

### **COLLABORATIVE RESEARCH** | Generating new science that informs decisions

PROJECT LEAD AND AFFILIATION	PROJECT TITLE	PARTICIPATING RESERVE(S)
<b>Celso Castro-Bolinaga</b> North Carolina State University	Improved Understanding of Sediment Dynamics for the Rachel Carson Reserve, North Carolina ( <b>Abstract</b> )	North Carolina (NC)
Christopher Janousek Oregon State University	A Long-Term Perspective on Tidal Wetland Restoration: Vegetation Development, Elevation Capital, and Carbon Sequestration in the Oldest Projects along the West Coast (Abstract)	South Slough (OR); Tijuana River (CA); Elkhorn Slough (CA); San Francisco (CA)
<b>Jessie Jarvis</b> University of North Carolina Wilmington	Evaluating and Enhancing Eelgrass Resiliency and Restoration Potential in a Changing Climate (Abstract)	Chesapeake Bay (VA)
<b>Peter Kingsley-Smith</b> South Carolina Department of Natural Resources	Collaborative Development of Novel Remote Sensing Workflows for Assessing Oyster Reef Condition to Inform Management and Restoration (Abstract)	ACE Basin (SC); North Inlet- Winyah Bay (SC); North Carolina (NC); Sapelo Island (GA); Guana Tolomato Matanzas (FL)
Hannah Ramage University of Wisconsin–Madison	Building a Collaborative Water Quality Monitoring Strategy for a Changing St. Louis River Estuary (Abstract)	Lake Superior (WI)
<b>Aaron Rice</b> Cornell University	Leveraging Conservation Technology to Improve Protected Species Management Efforts and Enhancing Ecosystem Services within the Hudson River National Estuarine Reserve (Abstract)	Hudson River (NY)
<b>Yoshimi Rii</b> Heʻeia National Estuarine Research Reserve	Wetland Water and 'Ike (WAI): Improving Understanding of Hydrology to Inform Management Decisions (Abstract)	He'eia (HI)



### SCIENCE TRANSFER | Promoting the use of science

PROJECT LEAD AND AFFILIATION	PROJECT TITLE	PARTICIPATING RESERVE(S)
<b>Kristen Goodrich</b> Tijuana River National Estuarine Research Reserve	Transferring Knowledge to Understand the NERRS' Niche in Addressing Aquatic-Bound Debris ( <b>Abstract</b> )	Tijuana River (CA); Heʻeia (HI); Padilla Bay (WA)
Geraldine Klarenberg University of Florida	Using Collaborative Open Science Tools to Improve Engagement with the Ecology of the Guana River Estuary ( <b>Abstract</b> )	Guana Tolomato Matanzas (FL)
Sarah Nuss Virginia Institute of Marine Science	Virginia Scientists and Educators Alliance (VA SEA) & Partners ( <b>Abstract</b> )	Chesapeake Bay (VA); Jacques Cousteau (NJ)
<b>Eleanor Sterling</b> Hawaii Institute of Marine Biology	Reciprocal Relationships in Reserves: Establishing a Community of Practitioners for Identifying and Using Cultural Ecosystem Services Approaches (Abstract)	Heʻeia (HI); Kachemak Bay (AK); Wells (ME); Tijuana River (CA)

Brief project summaries are below, organized by the following project types:

- Collaborative Research
- Science Transfer



### **COLLABORATIVE RESEARCH** | Generating new science that informs decisions

#### Improved Understanding of Sediment Dynamics for the Rachel Carson Reserve, North Carolina

Project Lead:	Celso Castro-Bolinaga
Reserve(s):	North Carolina (NC)

Budget Request: \$400,000

**Project Summary:** The goal of this project is to generate an improved understanding of sediment dynamics at and around the Rachel Carson Reserve, a component of the North Carolina Reserve. Specifically, this project seeks to quantify the magnitude and change in sediment loading rates and sources, determine the mechanisms through which the changing geomorphology of the Beaufort Inlet drives shoreline change and sediment dynamics, and examine the degree of geomorphological change caused by extreme storm events and their impact on habitat and infrastructure resiliency. The project team will collaborate with the North Carolina Reserve to produce a functional numerical model that can be used to simulate sediment dynamics at and around the reserve. They will also create maps that show the variability of the vulnerability index within the reserve to pronounced geomorphological change and its impact on water-sediment dynamics.

It is envisioned that results of this project will generate an improved understanding of how the interaction among extreme storm events, river systems, and coastal processes impact sediment dynamics at and around the reserve; refined decision-making and management for engineering practices at the Beaufort Inlet; and an improved understanding of the impact of sediment dynamics on the vulnerability of coastal habitats and infrastructure for informing effective resilience planning.

#### A Long-Term Perspective on Tidal Wetland Restoration: Vegetation Development, Elevation Capital, and Carbon Sequestration in the Oldest Projects Along the West Coast

Project Lead: Christopher Janousek

Reserve(s): South Slough (OR); Tijuana River (CA); Elkhorn Slough (CA); San Francisco (CA)

Budget Request: \$399,876

**Project Summary:** Tidal wetland restoration, often implemented by re-introduction of tidal flow, is a critical tool to increase coastal wetland area and enhance ecosystem services in estuaries. Although many millions of dollars have been spent on restoration over decades, there is still have limited information on some of the oldest projects along the West Coast and how their condition can inform future restoration efforts. Restoration practitioners, managers, scientists, and coastal policymakers need information on restoration outcomes and trajectories to plan future projects and quantify restoration benefits.

Working with four West Coast reserves, regional blue carbon working groups, and other partners, the project team will compile data on wetland elevation, vegetation communities, and carbon sequestration in multiple older (>15–20 years old) restoration sites and reference wetlands in California, Oregon, and Washington. They will use existing data sets and conduct targeted new sampling to examine restored site condition and relationships between vegetation, elevation, estuary landscape features, and carbon sequestration capacity. The project will also result in restoration-focused outputs including a guidance document, scientific publication(s), and data sets. The project will strengthen West Coast partnerships in wetland restoration and management and will inform blue carbon policy, project prioritization and monitoring, and ecological understanding of restoration over the long term.





#### Evaluating and Enhancing Eelgrass Resiliency and Restoration Potential in a Changing Climate

Project Lead:Jessie JarvisReserve(s):Chesapeake Bay (VA)Budget Request:\$395,503

**Project Summary:** In recent years, elevated water temperatures have resulted in large-scale eelgrass (*Zostera marina*) diebacks of entire meadows in the lower Chesapeake Bay, Virginia, resulting in a conversion from historically stable, dense meadows to low-density ephemeral ones. In contrast, many eelgrass populations in Back Sound, North Carolina, appear to be more resilient to warming water temperatures. The objectives of this project are to compare resiliency traits of eelgrass populations in North Carolina and Virginia, identify specific meadows in North Carolina that could serve as seed donor beds, and conduct reciprocal test restoration using North Carolina and Virginia eelgrass seeds for comparison. Eelgrass restoration without considering the resiliency of the meadows to climate change no longer appears to be a viable option for long-term success, so reserves, state agencies, and nonprofits in both Virginia and Maryland are in need of information and specific criteria in order to restore this foundational species.

#### Collaborative Development of Novel Remote Sensing Workflows for Assessing Oyster Reef Condition to Inform Management and Restoration

Project Lead: Peter Kingsley-Smith

Reserve(s): ACE Basin (SC); North Inlet-Winyah Bay (SC); North Carolina (NC); Sapelo Island (GA); Guana Tolomato Matanzas (FL)

Budget Request: \$305,463

**Project Summary:** Oyster reefs are primarily managed by state agencies in support of recreational and commercial fisheries but they also support additional ecosystem services. Oyster resource managers and reserve staff in Florida, Georgia, North Carolina, and South Carolina often rely on conventional monitoring approaches to inform management and restoration decisions, but these approaches have limitations (e.g., time consuming, limited spatial scale). End users in the region have expressed a need for rapid, standardized, and quantitative measures to assess reef condition in order to direct management and restoration actions. This project proposes to evaluate Uncrewed Aircraft Systems (UAS) as a tool for quantitatively measuring the intertidal eastern oyster's (*Crassostrea virginica*) reef structure and demographics, and how reefs change in response to natural and anthropogenic factors.

The project team will implement an integrated and collaborative process with end users in the southeastern United States to generate UAS workflows for quantifying oyster reef structural and demographic characteristics. The team will also create workflows that generate products shaped by end user input, and support communication and outreach through meetings with end users and presentations at scientific and management conferences. Anticipated outcomes include improved interstate collaboration supporting enhanced oyster management and restoration, and enhanced technical capacity for end users to conduct UAS-based oyster reef assessments.



Back to top

#### Building a Collaborative Water Quality Monitoring Strategy for a Changing St. Louis River Estuary

Project Lead:	Hannah Ramage
Reserve(s):	Lake Superior (WI)
Budget Request:	\$399,833

**Project Summary:** After a history of contamination, the St. Louis River Estuary is being revitalized through remediation, restoration and protection but simultaneously faces pressing new water quality challenges. Recent shifts in algal communities, harmful algal blooms, and hypoxia in estuary "hotspots" are not well understood, leaving water stewards without critical information needed to respond. This project conducts foundational research to quantify and characterize the nutrient dynamics that lead to degraded algal communities, toxic cyanobacterial blooms, and hypoxia in the estuary. Our diverse network of organizations is building a collaborative monitoring strategy to address current and future stressors.

This project will support that effort through a synthesis of known nutrient and algal dynamics; development of an easily interpreted data access platform; a recommendation report that specifies the location, timing, and parameters needed for a feasible and effective long-term monitoring program; and targeted local and national communications. The approaching delisting of the Area of Concern (AOC) creates a timely need to transition water quality monitoring efforts from "looking back" to "looking forward." This project ensures that already engaged end users will work from a shared understanding to build a collaborative monitoring strategy that protects the restored health of the estuary.

#### Leveraging Conservation Technology to Improve Protected Species Management Efforts and Enhancing Ecosystem Services within the Hudson River National Estuarine Research Reserve

Proiect	Lead:	Aaron Rice
iiojeee	LCUU.	/ aron nice

Reserve: Hudson River (NY)

#### Budget Request: \$399,976

**Project Summary:** The Reserve System plays an important role in providing and sustaining critical ecosystem services. The Hudson River Reserve identified management of key fisheries species within an ecosystem-services-based approach as a critical reserve priority, as these species provide important provisioning, cultural, regulating, and supporting services for the reserve and surrounding region. Several managed fisheries seasonally use the Hudson River Reserve waters, though where and when are unclear. There are ongoing survey efforts, but many critical management questions remain, particularly with respect to spatial patterns of habitat use and phenology. Conservation tech allows the opportunity to enhance data collection efforts as well as streamline survey approaches for informed decision-making on the management of these resources.

We will implement a passive acoustic monitoring effort in the Hudson River Reserve to specifically fill ongoing information gaps related to focal fisheries ecology and management within the reserve. Working closely with end users and stakeholders, our approach will help elucidate how and when these focal species utilize the reserve. In addition, novel research in fisheries provides great educational opportunities for both K–12 students and the general public. Online accessibility of acoustic resources also allows reserve educators to reach new audiences.



Back to top

## Wetland Water and 'Ike (WAI): Improving Understanding of Hydrology to Inform Management Decisions

Project Lead:	Yoshimi Rii
Reserve(s):	Heʻeia (HI)
Budget Request:	\$390,220

**Project Summary:** This project addresses wai (fresh water) as a specific monitoring need identified through community and stakeholder engagement. Native Hawaiian communities hold wai and its life-giving power as sacred and for centuries sustainably managed water to establish food security on the most remote islands on Earth. In the He'eia National Estuarine Research Reserve (NERR) on O'ahu, Hawaii, a century of land use and socio economic change has altered groundwater recharge, storage, and transport and reduced surface flows. To bring back abundance into the He'eia watershed, the community expressed the need to understand how wai flows through the wetland and estuary and its potential influence on Indigenous agroecology and aquaculture systems.

This project will improve understanding of watershed hydrology and biogeochemistry by examining the spatial and seasonal variability in surface and groundwater flows, create infrastructure to increase access to existing and new data streams, design workshops to promote intergenerational transfer of 'ike (knowledge) of water management, and develop water science and management curriculum for existing educational programs. This project will illuminate the drivers of nutrients and ecosystem productivity in the wetland and estuary, with data and outreach extensions, directly informing water resource management and planning of future phases of biocultural restoration.



Back to top

#### Transferring Knowledge to Understand the NERRS' Niche in Addressing Aquatic-Bound Debris

Project Lead:	Kristen Goodrich
Reserve(s):	Tijuana River (CA); Heʻeia (HI); Padilla Bay (WA)
Budget Request:	\$89,078

**Project Summary:** Plastic pollution is ubiquitous in the environment, but the transport and transformation of plastic and other debris through watersheds and in estuaries are understudied. Through its multi-sector approach and strong network of partners, the Reserve System has an opportunity to fill a unique niche in both understanding and addressing marine debris and plastic pollution in estuaries. In a recent survey, reserves expressed an overwhelming desire to work across sectors on this issue and develop coordinated long-term monitoring and public messaging to promote understanding, behavior change, and policy actions. We propose a series of knowledge transfer workshops across reserves and with the greater Debris Community of Practice (DCoP) to develop a draft Strategic Plan to address plastic issues in estuaries. The Plan will align goals, actions, and metrics of individual reserve efforts with a system-wide vision and mission and will complement ongoing efforts in the DCoP. To ground discussions in future tangible outputs, we intend to organize cross-sector workshops around an integrated set of proposed toolkits, such as an estuarine module for aquatic-bound debris monitoring, an education/stewardship toolkit to promote community involvement, and a coastal decision-maker engagement plan that addresses behavior change and policy actions.

## Using Collaborative Open Science Tools to Improve Engagement With the Ecology of the Guana River Estuary

Project Lead:	Geraldine Klarenberg
Reserve(s):	Guana Tolomato Matanzas (FL)
Budget Request:	\$99.988

**Project Summary:** This project proposes to develop a web-based, public-facing, interactive dashboard (Shiny app) that will provide open access to Guana River Estuary data sets, give users the ability to visualize data, and engage the community with the reserve and its ecology. The project will advance the goals of the Guana Tolomato Matanzas (GTM) Reserve by meeting end user needs and desires and by supporting open science. Outputs will include a web-based dashboard, a maintenance training module, and in-person collaborative training sessions. Implementation of this dashboard will provide scientists, students, agencies, and non-technical staff new access to data outside the System-wide Monitoring Program, which provides data through the Centralized Data Management Office. The Shiny app will diversify engagement with the GTM Reserve as community end users seek information such as water level, local water quality, and map-linked data. The product will encourage scientists to participate in open science and will serve as a model for other reserves that want to share non-SWMP data sets or make data interactive visualization tools available to their community. A shift toward open science in the broader global community will support the rapid advancements necessary to address larger global issues, such as environmental degradation and climate change.



#### Virginia Scientists and Educators Alliance (VA SEA) & Partners

Project Lead:	Sarah Nuss
Reserve(s):	Chesapeake Bay (VA); Jacques Cousteau (NJ)
Budget Request:	\$94,431

**Project Summary:** To improve science education, enhance graduate student science communication, and build capacity among other reserves and Sea Grant programs, the Chesapeake Bay Reserve in Virginia and the Virginia Institute of Marine Science (VIMS) Marine Advisory Program/Virginia Sea Grant educators propose to enhance and expand the Virginia Scientists and Educators Alliance model. This model was originally funded with NERRS Science Collaborative funds and has grown into a successful model for science translation within the Chesapeake Bay Reserve and VIMS and can be piloted and expanded through participation by the Jacques Cousteau Reserve and Florida Sea Grant educators. Graduate students from Virginia, New Jersey, and Florida will participate in the program, with project educators sharing lessons learned and strategies for implementation to encourage transfer of the project to other states.

## Reciprocal Relationships in Reserves: Establishing a Community of Practitioners for Identifying and Using Cultural Ecosystem Services Approaches

Project Lead:Eleanor SterlingReserve(s):He'eia (HI); Kachemak Bay (AK); Wells (ME); Tijuana River (CA)Budget Request:\$99,011

**Project Summary:** To support socially and ecologically thriving estuaries we must comprehensively understand Cultural Ecosystem Services (CES), or the intangible benefits to humans derived from ecosystems. However, CES are not often assessed, due to significant theoretical and practical gaps. The Reserve System is an ideal setting to pilot CES identification methods in estuarine ecosystems where "humans and natural communities thrive." This project will build upon a previously funded Catalyst project by training a cohort (hereafter: Cohort) composed of seven reserves, two of which were part of the Catalyst project, in a variety of place-based approaches for identifying and monitoring CES over three virtual workshops. Between workshops, participants will engage with CES approaches at their reserves and will share lessons learned in discussions with the Cohort. The Cohort will evaluate the approaches to develop guidance for future CES practitioners. Outputs include sharing findings at a gathering of reserves and a virtual professional development opportunity for NOAA Margaret A. Davidson Fellows. Ultimately, the team intends to establish a sustainable network of CES practitioners who can continue to support one another and engage others. The project will pave the way for broader inclusion of CES in ecosystem service assessments by refining guidance for application in a variety of contexts.

To learn more about these grant programs and follow the progress of these projects, visit http://nerrssciencecollaborative.org.



