National Estuarine Research Reserve System Science Collaborative

Project Descriptions: Catalyst, Research and Integrated Assessment Projects from 2015, 2016, 2017 & 2018

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2. Assessing ecological and physical performance of sustainable shoreline structures (PI: Stuart Findlay)
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12. Bringing together end users and stakeholders to identify and evaluate sea level rise adaptation options to solve road flooding in China Camp State Park (PI: Stuart Siegel)

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18. A multi-faceted collaborative approach toward managing stormwater impacts on NC reserves (PI: Rachel Noble)
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23. Evaluating the impact of hydrologic alterations on salt marsh sustainability in a changing climate (PI Rick Lathrop)
24. Mapping terrestrial and benthic habitat change to address mangrove and seagrass migration and die-off in response to recent and long-term environmental drivers (PI: Frank Muller Karger)

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25. Evaluation of Ecosystem Services Associated with Shellfish Culture Operations in Coastal Regions Served by the National Estuarine Research Reserve (PI: Beth Darrow)
26. Evaluating the effectiveness of different oyster aquaculture strategies for nitrogen loading remediation to inform end user decisions to restore water quality (PI: Dan Rogers)
27. Building a coastwide Olympia oyster network to improve restoration outcomes and enhance community engagement (PI: Kerstin Wasson)
28. Stakeholder-driven modeling investigation of factors affecting oyster population sustainability (PI: Will White)

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Living Shorelines

Title: Re-engineering living shorelines to halt erosion and restore coastal habitat functioning in high-energy environments

Team members:
Dr. Christine Angelini, University of Florida; Dr. Nikki Dix, Guana Tolomato Matanzas NERR; Tina Gordon, Guana Tolomato Matanzas NERR; Dr. Alex Sheremet, University of Florida; Dr. Scott Wasman, University of Florida; Dr. Raymond Grizzle, University of New Hampshire; Andrea Small, Northeast Florida Aquatic Preserves Manager & Guana Tolomato Matanzas NERR; Kenneth Rainer: Guana Tolomato Matanzas NERR; Dr. Tjeerd Bouma, NIOZ Royal Netherlands Institute for Sea Research and the University of Groningen; Dr. Tjisse van der Heide, Radboud University

Reserve(s): Guana Tolomato Matanzas NERR

Keywords: Living shorelines, habitat restoration, breaks

Project type: Collaborative research

Summary: In estuaries worldwide, loss of salt marshes and oyster reefs has been alarming, especially along high-energy coastlines. To dampen boat wake/ wave stress, mitigate erosion, and restore oysters, managers have been building living shorelines adjacent to salt marsh edges, efforts that, thus far, have been largely unsuccessful in achieving coastal management goals under the most destructive, high-energy conditions. This experimental study will utilize engineering and ecological approaches to optimize the design of living shorelines across an energy gradient in the Guana Tolomato Matanzas NERR. We will profile wave/wake forces and marsh erosion rates and will use these data to calculate the size and orientation of living shoreline structures needed to break waves/wakes across an energy gradient. In a large-scale field experiment, our team of engineers, ecologists, and end-users will test the efficacy of gabions positioned behind breaks - a new hybrid method for living shorelines - in dampening waves, slowing marsh erosion, and facilitating oysters. We will further refine the gabion-break design to optimize its ability to stabilize salt marshes and restore oysters at different wave/wake energy levels. This work will culminate in a training module for practitioners, a video manual, an interactive educational display and peer-reviewed publications.

Cohort: 2015

Title: Assessing ecological and physical performance of sustainable shoreline structures

Team members: Stuart E.G. Findlay, Cary Institute of Ecosystem Studies; Ona Ferguson, Consensus Building Institute, Inc.; Jon K. Miller, Stevens Institute of Technology

Reserve(s): Hudson River NERR

Keywords: Sustainable shorelines, coastal resiliency, rapid assessment

Project type: Collaborative research

Summary: Efforts to enhance and protect coastal shorelines have the potential to provide physical protection from storm events and improved ecological performance. Despite widespread interest and support for using sustainable shoreline stabilization structures, there is no documented guidance for evaluating their performance and stability. End users have repeatedly indicated that that local demonstration of novel shoreline treatments is the key to buy-in by property owners, consulting engineers and regulators. This project will build on previous collaborative efforts to better understand the role of sustainable shorelines in enhancing coastal resiliency to threats such as major storm events and sea level rise. Guided by a diverse and engaged advisory team of end users, the project team will develop field-validated rapid assessment protocols for evaluating the physical and ecological functions of soft shorelines and train local managers in the use of these protocols. The protocols will be simple enough for future application by land-managers and have the credibility gained from direct validation. Local landowners and managers will be trained in these techniques so they may track how well their shoreline is performing physically and ecologically. The validated protocols will address the need for an affordable, implementable protocol for agencies and organizations with limited resources.

Cohort: 2015

Title: Evaluating living shorelines to inform regulatory decision-making in South Carolina

Team members:

Denise Sanger, ACE Basin NERR, SC Department of Natural Resources, Marine Resources Research Institute; Erik Smith, North Inlet-Winyah Bay NERR, University of South Carolina; Peter Kingsley-Smith, SC Department of Natural Resources, Marine Resources Research Institute; Blaik Keppler, SC Department of Natural Resources, ACE Basin NERR; Matt Slagel, SC Department of Health and Environmental Control

Reserve(s): ACE Basin NERR, North Inlet–Winyah Bay NERR

Keywords: Living shorelines, oyster-reefs, policy, erosion control

Project type: Collaborative research

Summary: Living shorelines show great promise in coastal South Carolina as a tool to control erosion, increase habitat, and protect coastal areas from hazards both short-term (e.g., storms) and long-term (e.g., sea level rise). The SC Department of Natural Resources and ACE Basin NERR have constructed oyster-reef based living shorelines on public land for 15 years and private property owners are also showing interest in using living shorelines to prevent erosion. Current South Carolina permitting processes, however, do not address this emerging strategy and serves as a barrier for private property owners wishing to pursue this approach. In response to the state's desire to develop a comprehensive, science-based regulatory process to address the design and permitting of living shorelines, this research will comprehensively analyze the suite of living shoreline possibilities specifically suited to South Carolina and their performance under varying physical and environmental conditions. Using a stakeholder-driven process, case study assessments, experimental research sites and monitoring will generate the information needed by the state to develop state-wide living shoreline policy. Ultimately, this project will help to remove a critical barrier to living shoreline implementation.

Cohort: 2015

Title: End-user derived research to improve the effectiveness, sustainability, and prevalence of coastal restoration projects

Team members:
Eric Sparks, Mississippi State University & Mississippi-Alabama Sea Grant; Just Cebrian, Dauphin Island Sea Lab & University of South Alabama; Mike Shelton, Weeks Bay NERR; Judy Haner, The Nature Conservancy; Renee Collini, Mobile Bay National Estuary Program, Dauphin Island Sea Lab, & Mississippi-Alabama Sea Grant; Eric Brunden, Weeks Bay NERR; Scott Phipps, Weeks Bay NERR; L.G. Adams, Weeks Bay NERR

Reserve(s): Weeks Bay NERR

Keywords: Cost-effectiveness; breakwater; marsh; ecosystem service; resiliency

Project type: Collaborative research

Summary: To restore the ecosystem services lost through coastal habitat degradation, restoration projects have been conducted. Limited monitoring and evaluation prevents comparisons across designs to determine which are the most functional, sustainable, and cost-effective. The combination of limited comparisons across restoration designs and the sparse information on how to conduct restoration projects significantly hinders the implementation of projects. We are collaborating with a team of researchers, environmental managers, stakeholders, and end-users to address some of these issues with restoration projects. For this project, we will quantify the functionality, sustainability, and cost-effectiveness of several coastal restoration designs at the Weeks Bay National Estuarine Research Reserve. The designs will compare nursery grown marsh plants with transplanted natural marsh sods both with and without offshore breakwaters. Additionally, these combinations of restoration designs will be evaluated for potential effects of sea-level rise. Information gained from this research and the regulatory knowledge of our collaborative team will be combined with pre-existing literature to create user-friendly outreach materials that will be distributed through manuals, workshops, and meetings to private property owners, contractors, and agencies. The research and outreach associated with this project will improve the effectiveness and ease of implementation of coastal restoration projects.

Cohort: 2015

Marsh Resilience

Title: Synthesizing NERR Sentinel Site data to improve coastal wetland management across New England

Team members:
David Burdick, Jackson Estuarine Laboratory, University of New Hampshire; Jason Goldstein, Wells NERR; Christine Feurt, Wells NERR; Megan Tyrell, Waquoit Bay NERR; Kenny Raposa, Narragansett Bay NERR; Chris Peter, Jackson Estuarine Laboratory, University of New Hampshire; Bob Stankelis, Narragansett Bay NERR

Reserve(s): Wells NERR, Great Bay NERR, Waquoit Bay NERR, Narragansett Bay NERR

Keywords: Marsh resilience, sea level rise, vegetation change

Project type: Catalyst

Summary: Sea level rise and climate change present major threats to salt marshes nationwide. In an effort to better track and understand their impacts on marsh vegetation and sediment accretion, the National Estuarine Research Reserve System has established Sentinel Sites at reserves around the country. However, most reserves have not yet analyzed their Sentinel Site data, and there has been no attempt to conduct regional syntheses, despite the fact that regional-scale processes can strongly influence marsh vulnerability to sea level rise.

This project is synthesizing Sentinel Site data for four New England reserves (Great Bay, Narragansett, Waquoit Bay, and Wells), which have individually been monitoring salt marsh vegetation and elevation changes since at least 2011. Using Sentinel Site data sets, the team will develop statistics-ready data packages linking vegetation change with surface elevation and other data, including output from an inundation tool. The New England reserves and coastal managers will be equipped with new information that can inform and improve the management, protection, and restoration of salt marshes. The project will also improve Sentinel Site protocols and establish a methodology for analysis of marsh condition that can be utilized by other reserves and coastal managers nationwide.

Cohort: 2018

Title: Is marsh surface tracking sea level change? Developing tools and visualizations for NERRS Sentinel Site Data

Team members:
Kimberly Cressman, Grand Bay NERR; Margo Posten, Grand Bay NERR; Kristin Evans, Mission-Aransas NERR; Suzanne Shull, Padilla Bay NERR; Jenni Schmitt, South Slough NERR; Kari St. Laurent, Delaware NERR; Megan Tyrrell, Waquoit Bay NERR; Kacey Williams, MDMR

Reserve(s): Grand Bay NERR, Chesapeake Bay VA NERR, Delaware NERR, Elkhorn Slough NERR, Mission-Aransas NERR, Padilla Bay NERR, South Slough NERR, Waquoit Bay NERR

Keywords: Sea level rise, coastal resilience, marsh resilience

Project type: Catalyst

Summary: Coastal marshes provide a range of valuable ecosystem services, including buffering coastlines from storms, improving water quality, and providing habitat to a wide range of organisms. However, marshes are increasingly under threat from sea level rise, and coastal managers are struggling to understand if different marsh plant communities can keep pace, or are likely to drown with the rising seas.

To better understand the local impacts of climate change, the National Estuarine Research Reserve System expanded their long term monitoring efforts to include a Sentinel Site Application Module. A centerpiece of the Sentinel Site program is the use of highly specialized equipment—called Surface Elevation Tables, or SETs—to precisely measure and track changes to the marsh surface height over time. However, handling, analyzing, and interpreting Surface Elevation Table data is challenging and requires skills and statistical techniques that have not been standardized.

The reserve system has identified a need to increase its collective capacity to process and synthesize Surface Elevation Table data and to create visualizations and educational tools for scientists, managers, and the public. This project addresses these needs by developing standardized tools to quality-check Surface Elevation Table data, perform trend analyses, and generate informative visualizations for a variety of technical and non-technical audiences.

Cohort: 2018

Title: Thin-layer sediment placement: evaluating an adaptation strategy to enhance coastal marsh resilience across the NERRS

Team members:
Dr. Kenny Raposa, Narragansett Bay National Estuarine Research Reserve; Jennifer West, Narragansett Bay NERR; Dr. Kerstin Wasson, Elkhorn Slough NERR; Andrea Woolfolk, Elkhorn Slough NERR; Charlie Endris, Elkhorn Slough NERR; Monique Fountain, Elkhorn Slough NERR; Rachel Stevens, Great Bay NERR; Dr. Gregg Moore, University of New Hampshire; Dr. Megan Tyrell, Waquoit Bay NERR; Dr. Jenny Allen, Chesapeake Bay Maryland NERR; Scott Lerberg, Chesapeake Bay NERR; Dr. Brandon Puckett, North Caroline NERR; Dr. Matt Ferner, San Francisco Bay NERR; Dr. Elizabeth Watson, Drexel University; Dr. Joanna Nelson, LandSea Science; Dolores Leonard, Roca Communications+, LLC

Reserve(s): Great Bay NERR, Waquoit Bay NERR, Narragansett Bay NERR, Chesapeake Bay (MD) NERR, Chesapeake Bay (VA) NERR, North Carolina NERR, San Francisco Bay NERR, Elkhorn Slough NERR

Keywords: Sea level rise, thin-layer sediment placement, marsh restoration

Project type: Collaborative research

Summary: Tidal marshes provide key ecosystem services, but are threatened by sea level rise. Narragansett Bay and Elkhorn Slough NERRs recently led a project to assess marsh resilience to sea level rise across 16 NERR sites, resulting in a scientific publication, user-friendly summary, and do-it-yourself tool. Now we are moving beyond studying resilience to actively testing strategies to enhance it.

We will conduct replicated restoration experiments examining the effectiveness of thin-layer sediment placement as a climate adaptation strategy at eight NERR sites across the nation. Novel aspects of our project include the broad distribution of sites, the examination of effectiveness at different marsh elevations, a standardized monitoring protocol, and the incorporation of biochar to improve soils and plant health.

Beneficial use of dredged sediment to enhance coastal resilience is a concept that resonates in many coastal states, and we have already interviewed 32 and surveyed 86 end users in funding, permitting, implementation or monitoring of thin-layer sediment projects. Our project will address the needs they identified, including a vetted monitoring protocol to assess restoration success, a synopsis of permitting issues, and an evaluation of effectiveness of different treatments detailed in a technical report and summarized in a brochure and webinar.

Cohort: 2017

Title: Assessing and enhancing the value of coastal marshes for protecting coastal communities from storm surge and flooding in a changing climate

Team members:
Dr. Y. Peter Sheng, University of Florida; Christine Angelini, University of Florida; Betsy Blair, Hudson River NERR; Bennett Brooks, Consensus Building Institute; Ronald Busciolano, USGS New York Service Center; Justin Davis, University of Florida; Timothy Hall, NASA Goddard Institute of Space Sciences; Emilie Hauser, Hudson River NERR; Klaus Jacob, Piermont Waterfront Resilience Commission; David Letson, University of Miami; Edwin McGowan, Palisades Interstate Park Commission; Vladimir Paramygin, University of Florida

Reserve(s): Hudson River NERR

Keywords: Community resilience, coastal marsh, flood and wave buffering capacity, future climate, marsh management

Project type: Collaborative research

Summary: Coastal communities are striving to safeguard themselves from increasing storm risks. One approach is to restore and manage natural features, including coastal wetlands such as Piermont Marsh in New York. Residents believe Piermont Marsh significantly reduced wave, flood, and debris impingement on the abutting Village of Piermont during Hurricane Sandy. Marsh managers and Village leaders seek to understand the marsh's flood and wave buffering capacity, and the associated economic values, to inform marsh management and community resilience-building decisions. We will design state-of-the-art, predictive models of climate, coastal, and ecological processes that will evaluate alternative marsh management scenarios. To ensure our work is informed by and useful to the Village and creates products tailored to local needs, our project team includes a local leader in resilience planning. We also propose to hold regular briefings with the Piermont Waterfront Resilience Commission to sustain end-users-researcher communication. Broader community-wide outreach will be shaped in cooperation with local leaders. Key outputs include an assessment of marsh flood buffering capacity under different management scenarios and future conditions, and an economic valuation of this service. Primary outcomes are better-informed management decisions, increased understanding of coastal wetlands' role in enhancing community resilience, and transferrable approach and model products.

Cohort: 2016

Climate Adaptation

Title: Enhancing coastal resilience decision-support tools to reflect latest local, applied science

Team members:
Lisa Auermuller, Jacques Cousteau National Estuarine Research Reserve; Marjorie Kaplan, Rutgers Climate Institute; Richard Lathrop, Rutgers Center for Remote Sensing and Spatial Analysis; Robert Kopp, Rutgers Institute of Earth, Ocean, & Atmospheric Sciences; Jeanne Herb, Rutgers Bloustein School of Planning and Public Policy; Jennifer Whytlaw, Rutgers Bloustein School of Planning and Public Policy; Lucas Marxen, Rutgers Office of Research Analytics

Reserve(s): Jacques Cousteau NERR

Keywords: Coastal resilience, decision tools

Project type: Catalyst

Summary: Since Hurricane Sandy battered the New Jersey coastline in 2012, coastal decision makers have been inundated with data, tools, assessment techniques, and planning guidance to help them prepare communities to face future extreme storm events. Concurrently, the New Jersey Climate Adaptation Alliance, a network of policymakers, practitioners, academics, non-governmental organizations, and business leaders designed to build climate change preparedness in New Jersey, requested that Rutgers University convene a panel to identify planning options that coastal managers can use as part of resilience efforts. The panel suggested a framework for communities to apply a "total water level approach," reflecting user-defined combinations of sea level rise and flood conditions and providing communities with additional flexibility to evaluate a range of flood conditions and time horizons for planning.

In this project, Jacques Cousteau National Estuarine Research Reserve and Rutgers University, who have collaborated for more than a decade to develop coastal resilience tools, are working together to both streamline the resilience data, tools, and techniques used by coastal decision makers and operationalize the total water level approach. By streamlining and enhancing existing mapping and decision-support tools, this project will increase the capacity of New Jersey's coastal decision makers to assess and plan for potential risks to people and property from future storms and related flooding.

Cohort: 2018

Title: Facilitation tools, techniques, and tactics: Advancing local adaptation and evaluation dialogues throughout the NERRS

Team Members:
Danielle Boudreau, Tijuana River National Estuarine Research Reserve; Kristen Goodrich, Tijuana River NERR; Susanne Moser, Susanne Moser Research & Consulting; Syverine Bentz, Kachemak Bay NERR; Lisa Auermuller, Jacques Cousteau NERR; Christine Feurt, Wells NERR; Annie Cox, Wells NERR

Reserve(s): Tijuana River NERR, Kachemak Bay NERR, Jacques Cousteau NERR, Wells NERR

Keywords: Climate adaptation, decision tools

Project type: Catalyst

Summary: The *Successful Adaptation Indicators and Metrics* (SAIM) project 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 *SAIM 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 SAIM workshops available to the full NERRS Coastal Training Program (CTP) network, and key regional and national NERRS partners. There has been widespread interest among the CTPs not involved in SAIM to learn from the experiences of the SAIM 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.

Cohort: 2018

Title: Catalyzing a deeper understanding of the effects of storm surge barriers on the Hudson River estuary

Team members:
Philip Orton, Stevens Institute of Technology; Bennett Brooks, Consensus Building Institute; Kristin Marcell, New York State Department of Environmental Conservation; Sarah Fernald, NOAA Hudson River National Estuarine Research Reserve; Barbara Dehaven, Stevens Institute of Technology

Reserve(s): Hudson River NERR

Keywords: Storm surge, coastal resilience

Project type: Catalyst

Summary: Coastal cities around the country are exploring structural engineering options for defending against extreme storms and the resulting surges of ocean water that cause massive flooding. Storm surge barriers or tide gates can effectively protect harbors and minimize flooding, property damage, and loss of life during large storms. These barriers typically span the opening to a harbor or river mouth and include gates that are only closed when storm surges are expected. However, even when gates are open, the barriers reduce water flow and tidal exchange, which in turn affects water quality and ecological processes. Scientists and engineers are increasingly recognizing the need for broad research initiatives to more fully explore the advantages and disadvantages of large surge barriers.

One such initiative is currently underway in the New York metropolitan area, an area with highly valuable and vulnerable coastal infrastructure. The U.S. Army Corps of Engineers, states of New York and New Jersey, and New York City have partnered to conduct the Harbor and Tributaries Focus Area Feasibility Study to evaluate barriers and other options to manage coastal storm risks. Since a surge barrier could have significant impacts on the Hudson River and surrounding estuary ecosystem, the Hudson River Research Reserve and partners formed a Barrier Benefits and Impacts Workgroup in December 2017, with the goal of helping to review and supplement the Army Corps' feasibility study and Environmental Impact Assessment. This project extends the existing workgroup's effort and facilitates the development of a collaborative research agenda to address current information needs.

Cohort: 2018

Title: Bringing together end users and stakeholders to identify and evaluate sea level rise adaptation options to solve road flooding in China Camp State Park

Team members:
Stuart Siegel, San Francisco Bay NERR; Aimee Good, San Francisco Bay NERR; Michael Vasey, San Francisco Bay NERR; Matt Ferner, San Francisco Bay NERR; Sarah Ferner, San Francisco Bay NERR; Bree Hardcastle, California Department of Parks and Recreation; Damon Connolly, Marin County Board of Supervisors; Roger Leventhal, Marin County Department of Public Works; Dave Ceppos, Center for Collaborative Policy; Anna Deck, San Francisco Bay NERR; Susan Pelton, San Francisco State University

Reserve(s): San Francisco NERR

Keywords: Storm surge, coastal resilience, sea level rise, infrastructure

Project type: Catalyst

Summary: Rising seas and coastal flooding are threatening low-lying roads, homes, and other coastal infrastructure around the country. Coastal communities are struggling to come together and find creative solutions for dealing with transportation infrastructure that is repeatedly damaged or impassable due to storms and tidal flooding. This project addresses one specific example of this complex problem—a shoreline road that bisects the San Francisco Bay National Estuarine Research Reserve's China Camp State Park. The shoreline section of North San Pedro Road is an important transportation corridor, serving as the only entry point to a popular state park, an alternate route for commuters during heavy traffic, and a critical evacuation route for local communities.

This project brings together key stakeholders and decision makers to initiate adaptation planning from the bottom-up. The project approach involves a mix of targeted data collection, technical analyses and syntheses, and well planned and facilitated stakeholder meetings to identify, evaluate, and compare road reconfiguration options. The project will pave the way for implementing an adaptation solution at China Camp and potentially serve as a model for other communities facing similar problems nationwide

Cohort: 2018

Ecosystem Services

Title: Enhancing coastal zone public policy, management, and research through end user-driven quantification and public dissemination of carbon stocks data for Pacific Northwest tidal wetlands

Team members:
Craig Cornu, Institute for Applied Ecology; Jude Apple, Padilla Bay NERR; Dr. Bree Yednock, South Slough NERR; Cathy Angell, Padilla Bay NERR; John Bragg, South Slough NERR; Dr. J. Boone Kauffman, Oregon State University, Dr. Christopher Janousek, Oregon State University; Laura Brophy, Institute for Applied Ecology; Dr. Heida Diefenderfer, Pacific Northwest National Laboratory; Dr. Ronald Thom, Pacific Northwest National Laboratory; Michael Ewald, GeomaticsResearch LLC; Dr. Steve Crooks, Silvestrum Climate Associates LLC; Steve Emmett-Mattox, Restore America's Estuaries

Reserve(s): Padilla Bay NERR, South Slough NERR

Keywords: Blue carbon, carbon stocks, tidal wetlands, blue carbon working group

Project type: Collaborative research

Summary: The Pacific Northwest (PNW) Blue Carbon Working Group formed in 2014 to address gaps in regional blue carbon science. Our project includes three objectives: 1) engage end users to provide blue carbon information for policy and management; 2) develop a regional blue carbon database; 3) conduct research to determine blue carbon stocks in major PNW coastal wetland habitats. Our research will comprise the first comprehensive blue carbon assessment in PNW tidal wetlands, driven by four questions: 1) What is the range and variability of carbon stocks of intact tidal wetlands?, 2) How do carbon stocks of converted coastal wetlands (e.g., pastures) compare with least disturbed habitats?, 3) What are the potential greenhouse gas emissions that could arise from tidal wetland loss?, and 4) How do PNW carbon stocks compare with carbon pools in other North American wetlands? We will generate a user-friendly database that compiles regional blue carbon data to support end user use of blue carbon data. Input from end users will guide the design, scope, outputs and outcomes of the project. This project will contribute to national and international efforts to incorporate blue carbon science into coastal management and climate change mitigation and adaptation.

Cohort: 2016

Title: Feasibility planning for Pacific Northwest blue carbon finance projects

Team members:
Craig Cornu, Institute for Applied Ecology; Dr. Steve Crooks, Silvestrum Climate Associates LLC; Scott Settelmyer, Terracarbon LLC; Steve Emmett-Mattox, Silvestrum Climate Associates LLC; Sean Penrith, The Climate Trust; Dr. Jude Apple, Padilla Bay NERR; Dr. Bree Yednock, South Slough NERR; Cathy Angell, Padilla Bay NERR; John Bragg, South Slough NERR; David Antonioli, Verified Carbon Standard; Jeff Gaeckle, WA Department of Natural Resources; Kirsten Feifel, WA Department of Natural Resources; Marisa de Belloy, Cool Effect; Stefanie Simpson, Restore America's Estuaries; Amy Schmid, Verified Carbon Standard; Dr. Jenny Liu, Portland State University; Shawn McMahon, Environmental Services Inc; Dr. John Rybczyk, Western Washington University; Katrina Poppe, Western Washington University; Amber Moore, Puget Sound Partnership; Dr. Christopher Janousek, Oregon State University; Laura Brophy, Institute for Applied Ecology

Reserve(s): Padilla Bay NERR, South Slough NERR

Keywords: Blue carbon, carbon finance, Pacific Northwest, tidal wetlands

Project type: Catalyst

Summary: In this project, we will demonstrate the feasibility of connecting carbon finance to tidal wetland restoration projects in the Pacific Northwest (PNW). We build on several recent and ongoing advances in blue carbon (BC) research: 1) new valuation methods for coastal wetland carbon under the Verified Carbon Standard; 2) findings from the PNW BC stock assessment and database project (NERRS Science Collaborative-funded); and 3) BC feasibility assessments from the Snohomish Estuary (2014) and other U.S. and international projects. Our work will be conducted in the Snohomish (well positioned to be the region's first large scale BC finance demonstration project), Skagit and Coos estuaries, the latter two sites 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 emerging information gaps and approaches for filling those gaps; 3) assessments of projects' economic viability; and 4) engaged coastal communities in BC 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 BC market sector beyond its work in other ecosystems.

Cohort: 2018

Title: Exploring applications of ecosystem service conceptual models for coastal habitats

Team members:
Lydia Olander, Duke University; Sara Mason, Duke University; Brandon Puckett, North Carolina NERR; Brita Jessen, Rookery Bay NERR

Reserve(s): North Carolina NERR, Rookery Bay NERR

Keywords: Ecosystem services

Project type: Catalyst

Summary: Researchers at Duke University have been working with the National Oceanic and Atmospheric Administration and the reserve system to find streamlined ways to incorporate ecosystem services into coastal decision making, management, and research. Their first year of work resulted in the creation of a generalized Ecosystem Services Conceptual Model (ESCM) for salt marsh ecosystems, which displays how salt marsh restoration interventions result in ecosystem services and other human welfare impacts. These models represent a promising entry point for incorporating ecosystem service considerations into a program or a project.

This project is expanding on that modeling approach by improving the existing salt marsh model and developing new models for other estuarine habitats. The project team is developing site-specific ecosystem conceptual models at a salt marsh and oyster reef site at the North Carolina Reserve, and at a mangrove site at the Rookery Bay Reserve. These site-specific models will be used to improve and/or develop generalized ecosystem services models for each habitat type. This project is linked to a related project, Gulf of Mexico Ecosystem Service Logic Models and Socio-Economic Indicators (GEMS), which is using a similar approach by creating Ecosystem Services Conceptual Models to develop socio-economic indicators for restoration projects in the Gulf of Mexico. Feedback and integration between these two projects can enhance the outputs and findings of both. These efforts can ultimately assist in the development of a standardized approach for consideration of ecosystem services within NOAA and the research reserve system.

Cohort: 2018

Title: Expanding blue carbon implementation: Increasing greenhouse gas model application in tidally restricted and restored salt marshes

Team members:
Jim Rassman, Waquoit Bay NERR; Tonna-Marie Surgeon-Rogers, Waquoit Bay NERR; Jianwu Tang, Marine Biological Laboratory; Omar I. Abdul-Aziz, Florida International University; Serena Moseman-Valtierra, University of Rhode Island; Kevin Kroeger, US Geological Society; Tim Smith, Cape Cod National Seashore; Stephen Emmett-Mattox, Restore America's Estuaries; Joan Muller, Waquoit Bay NERR; Rebecca Roth, NERRA

Reserve(s): Waquoit Bay NERR

Keywords: Blue Carbon, carbon sequestration, greenhouse gas exchange model

Project type: Collaborative research

Summary: Blue carbon storage –carbon sequestration in wetlands –can help coastal managers and policymakers achieve broader wetlands management, restoration, and conservation goals by, among other ways, securing payment for carbon credits. While end users are becoming more interested in the blue carbon opportunities that carbon markets present, they are limited by their concerns about the transaction costs associated with bringing wetlands restoration projects to market. The use of models and readily available data such as temperature, vegetation type, and salinity has been identified by end users as ways to greatly reduce these transaction costs. The Waquoit Bay NERR is working with end users to enhance the applicability of an existing model to accurately predict the complex process of greenhouse gas exchange across a wide range of coastal wetlands using a small number of readily accessible environmental and ecological variables. The team will also explore the blue carbon-related information needs of end users and deliver resources to address those needs, including a case example of a feasibility analysis to seek carbon credits from a restoration project, teacher and decision-maker tools and education programs to build understanding of blue carbon, and capacity to integrate blue carbon considerations into restoration and management decisions.

Cohort: 2015

Water Quality & Sediment Dynamics

Title: Quantifying wetland contributions to reducing nutrient loading to Lake Erie

Team members:
Dr. Kristi Arend, Old Woman Creek NERR; Emily Kuzmick, Old Woman Creek NERR; Dr. Song S. Qian, University of Toledo; Dr. Kurt Kowalski, USGS Great Lakes Science Center; Dr. Ryan Winston, The Ohio State University; Matt Kovach, Ohio Chapter of The Nature Conservancy; Lynn Garrity, OH Department of Natural Resources Office of Coastal Management; Frank Lopez, Old Woman Creek NERR; Breann Hohman, Erie Soil and Water Conservation District; Aaron Klein, City of Sandusky, OH

Reserve(s): Old Woman Creek NERR

Keywords: Coastal wetlands, nutrients, modeling

Project type: Collaborative research

Summary: In 2015, Canada and the United States agreed to reduce phosphorus loading to Lake Erie's western and central basins by 40% in response to the effects of Lake Erie re-eutrophication (Great Lakes Water Quality Agreement Annex 4, Section B). Coastal wetland restoration has been identified as a management tool for reducing nutrient loading to the lake, and is central to nutrient reduction plans for Sandusky Bay. However, quantitative estimates of the extent to which these wetlands retain nutrients are generally lacking. Land managers, regulators, and conservation organizations recognize a need to better understand the contribution that wetlands provide in nutrient loading reduction in order to guide effective restoration and management. This project will address this need by: (1) quantifying the capacity for Lake Erie coastal wetlands to retain nutrients (i.e., nutrient assimilative capacity); and (2) assessing the application of the modeling framework to short-term nutrient data across different wetland types. Products will include: (1) nutrient retention capacity estimates for coastal Great Lakes and constructed wetlands; (2) evaluation of a modeling approach to estimate retention using shorter term data; and (3) practitioner tools including a monitoring protocol and Excel statistical model interface to quantify wetland nutrient assimilation.

Cohort: 2017

Title: Multi-faceted collaborative research to manage stormwater impacts on coastal reserves

Team members:
Rachel Noble, UNC Chapel Hill Institute of Marine Sciences; Michael F. Piehler, UNC Chapel Hill Institute of Marine Sciences

Reserve(s): North Carolina NERR

Keywords: Stormwater, fecal indicator bacteria, nutrients, water quality, microbial source tracking

Project type: Collaborative research

Summary: Stormwater outfalls that discharge into coastal waters have detrimental impacts on human and ecosystem health worldwide. Elevated levels of pathogenic bacteria, viruses, nutrients, sediment, and turbidity lead to swimming closures, illness, and negative impacts on estuarine ecosystems. The Rachel Carson Reserve (RCR), a component of the North Carolina (NC) National Estuarine Research Reserve (NCNERR), includes a series of islands and surrounding waters proximal to the Town of Beaufort (ToB), NC, an historic coastal town experiencing rapidly increasing development, and lagging stormwater and wastewater infrastructure. This project will conduct applied research using a multi-faceted approach to 1) quantify stormwater pathogenic bacteria, nutrient and sediment delivery to the RCR, 2) use the quantitative information generated, along with decades of historical data, to create predictive models for shellfish and recreational waters for the NCNERR, 3) use Collaborative Learning methodology to engage stakeholders and end-users to prioritize candidate remediation strategies, applicable to this and other reserves, and (4) engage coastal decision-makers, community members, K-12 students, and teachers in hands-on education on stormwater runoff and impacts. Preliminary data collected as part of this project will be presented, as well as initial lesson plans targeting North Carolina middle school student science standards.

Cohort: 2016

Title: Quantifying effects of dam removal on sediment transport and wetland sustainability in the Hudson River estuary

Team members:
David Ralston, Woods Hole Oceanographic Institution; Jon Woodruff, University of Massachusetts; Brian Yellen, University of Massachusetts; Ona Ferguson, Consensus Building Institute, Inc.; Sarah Fernald, Hudson River NERR

Reserve(s): Hudson River NERR

Keywords: Sediment supply, dam removal, watershed sediment yield, estuarine sediment transport

Project type: Collaborative research

Summary: Hundreds of dams built on tributaries of the Hudson River estuary have altered the hydrographic and sediment transport regime of the system. Natural resource managers are now interested in removing some of the dams to improve connectivity of aquatic habitats, restore anadromous fish spawning, and reduce risks of dam failures. A priority management need of the Hudson River NERR is to improve the scientific understanding of the impacts that dam removals have on sediment transport and downstream tidal wetlands, including how this might change under future climate conditions. This project will address needs identified by managers and regulators to assess immediate impacts of sediment release due to dam removals as well as longer term alterations to the estuarine sediment transport regime of many dam removals. The approach combines field observations using sediment cores from dam impoundments and tidal wetlands with analysis of estuarine sediment transport under altered sediment supply regimes using a proven hydrodynamic model. A collaborative process is planned to engage end users to ensure utility of project outputs, including development of watershed assessment tools for permitting dam removals and an improved scientific basis for incorporating potential downstream benefits of sediment supply to tidal wetlands into the regulatory process.

Cohort: 2016

Title: Improved understanding of sediment dynamics and direct management applications for the South Slough National Estuarine Research Reserve and the greater Coos Bay Estuary

Team members:
David A. Sutherland, University of Oregon; David K. Ralston, Woods Hole Oceanographic Institution; Peter Ruggiero, Oregon State University; Freelin Reasor, Coos Watershed Association

Reserve(s): South Slough NERR

Keywords: Sediment transport, estuarine management, estuarine circulation, dredging, Pacific Northwest

Project type: Collaborative research

Summary: The Coos Bay estuary has a diverse set of end users who share a common need to better understand circulation and sediment transport under current and future conditions. The estuary is one of three Oregon estuaries designated as “deep draft development”, meaning that planners must balance industry, restoration, and natural resource goals. Our primary research objectives are to fill data gaps that are critical to addressing these myriad management needs, including characterizing the present-day sediment distribution, monitoring sediment fluxes to the estuary, and modeling how circulation and sediment in the estuary will respond to perturbations due to both natural and human-induced causes, such as dredging or inundation due to sea level rise. The proposed research has direct application to management objectives identified by the South Sough NERR (SSNERR), and the broader needs of identified end-users, who include SSNERR, Coos County, Oregon Department of Fish and Wildlife, Oregon Department of Environmental Quality, and the Oregon Institute of Marine Biology. We plan to actively engage these end users during the project to reach agreed upon outcomes, such as updating the estuarine management plan, improving the success of oyster restoration projects, informing fisheries habitat maps, and increasing data efficiency amongst community stakeholders.

Cohort: 2016

Marsh Ecology

Title: Investigating the interconnectedness of climate change, nuisance mosquito populations, and long-term resilience of coastal salt marsh systems

Team members:
Richard G. Lathrop, Jr., Rutgers University; Michael J. Kennish, Rutgers University; Lisa Auermuller, Jacques Cousteau NERR

Reserve(s): Jacques Cousteau NERR

Keywords: Sea level rise, mosquito breeding habitat, thin-layer dredge spoil application, marsh restoration

Project type: Collaborative research

Summary: The Jacques Cousteau National Estuarine Research Reserve recently convened a roundtable of mosquito control agencies to examine the intersection between sea level rise, salt marsh structure, habitat modification/ restoration, and nuisance mosquito populations which can pose serious health risks to humans, livestock, and pets. Chief concerns are how climate change and sea level rise may affect marsh habitats and consequent mosquito production but also how past physical alterations to reduce mosquito habitat affect the ability of salt marshes to maintain their relative elevation position and thereby their long term resiliency in the face of sea level rise. Recognizing the valuable role that salt marshes play in buffering coastal communities, coastal decision-makers are increasingly advocating for the restoration of salt marshes. While the thin-layer application of sediment/dredge spoil as a means of supplementing vertical accretion processes is receiving widespread interest, it could also affect mosquito production. The inter-connection between thin-layer and other marsh restoration as well as mosquito habitat modification and population control techniques will be examined. Using an adapted mediated modeling collaborative approach, mosquito control agencies and other land management partners (ends users) will aid in the design and implementation of a research program to inform management actions, plans and strategies.

Cohort: 2016

Title: Mapping terrestrial and benthic habitat change to address mangrove and seagrass migration and die-off in response to recent and long-term environmental drivers

Team members:
Frank Muller-Karger, University of South Florida; Matthew McCarthy, University of South Florida; Tylar Murray, University of South Florida; Brita Jessen, Rookery Bay NERR; Jill Schmid, University of South Florida; Jessica McIntosh, University of South Florida; Keith Anderson, University of South Florida

Reserve(s): Rookery Bay NERR

Keywords: Sea level rise, vegetation change, habitat resilience

Project type: Catalyst

Summary: In recent years, seagrass and mangrove deaths have accelerated in the Rookery Bay National Estuarine Research Reserve and other parts of southern Florida. Sea level rise, climate change, and severe weather (such as hurricanes) place significant stress on these habitats, which are already under pressure from urban development, road construction, boating, and pollution. The loss of these habitats poses a threat to the local economy, as they support the tourism and fishing industries, which drive economic development in local communities. In order to mitigate and reverse the damage to these habitats, Rookery Bay reserve staff are looking for new ways to measure which pressure has the most impact and determine the location and extent of damages.

In this project, staff from Rookery Bay Reserve are partnering with researchers at the University of South Florida College of Marine Science to study the degradation of underwater habitats and coastal wetlands. Using commercial satellite images from ultra-high resolution cameras in space, laser topography maps collected from specialized aircraft (LIDAR data), and advanced high-speed computation, the team is updating existing habitat maps for the 110,000-acre reserve and creating new habitat maps. These maps will allow reserve staff to quantify changes to mangrove and seagrass habitats over the past decade and will guide reserve management priorities and future research on the causes of the decline.

Cohort: 2018

Title: Evaluating the impact of hydrologic alterations on salt marsh sustainability in a changing climate

Team members:
Dr. Amanda C. Spivak, Woods Hole Oceanographic Institution; Dr. Susan C. Adamowicz, USFWS Rachel Carson National Wildlife Refuge; Dr. Meagan Gonneea, USGS; Dr. Kevin Kroeger, USGS; Dr. Giulio Mariotti, Louisiana State University; Gabrielle Sakolsky, Cape Cod Mosquito Control Project; Tonna-Marie Surgeon-Rogers, Waquoit Bay NERR; Megan Tyrrell, Waquoit Bay NERR; Dr. Zhaohui Aleck Wang, Woods Hole Oceanographic Institution

Reserve(s): Waquoit Bay NERR

Keywords: Salt marsh, hydrology, climate change, management, sea level rise

Project type: Collaborative research

Summary: Coastal managers are faced with the challenge of managing marsh hydrology in a way that meets human health needs (e.g., mosquito control), optimizes ecosystem services (e.g., biomass production, carbon burial), and supports sustainability (e.g., elevation). This includes accounting for the effects of ditches that were dug decades ago in 90% of New England salt marshes. Ditches increase marsh drainage and reduce the spatial extent of shallow pools that may represent physical loss of buried soil carbon. However, efficient drainage may reduce the long-term sustainability of marshes by altering below-ground biogeochemical and physical processes in a way that results in subsidence and lowered marsh elevation. Managers, restoration practitioners, and scientists at the Waquoit Bay National Estuarine Research Reserve, US Fish and Wildlife Service, National Park Service, and the Cape Cod Mosquito Control Project, among others, have expressed a need to understand the tradeoffs of hydrologic management strategies (i.e., ditch remediation, density, maintenance) and identify actions that will likely achieve user-specified outcomes (e.g., drainage, maintaining elevation, carbon burial). Through a collaboration between scientists and end users, we will develop decision support tools for marsh hydrology management strategies that promote sustainability and delivery of valuable ecosystem services under future sea level scenarios.

Cohort: 2017

Title: Using DNA Methods to Monitor Invasive Species and Biodiversity in Estuarine Systems

Team members:
Dr. Alison Watts, University of New Hampshire; Dr. Bree Yednock, South Slough NERR; Dr. Jason Goldstein, Wells NERR; Dr. W. Kelley Thomas, Hubbard Center for Genome Studies and University of New Hampshire; Steve Miller, Great Bay Great Bay NERR; Paul E. Stacey, Great Bay NERR; Dr. Michael Kinnison, University of Maine; Dr. Jamie Anthony, Oregon Department of Fish and Wildlife; Cory Riley, Great Bay NERR

Reserve(s): Great Bay NERR, South Slough NERR, Wells NERR

Key words: Invasive species, environmental DNA, monitoring, invertebrates

Project type: Collaborative research

Summary: This project will design and implement a pilot environmental DNA (eDNA) monitoring program at several National Estuarine Research Reserve (NERR) sites. Scientists and staff from Great Bay, South Slough and Wells Reserves will work with researchers at the University of New Hampshire to identify estuarine target species of concern, with a focus on invasive invertebrates. We will develop eDNA sample collection and analysis protocols, with training materials and recommendations for the appropriate use of eDNA in estuarine monitoring. Sampling programs will be conducted in coordination with existing traditional monitoring programs to allow direct comparison and verification between methods. Our collaborative team will support a Learning Community of Practice composed of researchers, the three core Reserves, and additional Reserves and Natural Resource agencies that have expressed interest in the program. Members of the Learning Community will have the opportunity to submit test samples and will be introduced to the DNA analytic process from sample collection, through DNA extraction, sequencing, bioinformatics and interpretation. This project will assess the value of eDNA monitoring at Reserve sites, and will provide end users with key training to support informed decisions regarding the implementation and use of eDNA monitoring throughout the Reserve system.

Cohort: 2017

Oyster Management

Title: Evaluation of ecosystem services associated with shellfish culture operations in coastal regions served by the National Estuarine Research Reserve

Team members:
Elizabeth S. Darrow, University of North Carolina Wilmington; Troy D. Alphin, University of North Carolina Wilmington; Susanne M. Brander, University of North Carolina Wilmington; Brandon Puckett, North Carolina NERR; and Martin H. Posey, University of North Carolina Wilmington.

Reserve(s): North Carolina NERR

Keywords: Aquaculture, oyster, carrying capacity, stressors, habitat

Project type: Collaborative research

Summary: While many ecosystem services (i.e., filtration, habitat, nutrient cycling) provided by wild oysters have also been attributed to shellfish aquaculture, there is little research to support this assumption. North Carolina's shellfish aquaculture industry has been small but stable for over thirty years, however, regulatory changes are creating a climate for potential rapid growth. As such, the objective of this project is to assess ecosystem services, a major research need identified by NCNERR, by measuring impacts of newly-established shellfish aquaculture among sites in intertidal and sub-tidal grow-out conditions. Because there is an opportunity to assess conditions prior to aquaculture installation, NC estuaries provide an ideal model system for a BACI (Before After-Control Impact) design. We propose two years of intensive sampling in and adjacent to aquaculture operations, concentrating on wild shellfish resources and the physical and chemical environment, with an aim to link small scale perturbations (i.e., organic enrichment, oyster gene expression) with larger scale ecosystem-level alterations. Collaboration with stakeholders will identify parameters of interest to NCNERR, state agencies, and culturists. Outputs will include data, visualization tools, and models to allow resource managers, culturists and NERR staff to achieve outcomes of effective decision-making on locations and scales of aquaculture operations.

Cohort: 2016

Title: Evaluating effectiveness of different oyster aquaculture strategies for nitrogen loading remediation

Team members:
Dr. Daniel Rogers, Stonehill College; Dr. Virginia Edgcomb, Woods Hole Oceanographic Institution; Tonna-Marie Surgeon-Rogers, Waquoit Bay NERR; Joan Muller, Waquoit Bay NERR; Roy Martinsen, Town of Falmouth, MA; Christina Lovely, Town of Falmouth, MA; Anastasia Karplus, Science Wares, Inc.

Reserve(s): Waquoit Bay NERR

Key words: Oysters, nitrogen loading, aquaculture, water quality

Project type: Collaborative research

Summary: Growing populations along the coast without adequate infrastructure to manage the growing waste water needs has led to an increase in the amount of nitrogen (N) delivered to our waters. Additional N has been associated with decrease oxygen and fish kills, shellfishing and beach closures Towns are under regulatory, legal, economic and environmental pressure to move forward with implementing strategies to clean up water quality. Surveys conducted by the WBNERR Coastal Training Program indicate that this is the top environmental management issue for local officials. One strategy that many of the towns favor is shellfish aquaculture for the purpose of N-removal. However, there is not yet a consensus on which methods of aquaculture provide the most efficient and cost-effective removal of N.

Working with end-users, we will evaluate three of the most popular oyster aquaculture systems – floating bags, rack mount systems and bottom cages – for their efficiency at exporting N to the sediments and stimulating the sediment-host biological community to remove N. The data generated and insights gained will be used in a number of educational efforts, including the publication of a “best practices” document available to all growers.

Cohort: 2017

Title: Building a coastwide Olympia oyster network to improve restoration outcomes and enhance community engagement

Team members:
Kerstin Wasson, Elkhorn Slough NERR; April Ridlon, Elkhorn Slough NERR; Joachim Carolsfeld, World Fisheries Trust; Jude Apple, Padilla Bay NERR; Laura Brown, Confederated Tribes of Siletz Indians; Bree Yednock, Sough Slough NERR; Matt Ferner, San Francisco Bay NERR; Sarah Ferner, San Francisco Bay NERR; Edwin Grosholz, University of California, Davis; Chela Zabin, Smithsonian Environmental Research Center; Danielle Zacherl, California State University, Fullerton; Jeff Crooks, Tijuana River NERR; Fabiola Lafarga de la Cruz, Centro de Investigación Científica y de Educación Superior de Ensenada; Gabi Estill, Elkhorn Slough NERR

Reserve(s): Elkhorn Slough NERR, Padilla Bay NERR, South Slough NERR, San Francisco Bay NERR, Tijuana River NERR

Keywords: Oyster restoration, coastal resilience, habitat change

Project type: Catalyst

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. The team is 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.

The team 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, with particular interest in the role of invasive species affecting native oyster restoration. They 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. To promote education about Olympia oyster declines and potential ecosystem benefits of restoration, they 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.

Cohort: 2018

Title: Stakeholder-driven modeling investigation of factors affecting oyster population sustainability

Team members:
J. Wilson White, Oregon State University; Kaitlyn Dietz, Guana Tolomato Matanzas NERR; David Kimbro, Northeastern University; Nikki Dix, Guana Tolomato Matanzas NERR

Reserve(s): Guana Tolomato Matanzas NERR

Keywords: Oyster restoration, habitat change

Project type: 2018

Summary: In the Guana Tolomato Matanzas Reserve, water quality issues are causing some areas to be closed for harvesting, which could be intensifying harvesting pressure in remaining open areas. Other factors, such as predation, disease, and increased salinity, can also slow growth or kill oysters. This complicated situation recently led stakeholders and reserve staff to establish the Guana Tolomato Matanzas Oyster Water Quality Task Force in order to identify causes and collaboratively address the region's oyster challenges.

This project builds on this existing partnership by conducting a collaborative scientific modeling investigation to improve oyster population assessment and management. Incorporating the input of end users and local stakeholders, the project is adapting an existing oyster population model to study the relative influence of anthropogenic and environmental factors on oyster populations and identify variables that should be monitored to assess long-term sustainability.

Cohort: 2018

Conservation Planning

Title: Exploring the trends, the science, and the options of buffer management in the Great Bay Watershed

Team members:
Cory Riley, Great Bay NERR; David Patrick, New Hampshire Chapter of the Nature Conservancy; Paul Stacey, Great Bay NERR; Rachel Stevens, Great Bay NERR; Pete Steckler, New Hampshire Chapter of the Nature Conservancy; Robert Johnston, Clark University; James Houle, University of New Hampshire; Tom Ballestero, University of New Hampshire; Steve Miller, Great Bay NERR; Kalle Matso, Piscataqua Regional Estuaries Program; Michele Holt Shannon, University of New Hampshire; Dolores Leonard, Leonard Communications Consultants; Steve Couture, New Hampshire Department of Environmental Protection; Mary Ann Tilton, New Hampshire Department of Environmental Services

Reserve(s): Great Bay NERR

Keywords: Integrated assessment, policy, buffers

Project type: Integrated assessment

Summary: This project will enhance stakeholder capacity to make informed decisions on the protection and restoration of buffers around the Great Bay Estuary. This Integrated Assessment will focus on the following question: What are the options for addressing the challenges to effectively protecting and restoring buffer zones around New Hampshire's Great Bay? The project will lead to new research questions; strategic investments; and a strategy for outreach professionals to work with towns on habitat protection, climate adaptation and non-point source pollution control. The project will explore the ecosystem functions, services, and associated values that arise from protecting buffers, emphasizing services selected by end users and stakeholders. The team will quantify the benefits of retaining these services and map where they are likely to provide the greatest value. They will couple this watershed scale analysis with an assessment of the regulatory and social context of Great Bay communities and develop criteria to select a sub-watershed within which to explore barriers and potential solutions. The team will create an Integrated Assessment Report, with a decision support tool that guides end users through regulatory and non-regulatory options for buffer restoration and protection, and an implementation plan for assisting targeted sub-watershed communities.

Cohort: 2015

Title: An estuarine and shoreland use and zoning integrated assessment for the Coos estuary, Oregon

Team members:
Jennifer Schmitt, South Slough NERR; Jill Rolfe, Coos County Planning Department; Don Ivy, Partnership for Coastal Watersheds; Matt Spangler, OR Department of Land Conservation and Development; Christopher Claire, OR Department of Fish and Wildlife; Connie Stopher, South Coast Development Council; Eric Day, City of Coos Bay; John Bragg, South Slough NERR; Robert Parker, University of Oregon; Michael Howard, University of Oregon; Aniko Drlik-Muehleck, University of Oregon; Amy Dibble, Coos County

Reserve(s): South Slough NERR

Keywords: Estuarine, shoreland, management, zoning, use

Project type: Integrated assessment

Summary: This proposal seeks support for an estuarine and shoreland use and zoning analysis, and an integrated assessment to help determine highest and best uses of those lands. As the sixth largest estuary on the US west coast, the Coos estuary is one of Oregon's most valuable estuarine resources, both in its abundance, diversity, and quality of natural resources and in its economic and cultural values. However, modern management of the estuary and surrounding shorelands is based on the economic and social drivers of the 1970's era within which local land use plans were developed. The community agrees that current land use regulations need to evolve to reflect today's economic and social drivers while proactively addressing environmental changes and protecting natural resources. In order to identify areas where zone change will benefit estuarine management, this project will synthesize existing information to compare actual uses of estuarine and shorelands to zoned uses. For areas where lands are underutilized, have conflicting zones, or whose zone designations are now obsolete, team members, end users, and stakeholders will apply a triple bottom line lens (economic, social, and environmental) to generate scenarios and recommendations for Coos County to improve its estuarine and shoreland management.

Cohort: 2016

Title: Promoting Resilient Groundwater Resources and Holistic Watershed Management at the Kachemak Bay National Estuarine Research Reserve

Team members:
Coowe Walker, Kachemak Bay NERR; Dr. Mark Rains, University of South Florida; Syverine Abrahamson, Kachemak Bay NERR; Steve Baird, Kachemak Bay NERR; Sue Mauger, Cook Inlet Keeper; Donna Aderhold, Kachemak Bay NERR Community Council; Kenny Daher, Project GRAD; Kyra Wagner, Homer Soil and Water District; Dan Conetta, Kenai Peninsula Borough

Reserve(s): Kachemak Bay NERR

Key words: Groundwater, habitat, climate change, adaptation

Project type: Collaborative research

Summary: Kachemak Bay NERR (KBNERR) has held collaborative workshops to develop strategies for successful adaptation to coastal climate change over the past 2 years through a Science Transfer grant between the Tijuana River NERR and KBNERR, as well as involvement with the Successful Adaptation Indicators and Metrics Science Collaborative project. These workshops served as a catalyst, bringing together scientists and decision-makers in the Kachemak Bay region. Participants identified the urgent need to evaluate hydrologic changes and incorporate groundwater flows into decision-making during breakout groups focused on habitat protection. In response, KBNERR identified classifying and mapping groundwater discharge and recharge areas as a top priority, contributing to Reserve efforts to lead ecosystem service valuation and climate change adaptation efforts. This project leverages existing spatial data sets, modelling frameworks and local expertise, with new science aimed at developing a comprehensive conceptual model, and validated geospatial layer that can be used to predict specific locations where groundwater discharge and recharge occur. Working collaboratively with key end users who participated in the climate adaptation project, and additional end users identified through the KBNERR Community Council, we will interpret the groundwater model for use in land use planning, permitting, policy decisions and habitat protection.

Cohort: 2017