

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

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Territorial Climate and Infrastructure Workshop

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**PACIFIC ISLANDS**  
CLIMATE ADAPTATION SCIENCE CENTER





# 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, water, land, and people adapt to a changing climate.

- ★ University of Alaska Fairbanks
- University of Alaska Anchorage
- University of Alaska Southeast

## ALASKA



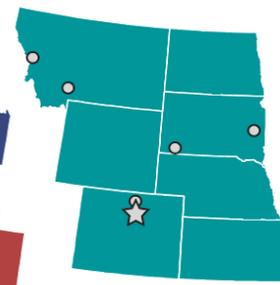
- ★ University of Washington
- Boise State University
- Oregon State University
- University of Montana
- Washington State University
- Western Washington University

## NORTHWEST



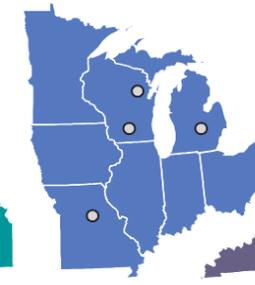
- ★ University of Colorado at Boulder
- Conservation Science Partners
- Great Plains Tribal Water Alliance
- South Dakota State University
- University of Montana
- Wildlife Conservation Society

## NORTH CENTRAL



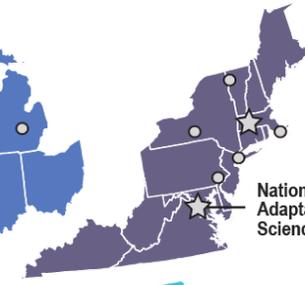
*The Midwest CASC is currently being competed. The states in this footprint were previously part of the Northeast CASC, and the institutions currently displayed in the region are part of the Northeast consortium.*

## MIDWEST



- ★ University of Massachusetts Amherst
- College of Menominee Nation
- Columbia University
- Cornell University
- Michigan State University
- Woodwell Climate Research Center
- University of Missouri
- University of Wisconsin
- University of Vermont
- USFS Northern Research Station

## NORTHEAST



National Climate Adaptation Science Center

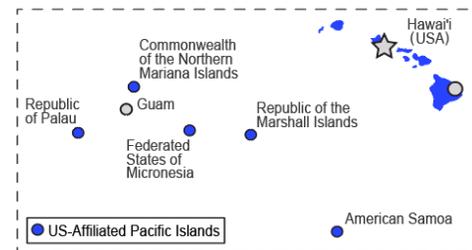
## SOUTHWEST

- ★ University of Arizona
- Colorado State University
- Desert Research Institute (Nevada)
- Scripps Institution of Oceanography at UC San Diego
- University of California - Davis
- University of California - Los Angeles
- Utah State University



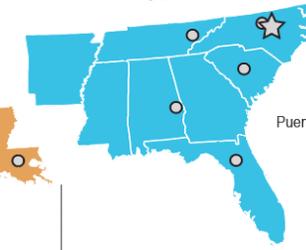
## PACIFIC ISLANDS

- ★ University of Hawai'i at Mānoa
- University of Hawai'i at Hilo
- University of Guam



## SOUTH CENTRAL

- ★ University of Oklahoma
- Chickasaw Nation
- Choctaw Nation of Oklahoma
- Louisiana State University
- Oklahoma State University
- Texas Tech University
- University of New Mexico



## SOUTHEAST

- ★ North Carolina State University
- Auburn University
- Duke University
- University of Florida
- University of South Carolina
- University of Tennessee

**EXPLANATION**  
 ★ CASC Host Institution  
 ○ CASC Consortium Member

# PI CASC Science Agenda for 2018-2023

## Management Priorities



Drought, Fire, and  
Associated Landscape Change



Biosecurity and Invasive Species



Coastal Adaptation and  
Management



Island to Island Tech Transfer and  
Building a Stronger Science Base



Forest Conservation and  
Agroforestry



Managing Novel Ecosystems

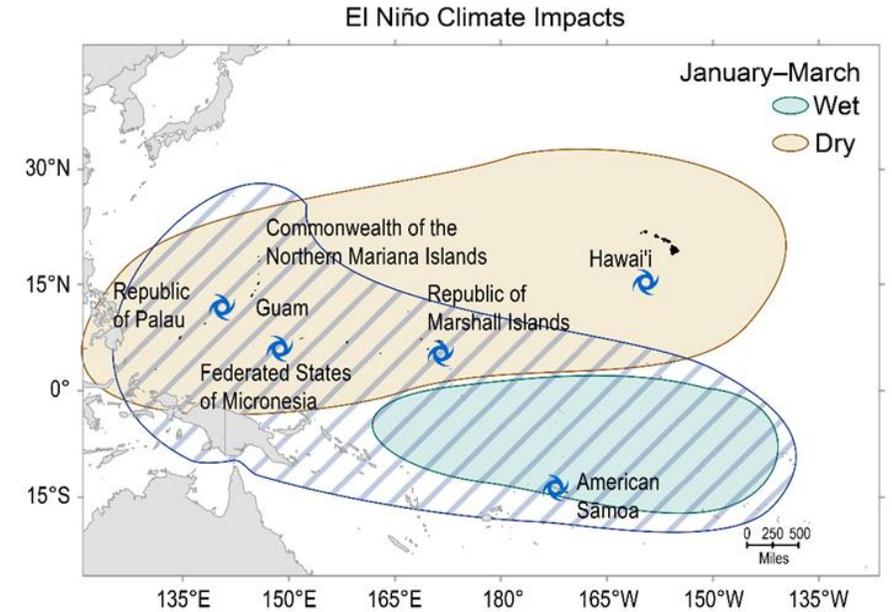
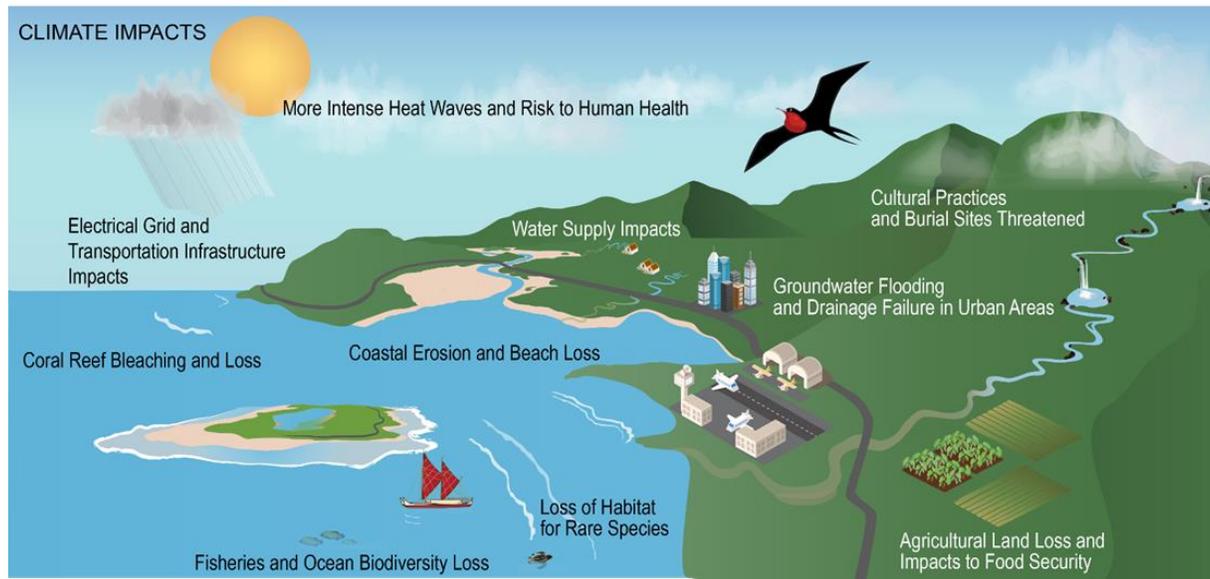
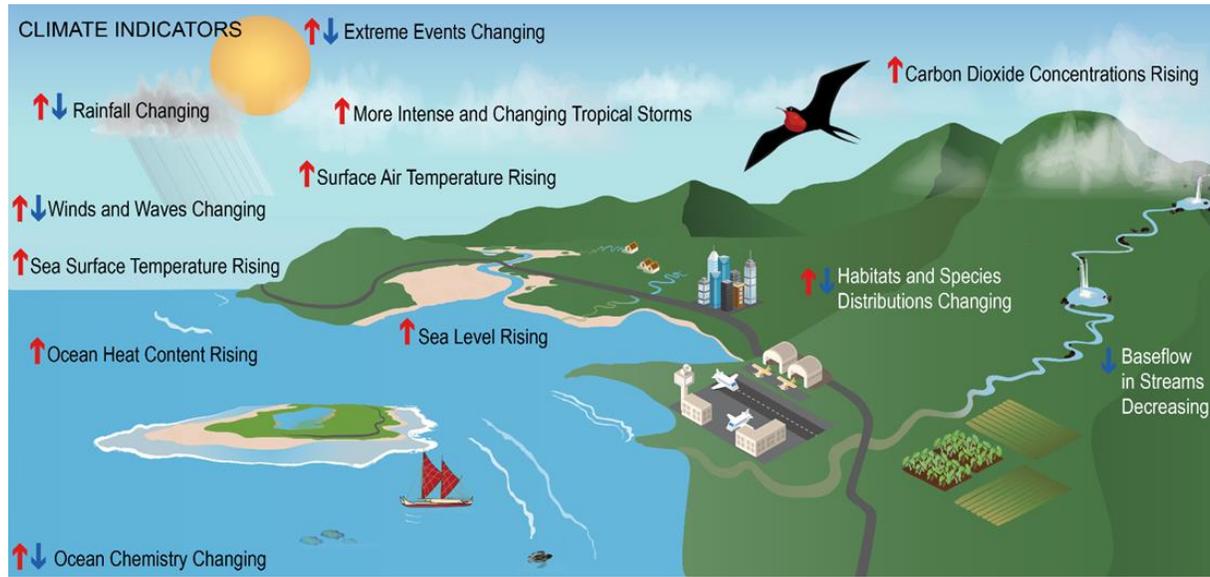


Adaptation and Survival in Low  
Atolls and Islands



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

## Nature-Based Solutions Can Build Resilience to Multiple Climate Hazards



Source: Global Commission on Adaptation, *Adapt Now* report, 2019.

20.05.20

# 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:*

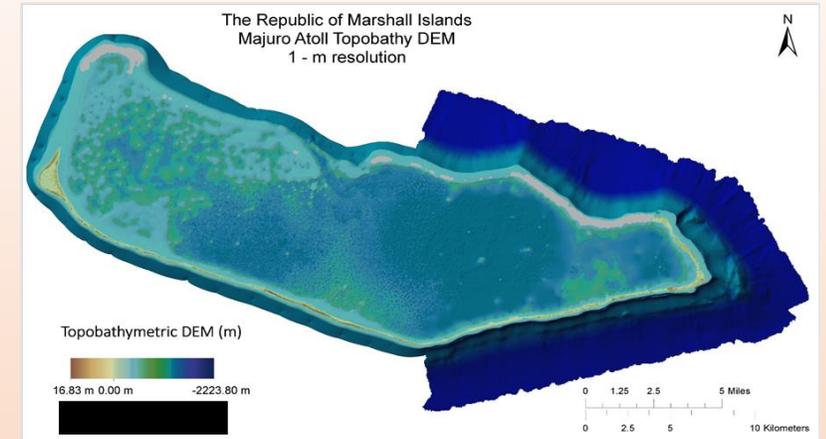
RMI atolls (4)

American Samoa

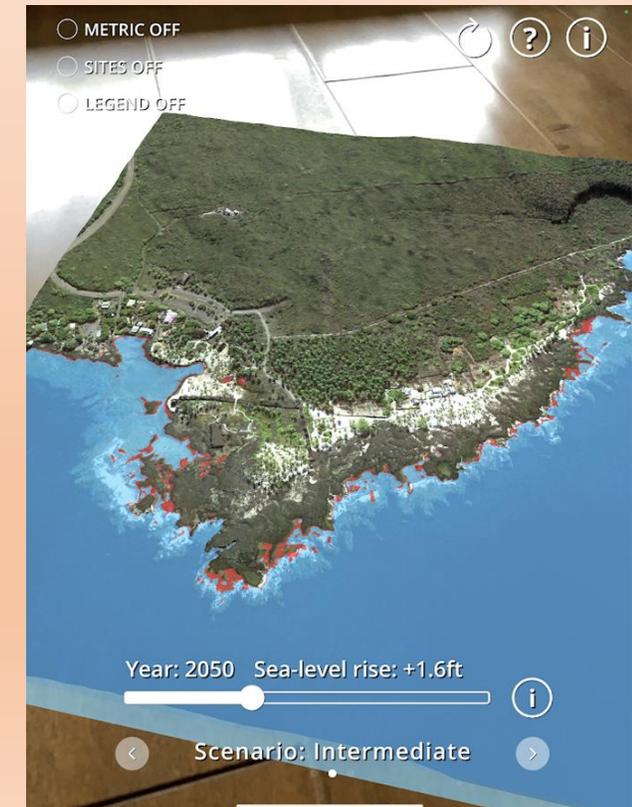
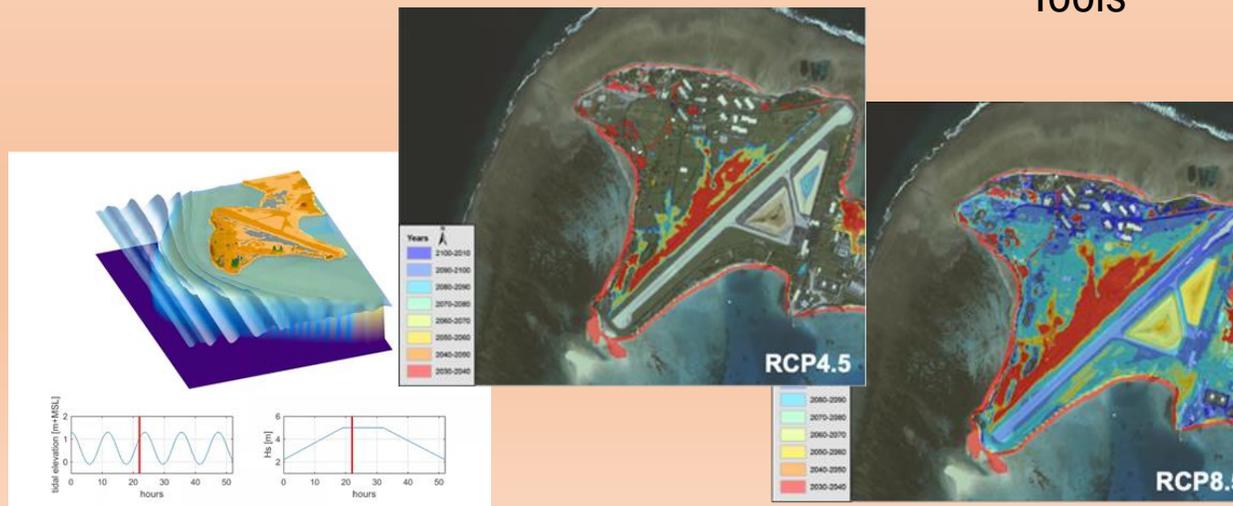
Guam

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)



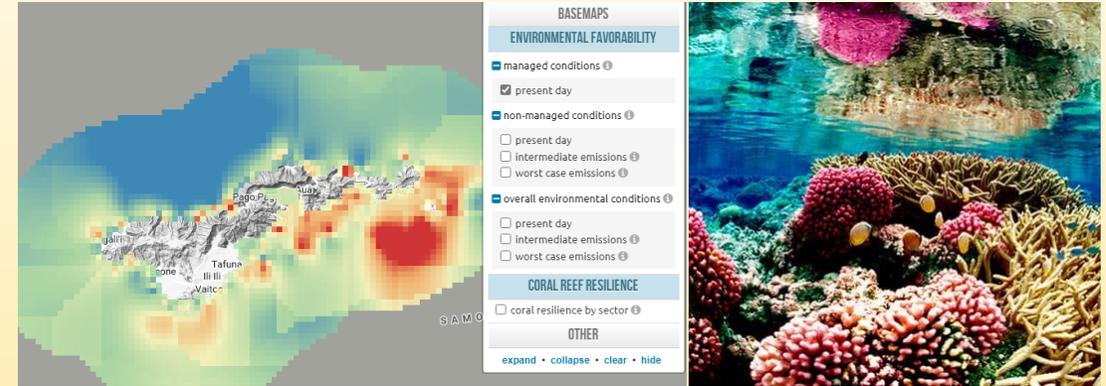
# Coastal Dynamics & Protection

## How do we manage coral systems as natural infrastructure?

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



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



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



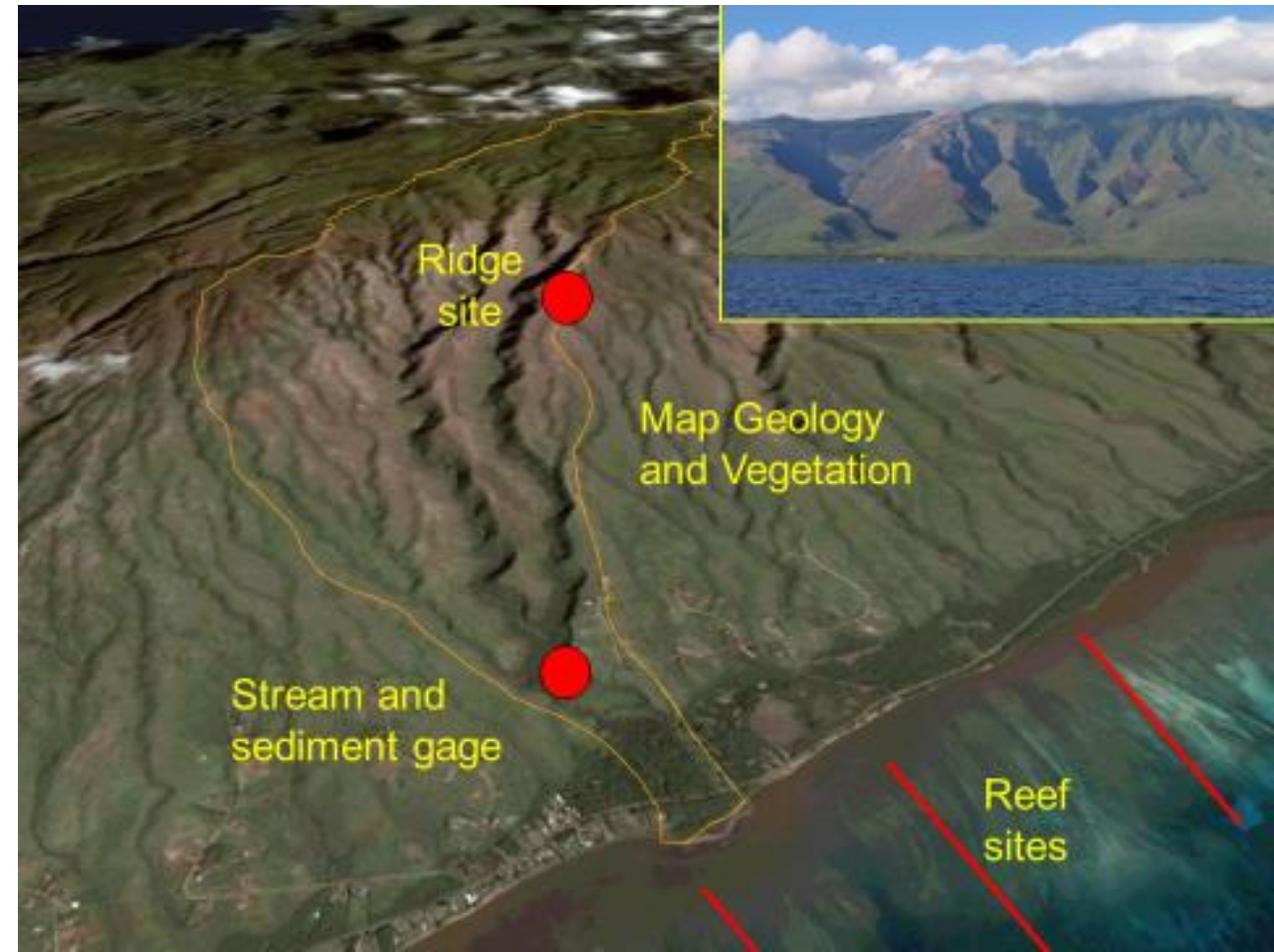
- Maintain indigenous food practices (ex. fishponds)

# 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 Molokaʻi](#)
- [Science Needs Assessment to Support Management of Loko Iʻa \(Hawaiian Fishpond\) 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 Hawaiʻi 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 Oʻahu](#)
- [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 Hawaiʻi](#)
- [Linking Models to Outcomes – How do Hawaiʻi 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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of HAWAII  
MANOA



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