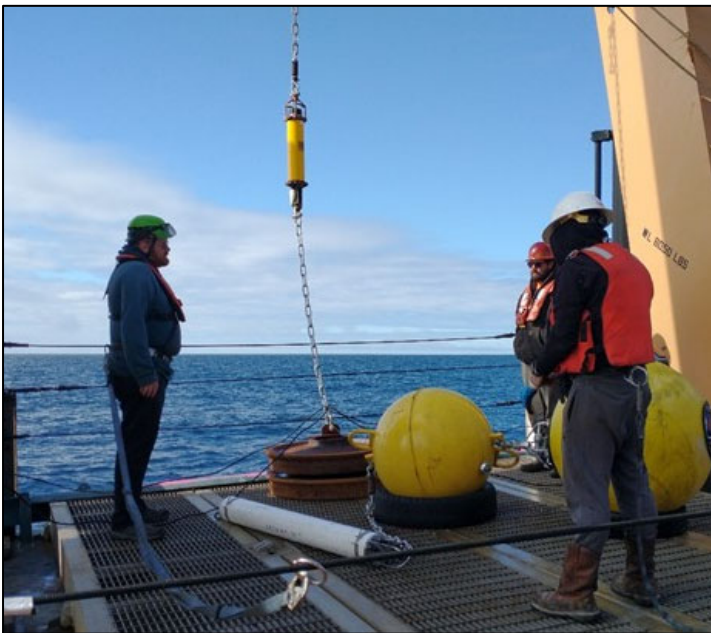
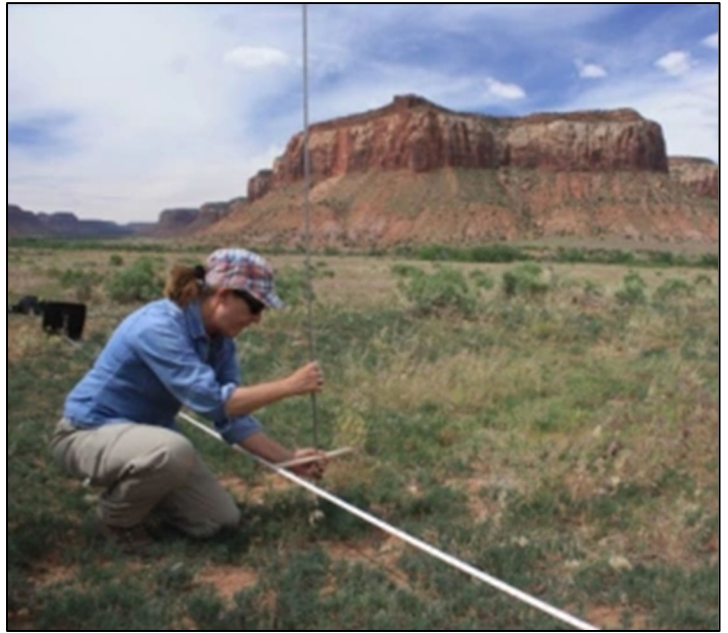




Annual Report on Technology Transfer

FY 2025 Activities

U.S. Department of the Interior



DESCRIPTION OF COVER PHOTOS

UPPER LEFT: Andrea Fritts of the Upper Mississippi Environmental Sciences Center holds a silver carp captured in Pool 19 of the Upper Mississippi River. The fish was implanted with an acoustic transmitter to evaluate the effects of underwater acoustic deterrent systems on resident fishes. Source: Amanda Milde, US Geological Survey

UPPER RIGHT: The Bureau of Land Management's Assessment, Inventory, and Monitoring (AIM) Data Gateway provides an entry point for data and reports, such as the AIM terrestrial data being collected here. Source: BLM

LOWER LEFT: Deployment of an acoustic mooring in the Cook Inlet, Alaska. Source: C. Berchok, National Marine Fisheries Service

LOWER RIGHT: A Bluetooth Global Positioning System tag being attached to a Wilson's Snipe (*Gallinago delicata*). Source: Fields Falcone, Overton Park Conservancy

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Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government and must not be used for advertising or product endorsement purposes.

August 21, 2026

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I. Executive Summary

This report identifies and describes how the Department of the Interior (Department) advanced technology transfer in Fiscal Year (FY) 2025, as required by the Stevenson-Wydler Technology Innovation Act of 1980 (as amended). These activities demonstrate the innovation, expertise, and dedication of Departmental employees to support the Department's mission: to protect and manage the Nation's natural resources and cultural heritage; to provide scientific and other information about those resources; and to honor its trust responsibilities or special commitments to American Indians, Alaska Natives, Native Hawaiians, and affiliated Island Communities.

During FY 2025, the Department continued to engage in a broad range of technology transfer activities—31 cooperative research and development agreements (CRADAs), 2,965 other cooperative research and development (R&D) activities, 16 new invention disclosures, 39 active licenses for inventions and other intellectual property, and over 7,014 publications—to achieve key outcomes including:

- To better manage data for assessing natural resource conditions and trends on public lands managed by the Bureau of Land Management, the Department created a new Assessment Inventory and Monitoring Data Gateway to serve as an easily accessible single point of entry.
- To prepare for new energy development in Alaska's Cook Inlet, the Department began an acoustic study to characterize seasonal occurrence of whales and understand the environmental conditions that correlate with their presence.
- To improve the safety of hydroelectric power generation, the Department tested alternative fire extinguishing systems that could be used to put out a generator fire with lower risk to personnel than traditional CO₂-based systems.
- To better maintain the integrity of underwater pipelines, the Department developed a new system to help remotely operated vehicles (ROV) conduct pipeline inspections, using automated systems to navigate and machine-learning algorithms to identify signs of loosening or degradation.
- To improve the effectiveness of fish rearing and management, the Department carried out cooperative R&D studies to help approve drugs and therapies for use in aquatic animals, improving their health and fertility.
- To improve public access to mine information, the Department launched a fully upgraded online map tool as part of the National Mine Map Repository, with a modern interface, improved searching and visualization, and a self-service map download feature; the tool was visited by over 28,000 people in its first year.

II. Introduction

Each year, technology transfer at the Department advances the goals of federal technology transfer laws, including the Stevenson-Wydler Technology Innovation Act of 1980, Federal Technology Transfer Act of 1986 (FTTA) and Technology Transfer Commercialization Act of 2000. In FY 2025, the Department strengthened the Nation's competitive ability in the global marketplace; furthered collaboration among government, industry, and universities that carry out the scientific enterprise; and improved the quality of life for the American people.

Achieving these goals also helped advance the Department's mission:

- To protect and manage the Nation's natural resources and cultural heritage;
- To provide scientific and other information about those resources; and
- To honor our trust and treaty responsibilities or special commitments to American Indians, Alaska Natives, and affiliated Island Communities.

This FY 2025 report shares examples of technology transfer activities at the Department in these categories:

- Publishing and exchanging scientific and technical information;
- Protecting and licensing intellectual property rights; and
- Sharing specialized scientific material and resources that the Department manages.

The report is the result of a cooperative effort by the Departmental Working Group on Technology Transfer, coordinated by the Office of Policy Analysis and composed of bureau and office personnel involved with their respective R&D programs. The Department prepared this report using data provided by the Departmental Working Group, compiled according to the most recent guidance from the Interagency Working Group on Technology Transfer.¹

¹ Technology Partnerships Office, National Institute of Standards and Technology, in conjunction with the Interagency Working Group on Technology Transfer. *Guidance for Preparing Annual Agency Technology Transfer Reports Under the Technology Transfer Commercialization Act*. Published April 2020, Revised September 2022. Available at: <https://www.nist.gov/system/files/documents/2022/10/03/2020%20Metrics%20Guidance%20-%20Revised%20September%202022.pdf>

III. Technology Transfer Across the Department

The programs supported through the Department’s R&D funding generate new and improved knowledge, information, and technology, which are then transferred within and beyond the Department, other stakeholders and the public to help meet its mission objectives. Most of the Department’s technology transfer activities use traditional technology transfer mechanisms, such as publications of peer-reviewed papers and reports, webpage postings, fact sheets, and presentations at meetings and conferences. Bureaus also use other conventional approaches to share scientific and technical resources and expertise with universities and other entities to address resource management issues.

The Department’s bureaus have varying levels of involvement with scientific and technical research, and innovation and technology transfer. In FY 2025, as in previous years, most technology transfer activities reported by the Department were undertaken by the U.S. Geological Survey (USGS), which is the Department’s largest R&D organization, both in terms of budget and personnel.²

Bureaus that are active in R&D or have research capabilities that complement U.S. commercial interests may also utilize technology transfer agreements authorized by the FTTA to collaborate with non-Federal partners. Such agreements allow the Department’s bureaus and the non-governmental sector (including private entities) to pool their expertise and resources to jointly create and advance technologies that support agency missions while helping U.S. industries innovate and commercialize technologies that strengthen the economy and create jobs. This report focuses primarily on, but is not limited to, aspects of technology transfer related to the FTTA.

Table 1: Scope of Activities and Plans Related to the FTTA, by Bureau

Mission	Technology Transfer
U.S. Geological Survey (USGS). The mission of the USGS is to serve the Nation by providing reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.	The USGS serves the Nation as an independent fact-finding agency that collects, monitors, and analyzes scientific and technical information to provide scientific understanding about natural resource conditions, issues, and problems. The USGS studies energy and mineral resources, natural hazards, and water resources; provides updated maps and images of Earth’s features; and makes this information and knowledge readily available to decision makers and the public. The USGS also pursues technology transfer opportunities under the FTTA and the Stevenson-Wydler Act in a variety of ways.

² National Center for Science and Engineering Statistics. URL: <https://nces.nsf.gov/surveys/federal-funds-research-development/2024-2025>

Mission	Technology Transfer
U.S. Fish & Wildlife Service (FWS). The mission of FWS is working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.	FWS's R&D is primarily focused on providing applied research for effective conservation to meet its mission. The FWS Fish Technology Centers (FTCs) were established in 1965 to develop and improve fish culture technology including new rearing methods and novel diets. Additionally, the Aquatic Animal Drug Approval Partnership program, which includes the National Investigational New Animal Drug Program, is the only program in the United States singularly dedicated to obtaining U.S. Food and Drug Administration approval of new medications needed for use in fish culture and fisheries management. The program collectively assists federal and state agencies and Tribes, and works with the aquaculture industry to improve aquaculture opportunities.
Office of Surface Mining Reclamation and Enforcement (OSM). OSM is responsible for ensuring, through a nationwide regulatory program, that coal mining is conducted in a manner that protects communities and the environment, restores the land to beneficial use following mining, and mitigates the effects of past mining by aggressively pursuing reclamation of Abandoned Mine Lands (AML).	OSM advances its mission by providing technical assistance, based on sound science and training, to its state and Tribal partners to enhance their ability to maintain effective programs. Although OSM has no formal R&D activities, its Technology Development and Transfer program promotes and disseminates information on technological innovations to better protect the environment during mining and in reclaiming and restoring active and abandoned mines. The program also provides training to help ensure states, Tribes, and OSM's contributing partners continue to administer their surface mining and AML reclamation programs efficiently and effectively.
National Park Service (NPS). The National Park Service preserves unimpaired the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of current and future generations. NPS cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.	NPS technology transfer activities are carried out under the NPS Benefits Sharing policy,³ pursuant to the Federal Technology Transfer Act (FTTA) of 1986 and other statutes. Benefits sharing occurs when NPS receives monetary or non-monetary benefits from the commercial use of a discovery or invention resulting from research originating under an NPS Scientific Research and Collecting Permit or other NPS permit or authorization. Benefits sharing contributes to preservation and management of park resources that are available for scientific study and public enjoyment. Authorities under the FTTA are essential to the NPS benefits-sharing program.

³ URL: <https://www.nps.gov/subjects/policy/index.htm>

Mission	Technology Transfer
Bureau of Reclamation (Reclamation or BOR). The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.	Reclamation is the largest supplier and manager of water in the 17 western States and the Nation’s second-largest producer of hydroelectric power. Reclamation manages water for agricultural, municipal, and industrial uses and provides flood risk reduction and recreation for millions of people. Its research program is applied toward the development of solutions that increase water use efficiency, reduce maintenance costs, improve the safety and reliability of dams and other infrastructure, and increase the effectiveness of desalination and other water treatment technologies to expand water supplies. The research programs use technology transfer fundamentals to help speed field deployment of new innovations.
Bureau of Land Management (BLM). The BLM mission is for multiple-use and sustained yield in managing public land resources for a variety of uses, such as energy and mineral development, recreation, wildlife conservation, wilderness, livestock grazing, clean water, and timber harvesting, while also protecting a wide array of natural, cultural, scientific, and historical resources. The Federal Land Policy and Management Act of 1976 (FLPMA) mandates that BLM manages public land resources for a combination of balanced and diverse resource uses that take into account the long-term needs of future generations for renewable and nonrenewable resources.	BLM’s scientific and technical focus has been on place-based applications to improve public land management in accordance with FLPMA. BLM focuses on traditional technology transfer activities to help advance FLPMA’s multiple-use mandate.
Bureau of Safety and Environmental Enforcement (BSEE).⁴ BSEE works to promote safety, protect the environment, and conserve resources offshore through vigorous regulatory oversight and enforcement.	The BSEE R&D program activities operate through the Office of Offshore Regulatory Programs (OORP) Emerging Technologies Branch (ETB) and the Oil Spill Preparedness Division (OSPD) Oil Spill Response Research (OSRR) role. BSEE research is associated with operational safety, pollution prevention, and oil spill cleanup techniques and technologies. BSEE research results are used to inform regulatory decision-making and promote Best Available and Safest Technology on the U.S. Outer Continental Shelf (OCS).

⁴ Secretary’s Order 3451, Establishment of the Marine Minerals Administration, issued July 10, 2026, reunifies BSEE and BOEM into the Marine Minerals Administration (MMA). This document reports on BSEE and BOEM separately, reflecting their organizational structure during FY 2025.

Mission	Technology Transfer
Bureau of Ocean Energy Management (BOEM).⁵ BOEM manages the exploration and development of the Nation’s offshore energy, geologic, and mineral resources in an environmentally and economically responsible way. It seeks to appropriately balance economic development, energy independence, and environmental protection through oil and gas leases, renewable energy development, and environmental reviews and studies.	BOEM’s Environmental Studies Program develops, conducts, and oversees scientific research specifically to inform policy decisions regarding development of OCS energy, geologic, and mineral resources. The research covers physical oceanography, atmospheric sciences, biology, protected species, social sciences, economics, submerged cultural resources, and environmental fates and effects. BOEM also funds research into offshore renewable energy technologies.

⁵ Secretary’s Order 3451, Establishment of the Marine Minerals Administration, issued July 10, 2026, reunifies BSEE and BOEM into the Marine Minerals Administration (MMA). This document reports on BSEE and BOEM separately, reflecting their organizational structure during FY 2025.

V. Technology Transfer by the Numbers

Pursuant to the National Institute of Standards and Technology [Guidance for Preparing Annual Agency Technology Transfer Reports Under the Technology Transfer Commercialization Act](#), the Department collects data on invention disclosures and patents, licenses, income from licenses, and collaborative agreements. In addition, the Department voluntarily reports the number of scientific and technical publications.

Data by Bureau, FY 2025

Bureaus disclosed 16 new inventions in FY 2025, most from USGS (Table 2).

Table 2: Invention Disclosures and Patents (FY 2025)

	USGS	BOR	Total
Invention Disclosures			
Total Invention Disclosures Received	15	1	16
Patents			
Total Patent Applications Filed	1	0	1
<i>US</i>	1	0	1
<i>Foreign</i>	0	0	0
Total PCT ⁶ Applications Filed	0	0	0
Total Patents Issued	1	0	1
<i>US</i>	1	0	1
<i>Foreign</i>	0	0	0

Two bureaus managed 39 total invention licenses in FY 2025, all of which were considered income-bearing (Table 3).

⁶ PCT = Patent Cooperation Treaty. See <https://www.wipo.int/pct/en/> for additional details.

Table 3: Active Licenses Managed by Bureaus (FY 2025)

	USGS	FWS	Total
Invention Licenses, Total Active	38	1	39
New Invention Licenses	2	0	2
New Invention Licenses to Small Businesses	2	0	2
Income bearing licenses, Total Active⁷	10	1	11
New Income Bearing Licenses	2	0	2
Exclusive licenses	8	1	9
Partially exclusive licenses	0	0	0
Non-exclusive licenses	2	0	2
Other Licenses, Total Active	28	0	28
New Other Licenses	0	0	0
New Other Licenses Granted to Small Businesses	0	0	0
Elapsed Amount of Time for Granting Invention Licenses			
Average (months)	1.5	0	1.5
Minimum (months)	1	0	1
Maximum (months)	2	0	2
Licenses terminated for cause	0	0	0

In FY 2025, total income was \$36,426 from the 39 income-bearing licenses (Table 4). Under 15 USC § 3710c, for all inventions originating in a federal agency, the agency must pay to the employee-inventors the first \$2,000 per year in license income, and a minimum of 15% of the yearly income thereafter. Each agency has discretion to implement its own sharing scheme, but the maximum that a single inventor can receive per year is \$150,000. Any residual funds are usually retained by the agency or laboratory where the intellectual property was developed.⁸

⁷ FWS reported one license as income-bearing. Although this license has the potential to bear income, by the end of FY 2025 it had not produced any income and FWS does not anticipate that it will in the future.

⁸ URL: <https://www.govinfo.gov/content/pkg/USCODE-2011-title15/html/USCODE-2011-title15-chap63-sec3710c.htm>

Table 4: License and Royalty Income by Bureau (FY 2025)

	USGS	Total
Invention License Income	\$36,426	\$36,426
Other License Income		
Total Earned Royalty Income (ERI)	\$36,426	\$36,426
ERI from top 1% of licenses	\$18,965	\$18,965
ERI from top 5% of licenses	\$18,965	\$18,965
ERI from top 20% of licenses	\$18,965	\$18,965
Minimum ERI	\$1,000	\$1,000
Maximum ERI	\$18,965	\$18,965
Median ERI	\$5,208	\$5,208
Disposition of ERI		
Percent of ERI distributed to inventors	33%	33%
Amount of ERI distributed to inventors	\$12,032	\$12,032
Percent of ERI distributed to the agency or lab	33%	33%
Amount of ERI distributed to the agency or lab	\$12,032	\$12,032

The Department managed 31 active CRADAs and 2,847 other collaborative agreements in FY 2025 (Table 5).

Table 5: Collaborative Relationships for Research & Development (FY 2025)

	USGS	BOR	FWS	BLM	Total
CRADAs					
Total Active CRADAs	21	5	5	0	31
New CRADAs	5	1	0	0	6
New CRADAs Involving Small Businesses	2	0	0	0	2
Other collaborative R&D relationships					
Other Collaborative Agreements, total active in FY 2025	2,890	4	0	71	2,965

In FY 2025, the Department released over 7,000 scientific and technical publications (Table 6)⁹.

⁹ The true number of publications may vary as not all bureaus track publication rates.

Table 6: Publications (FY 2025)

	USGS	BOR	BOEM	FWS	NPS	BSEE	OSM	Total
Reports and Books	0	31	55	0	163	9	0	258
Articles in Scientific Publications	5,694	0	9	473	0	8	0	6,184
Fact Sheets	0	0	0	140	0	0	0	140
Other (including abstracts, data releases, etc.)	380	0	0	0	0	35	17	432
Total Publications	6,074	31	64	613	163	52	17	7,014

Data, Department-Wide

The following tables summarize the Department's technology transfer activities across the entire department for the past five fiscal years, FY 2021-FY 2025.

Table 7: Disclosures and Patents, Department-Wide

		FY 2021	FY 2022	FY 2023	FY 2024	FY 2025
	Invention Disclosures					
1	Invention Disclosures Received	2	3	10	16	16
2	Total Patent Applications Filed	1	3	0	1	1
3	<i>US</i>	1	3	0	1	1
4	<i>Foreign</i>	0	0	0	0	0
5	Total PCT ¹⁰ Applications Filed	0	0	0	0	0
6	Number of patents Issued	1	1	0	1	1
7	<i>US</i>	1	1	0	0	1
8	<i>Foreign</i>	0	0	0	0	0

¹⁰ PCT = Patent Cooperation Treaty. See <https://www.wipo.int/pct/en/> for additional details.

Table 8: Licenses, Department-Wide

		FY 2021	FY 2022	FY 2023	FY 2024	FY 2025
9	Invention Licenses, Total Active	10	11	74	44	39
10	<i>New Invention Licenses</i>	2	2	2	1	2
11	<i>New Invention Licenses to Small Businesses</i>	1	2	2	0	2
12	Income bearing licenses, Total Active	9	10	13	13	11
13	<i>New Income Bearing Licenses</i>	1	2	0	1	2
14	<i>Exclusive licenses</i>	8	9	10	7	9
15	<i>Partially exclusive licenses</i>	0	0	0	0	0
16	<i>Non-exclusive licenses</i>	2	2	3	6	2
17	Other Licenses, Total Active	48	61	61	31	28
18	<i>New Other Licenses</i>	42	13	6	0	0
19	<i>New Other Licenses Granted to Small Businesses</i>	40	10	0	0	0
	Elapsed Amount of Time for Granting Invention Licenses					
20	Average (months)	30.5	7	2.5	3	1.5
21	Minimum (months)	29	5	2	3	1
22	Maximum (months)	32	9	3	3	2
23	Licenses terminated for cause	1	0	0	0	0

Table 9: License and Royalty Income, Department-Wide

		FY 2021	FY 2022	FY 2023	FY 2024	FY 2025
24	Invention License Income	\$122,749	\$67,694	\$108,761	\$87,897	\$36,426
25	Other License Income					
26	Total Earned Royalty Income (ERI)	\$122,749	\$67,694	\$107,761	\$81,857	\$36,426
27	<i>ERI from top 1% of licenses</i>		\$53,630	\$98,356	\$43,440	\$18,965
28	<i>ERI from top 5% of licenses</i>		\$53,630	\$98,356	\$43,440	\$18,965
29	<i>ERI from top 20% of licenses</i>		\$53,630	\$98,356	\$51,477	\$18,965
30	Minimum Earned Royalty Income		\$3,195	\$25,000	\$1,000	\$1,000
31	Maximum Earned Royalty Income		\$53,630	\$98,356	\$43,440	\$18,965
32	Median Earned Royalty Income		\$10,925	\$19,302	\$3,000	\$5,208
	Disposition of ERI					
33	Percent of ERI distributed to inventors	39%	36%	33%	33%	33%
33A	Amount of ERI distributed to inventors	\$47,872	\$24,045	\$35,561	\$27,013	\$12,032
34	Percent of ERI distributed to the agency or laboratory	34%	37%	33%	33%	33%
34A	Amount of ERI distributed to the agency or laboratory	\$41,735	\$24,762	\$35,561	\$27,013	\$12,032

Table 10: CRADAs, Department-Wide

		FY 2021	FY 2022	FY 2023	FY 2024	FY 2025
	CRADAs					
35	Total Active CRADAs	429	32	34	23	31
36	New CRADAs	139	5	2	4	6
37	New CRADAs Involving Small Businesses	1	1	0	2	2
	Other collaborative R&D relationships					
38	Other Collaborative Agreements, total active in the FY	625	1,034	1,669	3,149	2,965

Table 11: Publications, Department-Wide

		FY 2021	FY 2022	FY 2023	FY 2024	FY 2025
	Reports and Books	239	253	217	132	258
	Articles in Scientific Publications	88	3,287	3,116	4,793	6,184
	Fact Sheets	43	8	14	2	140
	Other (including abstracts, data releases, etc.)	74	79	53	463	432
	Total Publications	425	3,609	3,400	5,390	7,014

VI. Project Highlights

The Department depends on scientific and technological innovation. While conventional technology transfer activities such as patents and licensing are an essential part of the Department's work, its bureaus and offices carry out a broad range of R&D activities to achieve their missions. Their findings help protect public lands and wildlife, support economic growth, increase American energy production, create jobs, and expand the frontiers of knowledge for the benefit of all the American people.

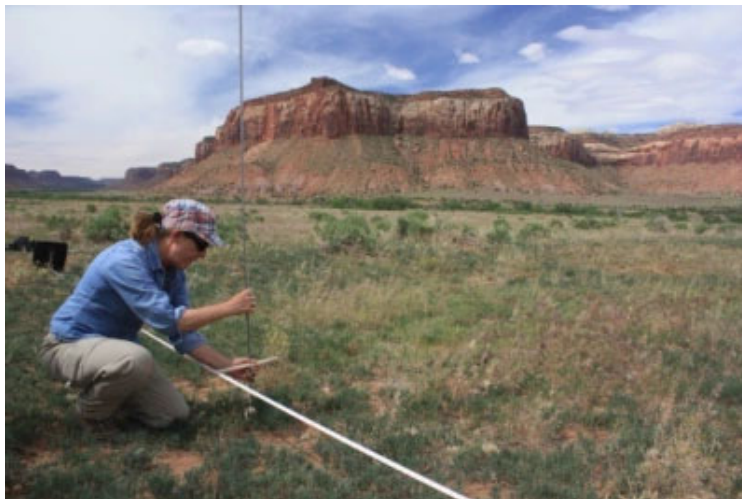
This section presents written summaries of 17 R&D projects from across the Department's bureaus and offices, highlighting progress and accomplishments made in FY 2025.

Assessment Inventory and Monitoring Data Gateway

BUREAU OF LAND MANAGEMENT

In FY 2025, the Bureau of Land Management transitioned from multiple Assessment Inventory and Monitoring (AIM) portals to the AIM Data Gateway, a single, streamlined entry point for AIM data and reports. Built on the Esri Experience Builder app development system and powered by an Azure database, the Gateway offers familiar outputs – Data Export, Site Visit Summary, and AIM Data Summary – with new workflows and navigation.

BLM's AIM Strategy provides a set of standards for assessing natural resource conditions and trends on BLM-managed public lands. The strategy provides a standard, quantitative approach to assessing the health of uplands (terrestrial), rivers and streams (lotic), and riparian and wetland ecosystems to inform management of public lands. It also provides quantitative data and tools to guide and justify policy actions, land uses, and adaptive management decisions.



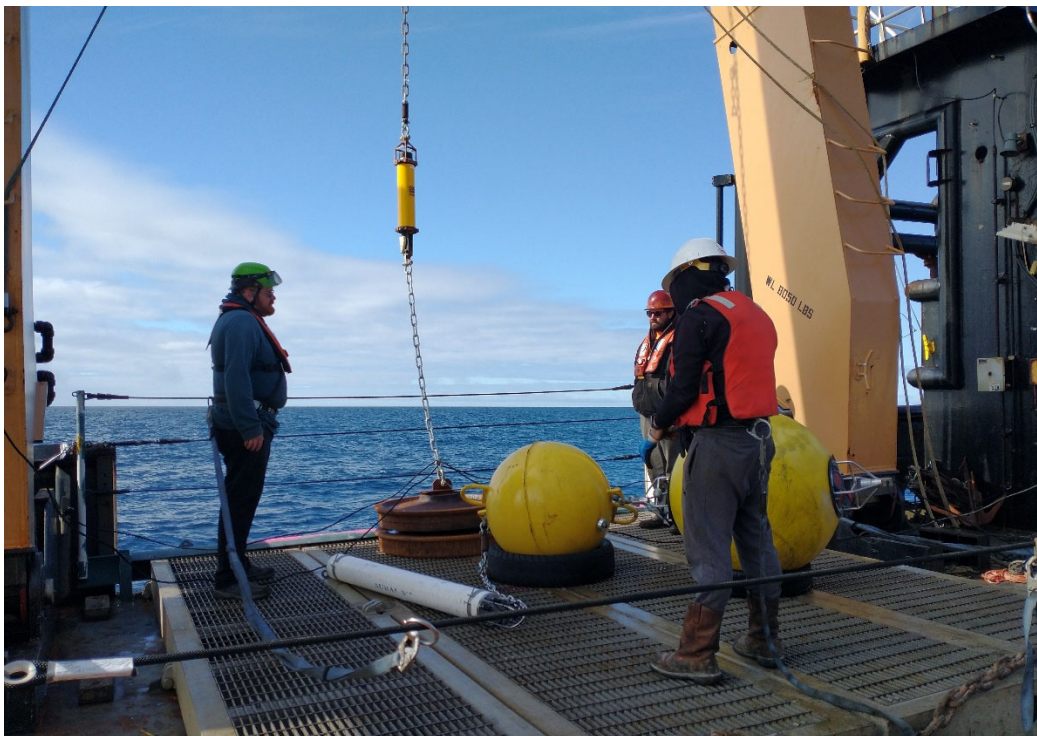
THE AIM DATA GATEWAY PROVIDES AN ENTRY POINT FOR DATA AND REPORTS, SUCH AS THE AIM TERRESTRIAL DATA BEING COLLECTED HERE. PHOTO: BLM

AIM data are a reliable, high-quality data source that meets Council on Environmental Quality and Data Quality Act Guidelines. The AIM dataset is one of the largest available datasets to inform resource management decisions on public lands. AIM data may be used alone or in conjunction with other types of data in a “multiple lines of evidence” approach to inform decision-making; the AIM Data Gateway now provides all AIM data and reports in an easily accessible single point of entry.

Acoustic Monitoring of Whales in Cook Inlet, Alaska

BUREAU OF OCEAN ENERGY MANAGEMENT

BOEM is planning conventional energy development in the Cook Inlet, Alaska, and has pursued baseline information on whale occurrence in the region. Previously, BOEM funded studies that collected passive acoustic recordings to identify whales in the region. A study that began in 2025 will deploy additional acoustic sensors to characterize seasonal occurrence of whales in the Cook Inlet, and complementary oceanographic equipment to understand how environmental conditions correlate with their presence.



DEPLOYMENT OF AN ACOUSTIC MOORING IN THE COOK INLET, ALASKA THAT INCLUDES AN AURAL FPOD AND A SOUNDTRAP. CREDIT: C. BERCHOK, NMFS

The acoustic recordings can also be analyzed to characterize background environmental signals and anthropogenic noise. BOEM will use this information for Cook Inlet planning, environmental analyses, and consultation activities.

Closing the Knowledge Gap in Marine Invertebrate Genomic Biodiversity

BUREAU OF OCEAN ENERGY MANAGEMENT

Over the past 40+ years, the Department of Invertebrate Zoology at the Smithsonian's National Museum of Natural History (NMNH-IZ) has partnered with BOEM's Environmental Studies Program to provide professional collection management services for the long-term curation of marine invertebrate specimens.



INVERTEBRATES COLLECTED DURING BOEM'S STUDIES ARE STORED AT THE NATIONAL MUSEUM OF NATURAL HISTORY MUSEUM SUPPORT CENTER IN SUITLAND, MD, AND SOME ARE ON DISPLAY IN THE OCEAN HALL AT THE NMNH IN WASHINGTON, DC. PHOTO: YON TIMBAL, BOEM

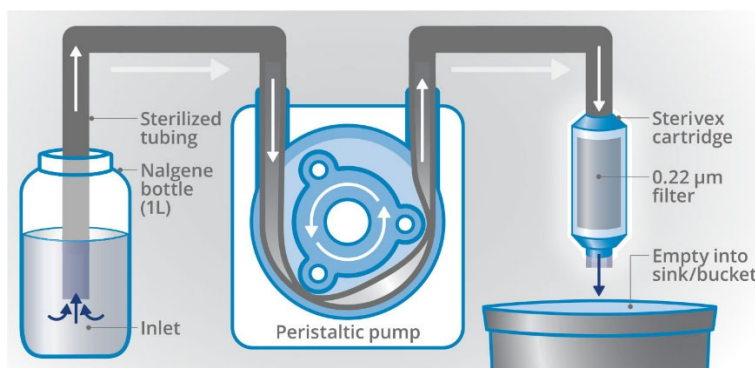
In 2020, the Smithsonian initiated a five-year effort to implement BOEM's genetic sampling strategy that targeted "missing" families of marine invertebrates that were not yet represented in genetic repositories. It has now significantly closed the gap from 31% of marine invertebrate families represented to 57% of families represented. In part, this was accomplished by employing genome skimming, which can sequence DNA from older invertebrate specimens collected in the 1970s and 1980's. Conventional DNA barcoding techniques have been unable to sequence these specimens. This accomplishment reinforces the importance of collections-based research to serve as an archive of genetic information, and the value of these collections to help understand and better manage ocean biodiversity.

eDNA Studies of Water from the Bering and Chukchi Seas

BUREAU OF OCEAN ENERGY MANAGEMENT

The Arctic Biodiversity Observing Network (AMBON) employed an environmental DNA (eDNA) analysis of filtered water samples from the Chukchi and Bering Seas. The purpose of this analysis was to better characterize phytoplankton and heterotrophic microbes in the marine

ecosystem and contribute data on microbe biomass and diversity. This complemented measurements of other components of the marine ecosystem.



THIS DIAGRAM SHOWS THE PROCESS USED ON TWO AMBON CRUISES TO COLLECT SEAWATER FOR GENOMIC ANALYSIS. SEAWATER WAS FILTERED, WITH THE CONTENTS PRESERVED IN ETHANOL AND FROZEN. CREDIT: PACIFIC MARINE ENVIRONMENTAL LAB

AMBON also conducted separate eDNA analyses that can more reliably detect animals in the marine environment, including invertebrates, fish and mammals. These analyses could then be compared to conventional methods to detect animals, such as trawl and visual surveys. The eDNA approach can broadly characterize marine biodiversity, which is especially informative during events such as harmful algal blooms. The AMBON results inform how eDNA technology can be applied in the future to study Arctic marine ecosystems. DNA sequences from the AMBON eDNA project are deposited with the [National Centers for Biotechnology Information](https://www.ncbi.nlm.nih.gov/bioproject/982176).¹¹

Innovative Thermal Detection Technique for Nighttime Mitigation

BUREAU OF OCEAN ENERGY MANAGEMENT

BOEM protects marine mammals and sea turtles by requiring monitoring and mitigation of development activities if protected species are observed in the project area. However, existing measures are less effective during nighttime development activities, an issue that has been raised by industry partners for consideration by BOEM.

In FY 2023, BOEM funded an environmental study to evaluate technology of thermal camera imaging as an alternative observing technique for nighttime monitoring for protected species. Thermal imaging has been developed for marine mammal observing with a capability to detect marine mammals up to 2.5 km from an observer, and may be effective for mitigating nighttime geophysical, sand dredging, and trawling activities, which could potentially impact sea turtles, as well. The final report, titled “Efficacy of thermal detection

¹¹ URL: <https://www.ncbi.nlm.nih.gov/bioproject/982176>.

technology for nighttime protected species observer surveys”¹² reviewed existing studies, existing federal mitigation practices, existing technologies, and provided a cost analysis of the thermal technology compared to more conventional monitoring techniques that are most effective only during the day.

Additional research is needed to ensure that thermal imaging can replace conventional methods, such as visual observers and passive acoustic monitoring, before it can be effectively integrated into mitigation strategies.

Hybrid Fire Extinguishing System Research

BUREAU OF RECLAMATION

As a cornerstone of the water and power industry in the Western United States, Reclamation continues to demonstrate its leadership in addressing critical safety challenges associated with hydroelectric power generation. Due to personnel safety concerns associated with CO₂ fire suppression systems, Reclamation researched alternative systems for fire suppression. One option is hybrid fire extinguishing systems. A hybrid fire extinguishing system uses a mix of inert gas (such as nitrogen) and water to extinguish fire by lowering temperatures and diluting oxygen, functioning similarly to CO₂ but without the safety concerns. The effectiveness of a hybrid fire extinguishing system was previously unproven under real-world operating conditions.

Reclamation’s Research and Development Office, Canyon Ferry Powerplant and Technical Service Center, Victaulic Company, and the Centre for Energy Advancement through Technological Innovation (CEATI) partnered on a Cooperative Research and Development Agreement (CRADA) to conduct a cutting-edge experiment to evaluate the effectiveness of hybrid fire extinguishing systems. Funding was provided by the Research and Development Office and CEATI while Victaulic provided the Victaulic Vortex™ Hybrid Fire Extinguishing System.

¹² URL: [BOEM 2025-006 Technical Summary: Efficacy of Thermal Detection Technology for Nighttime Protected Species Observer Surveys](#)



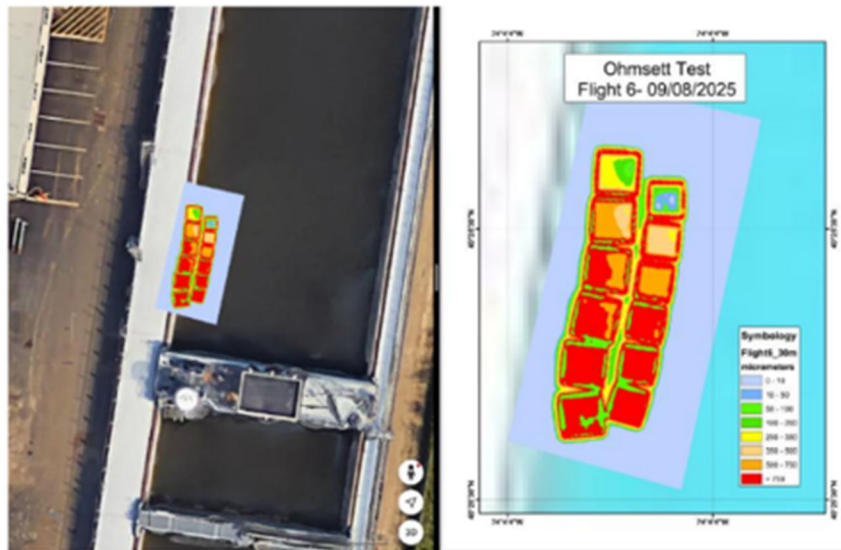
IMAGE SHOWING A SIDE VIEW OF THE FAULT CREATED FOR THE EXPERIMENT PRIOR TO DEPLOYMENT OF THE FIRE SUPPRESSION SYSTEM. PHOTO: BOR

The results are promising. The Victaulic Vortex™ hybrid fire extinguishing system shows effectiveness in suppressing fires, paving the way for its adoption by Reclamation and other members of the hydroelectric power industry, as well as related updates to fire safety standards. The research testing is a significant milestone for the hydropower industry, as it was the first time a hybrid fire extinguishing system was tested on an intentionally faulted hydroelectric generator. Through these efforts, Reclamation is enhancing the safety of its operations and setting a standard for the entire industry to follow.

[New Software Tool for Oil Spill Mapping via Uncrewed Aerial Vehicles](#)

BUREAU OF SAFETY AND ENVIRONMENTAL ENFORCEMENT

Research engineers with the Bureau of Safety and Environmental Enforcement (BSEE) Oil Spill Response Research branch, in collaboration with Water Mapping, LLC., have successfully developed a Python-based algorithm that provides mapping data and oil thickness measurements of oil spills in near-real time. This new technology leverages the power of Uncrewed Aerial Vehicles (UAVs) to transform how responders detect, monitor, and combat environmental hazards at sea. At the heart of this advancement is the Micasense Altum-PT, a cutting-edge multispectral sensor recently acquired by BSEE and the U.S. Coast Guard Research and Development Center (RDC).



MULTISPECTRAL IMAGERY AT OHMSETT OVERLAID ON GOOGLE EARTH IMAGE ON AN IPHONE (LEFT); PROCESSED IMAGE (RIGHT). CREDIT: OSCAR GARCIA AND GOOGLE EARTH

While previous operations required multiple flights or bulky equipment to capture different types of data, the Altum-PT integrates visual, thermal, and multispectral imaging into a single unit. This "all-in-one" approach ensures that all data points are collected simultaneously over the exact same location, drastically improving accuracy while slashing data processing times.

The new algorithm automates the transformation of raw data values into actionable thickness maps. Leveraging an open-source software architecture, the tool processes spectral reflectance data to differentiate between silver sheen, rainbow fanning, and thick emulsified crude as outlined in the Bonn Agreement Oil Appearance Code, which is used to estimate oil thickness and volume. Advancements include: 1) better consistency and accuracy by aligning different types of data maps; 2) automated classification through the algorithm's robust data libraries to categorize oil thickness in near-real-time; and 3) cross-platform portability, enabling the use of tablets and mobile devices for near real-time use in the field.

Validation testing—through assessments at the Ohmsett facility—demonstrates that this approach provides a tactical advantage. By providing high-resolution thickness measurements rather than simple presence/absence detection, the algorithm allows for more precise calculation of spill volume in near-real-time.

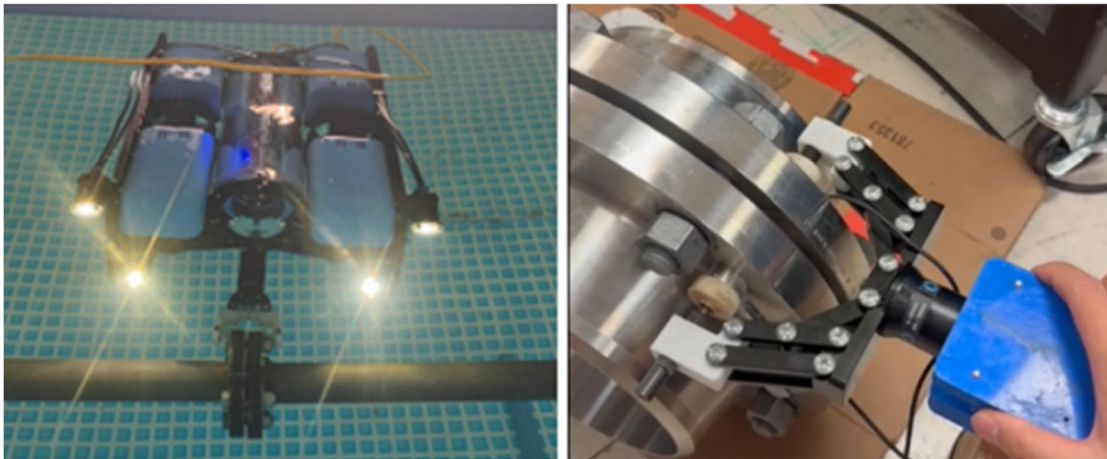
Robotic Assistive Smart Touch Inspection

BUREAU OF SAFETY AND ENVIRONMENTAL ENFORCEMENT

BSEE awarded a contract to the University of Houston for a project aimed at advancing integrity assessments of underwater pipelines, with an emphasis on bolted flange joints. The research

focuses on integrating robotics, machine learning, and autonomous navigation to improve how remotely operated vehicles (ROVs) perform contact-based inspection.

The team developed an autopiloted ROV navigation system using sonar and video sensing. It also developed a machine learning-driven active sensing algorithm capable of identifying signs of flange loosening or degradation. These technologies were combined into a smart-touch robotic inspection system designed to enhance precision and consistency while reducing reliance on manual ROV operation. A patent was submitted for this technology prior to BSEE's involvement.



ROV FOR SMART TOUCH (LEFT) AND ROBOTIC GRIPPER WITH PZT TRANSDUCERS (RIGHT).

PHOTO: UNIVERSITY OF HOUSTON

The project produced a peer reviewed journal article in the *2025 IEEE Transactions on Mechatronics*, four technical conference presentations at the *2025 Modeling, Estimation and Control Conference*, and another journal submission under review with the *IEEE Journal of Oceanic Engineering*. Together, these articles document advances in robotic control, sensing, and automated inspection.

Expected outcomes include safer, more reliable offshore inspections by reducing diver exposure, improving detection of mechanical issues, and lowering operational costs. The technology also has potential commercial applications within the offshore energy sector where autonomous, data rich inspection tools can support more frequent and accurate assessments of subsea infrastructure.

Partnerships to Provide New Medications for Aquatic Animals

FISH AND WILDLIFE SERVICE

In FY 2025, FWS maintained five Cooperative Research and Development Agreements (CRADAs) through the Aquatic Animal Drug Approval Partnership (AADAP) program within the Fish and Aquatic Conservation program. These CRADAs were established in collaboration with

pharmaceutical companies to work towards drug approvals for use in aquaculture and fisheries management. They are essential for AADAP's work in obtaining U.S. Food and Drug Administration approval of new medications needed to help keep aquatic animals healthy and to facilitate safe handling, spawning, marking, and other fisheries management activities.



THE AQUATIC ANIMAL DRUG APPROVAL PARTNERSHIP PROGRAM WORKS WITH PARTNERS TO CONDUCT RESEARCH WITH NEW MEDICATIONS TO GAIN APPROVALS THROUGH THE FDA FOR AQUATIC ANIMALS.

PHOTO: USFWS

Continued work under these CRADAs in FY 2025 included conducting studies and making progress towards drug approvals or expanded labels for therapeutics such as hydrogen peroxide, chloramine-T, and florfenicol medicated feed; several spawning aids; and anesthetics such as benzocaine. Safe and effective medications improve the health of aquatic animals. When fisheries professionals have more options for medications, they are better equipped to rear healthy fish, manage healthy aquatic populations, and maintain a healthy environment. Ultimately, this work allows fisheries professionals within states, Tribes, private industry, academia and federal agencies to more effectively and efficiently rear and manage a variety of fish species to meet production goals, stock healthy fish, and maintain a healthy environment.

[Abandoned Mine Lands Technology Roadshow](#)

OFFICE OF SURFACE MINING RECLAMATION AND ENFORCEMENT

OSM's Mid-Continent Regional office (MCR) partnered with the Alabama Abandoned Mine Lands Division and the Alabama Surface Mining Commission for a weeklong technology roadshow across the State. The initiative highlighted the tools and services the MCR's Technical

Services Division provided to support reclamation work under the Surface Mining Control and Reclamation Act (SMCRA) of 1977.

The roadshow began in Birmingham, where OSM staff provided on-site training to Alabama AML Division personnel on their newly purchased uncrewed aircraft system (UAS). Geographic Information Systems (GIS) specialists received hands-on instruction using the WingtraOne Gen II UAS, equipped with a three-color camera and a light detection and ranging (LiDAR) sensor. The Wingtra is a fully autonomous system designed to map large areas more efficiently and precisely than older drone models. To improve data accuracy, OSM also demonstrated how to set up Global Navigation Satellite System (GNSS) control points during the training. In Jasper, OSM staff met with the Alabama Surface Mining Commission to continue the roadshow.



OSM STAFF FROM THE MID-CONTINENT REGION AND ALABAMA STAFF ON SITE AT AN AML PROJECT WITH THE WINGTRAONE GEN II UAS. PHOTO: MIN KIM, OSM

Technical Services Division staff showcased capabilities in six areas:

- Hydrology: Monitoring and managing water flow.
- UAS Operations: Autonomous aerial data collection.
- Photogrammetry: Generating 3D models from imagery.
- Bathymetry: Mapping underwater terrain.
- NEPA (National Environmental Policy Act): Assessing environmental impacts.
- Geographic Information Systems (GIS): Visualizing and analyzing spatial data.

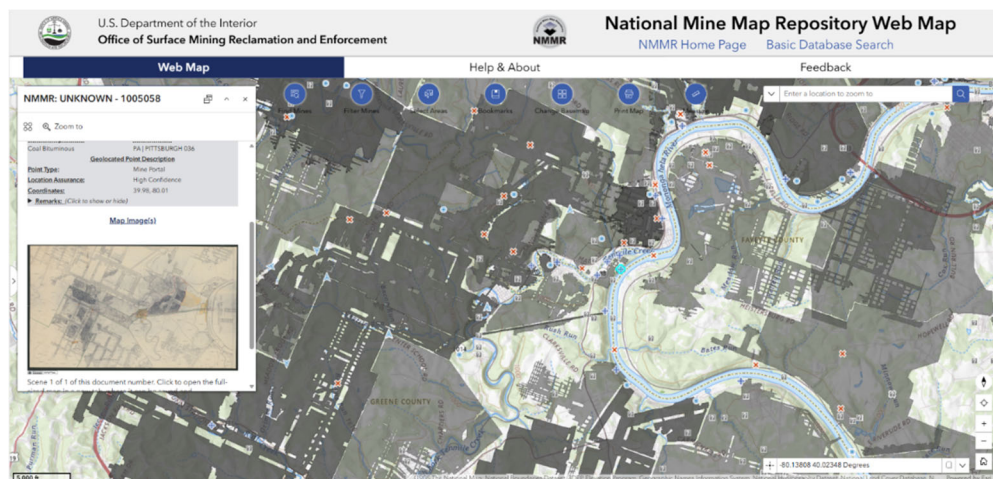
These tools are essential for modern reclamation work, helping States improve public safety, environmental outcomes, and long-term land use. This event demonstrated MCR's evolving technology offerings and the agency's commitment to innovation and collaboration in mine reclamation.

Connecting the Public with America's Mine Map History

OFFICE OF SURFACE MINING RECLAMATION AND ENFORCEMENT

The National Mine Map Repository (NMMR) preserves, manages, and shares historic and abandoned mine maps from across the country. Operated by a small team of specialists within the Office of Surface Mining Reclamation and Enforcement, the NMMR provides high quality digital map images to the public at no cost, supporting everyone from homeowners and genealogists to researchers, developers, and government agencies.

For many years, customers requested maps by emailing staff, who then searched the archive and delivered files online or mailed them on a flash drive. Growing demand highlighted the need for easier, faster public access.



NMMR WEB MAP VIEW OF MINE POINTS IN GREENE COUNTY, PA, INCLUDING DETAILS AND A MAP IMAGE FOR A SELECTED POINT. PHOTO: KAM PENDLETON, OSM

In 2025, the NMMR launched a fully upgraded online web map designed to better connect the public with mine map data. Rebuilt on the newest ESRI framework, the system offers a modern interface, improved searching and visualization, and, most notably, the pilot of NMMR's first self-service map download feature. In its first year, the upgraded system received more than 28,000 visits and supported over 111,000 views and downloads, demonstrating strong public engagement and reducing turnaround time for routine information requests.

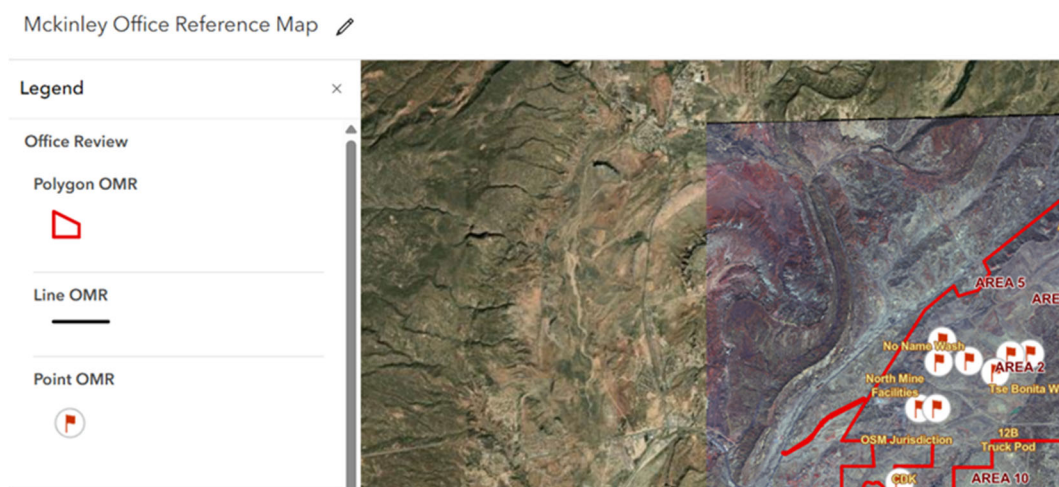
These enhancements not only streamline customer access but also allow NMMR staff to devote more time to complex research inquiries and specialized assistance. Building on the success of

the pilot, the NMMR is now designing a full production system to ensure newly archived maps become available to the public as quickly and seamlessly as possible.

Satellite Imagery Support

OFFICE OF SURFACE MINING RECLAMATION AND ENFORCEMENT

OSM's Western Region Geospatial Information Services Branch (GISB) provided technical support to 11 western region mine teams by coordinating monthly high-resolution satellite imagery collections for active mine sites. The team developed image services from the collected datasets and updated the western region mines web map application to ensure seamless access for field personnel.



McKINLEY MINE MAP ARCGIS ONLINE WITH WORLDVIEW 3 IMAGERY. CREDIT: ALDO PLASCENCIA, OSM

Satellite imagery plays a critical role in environmental monitoring, tracking mining progress, and evaluating reclamation outcomes. By providing consistently updated, high-quality imagery, GISB enables mine teams to better plan and prioritize field visits, optimize time on site, and reduce unnecessary travel. These datasets have also supported partial aerial inspections, reducing the need for on-site presence and minimizing exposure to hazards associated with active mining operations.

In addition to routine monthly collections, the GISB team supported OSM and State Partners by tasking and delivering new high-resolution satellite imagery for 19 additional sites. These collections supported both active mining operations and Abandoned Mine Lands assessments, frequently serving as foundational datasets for reclamation decision-making and long-term land management planning.

Surface Mining Control and Reclamation Training

OFFICE OF SURFACE MINING RECLAMATION AND ENFORCEMENT

In Fiscal Year (FY) 2025, OSM continued delivery of its Surface Mining Control and Reclamation Act (SMCRA) training mission through the National Technical Training Program (NTTP) and the Technical Innovation and Professional Services (TIPS) Program. These essential training services strengthened technical capability across Federal, State, and Tribal partners and ensured continuity of SMCRA implementation support.

In the fourth quarter of FY 2025, NTTP delivered two in-person courses to a total of 34 students, the maximum capacity. Throughout FY 2025, NTTP's self-paced online SMCRA courses remained continuously available and served as valuable training resources for State, Tribal, and OSM personnel. TIPS delivered 50 classes across 22 courses to 295 students using predominantly online instructor-led instruction. These courses include geospatial analysis using ArcGIS, computer-aided design using AutoCAD, hydrologic analysis, and 2D and 3D modeling. Course evaluations serve as the program's Key Performance Indicator (KPI), with a benchmark satisfaction target of 96 percent—a target which OSM regularly exceeds or comes close to exceeding.



STUDENTS PARTICIPATE IN A VIRTUAL TRAINING COURSE ON GEOSPATIAL APPLICATIONS FOR THE STATE OF COLORADO. PHOTO: MICHAEL SCHUCH, OSM

Both NTTP and TIPS continued to gather customer feedback, adjust delivery approaches, and refine future training targets to align with operational capacity. The FY 2025 accomplishments demonstrate OSM's resilience and commitment to supporting the SMCRA workforce through reliable, high-quality, and adaptive training services despite operational disruptions.

In other areas of OSM technology transfer training for FY 2025, Headquarters' Abandoned Mine Land Inventory System (eAMLIS) training classes reached 89 state, Tribal, and OSM participants,

and the Mid-Continent Region's Geospatial and Technology Transfer Branch delivered four technical assistance trainings. These additional training opportunities further enhanced the technical competence and professionalism of State and Tribal personnel, helping to foster consistent application of SMCRA standards nationwide.

Deployment of an Underwater Acoustic Deterrent System

US GEOLOGICAL SURVEY

USGS deployment and evaluation of an underwater acoustic deterrent system (uADS) at Lock 19 on the Mississippi River is helping to determine whether underwater sounds are effective deterrents for invasive carp migrating upstream.



ANDREA FRITTS (UMESC) HOLDS A SILVER CARP CAPTURED IN POOL 19 OF THE UPPER MISSISSIPPI RIVER. THE FISH WAS IMPLANTED WITH AN ACOUSTIC TRANSMITTER TO EVALUATE THE EFFECTS OF THE UADS ON RESIDENT FISHES. PHOTO: AMANDA MILDE, USGS

Deterrent design, deployment, operation, and effectiveness data from the uADS study has been used by the U.S. Army Corps of Engineers for Section 509 Tennessee-Cumberland Rivers deterrent planning, by the Minnesota Department of Natural Resources in development of the Invasive Carp Plan and for planning the deployment of a deterrent at Lock and Dam 5, and by the Great Lakes Advisory Committee for deterrent planning in the Sandusky River. Information from the uADS has also been used by the U.S. Army Corps of Engineers for the Brandon Road Multi-Deterrent project on the Illinois River. Transferring the uADS technology will assist the Nation to improve invasive carp management by deterring the invasive fish from areas they currently do not inhabit.

Point-of-Use eDNA Detection of Invasive Species

US GEOLOGICAL SURVEY

USGS created a simple, fast point-of-use environmental DNA (eDNA) test that can be used directly in the field to detect DNA from organisms of interest in various locations, such as invasive zebra and quagga mussels. These tests let people collect, extract, and analyze eDNA samples on the spot, without the need of a lab. They use easy-to-run steps and specialized chemicals, which can give results in minutes using small portable devices.

The goal of the tests is to help managers, law enforcement, or anyone in need of rapidly identifying invasive species, especially when quick management decisions are needed. Scientists at the Upper Midwest Environmental Sciences Center have created working methods for well-known invasive species like zebra and quagga mussels and invasive carp. These methods are now being used by groups such as the U.S. Forest Service, Wyoming Game and Fish Department, and the University of Montana to monitor mussels across the Intermountain West, as well as select airports to screen imports of moss balls.



STATE MANAGERS AND BIOLOGISTS LEARNING HOW TO CONDUCT POINT-OF-USE eDNA DETECTION IN THE FIELD.

PHOTO: STEPHEN SPEAR

New methods are being developed for other invasive species, such as the New Zealand mudsnail and golden mussel in the western U.S., brown tree snake and little fire ant in the Pacific islands and territories, and the New World screwworm threatening the southern border. The demand for this technology is extremely high and continues to expand. A new project will

test these tools on Department of War installations in Hawaii, Guam, and the Northern Mariana Islands, focusing on checking construction materials and shipments for invasive species.

Mississippi Delta Bird Habitat Studies

US GEOLOGICAL SURVEY

In alignment with Federal directives—including Executive Order 14313 and Secretary’s Order 3356, which encourage voluntary conservation partnerships with states and private landowners—researchers at the USGS Wetland and Aquatic Research Center are collaborating with nongovernmental organizations, farmers and other private landowners, academic partners, and State natural resource agencies to understand how migratory shorebirds use hydrologically managed, post-harvest agricultural fields. This work takes place in the Lower Mississippi Alluvial Valley, where agricultural conversion has led to extensive wetland loss. By incentivizing farmers to hold water on fields during the non-growing season, the project creates ephemeral wetland habitat that supports migrating birds.

To evaluate how birds use habitat and move among different habitats, researchers capture shorebirds during autumn migration and deploy advanced tracking technologies, including radio transmitters, Bluetooth GPS tags, and cellular GPS tags. These tools allow scientists to quantify stopover duration, fine scale habitat use, and movements that range from local foraging to long distance migration. By integrating these techniques, the project documents how shorebirds rely on both hydrologically managed working lands and adjacent natural landscapes, highlighting the functional importance of agricultural fields enrolled in voluntary conservation programs.



DETECTIONS OF A LESSER YELLOWLEGS (*TRINGA FLAVIPES*) USING AUTOMATED RADIO TELEMETRY. THE INDIVIDUAL WAS CAPTURED AND TAGGED NEAR INDIANOLA, MS DURING AUTUMN MIGRATION AND WAS THEN REDETECTED IN PANAMA 3 DAYS LATER, APPROXIMATELY 2,812 KM AWAY. CREDIT: EMMA COUNCE, LARRY PACE

The project is already producing scientific insights showing that hydrologically managed working lands can help offset habitat loss across interior migratory routes. As the research expands to include avian health assessments, such as testing for avian influenza, pesticide exposure, and fungal loads, it will provide a deeper understanding of habitat quality and the ecological tradeoffs associated with inland stopover sites. These outcomes will support the identification of priority landscapes, refine estimates of habitat value, and inform conservation practices across the Mississippi Delta—including those supported through Farm Bill programs. Ultimately, this work strengthens local, state, and federal conservation planning efforts while contributing to global initiatives aimed at sustaining migratory shorebird populations.

Joint Fire Science Program

US WILDLAND FIRE SERVICE

The U.S. Wildland Fire Service's (USWFS) Joint Fire Science Program (JFSP) provides leadership to the fire science community by identifying high-priority research needs that directly support management objectives. The program funds federal and state agencies, academic institutions, private organizations, and non-governmental partners across three key areas: primary research addressing emerging and long-term management needs; Graduate Research Innovation (GRIN) awards that advance management-relevant graduate research; and science exchange awards through the Fire Science Exchange Network.

In FY 2025, JFSP awarded funding to eight projects selected from 22 proposals submitted under two research task statements: (1) *Accelerating Science to Action in Fire-Prone Ecosystems: Spurring Innovation in Adaptation Through Knowledge Exchange and Place-Based Partnerships*, and (2) *Interactions Between Invasive Plants and Fire Regimes and Incorporation into Wildland Fire Fuel Models, Risk Assessments, and Other Decision Support Tools*.

JFSP also awarded funding to seven projects selected from 22 proposals submitted for Graduate Research Innovation (GRIN) awards by graduate students studying wildland fire and related physical, biological, and social sciences.



U.S. WILDLAND FIRE SERVICE'S (USWFS) JOINT FIRE SCIENCE PROGRAM'S (JFSP) 15 NETWORKS/CONSORTIUMS. CREDIT: JOINT FIRE SCIENCE PROGRAM

A central priority of JFSP is ensuring that research findings are effectively transferred to managers, practitioners, and policymakers. This work is carried out through the program's 15 regional fire science exchanges, collectively known as the Fire Science Exchange Network (FSEN). The exchanges play a critical role in sharing, synthesizing, interpreting, demonstrating, and validating science to support its application in land management. As a national collaboration, FSEN delivers timely and relevant wildland fire science information while fostering connections among scientists, fire managers, and practitioners to address shared challenges.

In FY 2025, the exchanges:

- Produced 284 newsletters
- Published 42 blog posts
- Hosted 101 webinars
- Developed 39 syntheses
- Hosted 217 conferences and workshops
- Delivered 53 short courses and continuing education units
- Created 143 video productions

Approximately 26,000 individuals participated in FSEN-organized wildland fire science delivery activities in FY 2025.

Together, JFSP's investments in research, graduate innovation, and science exchange ensure that the latest fire science is not only generated but actively applied. By strengthening the connection between science and practice, the program helps equip decision-makers with the knowledge needed to address increasingly complex wildfire challenges.

VII. Conclusion

During FY 2025, the Department's technology transfer activities provided critical information and technologies to improve our understanding of and ability to address key issues such as rangeland management, mining, and wildland fire. During FY 2025, the Department's technology transfer activities included the following activities:

- Engaged in 31 CRADAs and at least 2,965 other collaborative R&D relationships.
- Disclosed 16 new inventions, filed one new patent application, and received one new patent.
- Managed 39 active licenses for inventions and other intellectual property, which collectively earned \$36,426.
- Published over 7,000 reports, books, papers, fact sheets, and other documents.

Appendix I: Updated FY 2024 Technology Transfer Data Tables

Due to varying reporting timelines, some data on licensing and royalty income were not available in time for inclusion in the FY 2024 Annual Report on Technology Transfer. This appendix presents a complete set of FY 2024 data tables, including the licensing and royalty income data that were omitted from the previous report.

Table 1: Disclosures and Patents, Department-Wide

		FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
	a					
1	Invention Disclosures Received	4	2	3	4	16
2	Total Patent Applications Filed	4	1	3	0	1
3	<i>US</i>	2	1	3	0	1
4	<i>Foreign</i>	0	0	0	0	0
5	Total PCT ¹³ Applications Filed	0	0		0	0
6	Number of patents Issued	3	1	1	0	1
7	<i>US</i>	0	1	1	0	0
8	<i>Foreign</i>	0	0	0	0	0

¹³ PCT = Patent Cooperation Treaty. See <https://www.wipo.int/pct/en/> for additional details.

Table 2: Licenses, Department-Wide

		FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
9	Invention Licenses, Total Active	2	10	11	74	44
10	<i>New Invention Licenses</i>	0	2	2	2	1
11	<i>New Invention Licenses to Small Businesses</i>	0	1	2	2	0
12	Income bearing licenses, Total Active	14	9	10	13	13
13	<i>New Income Bearing Licenses</i>	0	1	2	0	1
14	<i>Exclusive licenses</i>	7	8	9	10	7
15	<i>Partially exclusive licenses</i>	0	0	0	0	0
16	<i>Non-exclusive licenses</i>	6	2	2	3	6
17	Other Licenses, Total Active	0	48	61	61	31
18	<i>New Other Licenses</i>	0	42	13	6	0
19	<i>New Other Licenses Granted to Small Businesses</i>	0	40	10	0	0
	Elapsed Amount of Time for Granting Invention Licenses					
20	Average (months)	7	30.5	7	2.5	3
21	Minimum (months)	7	29	5	2	3
22	Maximum (months)	7	32	9	3	3
23	Licenses terminated for cause	1	1	0	0	0

Table 3: License and Royalty Income, Department-Wide

		FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
24	Invention License Income	\$122,749	\$67,694	\$108,761	\$76,794	\$85,897
25	Other License Income					
26	Total Earned Royalty Income (ERI)	\$122,749	\$67,694	\$107,761	\$76,794	\$81,857
27	<i>ERI from top 1% of licenses</i>		\$53,630	\$98,356	\$55,656	\$43,440
28	<i>ERI from top 5% of licenses</i>		\$53,630	\$98,356	\$55,656	\$43,440
29	<i>ERI from top 20% of licenses</i>		\$53,630	\$98,356	\$62,793	\$51,477
30	Minimum Earned Royalty Income			\$3,195	\$25,000	\$1,000
31	Maximum Earned Royalty Income			\$53,630	\$98,356	\$43,440
32	Median Earned Royalty Income			\$10,925	\$19,302	\$3,000
	Disposition of ERI					
33	Percent of ERI distributed to inventors	39%	36%	33%	33%	33%
33A	Amount of ERI distributed to inventors	\$47,872	\$24,045	\$35,561	\$25,342	\$27,013
34	Percent of ERI distributed to the agency or laboratory	34%	37%	33%	33%	33%
34A	Amount of ERI distributed to the agency or laboratory	\$41,735	\$24,762	\$35,561	\$25,342	\$27,013

Table 4: CRADAs, Department-Wide

		FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
	CRADAs					
35	Total Active CRADAs	489	428	32	34	23
36	New CRADAs	237	139	5	2	4
37	New CRADAs Involving Small Businesses	2	1	1	0	2
	Other collaborative R&D relationships					
38	Other Collaborative Agreements, total active in the FY	353	625	1015	1669	3149