2018 Collaborative Science Catalyst Projects*

Project Lead and Affiliation	Project Title	Participating Reserve(s)	Topic Area
Lisa Auermuller, Jacques Cousteau NERR	Enhancing coastal resilience decision-support tools to reflect latest local, applied science (Link)	Jacques Cousteau (NJ)	Climate adaptation
Dani Boudreau, Tijuana River NERR	Facilitation tools, techniques, and tactics: Advancing local adaptation and evaluation dialogues throughout the NERRS (Link)	Tijuana River (CA), Kachemak Bay (AK), Jacques Cousteau (NJ), Wells (ME)	Climate adaptation
David Burdick, University of New Hampshire	Synthesizing NERR Sentinel Site data to improve coastal wetland management across New England (Link)	Wells (ME), Great Bay (NH), Waquoit Bay (MA), Narragansett Bay (RI)	Marsh resilience
Craig Cornu, Institute for Applied Ecology	Feasibility planning for Pacific Northwest blue carbon finance projects (Link)	Padilla Bay (WA), South Slough (OR)	Ecosystem services
Kimberly Cressman, Grand Bay NERR	Is marsh surface tracking sea level change? Developing tools and visualizations for NERRS Sentinel Site Data (Link)	Grand Bay (MS), Chesapeake Bay (VA), Delaware (DE), Elkhorn Slough (CA), Mission-Aransas (TX), Padilla Bay (WA), South Slough (OR), Waquoit Bay (MA)	Marsh resilience
Frank Muller-Karger, University of South Florida	Mapping terrestrial and benthic habitat change to address mangrove and seagrass migration and die-off in response to recent and long-term environmental drivers (Link)	Rookery Bay (FL)	Marsh resilience
Lydia Olander, Duke University	Exploring applications of ecosystem service conceptual models for coastal habitats (Link)	North Carolina (NC), Rookery Bay (FL)	Ecosystem services

Philip Orton, Stevens Institute of Technology	Catalyzing a deeper understanding of the effects of storm surge barriers on the Hudson River estuary (Link)	Hudson River (NY)	Climate adaptation
Stuart Siegel, San Francisco Bay NERR	Bringing together end users and stakeholders to identify and evaluate sea level rise adaptation options to solve road flooding in China Camp State Park (Link)	San Francisco Bay (CA)	Climate adaptation
Kerstin Wasson, Elkhorn Slough NERR	Building a coastwide Olympia oyster network to improve restoration outcomes and enhance community engagement (Link)	Elkhorn Slough (CA), Padilla Bay (WA), South Slough (OR), San Francisco Bay (CA), Tijuana River (CA)	Oyster management
Wilson White, Oregon State University	Stakeholder-driven modeling investigation of factors affecting oyster population sustainability (Link)	Guana Tolomato Matanzas (FL)	Oyster management

* These projects have been recommended to NOAA for funding; grant awards are contingent upon the findings of NOAA environmental compliance reviews.

Project summaries are listed below and can be quickly located by clicking on (Link) in the table above.

Summaries for the 2018 Collaborative Science Catalyst Projects

Brief project summaries are provided below, organized by the following topic areas:
- Climate Adaptation
- Ecosystem Services
- Marsh Resilience
- Oyster Management

Climate Adaptation

Enhancing Coastal Resilience Decision-support tools to Reflect Latest Local, Applied Science

Project Lead: Lisa Auermuller, Jacques Cousteau NERR
Reserves: Jacques Cousteau (NJ)
Budget Request: $152,931
RFP Objective: Amplify or enhance existing collaborative research efforts

Project Summary: New Jersey decision makers have been faced with an overwhelming plethora of data, planning tools, techniques and guidance related to climate change adaptation. Concurrently, the NJ Climate Adaptation Alliance, a network of stakeholders designed to enhance resilience preparedness, requested that Rutgers University convene a Science Panel to identify planning options for enhancing resilience around current and future flood risks. The Panel's resultant framework applies local sea level rise projections to assess future flood exposure using historic observations of flood events and calculated extreme water levels at tide gauges. The projected water level approach reflects user-defined combinations of sea-level rise and flood conditions, providing users with flexibility to evaluate a range of flood conditions and time horizons.

Guided by end-users, this project will streamline Rutgers data, tools and planning techniques by merging our current decision-support tools into a single, enhanced platform. This project will operationalize the total water concept by merging tools to: (1) step end users through the decision points of the framework; (2) relate water level outputs to geographically relevant historic events; and, (3) allow users to visualize total water level outputs. These efforts will result in the statewide adoption of a collaboratively developed coastal resilience assessment and planning framework.

Facilitation Tools, Techniques, and Tactics: Advancing Local Adaptation and Evaluation Dialogues throughout the NERRS

Project Lead: Daneille Boudreau, Tijuana River NERR
Reserves: Tijuana River (CA), Kachemak Bay (AK), Jacques Cousteau (NJ), Wells (ME)
Budget Request: $90,048
RFP Objective: Amplify or enhance existing collaborative research efforts

Project Summary: The on-going project, *Successful Adaptation Indicators and Metrics* (SAIM), has been working with multiple National Estuarine Research Reserves to advance understanding of and dialogue around climate adaptation in the context of evaluating adaptation actions by monitoring specific indicators and metrics. As part of this proposal, four of the participating reserves – Tijuana River, Kachemak Bay, Jacques Cousteau, and Wells NERRS – have come together alongside the SAIM project team to develop a decision support toolbox that will make the facilitation tools, techniques, and tactics utilized as part of multiple workshops available to the full NERRS Coastal Training Program network, and key regional and national NERRS partners. There has been widespread interest among the reserves not yet involved in SAIM to learn from the experiences of the participating reserves. To date there has been no coordinated effort to pull together the SAIM products into a decision support tool to transfer lessons learned from the project to a wider audience. The resulting toolbox will include a variety of tools in different formats to provide all reserves and key partners the capacity to lead, engage in, and facilitate dialogues around adaptation and evaluation, helping to advance local, regional, and national conversations around successful adaptation.

Catalyzing a Deeper Understanding of the Effects of Storm Surge Barriers on the Hudson River Estuary

Project Lead: Philip Orton, Stevens Institute of Technology
Reserves: Hudson River (NY)
Budget Request: $132,319
RFP Objective: Facilitate the development of new collaborative science ideas

Project Summary: Storm surge barriers are currently being evaluated by the U.S. Army Corps of Engineers as an option for flood risk reduction for the New York metropolitan area. The decision of whether or not to build surge barriers to protect one of our nation's main commercial hubs and ports, crossing one of our most iconic estuaries, is a major decision worthy of collaboration. The Hudson River NERR identified an analysis of proposed alternatives as an "*urgent*" reserve management need. The project team organized a workgroup and meeting in December 2017 with the long-term goal of entraining the scientific community to supplement the current study.

This one-year project will build on current studies and facilitate the development of a collaborative research agenda to address these complex and pressing information needs. This will be achieved through a stakeholder-guided approach with an Advisory Panel comprising Decision-maker End Users, Collaborator End Users and Science Advisers. Outputs will include several workshops with reports, a collaboratively-determined initial and future work plans, modeling and scientific analyses of estuary physical processes, and written plans for expanding the research and the scientific community involved.

Bringing Together End Users and Stakeholders to Identify and Evaluate Sea Level Rise Adaptation Options to Solve Road Flooding in China Camp State Park

Project Lead: Stuart Siegel, San Francisco Bay NERR
Reserves: San Francisco Bay NERR (FL)
Budget Request: $157,321
RFP Objective: Facilitate the development of new collaborative science ideas

Project Summary: A shoreline road transects one section of the San Francisco Bay NERR within China Camp State Park. This road tidally floods several times annually and flooding events are expected to be more frequent and severe with sea level rise. The road limits marsh connectivity, but is important because it connects two communities, provides access to popular recreational areas, and is a critical emergency access corridor. Adapting this road for sea level rise resiliency, marsh ecological integrity, public use, and public safety is, therefore, of the utmost importance. Structurally failing culverts jeopardize road integrity and impair interior marsh functions. This end-user focused project brings together landowners and managers, key decision makers, public safety authorities, residents, and Park recreational users to initiate adaptation planning by developing and evaluating possible solutions and mapping the path to move forward. It builds directly on the successful October 2017 workshop (supported by a NERR capacity building grant) and will help implement NOAA evaluation recommendations for the reserve. We will collect, compile and analyze System-Wide Monitoring Program data in addition to other data; initiate a significant collaboration process utilizing best available science to engage end users and stakeholders to identify and evaluate adaptation options and strategies to move forward; and collaboratively develop and assess policy and management options based on synthesizing existing science.

Ecosystem Services

Feasibility Planning for Pacific Northwest Blue Carbon Finance Projects

Project Lead: Craig Cornu, Institute for Applied Ecology
Reserves: Padilla Bay (WA), South Slough (OR)
Budget Request: $249,956
RFP Objective: Amplify or enhance existing collaborative research efforts

Project Summary: In this project we will demonstrate the feasibility of connecting carbon finance to tidal wetland restoration projects in the Pacific Northwest. We will build on several recent and ongoing advances in blue carbon research: 1) new valuation methods for coastal wetland carbon under the Verified Carbon Standard; 2) findings from the Pacific North West blue carbon stock assessment and database project (NERRS Science Collaborative-funded); and 3) blue carbon feasibility assessments from the Snohomish Estuary (in 2014) and other U.S. and international projects. Our work will be conducted in the Snohomish, a site that is well positioned to be the region's first large scale blue carbon finance demonstration project, as well as Skagit and Coos estuaries, which are closely linked to the Padilla Bay and South Slough NERRs. The outcomes of this project include: 1) roadmaps for future carbon finance projects in three regional estuaries based on local lessons learned; 2) identification of

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emerging information gaps and approaches for filling those gaps; 3) assessments of projects' economic viability; and 4) engage coastal communities in blue carbon project development. This demonstration project will benefit end users such as The Climate Trust which use feasibility assessments to determine whether to expand investment to the blue carbon market sector beyond its work in other ecosystems.

Exploring Applications of Ecosystem Service Conceptual Models for Coastal Habitats

Project Lead: Lydia Olander, Duke University
Reserves: North Carolina (NC), Rookery Bay (FL)
Budget Request: $113,308
RFP Objective: Amplify or enhance existing collaborative research efforts

Project Summary: The Ecosystem Services Program at the Nicholas Institute for Environmental Policy Solutions has been working with NOAA and NERRS over the past year to find streamlined ways to incorporate ecosystem services into agency decision-making, research, and management. There has been a desire to better incorporate ecosystem services into NERRS management and stewardship both from the network as a whole (NERRS strategic plan), as well as at a local level (individual reserves and partners). This project will build on previous work that produced a generalized Ecosystem Services Conceptual Model and associated library of supporting evidence for salt marsh ecosystems. This model graphically displays the cascade of potential biophysical, ecological, ecosystem service, and social effects that restoring or protecting salt marsh habitat may have. Through collaborative workshops with NERRS staff, technical experts, and relevant local partners, the proposed project will develop new ecosystem-based generalized models and generate site-specific adaptations of these models. These workshops will also produce a set of socio-economic metrics (for the ecosystem service and social outcome model endpoints) to enable comparison of projects and inform future monitoring efforts. An ultimate goal of this work is to generate a set of common conceptual models for use within the NERRS. This would allow coastal managers to more easily identify and anticipate ecosystem service related outcomes of management interventions, provide an outreach tool to help stakeholders understand ecosystem services, and develop common ecosystem service metrics that would enable comparison across projects throughout the NERRS and beyond.

Marsh Resilience

Synthesizing NERR Sentinel Site Data to improve coastal wetland management across New England

Project Lead: David Burdick, University of New Hampshire
Reserves: Wells (ME), Great Bay (NH), Waquoit Bay (MA), Narragansett Bay (RI)
Budget Request: $105,298
RFP Objective: Conduct NERRS System Wide Monitoring Program (SWMP) syntheses for a regional and/or national application

Project Summary: This project plans to produce a synthesis of NERR Sentinel Site salt marsh data for the four New England region NERRs. These salt marsh Sentinel Sites have been monitored since 2011 (and some longer) to detect vegetation change; Although we have been witnessing marsh losses across the region, we have no synthesis of Sentinel Site data to inform management actions. Our University of New Hampshire/NERR team brought regional NERR and other agency staff together in January 2018 to establish need and benefits of understanding vegetation and elevation changes to help set priorities for marsh restoration, protection and provision for migration. Subsequent meetings will fine-tune approaches to ensure value for end users beyond the NERRs and share results and methodologies. This will be the first vegetation analysis for most NERRs and the first regional trend analyses of Sentinel Site vegetation and marsh surface elevation change in response to sea level rise. We will inform improvement of Sentinel Site protocols and also establish a prototype methodology for analysis of marsh condition. This project will build on existing collaborations in New England, catalyzing larger geographic scale analyses of data from Reserves nationally and other regional analyses for entities with similar data (e.g., US Fish and Wildlife Service, National Park Service).

Is Marsh Surface Tracking Sea Level Change? Developing Tools and Visualizations for NERRS Sentinel Site Data

Project Lead: Kim Cressman, Grand Bay NERR
Reserves: Grand Bay (MS), Chesapeake Bay (VA), Delaware (DE), Elkhorn Slough (CA), Mission-Aransas (TX), Padilla Bay (WA), South Slough (OR), Waquoit Bay (MA)
Budget Request: $112,857
RFP Objective: Conduct NERRS System Wide Monitoring Program (SWMP) syntheses for a regional and/or national application

Project Summary: Can marsh vegetation communities keep pace with sea level rise? To address this critical coastal management issue, the NERRS established a Sentinel Site Application Module of the System Wide Monitoring Program. A centerpiece is the use of Surface Elevation Tables (SETs) to precisely measure marsh surface elevation over time. Many reserves have been collecting these data for years, resulting in a need for both reserve-specific and system-wide data processing and analyses. This project will create standardized tools to quality-check SET data, perform trend analyses, and produce informative visualizations for varied audiences. A technical team, to include a statistician, will focus on creating quality-control and analysis tools, while an outreach team will craft visualizations for communication

products and educational curricula. In-person and webinar workshops will be held to train end-users on both technical and outreach tools. Participating reserves will receive site-specific trend analyses, visualizations, and a national synthesis of surface elevation change vs. sea level trends. This project will catalyze the use of Sentinel Site data by providing reserves the tools they need to analyze, understand, and communicate these important, underutilized datasets.

Mapping Terrestrial and Benthic Habitat Change to Address Mangrove and Seagrass Migration and Die-Off in Response to Recent and Long-Term Environmental Drivers

> *Project Lead:* Frank Muller-Karger, University of South Florida
> *Reserves:* Rookery Bay (FL)
> *Budget Request:* $185,348
> *RFP Objective:* Facilitate the development of *new* collaborative science ideas

Project Summary: Rookery Bay reserve staff have reported unsustainable death rates of seagrass and mangroves over the past decade. The goal of this project is to address the expressed need of the reserve staff to identify the location, extent, and severity of damage to terrestrial and underwater habitats throughout Rookery Bay. We will achieve our goals by pairing the habitat-mapping capabilities of the University of South Florida with the in-situ knowledge of reserve staff and partners, including Ten Thousand Islands National Wildlife Refuge end users. We will use very high-resolution satellite imagery, and advanced processing techniques to map habitats throughout the 110,000-acre reserve to a higher level of spatial detail than before for this area. Our new techniques allow this work to be completed much faster than traditional methods. Outputs will include habitat maps for the years 2010, 2016, 2017 and 2018 to quantify how habitats have changed from one year to the next and in response to disturbances like Hurricane Irma. This work will result in a better understanding of habitat degradation in the reserve with which to guide management action, and a collaborative relationship between Rookery Bay reserve and the University of South Florida. The strategy to obtain habitat maps can be applied to other reserves.

Oyster Management

Building a Coastwide Olympia Oyster Network to Improve Restoration Outcomes and Enhance Community Engagement

> *Project Lead:* Kerstin Wasson, Elkhorn Slough NERR
> *Reserves:* Elkhorn Slough (CA), Padilla Bay (WA), South Slough (OR), San Francisco Bay (CA), Tijuana River (CA)
> *Budget Request:* $250,000
> *RFP Objective:* Facilitate the development of *new* collaborative science ideas

Project Summary: The only oyster native to the North American West Coast, the Olympia oyster, has been the focus of far fewer scientific studies and restoration efforts than the eastern oyster. However, there are now over a dozen oyster restoration initiatives along the Pacific coast. We are building a coastwide network from Baja California to British Columbia to

integrate these efforts, with a highly engaged Steering Committee of 25 end users representing all major restoration projects. We will conduct the first synthesis of past restoration projects to share lessons learned and to identify the practices and environmental conditions that predict the best outcomes. We are particularly interested in the role of invasive species affecting native oyster restoration. We will develop an experimental design for a replicated restoration experiment aimed at optimizing native oyster dominance relative to non-native species, to be conducted at ten sites along 2500 km of coast, which will form the basis of a future collaborative research proposal. The public is largely unaware of Olympia oyster declines and potential ecosystem benefits of restoration, so we will catalog and create education and outreach materials that convey the value of resilient native oyster populations as an integral part of healthy coastal ecosystems.

Stakeholder-Driven Modeling Investigation of Factors Affecting Oyster Population Sustainability

Project Lead: J. Wilson White, Oregon State University
Reserves: Guana Tolomato Matanzas (FL)
Budget Request: $157,308
RFP Objective: Amplify or enhance existing collaborative research efforts

Project Summary: The oyster (*Crassostrea virginica*) is an important species in Florida estuaries because it provides important ecosystem services and supports local oyster fisheries. In the GTMNERR, local harvesters and scientists are concerned that harvest closures related to water quality are affecting oyster population sustainability by intensifying harvesting pressure in remaining open areas. However, there is also concern that other ecological factors (e.g., increasing salinity and predation) may have a greater effect than harvest on oyster population sustainability. These concerns have engendered a collective need by GTMNERR, state, and local end-users to conduct a collaborative, scientific modeling investigation to improve oyster population assessment and management. In this project, an existing mathematical model (developed with funding from Florida Department of Environmental Protection and the National Science Foundation) will be adapted to 1) investigate the relative influence of abiotic, biotic, and management (e.g., harvesting) factors on oyster population sustainability, and 2) identify variables that should be field-monitored to assess sustainability long term. The project will utilize existing oyster and water quality data from GTMNERR to parameterize the model. The project will also supplement existing collaborative funds (from NSF) to engage local stakeholders during model development and communicate project results.