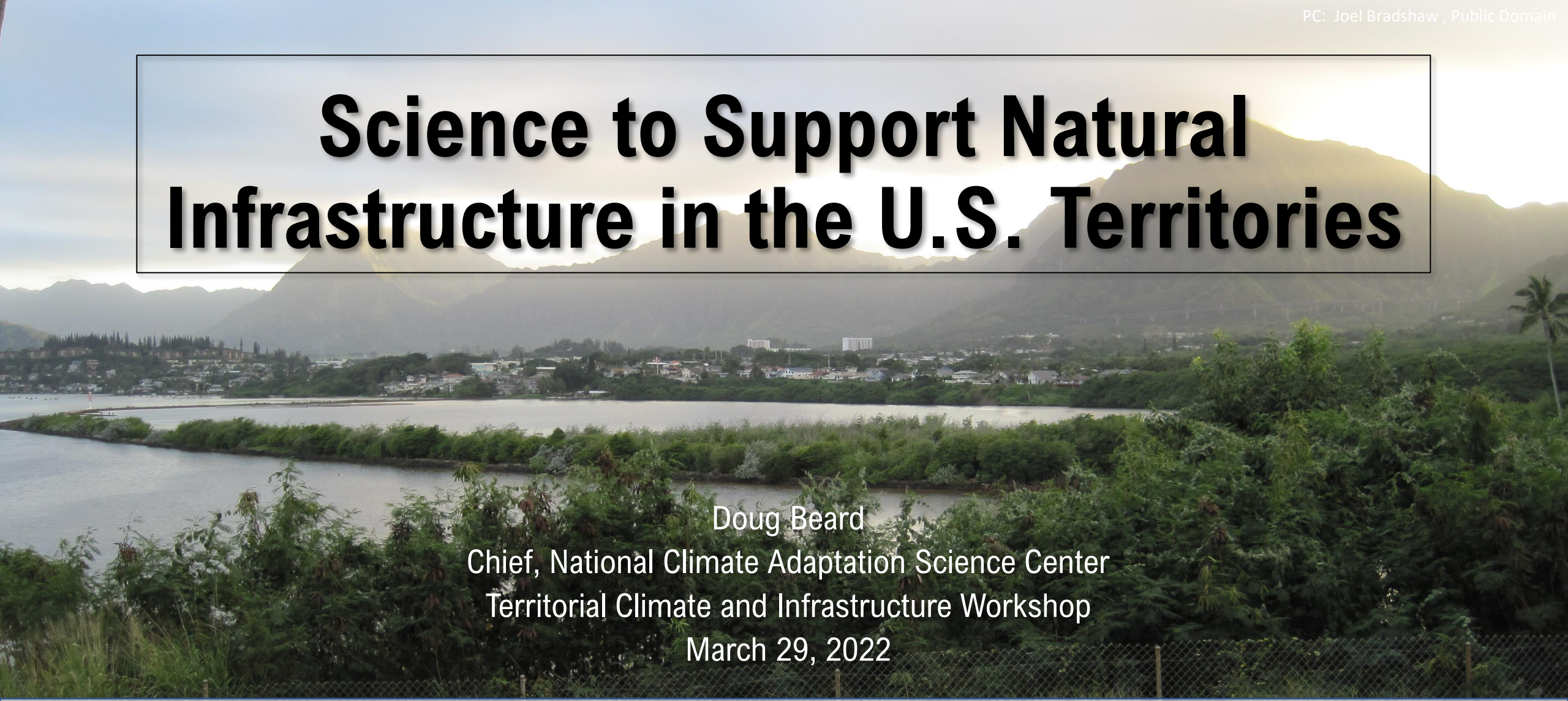


Science to Support Natural Infrastructure in the U.S. Territories

Doug Beard
Chief, National Climate Adaptation Science Center
Territorial Climate and Infrastructure Workshop
March 29, 2022

SOUTHEAST
Climate Adaptation Science Center

PACIFIC ISLANDS
CLIMATE ADAPTATION SCIENCE CENTER

USGS
science for a changing world

U.S. DEPARTMENT OF THE INTERIOR
MARCH 3, 1849

The USGS in the Territories

Water Science Centers

Ecosystem Research Science Centers

Climate Adaptation Science Centers

Earth Resources Observation And Science Center

Pacific Coastal and Marine Science Center

National Wildlife Health Center

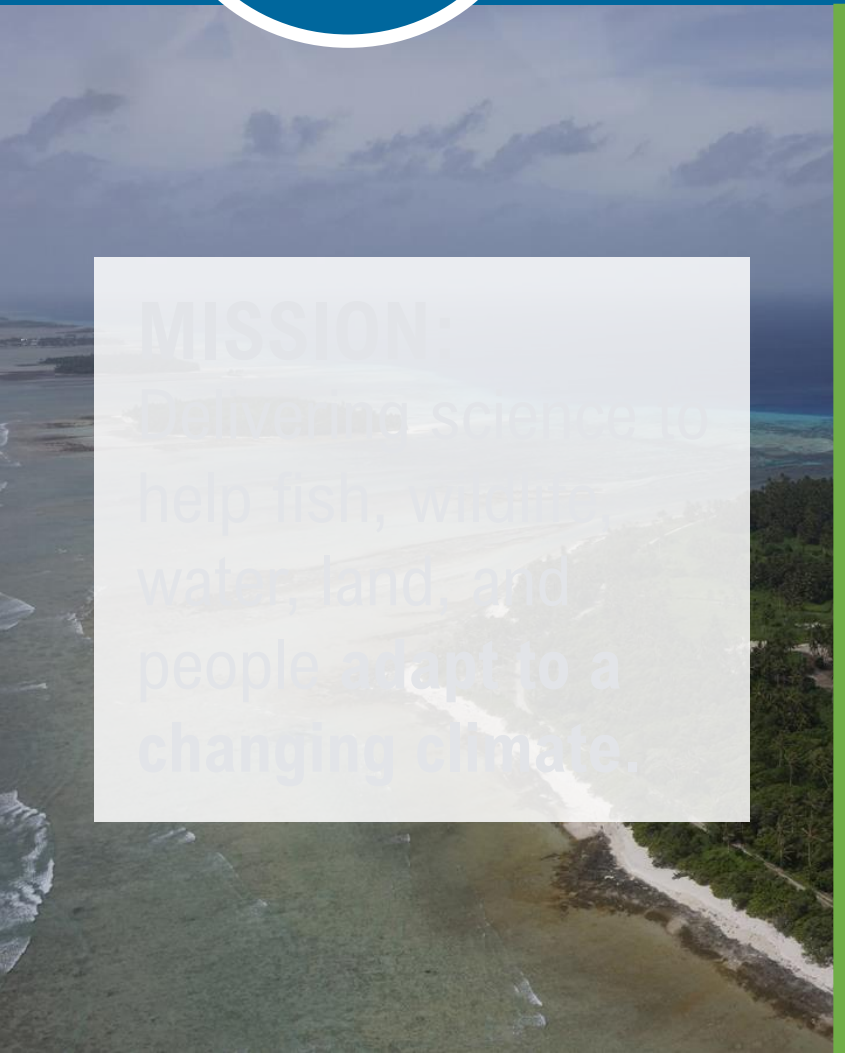
Volcano Hazards Observatory

Wetland and Aquatic Research Center

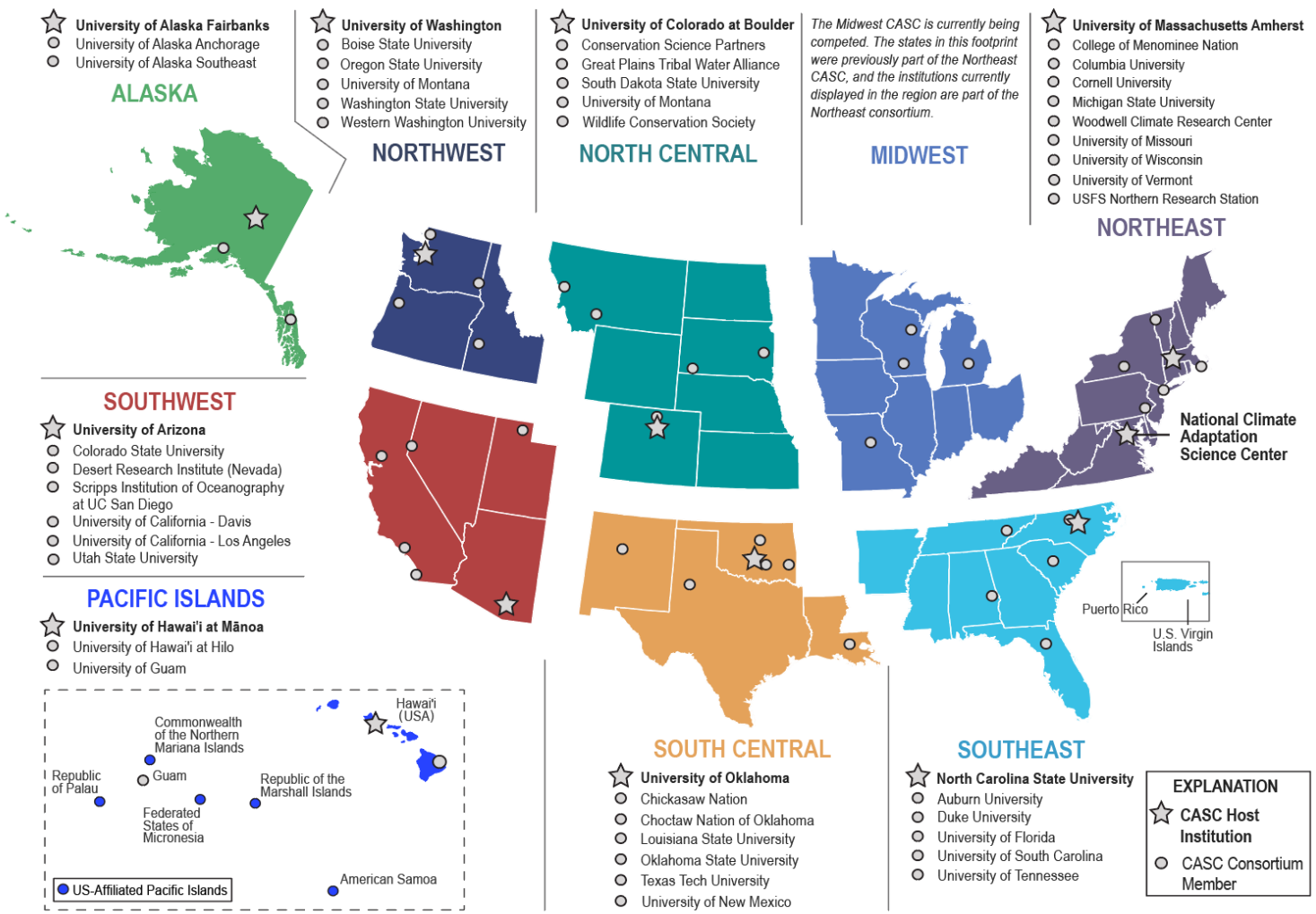
Western Ecological Research Center

Plus - Broad interagency collaboration across the Federal Government and collaborations with regional universities; local, regional, and indigenous governments, non-profits, and community groups, etc.

CASCs - Where We Work



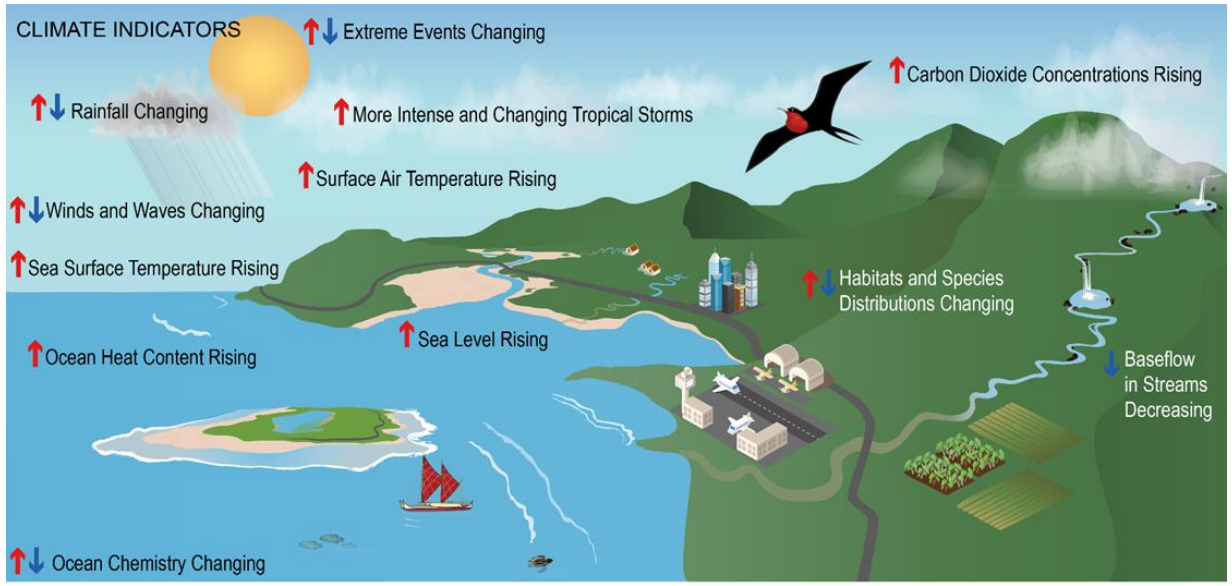
MISSION:
Delivering science to help fish, wildlife, water, land, and people adapt to a changing climate.

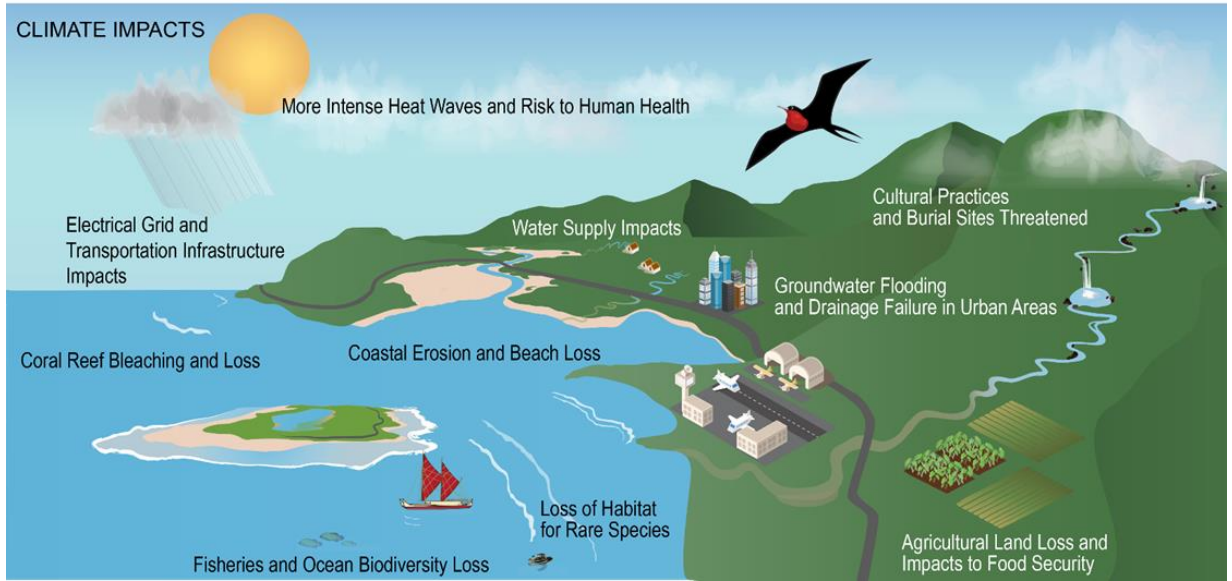


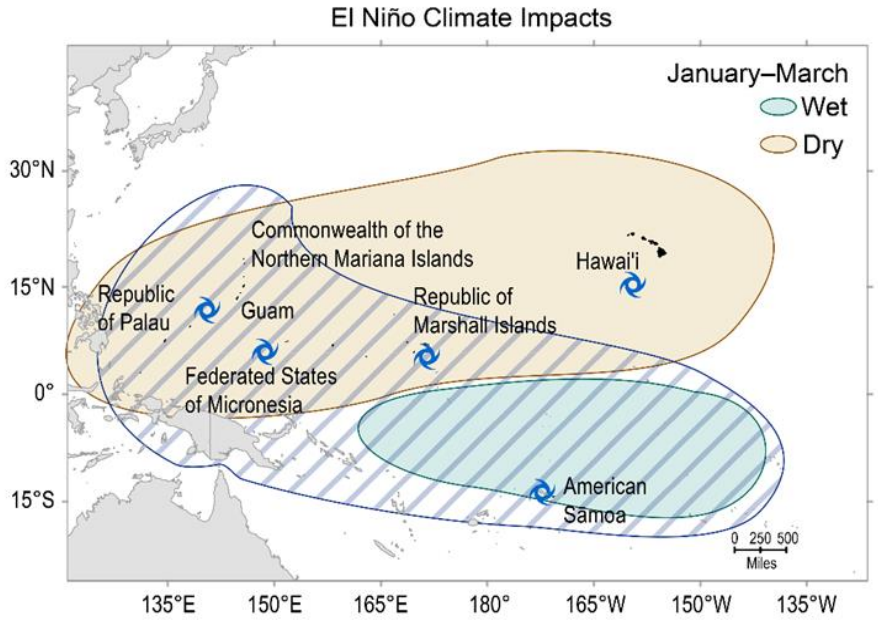
PI CASC Science Agenda for 2018-2023 Management Priorities

- Drought, Fire, and Associated Landscape Change
- Coastal Adaptation and Management
- Forest Conservation and Agroforestry
- Adaptation and Survival in Low Atolls and Islands
- Biosecurity and Invasive Species
- Island to Island Tech Transfer and Building a Stronger Science Base
- Managing Novel Ecosystems
- Risk and Vulnerability Assessments

Climate Change Impacts Everything







A Climate-Smart Approach to Natural Infrastructure

We can provide the science you need for climate resilient projects

- Science-based planning developed with community engagement can lead to effective integrated resource management and climate adaptation within natural infrastructure projects
- Climate change projections and adaptation approaches can increase the sustainability and longevity of infrastructure projects
- Science and technology transfer across the territories can provide meaningful lessons learned and build a stronger science base for all

Regional Interest in Natural Infrastructure

Sea Level Rise Information/tools:

- Models and Viewers
- Compounding factors impacting sea level:
  - subsidence, elevation, storm frequency/intensity, attenuation, coastal topography

Coastal Dynamics and Protection:

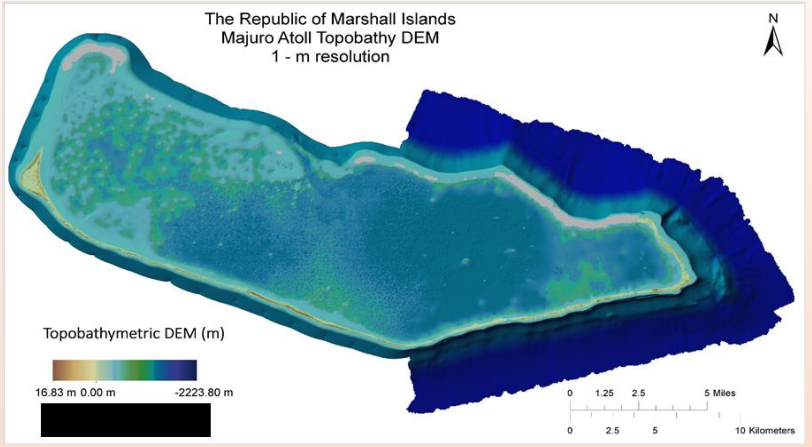
- Wetlands, Mangroves
- Corals
- Fishponds

Ridge to Reef Management:

- Compounding Challenges: Droughts/Fires/Water/Invasive Species → Erosion
- Biodiversity, Agroforestry, and Aquaculture for food, water, economic security

Sea-Level Rise Information & Tools

Understanding Sea Level Rise, Promoting Natural Resilience



Model Development

- BEWARE+ as operational flood models for coral reef lined coast (chosen for use by ONR and NWS, expanding nationwide)
- Topobathymetric Digital Elevation Modeling
- Shoreline Inventory

Future Flood Projections and Scenarios for:

Majuro

In development:

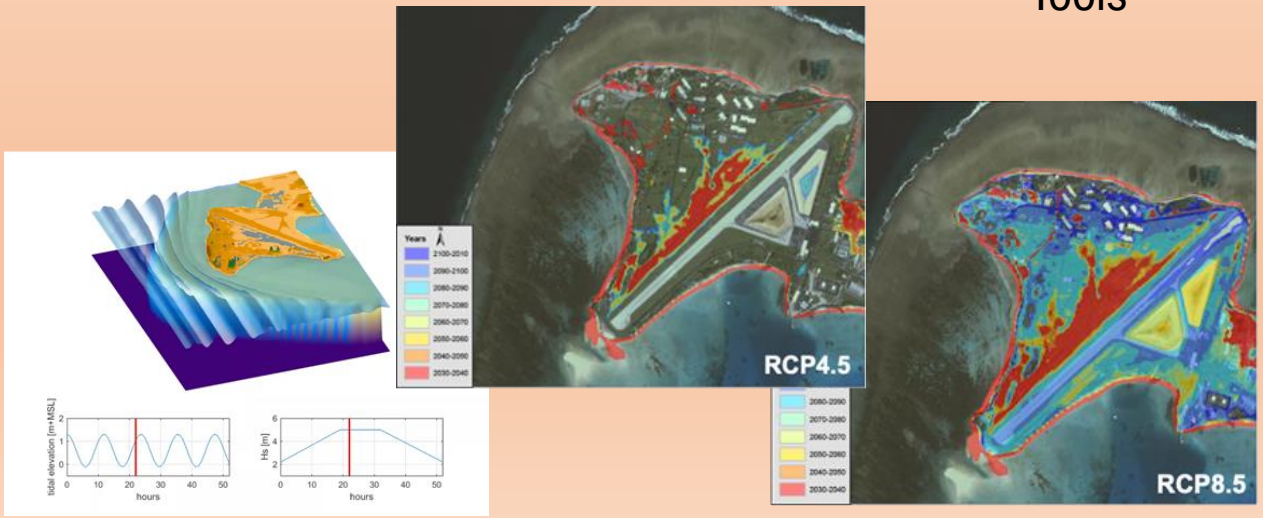
RMI atolls (4)

American Samoa

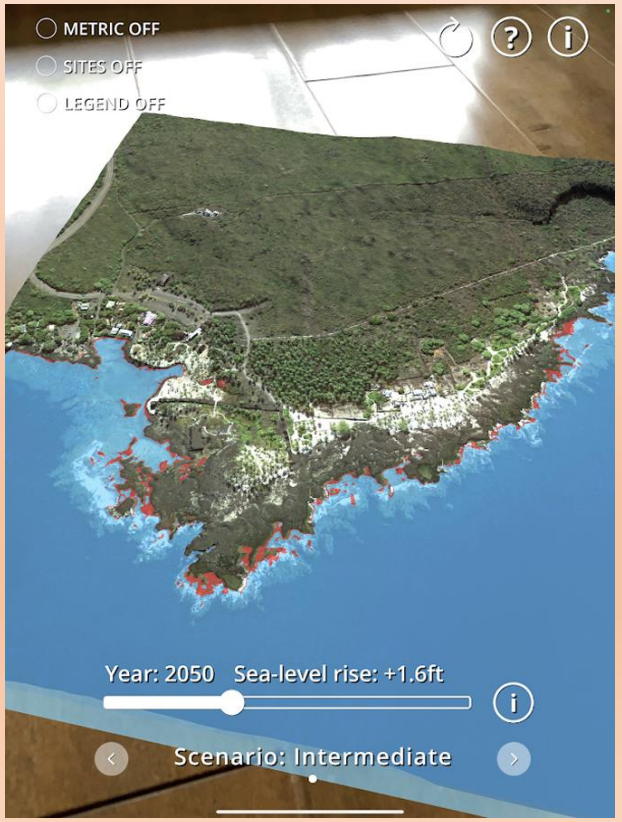
Guam

Saipan

Tinian



Visualizing SLR scenarios with online and App-based Interactive Tools



Coastal Dynamics & Protection

How do we manage wetland and mangrove systems as natural infrastructure?

- Consider projected changes in precipitation and coastal dynamics as you support wetland and mangrove systems
- Look to Indigenous Knowledge
- Restore with native species

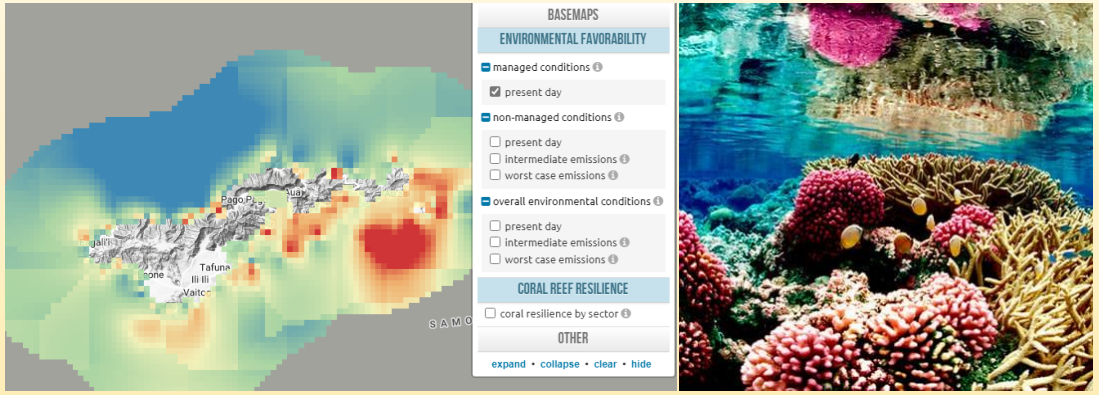
Conserve wetland systems
Retain sediment from downstream flows and improves nearshore water quality for reefs (Molokai, HI)

Conserve mangrove systems
Protect coastlines and provide a sustainable food source (Kosrae, Pohnpei, Yap)

Coastal Dynamics & Protection

How do we manage <u>coral systems</u> as natural infrastructure?

- Restore coral reefs with climate-resilient out-planting and artificial structures
- Control harmful invasive species
- Decrease land-based erosion



- Determine optimal reef restoration areas to reduce flooding impacts (Guam, American Samoa)
- Assess coral reef bleaching events (Guam, CNMI)

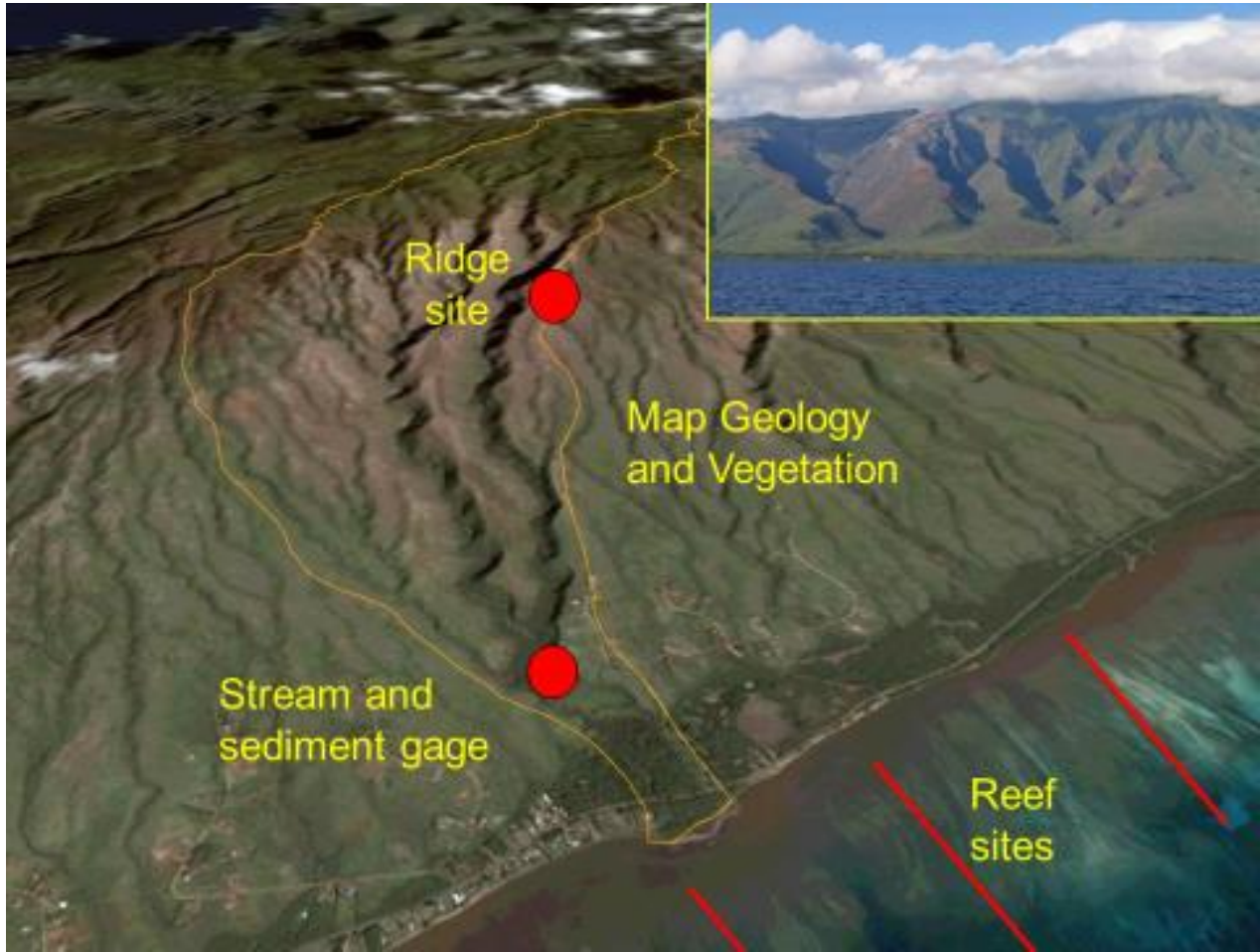
- Decrease smothering of reefs and coral disease risk
- Determine shoreline setbacks (Hawaii)

- Maintain indigenous food practices (ex. fishponds)

Management Lens: **RIDGE TO REEF**

Integrated ridge to reef is a holistic approach to decision making and management that stresses upstream and downstream environmental, social and economic linkages.

Compounding Challenges	Impacts
Drought/Precipitation Wildfire Groundwater Aquatic Flows Invasive Species	Biodiversity Agroforestry Aquaculture Ecological Security Food Security



Other Relevant CASC Projects

Wetland restoration

- A Prioritization Plan for Coastal Wetland Restoration on Moloka‘I
- Science Needs Assessment to Support Management of Loko I‘a (Hawaiian Fishpond) Resources and Practices Critical to the Native Hawaiian Community (final report download)

SLR Information & Tools

- Supporting Sea-Level Rise Preparedness in Hawaiian National Parks

Coastal Dynamics & Protection

- Enhancing social-ecological resilience and ecosystem services through restoration of coastal agroforestry systems

Shoreline Protection, Living Shoreline

- Sea-Level Rise Viewer for American Samoa: A Co-Developed Visualization and Planning Tool
- Developing the American Samoa climate and GIS data portal: A collaborative approach to enhancing data availability and adaptation capacity
- Generating a shoreline inventory for Hawai‘i island to increase resilience in the face of rising sea levels

Artificial Reefs & Coral Transplants

- Ecological and Socio-Cultural Responses to Transplanting Corals to Enhance Reef Resilience Near O‘ahu
- Coral Reef Resilience to Climate Change in the Commonwealth of the Northern Mariana Islands
- Coral response to land-to-ocean freshwater flux: a ridge-to-reef perspective

Watershed Management Planning

- Application of an Adaptive Management Plan to Reduce Uncertainty and Improve Decisions in Restoring the Herring River Estuary

Upland Management

- Optimizing techniques to restore forest to increase endangered species habitat and mitigate future drought: Kanakaleonui Bird Corridor
- Managing non-native game mammals to reduce future conflicts with native plant conservation in Hawai‘i
- Linking Models to Outcomes – How do Hawai‘i Stakeholders Use and Contribute to Land-to-Sea Ecosystem Service Analyses

Other

- Clam Gardens: An Indigenous Community-Driven Climate Adaptation Strategy to Manage Aquatic Species and Habitats in the Pacific Northwest

Thank you!

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