		14.1	14.1
Reimbursable ATC Services	0.0		0.4	0.4
Office of Civil Rights	12.7		15.3	15.3
OLESEM Security Conference	0.5		0.6	0.6
Office of Law Enforcement, Security, and Emergency Management	0.5		0.6	0.6
Oracle License & Support Contract	257.0	1,571.0	915.4	943.9
Enterprise Architecture Services	0.0	251.8	0.0	0.0
Microsoft Enterprise Licenses	1,682.2		1,339.5	1,541.5
Anti-Virus Software Licenses	187.5	105.5	140.6	141.6
Popkin System Architect Licenses	2.3		2.9	2.0
IT Security Certification & Accreditation	-58.6	75.2	0.0	0.0

2009 WORKING CAPITAL FUND
DIRECT BILLING
U.S. GEOLOGICAL SURVEY

(Dollars in Thousands)

Activity/Office	2007 Actual	2008 PY Collections	2008 Estimate	2009 Estimate
Other OS Activities – Cont'd				
Karta GoLearn Licenses	4.3		0.0	0.0
Enterprise Services Network – Circuits	2,469.4		2,343.0	2,343.0
Data at Rest Initiative	3.0		0.0	0.0
OCIO Bureau Reimbursable Travel	2.2		0.0	0.0
Office of The Chief Information Officer	4,549.3	2,003.5	4,741.5	4,971.9
2007 CFO Audit	146.4		0.0	0.0
2008 CFO Audit	0.0		36.0	25.0
2009 CFO Audit	0.0		0.0	24.0
Central Services	146.4		36.0	49.0
Federal FSA Program	169.7		190.1	210.5
State Department International Renewable Energy Conference	0.0		10.9	0.0
Central Services	169.7		201.0	210.5
Subtotal Other OS Activities	5,648.7	2,027.4	6,063.9	5,955.9

2009 WORKING CAPITAL FUND
DIRECT BILLING
U.S. GEOLOGICAL SURVEY

(Dollars in Thousands)

Activity/Office	2007 Actual	2008 PY Collections	2008 Estimate	2009 Estimate
National Business Center				
Acq Svc Div – Southwest Branch	4.5		0.0	0.0
Acquisition Services - DC	1.4		152.7	156.9
DC Credit Card & Contract Passthrough	139.8		0.0	0.0
NBC – Acquisition Services Directorate	145.7		152.7	156.9
Training Services				
Financial Management Intern Program 6	12.0		12.0	12.0
Washington Learning & Performance Center	0.0		5.1	5.2
Albuquerque Learning & Performance Center	0.0		0.0	0.0
Anchorage Learning & Performance Center	0.0		4.5	4.6
Denver Learning & Performance Center	0.0		0.0	0.0
Online Learning	63.4		14.4	15.0
Government-wide Forums	0.0		5.7	5.8
NBC – Training Services Directorate	75.4		41.8	42.7
Enterprise Infrastructure	572.3		581.1	587.6
Technology Services	1.0		1.0	1.1
NBC – ITD	573.3		582.1	588.7
Human Resources Directorate				
Client Liaison and Product Development Division	4.0		4.0	3.6
Personnel & Payroll Systems Division	302.7		354.6	414.5
HR Management Systems Division	0.0		0.0	66.9
NBC - HRD	306.7		358.6	485.0
Facilities Reimbursable Services	0.0		1.2	0.1
Creative Communications	44.4		60.8	62.2
Reimbursable Mail Services	6.8		9.5	9.6
NBC – Administrative Operations Directorate	51.2		71.6	71.9
Financial Management				
IDEAS	121.7		121.7	121.7
Financial Systems	65.0		70.0	70.0
NBC – Financial Management Directorate	186.7		191.7	191.7
Subtotal National Business Center	1,339.0		1,398.4	1,536.8
TOTAL	6,987.8	2,027.4	7,462.3	7,492.7

Payments to other Federal agencies include the following:

	2008 Budget	2008 Revised	2009 Fixed Costs Change
Worker's Compensation Payments	$2,892	$2,892	+$103

The adjustment is for actual charges through June 2006, in the costs of compensating injured employees and dependents of employees who suffered accidental deaths while on duty. Costs for 2008 will reimburse the Department of Labor, Federal Employees Compensation Fund, pursuant to 5 U.S.C. 8147(b) as amended by Public Law 94-273.

	2008 Budget	2008 Revised	2009 Fixed Costs Change
Unemployment Compensation Payments	$732	$732	-$107

The adjustment is for estimated changes in the costs of unemployment compensation claims to be paid to the Department of Labor, Federal Employees Compensation Account, in the Unemployment Trust Fund, pursuant to Public Law 96-499

	2008 Budget	2008 Revised	2009 Fixed Costs Change
Rental Payments to GSA and Others	$61,647	$61,647	+$2,665

The adjustment is for changes in the costs payable to General Service Administration (GSA) and others resulting from changes in rates for office and non-office space as estimated by GSA, as well as the rental costs of other currently occupied space. These costs include building security; in the case of GSA space, these are paid to DHS. Costs of mandatory office relocations, i.e., relocations in cases where due to external events there is no alternative but to vacate the currently occupied space, are also included.

Internal Bureau Overhead/Cost Allocation Methodology

The USGS manages overhead/administrative costs at two levels—the bureau and science center. Bureau-level costs include headquarters and regional support for executive, managerial, supervisory, administrative, and financial functions and related bureauwide systems. At the bureau level, funding appropriated to the Science Support and Enterprise Information budget activities pays the bureauwide overhead costs in the same proportion as appropriated funding is to total funding. For this reason, bureauwide overhead costs collected on reimbursable support agreements are deposited within the Science Support and Enterprise Information program areas, as well.

The USGS charges a bureau overhead rate (12 percent in 2007 and 2008) on reimbursable work from non-Interior customers to cover their share of bureau-level costs. In some cases, the USGS does apply reduced or special rates when it can be demonstrated that indirect costs are substantially and consistently less than the norm and the amount collected covers the full costs, such as with pass-through funding where the Survey does not perform any of the actual work. The following table shows the funding available to the Science Support and Enterprise

Information programs, including the anticipated overhead collections to pay for bureauwide costs.

(Dollars in Thousands)

Source of Funding	2009 Appropriation	2009 Bureau Overhead Distribution	2009 Total
Science Support Budget Activity	67,200	28,620	95,820
Enterprise Information Budget Activity	112,121	8,072	120,193
Total Funding	**179,321**	**36,692**	**216,013**

At the science center level, because there generally is not an appropriated funding source to pay the local overhead (common services) costs, both the appropriated and reimbursable funding are assessed a percentage to cover their share of science center level costs. Science center common services costs include center costs that are not directly attributable to a specific activity or project, such as managerial, supervisory, administrative, and financial functions and related systems, as well as costs incidental to providing services and products, such as postage, training, miscellaneous supplies and materials, etc. The cost during 2007, for the local overhead, totaled $147.0 million from both appropriated and reimbursable funds.

In recognition of the USGS role as the science bureau for the Department of the Interior, the USGS is continuing to give Department bureaus and offices a "preferred" customer rate on overhead charges for a significant portion of reimbursable work, to the extent that matching funds are available within the USGS budget. The maximum rate that cost centers may charge other Department bureaus for common services and bureau costs combined remains 15 percent net. In 2009, of the 15 percent, 7.5 percent is applied to bureau costs, and the remaining 7.5 percent is applied to common services costs. Cost centers must fund the common services costs not recovered (e.g., the difference between the cost center's standard common services costs and the 7.5 percent) from USGS appropriated funds. In 2005, the bureau began a glide path to share the combined 15 percent overhead more equitably. Under this distribution, the cost centers are required to fund a lesser amount from science program funds and the bureau is required to use a greater proportion of science support funding for the total bureau overhead costs. In this way, the USGS is partnering on the science needs of Interior from both the bureau and cost centers.

- The Chief Financial Officer establishes the USGS bureau special rate for each fiscal year. The special rate for 2008 is 3 percent. Cost centers do not charge more than the bureau special rate for facilities-related costs or their standard common services rate when funding is approved for a bureau-level special rate. Special rates are applied under the following circumstances.
- A bureau special rate of 3 percent net is applied to cover reduced administrative costs when the USGS receives funds from a non-USGS organization and awards a grant to a third-party entity.
- A bureau special rate of 3 percent net is applied to cover reduced administrative costs when the USGS receives funds from one or more non-USGS organizations to support, under USGS leadership, a strategic science objective which includes the USGS passing through funds to one or more third party entities.

- A bureau special rate of 3 percent net is applied to cover reduced administrative costs when the USGS receives funds from a non-USGS organization for the purpose of the customer acquiring services through the Cartographic Services or the Remotely Sensed Data Contracts. The special rate helps encourage other Federal agencies to use these contracts for cartographic services and remotely sensed data, rather than establishing and managing their own contracts, and ensures greater data consistency through the use of common service providers.
- A bureau special rate of 3 percent net is applied to cover reduced administrative costs when the USGS receives funds from a non-USGS organization for the purpose of passing through the customer's funds to State and local governments for the direct purchase of geospatial data.
- Biology Cooperative Research Units (CRUs) are supported by a three-way partnership including the USGS, a State, and a university. The academic institutions where CRUs are collocated provide significant administrative support. In recognition of the direct services support received from the non-USGS partners, CRUs only recover one-half of the bureau rate (6 percent) normally recovered from reimbursable customers or partners.

Authorizations

43 U.S.C. 31 et seq. Organic Act of March 3, 1879, as amended, establishes the United States Geological Survey. Provides, among other matters, that the USGS is directed to classify the public lands and examine the geological structure, mineral resources, and products within and outside the national domain. Establishes the Office of the Director of the United States Geological Survey under the Department of the Interior. The Director is appointed by the President by and with the advice and consent of the Senate. P.L. 102–285, Sec. 10(a) establishes the official name as United States Geological Survey.

Title 2 – The Congress

2 U.S.C. 681–688 Congressional Budget and Impoundment Control Act of 1974. Describes the general Federal budget process, including rescissions, reservations, and deferrals of budget authority.

Title 5 – Government Organization and Employees

5 U.S.C. Includes personnel matters (classification, pay rates, benefits, etc.), the Freedom of Information Act, the Privacy Act, the Computer Matching and Privacy Act, and other issues related to general Federal functions and employment. The Appendices to Title 5 include the Federal Advisory Committee Act (FACA) of 1972, Inspector General mandates, and other matters that include Federal entities such as the USGS.

Title 7 – Agriculture

7 U.S.C. 136 Federal Environmental Pesticide Control Act of 1972. Amends the program established by the Federal Insecticide, Fungicide and Rodenticide Control Act of 1947 for controlling the sale and distribution of "economic poisons." The law requires registration of pesticides to avoid unreasonable adverse effects to humans or the environment.

7 U.S.C. 2201 Department of Agriculture Organic Act of 1956. Requires the Secretary of Agriculture to obtain the advice of the Secretary of the Interior as to whether certain lands that are being patented, disposed of, or exchanged are mineral in character.

7 U.S.C. 2204(b) Rural Development and Policy Act of 1980. Authorizes the Secretary of Agriculture to enter cooperative agreements with other Federal agencies and other organizations concerning water management for rural areas.

Title 15 – Commerce and Trade

15 U.S.C. 631, 631(a) Small Business Act. Fosters the economic interests of small businesses and sets forth procedures. Encourages Federal agencies to use small businesses and women-owned businesses for services and other contracted activities.

15 U.S.C. 2901–2908 The National Climate Program Act of 1978. Establishes a national climate program to assist the Nation and the world in understanding and responding to natural and human-induced climate processes and their known and potential effects. The Department of the Interior has a mandated role in this Program.

15 U.S.C. 2921 et seq. The Global Change Research Act of 1990. Establishes the United States Global Change Research Program aimed at understanding and responding to global change, including the

cumulative effects of human activities and natural processes on the environment, to promote discussions toward international protocols in global change research, and for other purposes.

15 U.S.C. 5631 et seq. Land Remote Sensing Policy Act of 1992. Enables the United States to maintain leadership in land remote sensing by providing data continuity for the Landsat program. Assigns responsibility for the "National Satellite Land Remote Sensing Data Archive" to the Department of the Interior. Authorizes and encourages the Department of the Interior and other Federal agencies to carry out research and development programs in applications of these data and makes Landsat data available to the public.

Title 16 – Conservation

16 U.S.C. 17 et seq. National Park Service Organic Act of 1916. Parts of Title 16, Conservation, as amended and supplemented, apply to the USGS. Notably, the Outdoor Recreation Act of 1936 authorizes the Secretary of the Interior to sponsor, engage in, and assist in research relating to outdoor recreation, directly or by contract or cooperative agreements, and make payments for such purposes; undertake studies and assemble information concerning outdoor recreation; and cooperate with educational institutions and others to assist in establishing education programs and activities and to encourage public use and benefits from outdoor recreation.

16 U.S.C. 661 et seq. Fish and Wildlife Coordination Act of 1934. Authorizes the Secretary of the Interior to prepare plans to protect wildlife resources, to conduct surveys on public lands, and to accept funds or lands for related purposes; authorizes the investigation and reporting of proposed Federal actions that affect the development, protection, rearing, and stocking of all species of wildlife and their habitat in controlling losses, minimizing damages, and providing recommendations to minimize impacts on fish and wildlife resources. National Wildlife Refuge System Improvement Act of 1997 (P.L. 105–57) amends the National Wildlife Refuge System Administration Act of 1966 to improve the management of the National Wildlife Refuge System, and for other purposes.

16 U.S.C. 703–712 Migratory Bird Treaty Act of 1918, as amended. Implements four international treaties that individually affect migratory birds common to the United States, Canada, Mexico, Japan, and the former Soviet Union. Establishes Federal responsibility for protection and management of migratory and nongame birds, including the establishment of season length based on scientific information relative to zones of temperature, distribution, abundance, breeding habits and times and lines of migratory flight of migratory birds. Establishes the Secretary of the Interior's responsibility for bag limits and other hunting regulations and issuance of permits to band, possess, or otherwise make use of migratory birds.

16 U.S.C. 715 Migratory Bird Conservation Act of 1900. Establishes the Migratory Bird Conservation Commission; authorizes the Secretary of the Interior to conduct investigations and publish documents related to North American birds.

16 U.S.C. 742(a) et seq. Fish and Wildlife Act of 1956. Authorizes the Secretary of the Interior to conduct investigations, prepare and disseminate information, and make periodic reports to the public regarding the availability and abundance and the biological requirements of fish and wildlife resources; provides a comprehensive national fish and wildlife policy and authorizes the Secretary of the Interior to take steps required for the development, management, advancement, conservation, and protection of fisheries and wildlife resources through research, acquisition of refuge lands, development of existing facilities, and other means.

16 U.S.C. 742(l) Fish and Wildlife Improvement Act of 1978, as amended by P.L. 95–616. Authorizes the Secretary of the Interior to enter into cooperative agreements with colleges and universities, State fish and game agencies, and nonprofit organizations for the purpose of developing adequate, coordinated, cooperative research and training programs for fish and wildlife resources.

16 U.S.C. 797(c) Following language supports Appropriations language "and Federal Energy Regulatory Commission licensees." States that, "To cooperate with the executive departments and other agencies of

States or National Governments in such investigations; and for such purposes the several departments and agencies of the National Government are authorized and directed upon the request of the commission, to furnish such records, papers and information in their possession as may be requested by the commission, and temporarily to detail to the commission such officers or experts as may be necessary in such investigations."

16 U.S.C. 931–939 Great Lakes Fishery Act of 1956. Implements the Convention on Great Lakes Fisheries between the United States and Canada; authorizes construction, operation, and maintenance of sea lamprey control works; sets forth procedures for coordination and consultation with States and other Federal agencies; and establishes the Great Lakes Fisheries Commission.

16 U.S.C. 1131 and 1133 Wilderness Act of 1964, as amended. Requires the USGS to assess the mineral resources of each area proposed or established as wilderness. The studies are to be on a planned and recurring basis. The original series of studies has been completed, and no recurring studies have been requested or funded.

16 U.S.C. 1361 et seq. Marine Mammal Protection Act of 1972, as amended. Establishes a responsibility to conserve marine mammals with management authority vested in the Department of the Interior for the sea otter, walrus, polar bear, dugong, and manatee.

16 U.S.C. 1451 et seq. Coastal Zone Management Act of 1976. Provides that each department, agency, and instrumentality of the Executive Branch of the Federal Government may assist the Secretary of Commerce, on a reimbursable basis or otherwise, in carrying out research and technical assistance for coastal zone management.

16 U.S.C. 1531 et seq. Endangered Species Act of 1973, as amended. Provides for the conservation of threatened and endangered species of fish, wildlife, and plants, and authorizes establishment of cooperative agreements and grants-in-aid to States that establish and maintain active and adequate programs for endangered and threatened wildlife and plants.

16 U.S.C. 1604. Forest and Rangeland Renewable Resources Planning Act of 1974, as amended by the National Forest Management Act of 1976. The USGS is a party in an interagency agreement with the Forest Service to assess the mineral resources of National Forests.

16 U.S.C. 2801 et seq. National Aquaculture Act of 1980. Directs the Secretary of the Interior to participate in the development of a National Aquaculture Development Plan and authorizes research, development, and other activities to encourage the development of aquaculture in the United States.

16 U.S.C. 3141 et seq. Alaska National Interest Lands Conservation Act of 1980. Designates certain public lands in Alaska as units of the National Park, National Wildlife Refuge, Wild and Scenic Rivers, National Wilderness Preservation and National Forest Systems, resulting in general expansion of all systems and provided comprehensive management guidance for all public lands in Alaska. Section **3141** requires the Secretary of the Interior to assess the oil and gas potential of Federal lands (other than submerged lands on the Outer continental Shelf) in Alaska north of 68 degrees north latitude and east of the western boundary of the National Petroleum Reserve–Alaska (NPRA), other than lands included in the NPRA and in conservation system units established by the Act. Also authorizes the Secretary of the Interior to initiate and carry out a study of all Federal lands in designated areas of Alaska; the study is to assess the potential oil and gas resources of these lands; review the wilderness characteristics; and study the wildlife resources of these lands. Section **3142** provides for a comprehensive and continuing inventory and assessment of the fish and wildlife resources of the coastal plain of the Arctic National Wildlife Refuge. Also states that the USGS "has made and may be called upon to make water studies pertinent to implementation of the Act." Section **3148** authorizes the Secretary to conduct studies, or collect and analyze information obtained by permittees, of the oil and gas potential of non-North Slope Federal lands and environmental characteristics and wildlife resources that would be affected by the exploration for and development of such oil and gas. Section **3150** requires that the Secretary of the Interior assess the oil, gas, and other mineral potential on all public lands in the State of Alaska to expand

the database with respect to the mineral potential of such lands. This responsibility has been delegated to the USGS. Section **3151** requires an annual minerals report be presented to Congress; the preparation of this report was delegated to the USGS. The annual reporting requirement was terminated, effective May 15, 2000, pursuant to section 3003 of P.L. 104–66, as amended.

16 U.S.C. 3501 et seq. Coastal Barrier Resources Act of 1982. Designates various underdeveloped coastal barrier islands depicted by specific maps for inclusions in the Coastal Barrier Resource System. **P.L. 106–514** Coastal Barrier Resources Reauthorization Act of 2000. Reauthorizes and amends the Coastal Barrier Resources Act of 1999. Section **6** authorizes cooperative efforts between the Secretary of the Interior and the Director of FEMA to provide existing digital spatial data, including digital orthophotos, and shoreline, elevation, and bathymetric data of the John H. Chafee Coastal Barrier Resource System maps. If data do not exist to carry out this pilot project, the USGS, in cooperation with other Federal agencies, as appropriate, will obtain and provide the data required to the Secretary. In addition, all data used or created to carry out this section shall comply with the National Spatial Data Infrastructure established by Executive Order 12906 (59 Fed. Reg. 17671 (April 13, 1994)); and any other standards established by the Federal Geographic Data Committee established by Office of Management and Budget Circular A–16.

16 U.S.C. 4701 et seq. Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990. Establishes a Federal program to prevent introduction and control the spread of introduced aquatic nuisance species.

Title 22 – Foreign Relations and Intercourse

22 U.S.C. 3201 et seq. Nuclear Non-Proliferation Act of 1978. Provides that under Title V, United States Assistance to Developing Countries, the USGS assists, through the State Department and the Agency for International Development, in evaluation of nuclear facilities sites in other countries.

Title 25 – Indians

25 U.S.C. 450 et seq. Tribal Self-Governance Act of 1994. The USGS participates in the Tribal Self-Governance Program by identifying USGS activities that may be available for tribal operation under the Self-Governance Act. The USGS discusses programs and activities with interested tribal governments.

Title 29 – Labor

29 U.S.C. 651 Occupational Safety and Health Act of 1970. Provides criteria "… to assure so far as possible every working man and woman in the Nation safe and healthful working conditions …."

Title 30 – Mineral Lands and Mining

30 U.S.C. 21(a) Mining and Minerals Policy Act of 1970. Emphasizes Department of the Interior responsibility for assessing the mineral resources of the Nation.

30 U.S.C. 201 Federal Coal Leasing Amendments Act of 1976. Provides that no lease sale may be held on Federal lands unless the lands containing the coal deposits have been included in a comprehensive land-use plan. Provides that the Secretary is authorized and directed to conduct a comprehensive exploratory program designed to obtain sufficient data and information to evaluate the extent, location, and potential for developing the known recoverable coal resources within the coal lands. The USGS provides data and information from coal research and field investigations, which are useful to the BLM to meet the requirements of the coal leasing program. Further, the Secretary, (**Sec. 208–1(b)**) through the USGS, "... is authorized to conduct seismic, geophysical, geochemical, or stratigraphic drilling, or to contract for or purchase the results of such exploratory activities from commercial or other sources which may be needed to implement the ..." exploratory program.

30 U.S.C. 641 Following language supports Appropriations language "administer the minerals exploration program." Provides that, "The Secretary of the Interior is hereby authorized and directed, in order to provide for discovery of additional domestic mineral reserves, to establish and maintain a program for exploration by private industry within the United States, territories and possessions for such minerals, excluding organic fuels, as he shall from time to time designate, and to provide Federal financial assistance on a participating basis for that purpose." (P.L. 85–701.)

30 U.S.C. 1026 Section **6** of the Geothermal Steam Act Amendments of 1988. Requires the Secretary of the Interior to (1) maintain a monitoring program for significant thermal features within units of the National Park System and (2) establish a research program to collect and assess data on the geothermal resources within units of the National Park System with significant thermal features in cooperation with the USGS. Section **8** requires the USGS to conduct a study of the impact of present geothermal development in the vicinity of Yellowstone National Park on the thermal features within the park.

30 U.S.C. 1028 Energy Policy Act of 1992. Directs the Secretary of the Interior, through the USGS and in consultation with the Secretary of Energy, to establish a cooperative government- private sector program with respect to hot dry rock geothermal energy resources on public lands. Supports recurring assessments of the undiscovered oil and gas resources of the United States.

30 U.S.C. 1101, 1121, 1123 Geothermal Energy Research, Development, and Demonstration Act of 1974. Provides that the Department of the Interior is responsible for the evaluation and assessment of the geothermal resource base and the development of exploration technologies. The Chairman, acting through the USGS and other appropriate agencies, shall develop and carry out a plan for the inventorying of all forms of geothermal resources of Federal lands; conduct regional surveys; publish and make available maps, reports, and other documents developed from the surveys; and participate with non-Federal entities in research to develop, improve, and test technologies for the discovery and evaluation of geothermal resources.

30 U.S.C. 1201–1202, 1211 Surface Mining Control and Reclamation Act of 1977, as amended. Establishes the Office of Surface Mining Reclamation and Enforcement (OSM). OSM depends in part upon the USGS for a determination of the probable hydrologic consequences of mining and reclamation operations.

30 U.S.C. 1419 et seq. Deep Seabed Hard Mineral Resources Act of 1980. Provides authorization for conducting a continuing program of ocean research that "shall include the development, acceleration, and expansion, as appropriate, of the studies of the ecological, geological, and physical aspects of the deep seabed in general areas of the ocean where exploration and commercial development are likely to occur …." The USGS, based on expertise developed in regional offshore geologic investigations, provides geological and mineral resource expertise in responding to the requirements of the Act.

30 U.S.C 1601 et seq. National Materials and Minerals Policy, Research and Development Act of 1980. Reemphasizes the responsibility of the Department of the Interior to assess the mineral resources of the Nation.

30 U.S.C. 1901–1902 Methane Hydrate Research and Development Act of 2000. Authorizes appropriations for the establishment of a methane hydrate research and development program within the DOE. The DOE is directed to carry out this program in consultation with the U.S. Navy, USGS, Minerals Management Service, and NSF, through grants, contracts, and cooperative agreements with universities and industrial enterprises. Provides for the study of the use of methane hydrate as a source of energy. Sunsets the methane hydrate research and development program at the end of FY 2005.

Title 31 – Money and Finance

31 U.S.C. 501, 901–903 note Chief Financial Officers (CFO) Act of 1990. Section **501** refers to findings and purpose for the CFO Act. Sections **901–903** provide for establishment of a CFO in each agency,

describe the authority and functions of agency CFOs, and provide for the establishment of agency Deputy CFOs.

31 U.S.C. 1535 Economy Act of 1932, as amended. Authorizes any agency to obtain goods and services from and reimburse any other agency if certain criteria are met.

31 U.S.C. 3302 The custody and possession of public money by Federal officials is dealt with in this section. (P.L. 97–258.)

31 U.S.C. 3501 et seq. Budget Accounting and Procedures Act of 1950. Federal Managers' Financial Integrity Act of 1982.

31 U.S.C. 3512 Federal Financial Management Improvement Act of 1996. Provides for the implementation of financial management systems that comply with Federal financial management systems requirements, applicable Federal accounting standards, and the U.S. Government Standard General Ledger at the transaction level.

31 U.S.C. 3701–3720(e) Debt Collection Improvement Act of 1996. Maximizes collections of delinquent debts owed to the Federal Government; describes policies and requirements.

31 U.S.C. 3901–3907 Prompt Payment Act of 1982, as amended. Requires Federal agencies to pay interest penalties on overdue payments to businesses for property or services, and requires the Office of Management and Budget to prescribe regulations to implement provisions of the act and subsequent amendments.

31 U.S.C. 6301–6308 Federal Grant and Cooperative Agreement Act of 1977. Provides criteria for distinguishing between contract, grant, and cooperative agreement relationships and provides discretionary authority to vest title to equipment or other tangible personal property purchased with contract, grant, or cooperative agreement funds in nonprofit research or higher education institutions.

31 U.S.C. 7501 Single Audit Act of 1984, as amended. Provides for audits of Federal awards administered by non-Federal entities.

31 U.S.C. 9701 Independent Office Appropriations Act of 1952; Title 5, Fees and charges for Government services and things of value. Encourages Federal services and products ("things of value") to be as financially self-sustaining as possible. Authorizes costs to be charged for Federal services and products based on the costs to the Government, the value of the service or thing to the recipient, and the public policy or interest served.

Title 33 – Navigation and Navigable Waters

33 U.S.C. 883(a) Great Lakes Shoreline Mapping Act of 1987. Section **3202(a)** requires that the Director of the National Oceanic and Atmospheric Administration "... in consultation with the Director of the United States Geological Survey, shall submit to the Congress a plan for preparing maps of the shoreline of the Great Lakes under section 3203." Section **3203** requires that "... subject to authorization and appropriation of funds, the Director, in consultation with the Director of the United States Geological Survey, shall prepare maps of the shoreline areas of the Great Lakes."

33 U.S.C. 1251–1274, 2901 Federal Water Pollution Control Act Amendments of 1972, Clean Water Act of 1977, and Water Quality Act of 1987, authorize extensive water quality planning, studies, and monitoring under the direction primarily of the EPA. Section **1254** authorizes the Administrator of the EPA to establish national programs for the prevention, reduction, and elimination of pollution including the establishment of a water quality surveillance system for the purpose of monitoring the quality of the navigable waters and ground waters, utilizing the resources of the USGS and others. The USGS is called upon to participate in many of these activities, partly by the EPA and partly by State agencies in the Federal-State Cooperative Program [now called the Cooperative Water Program]. The Act of 1987

includes water quality work in Chesapeake Bay, the Great Lakes, Estuary and Clean Lakes Programs, and studies of water pollution problems in aquifers. Estuaries and Clean Waters Act of 2000. Amends the Federal Water Pollution and Control Act (commonly known as the Clean Water Act) to include authorization for the following: Title I, Estuary Restoration; Title II, Chesapeake Bay Restoration; Title III, National Estuary Program; Title IV, Long Island Sound Restoration; Title V, Lake Pontchartrain Basin Restoration; Title VI, Alternative Water Sources; Title VII, Clean Lakes; and Title VIII, Tijuana River Valley Estuary and Beach Cleanup. (The Clean Water Act charges States and Tribes with setting specific water-quality criteria appropriate for their waters and for developing pollution control programs to meet the criteria. States and Tribes utilize USGS hydrologic data collection and monitoring to help meet Clean Water Act requirements. The USGS also is a key Federal partner in both the Chesapeake Bay Program and the National Estuary Program.)

33 U.S.C. 1271 Water Resources Development Act of 1992. Establishes a National Contaminated Sediment Task Force, with USGS as a member, to conduct a comprehensive national survey of aquatic sediment quality.

33 U.S.C. 2201 et seq. Water Resources Development Act of 1990. Authorizes a program for planning, construction, and evaluation of measures for fish and wildlife habitat rehabilitation and enhancement; cooperative effort and mutual assistance for use, protection, growth, and development of the Upper Mississippi River system; implementation of a long-term resource monitoring program; and implementation of a computerized inventory and analysis systems.

33 U.S.C. 2701, 2761 Oil Pollution Act of 1990. Section **2761** authorizes the establishment of an Interagency Coordinating Committee on Oil Pollution Research, of which the Department of the Interior is a member, to develop a plan for the implementation of the oil pollution research, development, and demonstration program.

Title 40 – Public Buildings, Property, and Works

40 U.S.C. 471 Federal Property and Administrative Services Act of 1949. Provides for management, utilization, and disposal of government property.

40 U.S.C. 601 Public Buildings Amendment Act of 1972. Prohibits construction of buildings except by the Administrator of General Services.

40 U.S.C. 606 Public Buildings Act of 1959. Establishes criteria for the approval of proposed construction, alteration, acquisition, and lease of public buildings by Congress, over a designated threshold of cost.

40 U.S.C. 1401 Clinger-Cohen Act, formerly known as the Information Technology Management Reform Act of 1996, along with the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.). Provides the opportunity to improve significantly the way the Federal Government acquires and manages information technology. Agencies have the clear authority and responsibility to make measurable improvements in mission performance and service delivery to the public through the strategic application of information technology. Executive Order 13011, July 16, 1996, provides policy and procedures regarding implementation of this Act.

Title 41 – Judicial Review of Administrative Decisions

41 U.S.C. 251 et seq. Competition in Contracting Act of 1984. Provides direction regarding agency procurements, including support for small businesses, acquisition thresholds regarding soliciting bids, etc.

41 U.S.C. 433 Federal Acquisition Reform Act of 1996. Mandates the continued career development and training of the acquisition workforce.

41 U.S.C. 601–613 Contract Disputes Act of 1978. Describes procedures regarding the resolution of contract disputes.

Title 42 – The Public Health and Welfare

42 U.S.C. 300(f) et seq. Safe Drinking Water Act Amendments of 1996. Authorizes research "... relating to the causes, ... treatment, ... prevention of ... impairments of man resulting directly or indirectly from contaminants in water, or to the provision of a dependably safe supply of drinking water ...." The USGS and EPA have an interagency agreement covering aquifer studies conducted by the USGS relating to sole source aquifers.

42 U.S.C. 2021(b) et seq. Low-Level Radioactive Waste Policy Act of 1980. Requires intra-State or regional arrangements for disposal of low-level radioactive waste by July 1986. The USGS provides geohydrologic research and technology to Federal and State agencies developing plans for low-level waste management. The amending Act of 1985 included approval of seven interstate compacts.

42 U.S.C. 2210(b), 2231 Nuclear Regulatory Commission Authorization Act. Requires the Secretary of Energy to monitor and report to the President and Congress on the viability of the domestic uranium industry. Under a Memorandum of Understanding between the Department of Energy and the Department of the Interior, the USGS provides information on domestic uranium resources to the Energy Information Agency.

42 U.S.C. 4321 et seq. National Environmental Policy Act of 1969, as amended. Requires prior-to-action determination that any major Federal action will not have a significantly adverse effect upon the environment. The USGS is called upon to provide technical review or inputs to resource-related actions proposed by other Federal agencies.

42 U.S.C. 5121, 5132 Disaster Relief Act of 1974, Section **202(a).** States that "The President shall ensure that all appropriate Federal agencies are prepared to issue warnings of disasters to State and local officials." In addition, Section **202(b)** states that "The President shall direct appropriate Federal agencies to provide technical assistance to State and local governments to insure that timely and effective disaster warning is provided."

42 U.S.C. 5845(c) Energy Reorganization Act of 1974. Directs all other Federal agencies to "... (2) ... furnish to the (Nuclear Regulatory) Commission ... such research services ... for the performance of its functions; and (3) consult and cooperate with the Commission on research development matters of mutual interest and provide such information and physical access to its facilities as will assist the Commission in acquiring the expertise necessary to perform its licensing and related regulatory functions." The USGS conducts geological mapping in areas where nuclear reactor construction is anticipated and conducts investigations of geologic processes that could imperil the safe operation of the reactors or other critical energy facilities.

42 U.S.C. 6217 Energy Act of 2000. Extends energy conservation programs under the Energy Policy and Conservation Act through FY 2003. Specifically for the USGS, Section **604,** "Scientific Inventory of Oil and Gas Reserves," instructs the Secretary of the Interior, in consultation with the Secretaries of Agriculture and Energy, to conduct and update regularly an inventory of all onshore Federal lands. The inventory will identify (1) USGS reserve estimates of the oil and gas resources underlying these lands, (2) restrictions or impediments to development of such resources, and (3) furnish such inventory data to the House Committee on Resources and the Senate Committee on Energy and Natural Resources. Authorizes appropriations as necessary for implementation.

42 U.S.C. 6901 et seq. Resource Conservation and Recovery Act of 1976 and Hazardous and Solid Waste Amendments of 1984. Requires the EPA to promulgate guidelines and regulations for identification and management of solid waste, including disposal. The expertise of the USGS is a present and potential source of assistance to the EPA in defining and predicting the hydrologic effects of waste disposal.

42 U.S.C. 7418, 7401, 7470. Clean Air Act of 1977, as amended. Requires Federal facilities to comply with air quality standards to the same extent as non-governmental entities. Establishes requirements to prevent significant deterioration of air quality and to preserve air quality in national parks, national wilderness areas, national monuments and national seashores.

42 U.S.C. 7701 et seq. Earthquake Hazards Reduction Act of 1977. Sets as a national goal the reduction in the risks of life and property from future earthquakes in the United States through the establishment and maintenance of a balanced earthquake program encompassing prediction and hazard assessment research, seismic monitoring and information dissemination. Subsequent public laws established a National Earthquake Hazards Reduction Program, of which the USGS is a part. P.L. 96–472 authorizes the establishment of a National Earthquake Prediction Evaluation Council. P.L. 101–614 (National Earthquake Hazards Reduction Program Reauthorization Act), P.L. 105–47, and P.L. 106–503 (Earthquake Hazards Reduction Authorization Act of 2000) reauthorize the 1977 Act, repeal some sections, and add new language in some sections including the establishment of an Advanced National Seismic Research and Monitoring System.

42 U.S.C. 8901 et seq. Acid Precipitation Act of 1980. Authorizes an "Acid Precipitation Program and Carbon Dioxide Study," including the establishment of an Acid Precipitation Task Force (of which the Department of the Interior is a member) and a comprehensive 10-year research program. Title IX of the Clean Air Act Amendments of 1990 (P.L. 101–549) calls for continuation of the National Acid Precipitation Assessment Program (NAPAP) established under the Acid Precipitation Act of 1980. The USGS is an active participant in the research program and coordinates interagency monitoring of precipitation chemistry. The USGS National Coal Resources Data System was named by the EPA as the official database for information on coal quality. The EPA, utility companies, and coal mining industries use the database to estimate the amount of air pollution derived from coal combustion. The USGS is a participant in studies of acid precipitation as a result of prior work in this field.

42 U.S.C. 9601 et seq. Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). Establishes a Hazardous Substance Superfund (26 U.S.C. 9507) to help finance the massive cleanup programs needed at sites that are heavily contaminated with toxic wastes. The USGS is called upon by the EPA and State agencies to investigate and determine the extent of contamination and remedial measures at some of these sites.

42 U.S.C. 10101 et seq. Nuclear Waste Policy Act of 1982. Defines the DOE as lead agency with responsibility for siting, building, and operating high-level radioactive waste repositories. Requires participation by the USGS in a consultative and review role to the DOE. The Nuclear Waste Policy Amendments Act of 1987 (Title V of the Omnibus Budget Reconciliation Act of 1987) identifies Yucca Mountain, NV, as the first site to be studied to ascertain suitability for disposal of high level nuclear waste. The 1987 Act provides that the DOE conduct a survey of potentially suitable sites for a monitored retrievable storage facility.

42 U.S.C. 10301 et seq. Water Resources Development Act of 1986. Amends the Water Resources Research Act of 1984 (P.L. 98–242) by adding a new Title III, "Ogallala Aquifer Research and Development." P.L. 109–471 amends the act to extend authorization of appropriations through FY 2010. The Water Resources Research Act of 1984, as amended, provides for water resources research, information transfer, and student training in grants and contract programs that will assist the Nation and the States in augmenting their science and technology to discover practical solutions to water shortage and quality deterioration problems. Establishes a Federal-State partnership in water resources research, education, and information transfer through a matching grant program that authorizes State Water Resources Research Institutes at land grant universities across the Nation.

Title 43 – Public Lands

43 U.S.C. 31 et seq. Organic Act of March 3, 1879, as amended, establishes the United States Geological Survey. Provides, among other matters, that the USGS is directed to classify the public lands

and examine the geological structure, mineral resources, and products within and outside the national domain. Establishes the Office of the Director of the United States Geological Survey under the Department of the Interior. The Director is appointed by the President by and with the advice and consent of the Senate. P.L. 102–285, Sec. 10(a) establishes the official name as the United States Geological Survey.

Particularly: Section **4** of the Continental Scientific Drilling and Exploration Act of 1988. Requires that "The Secretary of the Department of Energy, the Secretary of the Department of the Interior through the United States Geological Survey, and the Director of the National Science Foundation assure an effective, cooperative effort in furtherance of the Continental Scientific Drilling Program of the United States."

And: 43 U.S.C. **31(a–h).** National Geologic Mapping Act of 1992. Establishes in the USGS a National Cooperative Geologic Mapping Program. States "The objectives of the geologic mapping program shall include (1) determining the Nation's geologic framework through systematic development of geologic maps at scales appropriate to the geologic setting and the perceived applications, such maps to be contributed to the national geologic map database; (2) development of a complementary national geophysical-map database, geochemical-map database, and a geochronologic and paleontologic database that provide value-added descriptive and interpretive information to the geologic-map database; (3) application of cost-effective mapping techniques that assemble, produce, translate and disseminate geologic-map information and that render such information of greater application and benefit to the public; and (4) development of public awareness for the role and application of geologic-map information to the resolution of national issues of land use management." Section **31(g)** requires the Secretary of the Interior to provide biennial reports on the status of the program, progress in developing the national geologic map database, and any recommendations the Secretary may have for legislative or other action to achieve the purposes of the Act to the Committee on Resources of the House of Representatives and the Committee on Energy and Natural Resources of the Senate. The Act was reauthorized in 1997 (P.L. 105–36) and 1999 (P.L. 106–148). **31(i)** Requires the National Academy of Sciences to review and report on the resource research activities of the USGS. **31(j)** FY 1997 Omnibus Appropriations Act. Requires that, beginning in FY 1998 and once every five years thereafter, the National Academy of Sciences shall review and report on the biological research activity of the USGS.

43 U.S.C. 32 Authorizes the Secretary of the Interior to authorize one of the geologists to act as Director of the USGS in his/her absence.

43 U.S.C. 34 States that the scientific employees of the USGS shall be selected by the Director, subject to the approval of the Secretary of the Interior exclusively for their qualifications as professional experts.

43 U.S.C. 36 Authorizes the purchase of professional and scientific books and periodicals needed for statistical purposes by the scientific divisions of the USGS and that the purchases may be paid for out of appropriations made for the USGS. **36(a)** The Director of the USGS is authorized "… to acquire for the United States, by gift or devise, scientific or technical books, manuscripts, maps, and related materials, and to deposit the same in the library of the United States Geological Survey for reference and use as authorized by law." **36(b)** "The Secretary of the Interior may, on behalf of the United States and for the use by the United States Geological Survey in gaging streams and underground water resources, acquire lands by donation or when funds have been appropriated by Congress by purchase or condemnation ...." Following language supports Administrative Provisions language "acquisition of lands for gauging stations and observation wells;": Provides that, "The Secretary of the Interior may, on behalf of the United States and for the use by the Geological Survey in gaging streams and underground water resources, acquire lands by donation or when funds have been appropriated by Congress by purchase or condemnation ...." **36(c)** Acceptance of contributions from public and private sources; cooperation with other agencies in prosecution of projects. States that "In fiscal year 1987 and thereafter the United States Geological Survey is authorized to accept lands, buildings, equipment, and other contributions from public and private sources and to prosecute projects in cooperation with other agencies, Federal, State, or private."

43 U.S.C. 38 Topographic surveys; marking elevations. Provides for the establishment and location of permanent benchmarks used in the making of topographic surveys.

43 U.S.C. 41 Publications and reports; preparation and sale. Provides for the publication of geological and economic maps, illustrating the resources and classification of the lands, and reports upon general and economic geology and paleontology. Provides for the scientific exchange and sale of such published material.

43 U.S.C. 42 et seq. Distribution of maps and atlases, etc. Authorizes and directs the Director, USGS, upon the approval of the Secretary of the Interior, to distribute topographic and geologic maps and atlases of the United States. The prices and regulations are to be fixed by the Director with the approval of the Secretary. Provides that copies of each map or atlas, not to exceed five hundred, shall be distributed gratuitously among foreign governments, departments of our own Government, literary and scientific associations, and to educational institutions or libraries. States that "In fiscal year 1984 and thereafter, all receipts from the sale of maps sold or stored by the United States Geological Survey shall be available for map printing and distribution to supplement funds otherwise available, to remain available until expended."

43 U.S.C. 43 Copies to Senators, Representatives and Delegates. Provides that one copy of each map and atlas shall be sent to each Senator, Representative, and Delegate in Congress, if published within his term, and that a second copy be placed at the disposal of each.

43 U.S.C. 44 Sale of transfers or copies of data. Provides that the USGS may furnish copies of maps to any person, concern, institution, State, or foreign government.

43 U.S.C. 45 Production and sale of copies of photographs and records; disposition of receipts. Authorizes the USGS to produce and sell on a reimbursable basis, copies of aerial or other photographs, mosaics, and other official records. Discusses disposition of receipts from sales.

43 U.S.C. 49 Extension of cooperative work to Puerto Rico. Authorizes the making of topographic and geological surveys and conducting investigations relating to mineral and water resources in Puerto Rico by the USGS.

43 U.S.C. 50 Provides that the share of the USGS in any topographic mapping or water resources investigations carried on in cooperation with any State or municipality shall not exceed 50 percent of the cost thereof. **50(b)** Recording of obligations against accounts receivable and crediting of amounts received; work involving cooperation with State, Territory, etc. "Before, on, and after October 18, 1986, in carrying out work involving cooperation with any State, Territory, possession, or political subdivision thereof, the United States Geological Survey may, notwithstanding any other provision of law, record obligations against accounts receivable from any such entities and shall credit amounts received from such entities to this appropriation." (Note U.S.C. states that "this appropriation" refers to USGS annual appropriation as contained in the Department of the Interior and Related Agencies Appropriations Act.) Following language supports Appropriations language "Provided further, that, heretofore and hereafter, in carrying out work involving cooperation with any State, Territory, possession, or political subdivision thereof, the Geological Survey may, notwithstanding any other provisions of law, record obligations against accounts receivable from any such entities and shall credit amounts received from such entities to this appropriation." **50(c)** Payment of costs incidental to utilization of services of volunteers. "Appropriations herein and on and after December 22, 1987, made shall be available for paying costs incidental to the utilization of services contributed by individuals who serve without compensation as volunteers in aid of work of the United States Geological Survey, and … Survey officials may authorize either direct procurement of or reimbursement for expenses incidental to the effective use of volunteers such as, but not limited to, training, transportation, lodging, subsistence, equipment, and supplies: Provided further, That provision for such expenses or services is in accord with volunteer or cooperative agreements made with such individuals, private organizations, educational institutions, or State or local government." **50(d)** Services of students or recent graduates. "The United States Geological Survey may on and after November 19, 1999, contract directly with individuals or indirectly with institutions or

nonprofit organizations, without regard to section 5 of title 41, for the temporary or intermittent services of students or recent graduates, who shall be considered employees for the purposes of chapters 57 and 81 of title 5, relating to compensation for travel and work injuries, and chapter 171 of title 28, relating to tort claims, but shall not be considered to be Federal employees for any other purposes."

43 U.S.C. 51 Funds for mapping and investigations considered intragovernmental funds. "Beginning October 1, 1990, and thereafter, funds received from any State, territory, possession, country, international organization, or political subdivision thereof, for topographic, geologic, or water resources mapping or investigations involving cooperation with such an entity shall be considered as intragovernmental funds as defined in the publication titled 'A Glossary of Terms Used in the Federal Budget Process.'"

43 U.S.C. 364 et seq. Board on Geographic Names, 1947. Establishes the Board on Geographic Names to provide for uniformity in geographic nomenclature and orthography throughout the Federal Government and to promulgate in the name of the Board decisions with respect to geographic names and principles of geographic nomenclature and orthography.

43 U.S.C. 371 Reclamation Projects Authorization and Adjustment Act of 1992. Public Law 104–46 amends the 1992 law to add Section **3001,** "Western Water Policy Review Act of 1992." Directs the President to undertake a comprehensive review of Federal activities in the 19 western States that directly or indirectly affect the allocation and use of resources, whether surface or subsurface. The Secretary of the Interior, "... given … responsibilities for … investigations and reviews into ground water resources through the Geologic Survey (now United States Geological Survey) ..." and the Secretary of the Army "have the resources to assist in a comprehensive review ...."

43 U.S.C. 1334 et seq. Outer Continental Shelf (OCS) Lands Act. Authorizes the Secretary of the Interior to prescribe rules and regulations to provide for the prevention of waste and conservation of the natural resources of the OCS; to conduct geological and geophysical explorations of the OCS; directs the Secretary of the Interior to conduct a study of any region in any gas and oil lease sale to obtain information necessary for assessment and management of environmental impacts on human, marine and coastal areas which may be affected by oil and gas development on such areas.

43 U.S.C. 1801 et seq. OCS Lands Act Amendments of 1978. Provides for management of oil and natural gas in the Outer Continental Shelf and for other purposes. The Minerals Management Service is responsible for carrying out all functions in direct support of management of the OCS program. The USGS provides indirect support to the Department's management activities through the basic mission to examine the geological structure, mineral resources, and products of the national domain, which, offshore, includes the EEZ.

Title 44 – Public Printing and Documents

44 U.S.C. 1318 Classes and sizes of publications; report of mineral resources; number of copies; reprints; distribution. Provides for publication, by the Geological Survey, of various reports, including a report of mineral resources of the United States, bulletins and professional papers, and monographs. Also specifies, in some instances, numbers of copies to be printed and the distribution thereof.

44 U.S.C. 1319 Specific appropriations required for monographs and bulletins. Scientific reports known as monographs and bulletins of the USGS may not be published until specific, detailed estimates, and specific appropriations based on these estimates, are made for them.

44 U.S.C. 1320 Distribution of publications to public libraries. The Director of the USGS shall distribute to public libraries that have not already received them, copies of sale publications on hand at the expiration of 5 years after date of delivery to the Survey document room, excepting a reserve number not to exceed two hundred copies.

44 U.S.C. 1903 Distribution of publications to depositories; notice to Government components; cost of printing and binding. Upon request of the Superintendent of Documents, components of the Government ordering the printing of publications shall either increase or decrease the number of copies of publications furnished for distribution to designated depository libraries and State libraries so that the number of copies delivered to the Superintendent of Documents is equal to the number of libraries on the list.

44 U.S.C. 3105–3107, 3301–3324 Federal Records Act, as amended. Establishes procedures for records management by Federal agencies, including disposal of records.

44 U.S.C. 3501 Paperwork Reduction Act. Establishes polices regarding Federal information, including minimizing the paperwork burden for all persons and organizations.

44 U.S.C. 3504 Government Paperwork Elimination Act of 1998, Title XVII of the Omnibus Consolidated and Emergency Supplemental Appropriations Act of 1999. Provides for development of procedures for electronic signatures by executive agencies.

Title 50, Appendix – War and National Defense

50 U.S.C. 98 Strategic and Critical Materials Stock Piling Act of 1946 as amended by the Revision Act of 1979. Supports the USGS programs for assessment of domestic minerals, especially for strategic and critical minerals, to complement the Federal mineral stockpile program. Section **98(g)** following language supports Appropriations language "and to conduct inquiries into the economic conditions affecting mining and materials processing industries ... and related purposes as authorized by law and to publish and disseminate data …." Provides for scientific, technologic, and economic investigations concerning the development, mining, preparation, treatment, and utilization of ore and other mineral substances.

Public Laws

P.L. 81–82, P.L. 82–231 Arkansas River Compact and Yellowstone River Compact, respectively. Congress has granted consent to many interstate water compacts. For such compacts, the USGS provides administrative support for the Federal representative, usually appointed by the President. Also, the USGS collects hydrologic data for 25 interstate compacts. The data collection is supported partly by the Federal Program and partly by the Water Resources Investigations Activity.

P.L. 93–322 Special Energy Research and Development Appropriation Act of 1975. Provides funds "for energy research and development activities of certain departments …." The USGS water resources investigations in coal hydrology support that legislation.

P.L. 106–291 FY 2001 Interior and Related Agencies Appropriations Act. Supports Appropriations language "of which ( ) shall be available until September 30, ( ), for the operation and maintenance of facilities and deferred maintenance …."

P.L. 106–498 Klamath Basin Water Supply Enhancement Act of 2000. Authorizes the Bureau of Reclamation to conduct feasibility studies to augment water supplies for the Klamath Project, Oregon and California, and for other purposes. The Secretary of the Interior is directed to complete ongoing hydrologic surveys in the Klamath River Basin that are currently being conducted by the USGS. Since 1992, USGS scientists have been conducting hydrological and biological research on many of the factors affecting Klamath Basin water resources. These studies include water-quality and quantity issues, endangered species and other fishery issues, and decreased water supply to wetland areas in National Wildlife Refuges.

P.L. 106–541 Water Resources Development Act of 2000. Authorizes appropriations to the Secretary of the Army for the conservation and development of water and related resources to construct various projects for improvements to rivers and harbors of the United States, and for other purposes. Sections of interest to the USGS: Section **403** (33 U.S.C. 652) Upper Mississippi River Basin Sediment and Nutrient Study. Section **509**, CALFED Bay-Delta Program Assistance, California. Section **542**, Lake Champlain

Watershed, New York and Vermont. Section **601**, Comprehensive Everglades Restoration Plan. Section **701**, Missouri River Valley, Missouri (Missouri River Valley Improvement Act).

P.L. 107–63 FY 2002 Interior and Related Agencies Appropriations Act.

P.L. 107–347 E-Government Act of 2002. Establishes a broad framework of measures that require using Internet-based information technology to enhance citizen access to Government information and services. Title III, the Federal Information Security Management Act of 2002, lays out a framework for ensuring the effectiveness of information security controls over information resources that support Federal operations and assets and for other purposes.

P.L. 108–7 FY 2003 Interior and Related Agencies Appropriations Act. Consolidated Appropriations Resolution, 2003. Following language included in Administrative Provisions of the USGS part of the public law: "Provided further, that notwithstanding the provisions of the Federal Grant and Cooperative Agreement Act of 1977 (31 U.S.C. 6301–6308), the United States Geological Survey is authorized to continue existing, and hereafter, to enter into new cooperative agreements directed towards a particular cooperator, in support of joint research and data collection activities with Federal, State, and academic partners funded by appropriations herein, including those that provide for space in cooperator facilities."

P.L. 108–108 FY 2004 Interior and Related Agencies Appropriations Act.

P.L. 108–360 Earthquake Hazards Reduction Authorization Act of 2004. Authorizes appropriations through fiscal year 2009 and establishes an Interagency Coordinating Committee on Earthquake Hazards Reduction, of which the USGS is a member.

P.L. 108–447 FY 2005 Consolidated Appropriations Act. Division E contains the Department of the Interior and Related Agencies Appropriations Act, 2005. Following language is included: "of which $1,600,000 shall be available until expended for the deferred maintenance and capital improvement projects that exceed $100,000 in cost…."

P.L. 109–54 Department of the Interior, Environment, and Related Agencies Appropriations Act, 2006.

P.L. 110–140 Renewable Fuels, Consumer Protection, and Energy Efficiency Act of 2007 – Title I: Biofuels for Energy Security and Transportation - Biofuels for Energy Security and Transportation Act of 2007 - Subtitle A: Renewable Fuel Standard - (Sec. 111) Directs the President to promulgate regulations to ensure that motor vehicle fuel and home heating oil sold or introduced into commerce in the United States on an annual average basis, contains the applicable volume of renewable fuel determined in accordance with a specified calendar year schedule for 2008–22.