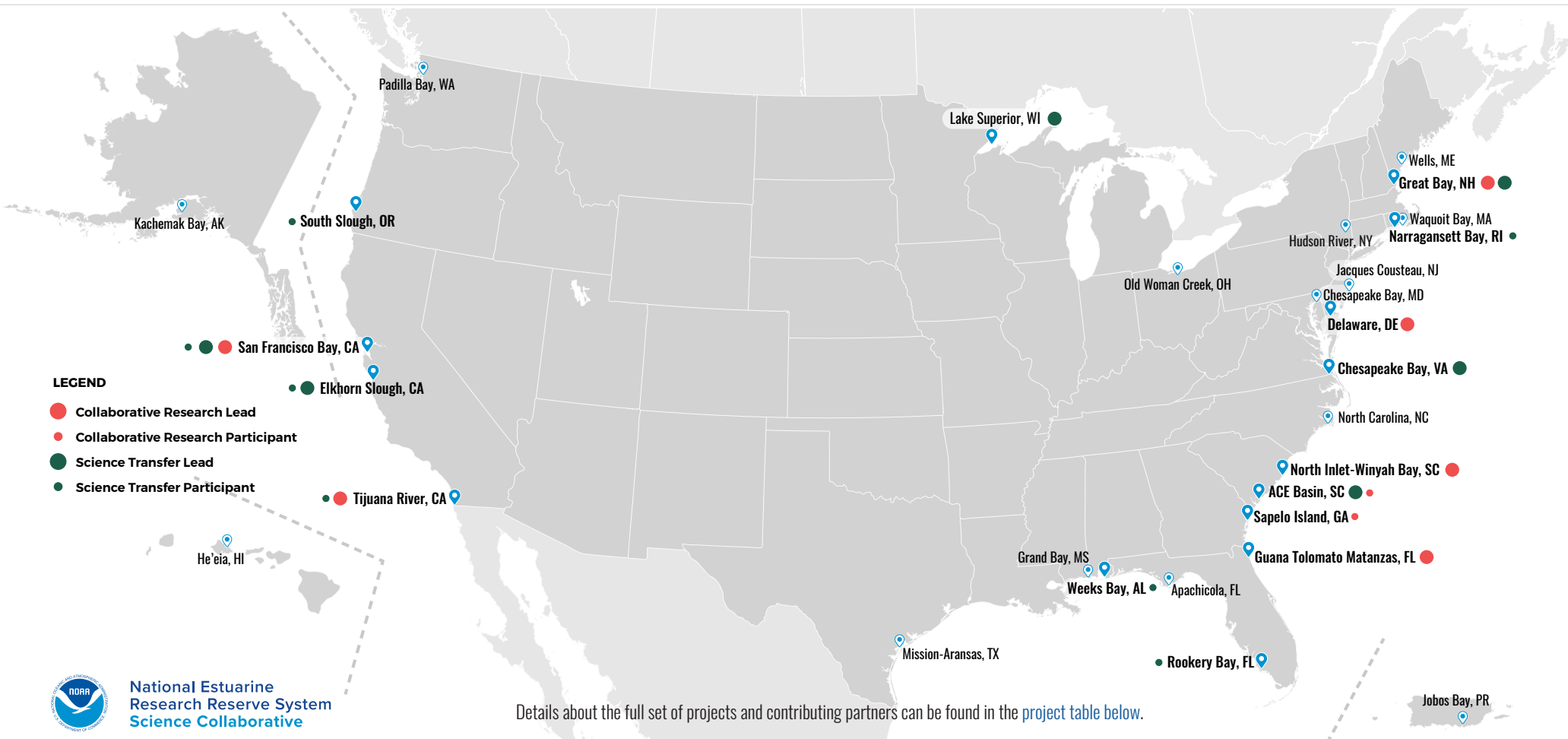


2021 NERRS SCIENCE COLLABORATIVE GRANT AWARDS



National Estuarine
Research Reserve System
Science Collaborative

2021 NERRS SCIENCE COLLABORATIVE GRANT AWARDS

COLLABORATIVE RESEARCH | Generating new science that informs decisions

PROJECT LEAD AND AFFILIATION	PROJECT TITLE	PARTICIPATING RESERVE(S)
Robert Dunn North Inlet-Winyah Bay NERR	Incorporating Environmental Variability Into Ecosystem-Based Management for Penaeid Shrimp in the Southeast U.S. (Abstract)	North Inlet-Winyah Bay (SC) ACE Basin (SC) Sapelo Island (GA)
William McDowell University of New Hampshire	Resilience and Positive Feedbacks: Water Quality Management and Eelgrass Health in the Great Bay Estuary, NH/ME (Abstract)	Great Bay (NH)
Luke Miller San Diego State University	Habitat Heartbeats: Incorporating Bivalve Biosensors Into Estuary Monitoring Infrastructure to Inform Water Quality Monitoring and Management Decisions (Abstract)	Tijuana River (CA)
Sarah Miller Flagler College	From Past to Present: Ecosystem Services and People at the Guana River (Abstract)	Guana Tolomato Matanzas (FL)
Stuart Siegel San Francisco Bay NERR	Respecting the Past, Planning for the Future: Assessing Cultural Resources and Watershed Connectivity Associated with a Proposed China Camp State Park Road Modification Project (Abstract)	San Francisco Bay (CA)
Andrew Wozniak University of Delaware	Do Prescribed Burns of <i>Phragmites australis</i> During Salt Marsh Restoration Increase Denitrification and Carbon Sequestration Ecosystem Services? (Abstract)	Delaware (DE)



2021 NERRS SCIENCE COLLABORATIVE GRANT AWARDS

SCIENCE TRANSFER | Promoting the use of science

PROJECT LEAD AND AFFILIATION	PROJECT TITLE	PARTICIPATING RESERVE(S)
Julie Binz ACE Basin NERR	Advancing Science Literacy with a System-Wide Monitoring Data Exhibit (Abstract)	ACE Basin (SC) Elkhorn Slough (CA) Tijuana River (CA) South Slough (OR) Rookery Bay (FL) Weeks Bay (AL) Narragansett Bay (RI)
Daniel Brumbaugh Elkhorn Slough NERR	Resilient Roads and Reserves: Opportunities for Improving Habitat and Access in California (Abstract)	Elkhorn Slough (CA) San Francisco Bay (CA) Tijuana River (CA)
Cirse Gonzalez Chesapeake Bay Virginia NERR	State of the York: A Holistic Synthesis of Place-Based Data for Informed Decision-Making and Outreach (Abstract)	Chesapeake Bay (VA)
Maya Hayden Point Blue Conservation Science	Planning with Nature: Identifying Opportunities for Nature-Based Coastal Adaptation Strategies Using the Sea Level Rise Adaptation Framework (Abstract)	San Francisco Bay (CA) Elkhorn Slough (CA)
Karina Heim Lake Superior NERR	Greener Shores; Bringing Plant-Scale Knowledge to Shoreline Habitat Practitioners in the Lake Superior Basin (Abstract)	Lake Superior (WI)
Peter Steckler The Nature Conservancy	Transferring Conservation Science in New Hampshire's Coastal Watershed (Abstract)	Great Bay (NH)

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

- [Collaborative Research](#)
- [Science Transfer](#)



2021 NERRS SCIENCE COLLABORATIVE GRANT AWARDS

COLLABORATIVE RESEARCH | Generating new science that informs decisions

Incorporating Environmental Variability into Ecosystem-Based Management for Penaeid Shrimp in the Southeast U.S.

Project Lead: Robert Dunn

Reserves: North Inlet-Winyah Bay (SC); ACE Basin (SC); Sapelo Island (GA)

Budget Request: \$599,959

Project Summary: Estuaries are complex seascapes that encompass multiple habitat types supporting critical nursery functions for commercially-harvested species. Shrimp reside in estuaries during multiple life stages, and because shrimp life-history occurs on an annual scale, populations are sensitive to changes in environmental conditions and available habitat. Commercial shrimp landings have been highly variable over the past two decades, with the effects of environmental factors on shrimp abundance remaining unclear.

To better understand changes in shrimp abundance in response to environmental variability due to changing climate conditions, weather events, and habitat modifications, this project team will utilize ongoing, long-term data collections within estuaries across South Carolina and Georgia and conduct additional sampling for shrimp and their prey. These efforts will leverage the NERR System-Wide Monitoring Program environmental data and infrastructure.

The diverse team spans universities, fishery management agencies, fishery extension offices, and NERR sites. Using a multi-faceted research approach based on iterative guidance from end users, the team will explore the importance of different estuarine habitat types and variable environmental conditions on shrimp populations—information critical to future management of this multi-million-dollar fishery.

Resilience and Positive Feedbacks: Water Quality Management and Eelgrass Health in the Great Bay Estuary, NH/ME

Project Lead: William McDowell

Reserve: Great Bay (NH)

Budget Request: \$549,923

Project Summary: In the Great Bay Estuary, on the border of New Hampshire and Maine, loss of eelgrass habitat has resulted in the U.S. EPA recently releasing a Total Nitrogen General Permit that addresses both point and nonpoint sources of nitrogen (N). The New Hampshire Department of Environmental Services and permitted municipalities are looking to their partners to provide the critical scientific insights needed to meet the new permit requirements.

Gaps in understanding of how eelgrass responds to changes in water quality limit the management tools available for ensuring eelgrass health. This project combines hydrodynamic modeling and new field observations along a spatial gradient to delineate the relationships among N loading, in situ N processing, sediment dynamics, light, and eelgrass resilience. Well-resourced collaboration efforts will link the science to decision-making and actions that are urgently needed to facilitate progress on the most contentious management issue for this estuary.

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Habitat Heartbeats: Incorporating Bivalve Biosensors Into Estuary Monitoring Infrastructure to Inform Water Quality Monitoring and Management Decisions

Project Lead: Luke Miller

Reserves: Tijuana River (CA)

Budget Request: \$591,349

Project Summary: The NERR System-Wide Monitoring Program includes a long-term effort to monitor water quality conditions in estuaries. An expressed need within the Tijuana River NERR (TRNERR) is to improve habitat resilience through the collection of biological data, including through the use of “biosentinels,” which are living organisms that can be monitored continuously and integrated with the existing monitoring efforts. Biosentinels can help determine how the estuary responds to environmental variation and human impacts, and can be of use in decision-making processes tied to estuary mouth closure events, water quality improvement plans, and monitoring the impacts of sewage pollution.

Through an iterative co-production process with TRNERR and other identified end users, the project team will develop a biosensor system utilizing shellfish (oysters and mussels) as biosentinels that can give real-time feedback about these important members of the estuary community. The primary planned output will be a low-cost, long-duration biosensor design that can be coupled with existing physical environmental data sources to use shellfish as ‘canaries in the coal mine’ to monitor when water quality conditions might threaten the biotic community. The primary planned outcome will be to produce a monitoring data source (biosensors) that can be used to enhance existing decision-making tools related to estuary mouth-management actions.

From Past to Present: Ecosystem Services and People at the Guana River

Project Lead: Sarah Miller

Reserves: Guana Tolomato Matanzas (FL)

Budget Request: \$600,000

Project Summary: For over 6,000 years, people have called the Guana Peninsula home, largely due to the estuary’s bountiful resources. These resources, both natural and cultural, are at risk now more than ever due to threats from climate change impacts and development.

This project aims to better understand, through a combination of archaeological investigations and applied anthropological methods, how people have used the resources of the Guana Peninsula in the past, as well as how people continue to use these resources today. This information will help current land managers understand and interpret the history of the area, as well as inform and guide management strategies for cultural and environmental resources to best fit the needs of the current stakeholder community.

Project goals include the following:

- 1) Create predictive models of climate change impacts;
- 2) Monitor and track changes to archaeological sites;
- 3) Conduct community surveys about coastal heritage and resources;
- 4) Conduct small-scale excavations at select sites to target past environmental data; and
- 5) Create outputs, including technical reports and data, educational events and products, and frameworks for tackling heritage at risk and engaging stakeholders.

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Respecting the Past, Planning for the Future: Assessing Cultural Resources and Watershed Connectivity Associated with a Proposed China Camp State Park Road Modification Project

Project Lead: Stuart Siegel

Reserves: San Francisco Bay (CA)

Budget Request: \$525,000

Project Summary: North San Pedro Road traverses China Camp State Park in Marin County, California. Built in the 1890s, low-lying reaches of this road cross historic tidal marsh, flood regularly with king tides and winter storms, alter vegetation in interior, tidally restricted marsh habitats, and inhibit future sea-level rise-driven marsh migration and marsh resilience. This road also serves critical community transportation needs.

Through a [previous NERRS Science Collaborative Catalyst Grant](#), end users and stakeholders reached consensus to pursue a sea-level rise adaptation project, providing long-term road transportation needs that enhance the marshlands, allow for marsh migration and resilience, preserve the recreational uses of the park, and protect and enhance archaeological and tribal resources. That effort produced a handful of community-supported road modification alternatives, and also identified important gaps in knowledge necessary to identify a preferred alternative and implement a project.

This project will address three of those gaps by providing the following:

- 1) Geophysical data to support vulnerability assessments and adaptation options for natural, recreational, archaeological, and tribal resources that integrate hydrogeomorphic watershed connectivity with bayside tidal and interior, tidally restricted marshes that will likely be a desired outcome of any future project;
- 2) A current inventory of Coast Miwok archeological sites and tribal resources vulnerable to sea-level rise; and
- 3) Increased participation of the Coast Miwok tribe on archaeological and tribal resources vulnerability assessment and adaptation options that support the tribe's ongoing participation and use of China Camp.

The project builds upon several site-specific, regional, and national efforts addressing sea-level rise adaptation, marsh migration, resilience of coastal resources, utilization of available sediment to support marsh resilience, and restoration and enhancement of estuarine-upland linkages.

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Do Prescribed Burns of *Phragmites australis* During Salt Marsh Restoration Increase Denitrification and Carbon Sequestration Ecosystem Services?

Project Lead: Andrew Wozniak

Reserve: Delaware (DE)

Budget Request: \$598,966

Project Summary: This work explores whether incorporating prescribed burns into salt marsh restoration improves water quality and stores carbon in marsh soils. The project responds to interest from Delaware NERR in better understanding nutrient pollution impacts on tidal wetland ecosystems and how biochar inputs alter tidal wetland processes: Biochar produced from burning biomass is known to increase soil nitrogen removal and carbon storage, but whether these ecosystem services are improved in restored marshes relative to unburned marshes or marshes dominated by invasive *Phragmites australis* is unknown.

Project objectives include the following:

- 1) Quantify prescribed burn biochar incorporation into marsh soils;
- 2) Quantify nitrogen removal in biochar-amended soils; and
- 3) Develop a workshop to inform coastal managers about the use of prescribed burns for salt marsh restoration and biochar impacts on marsh biogeochemistry.

Project outcomes include the following:

- 1) A quantitative understanding of biochar impacts on salt marsh ecosystem services;
- 2) Education of students in collaborative research and coastal land management; and
- 3) Tools to help end users decide whether to incorporate burns or manual biochar inputs into management practices.

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Advancing Science Literacy with a System-Wide Monitoring Data Exhibit

Project Lead: Julie Binz

Reserves: ACE Basin (SC), Elkhorn Slough (CA), Tijuana River (CA), South Slough (OR), Rookery Bay (FL), Weeks Bay (AL), Narragansett Bay (RI)

Budget Request: \$99,093

Project Summary: This project is developing activities to support NERRS in developing effective water quality-related exhibits for their visitors. Many reserves have visitor centers that provide interactive displays to engage coastal residents, students and teachers, and tourists of all ages to teach the importance of their coastal habitats. These visitor centers are critical teaching spaces because they may be the only opportunity for some to receive information about the reserve's coastal environment.

The project seeks to improve the way that reserves provide information about the importance of clean and healthy waterways through three key approaches:

- 1) Developing a NERR System-Wide Monitoring Program (SWMP) Exhibit Guide for reserves based on exhibit design best practices and the learned experience of reserves and partners adept at design and evaluation;
- 2) Developing a SWMP Data Exhibit Training for reserves' visitor center staff and volunteers on engaging visitors with the exhibit to improve learning outcomes; and
- 3) Designing and implementing a new SWMP data exhibit at the ACE Basin Reserve's Environmental Learning Center.

This collaboration to transfer knowledge of exhibit creation and data visualization will create more impactful exhibits that increase water quality knowledge and encourage positive action towards maintaining healthy estuaries.

Resilient Roads and Reserves: Opportunities for Improving Habitat and Access in California

Project Lead: Dan Brumbaugh

Reserve: Elkhorn Slough (CA)

Budget Request: \$99,628

Project Summary: A critical planning challenge facing California is the coastal flooding that threatens low-lying coastal roads, exacerbated when the roads overlap with natural areas. The three California NERRs are individually working to find solutions for critical coastal roads that periodically flood due to storms and tidal flooding in their areas. This project will bring these NERRs together to synthesize and leverage their experiences to inform and promote how they, their state partner agencies, other California coastal managers, and the whole NERRS can better engage in planning processes involving dual management concerns for flood-vulnerable roads and adjacent coastal habitats.

Through the iterative development of a synthetic report, an inclusive stakeholder workshop at Elkhorn Slough NERR, an issue brief, and office visits with decision makers in the state capital, the project will demonstrate how collaborative learning processes can strengthen shared understanding across sectors, build a foundation for better coordinated transportation planning and habitat management, and showcase how the NERRs and their partners can play important supporting roles in these dual road and habitat management processes. In these ways, the project will contribute to more intentional, inclusive, and ultimately efficient approaches to addressing this rising coastal challenge.

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State of the York: A Holistic Synthesis of Place-Based Data for Informed Decision-Making and Outreach

Project Lead: Cirse Gonzalez

Reserves: Chesapeake Bay (VA)

Budget Request: \$100,000

Project Summary: A State of the York and Surrounding Small Coastal Basins synthesis is a priority deliverable for the York River and Small Coastal Basin Roundtable, a forum of watershed stakeholders in Eastern Virginia dedicated to community, literacy, capacity, and resilience. A similar report was last published in 2000. Updated, augmented information is needed for awareness and advocacy in a contemporary format that resonates with end users.

The project team proposes to synthesize a print-ready report that will be translated into an additional outreach product for mass consumption. For the most effective outreach and applicability of data, Roundtable member input will inform report content, as well as the outreach product's format (e.g. story map, dashboard). Content may include, but is not restricted to, information—status, trends, emerging opportunities—on water quality, sea-level rise, flooding, land use, habitat vulnerability, social vulnerability, cultural resources and community science monitoring.

A synthesis would represent a holistic integration of, and benefit to, the work of Roundtable member organizations toward improved understanding, support, communication and adoption of best practices for watershed health and resilience. Moreover, a synthesis would help identify data gaps and predict future trends, whereupon the project team seeks to motivate action and engagement.

Planning With Nature: Identifying Opportunities for Nature-Based Coastal Adaptation Strategies Using the Sea-Level Rise Adaptation Framework

Project Lead: Maya Hayden

Reserves: San Francisco Bay (CA), Elkhorn Slough (CA)

Budget Request: \$100,000

Project Summary: Transitioning from understanding sea-level rise vulnerability to identifying adaptation solutions is a significant challenge faced by California coastal decision makers. Natural and nature-based measures are less understood options for adapting to rising seas, but they can achieve multi-benefit outcomes. Barriers to more widespread adoption include a lack of familiarity with the options and a lack of technical guidance to understand where and under what conditions different options may be appropriate.

The project team aims to transfer its established nature-based adaptation planning process from the inner bayshore of Marin County, California, where it was piloted, to three primary end users: the Greater Farallones National Marine Sanctuary, the San Francisco Bay NERR Coastal Training Program (CTP), and the Elkhorn Slough NERR CTP.

The team will implement the new training module in the San Francisco Bay Area to build on our introductory living shorelines workshops, and then transfer it to the Elkhorn Slough NERR and Central Coast. The transfer will establish consistency in practice, and deepen understanding among coastal managers with respect to natural and nature-based coastal adaptation options. The training curriculum, materials, and lessons learned will be shared more broadly via presentations, and new activities will be incorporated into existing NOAA training.

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Greener Shores: Bringing Plant-Scale Knowledge to Shoreline Habitat Practitioners in the Lake Superior Basin

Project Lead: Karina Heim

Reserve: Lake Superior (WI)

Budget Request: \$73,666

Project Summary: As fluctuating water levels and dynamic climatic conditions escalate coastal hazards across the region, Lake Superior shoreline communities and practitioners have a heightened awareness of shoreline protection needs. They also have limited resources to support long term coastal and community resilience strategies, such as native plantings, catered to these northern-climate coastal ecosystems.

This project pairs institutional science and Indigenous ecological knowledge at the plant scale through the creation of a professionally designed regional shoreline planting guidebook for coastal and estuarine environments. End users utilize the plant menu guidebook to identify recommended species for a given shoreline environment, learn the ideal placement and environmental limitations of each species, and understand some of the ecological and cultural benefits afforded by selected plants that go beyond shoreline stabilization. This project seeks to gather plant ecology and the expertise of Indigenous cultural knowledge-holders to generate plant-scale information. It culminates in the launch of the guidebook and a pilot workshop to connect practitioners to plant knowledge and its practical application on the landscape.

Transferring Conservation Science in New Hampshire's Coastal Watershed

Project Lead: Peter Steckler

Reserve: Great Bay (NH)

Budget Request: \$99,893

Project Summary: Numerous conservation science products for New Hampshire's coastal watershed have been produced over the last 15 years. This science informs where to invest in conservation actions that will have the greatest benefit for both ecosystems and human communities. The 2021 New Hampshire Coastal Conservation Plan synthesizes and prioritizes these conservation science products to identify lands and waters critical to ecosystem function and with multiple conservation values. It boils down a complex set of inputs into a single output for a broad set of end users to understand and implement.

This project will transfer the conservation science from the 2021 New Hampshire Coastal Conservation Plan to the region's conservation, land-use decision-making, and funding communities. The project team will conduct a rapid needs assessment to efficiently and effectively meet the science transfer needs of these end users. The team will develop communications products (including an accessible website) and training modules to transfer the science to at least ten communities and five project funders. The intended outcome is to empower end users to implement conservation measures to protect ecosystems and their services.

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

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