Margaret A. Davidson Fellowship
Reserve Management Needs for the 2024-25 Cohort

June 2023

Fellowship research is focused on addressing a key coastal management question, a question that strives to help the National Estuarine Research Reserves and their communities understand the drivers of environmental change and how that change affects human and coastal resilience. This document describes the current management needs of each reserve. Proposed research projects must address at least one of the listed priorities for the selected reserve.

Applicants are strongly encouraged to contact the reserve before submitting a proposal to discuss the feasibility of their project idea and the resources available.

For questions, please contact:

NOAA Office for Coastal Management
Email: *ocm.davidsonfellowship@noaa.gov*

Participating Reserves

Click on each reserve's name to read about its specific management needs.

Caribbean Region

Jobos Bay Reserve, Puerto Rico
Ecological-economic-livelihood assessment of seagrasses: An important resource is the extensive seagrass meadows and the ecosystem services they provide. The reserve has been impacted by the invasive seagrass *Halophila stipulacea* since 2015, and we want to address its effects on native species. However, little is known about how the invasive seagrass is affecting native seagrass species and benthic and demersal fauna, as well as the effects of its phytomyxid endoparasite. *Reserve Contact: Angel Dieppa, adieppa@drna.pr.gov, 787-853-4617 x3161*
Coral reef resilience and recovery: This reserve is composed of three major tropical ecosystems: mangroves, seagrasses, and coral reefs. It is important to maintain an equilibrium due to their interdependency in terms of genetic variability, biodiversity, and health. To maintain that equilibrium and coral reef ecosystem services, stony coral tissue loss disease must be addressed. The reserve seeks to collaborate with experts to implement best management practices to restore coral reefs. *Reserve Contact: Angel Dieppa, adieppa@drna.pr.gov, 787-853-4617 x3161*
Ecological-economic-livelihood assessment of mangroves: Mangroves are a key component of coastal ecosystems, including human settlements. Mangroves interact with seagrass and coral reef ecosystems by exchanging nutrients, food, and fauna. Anthropogenic pressure can disrupt that exchange, degrading the ecosystems. The reserve is interested in understanding what residents know about mangroves, what value they place on them, and how they envision the role of mangroves in coastal resilience. *Reserve Contact: Angel Dieppa, adieppa@drna.pr.gov, 787-853-4617 x3161*
Habitat restoration: Mangroves are living shorelines that provide socio-economic and ecological benefits, but this resource has been degraded by poor watershed management and natural processes, such as intense storms. The reserve needs to understand the factors and drivers of mangrove resilience and recovery, and how mangroves affect the resilience of other ecosystems and human settlements. *Reserve Contact: Angel Dieppa, adieppa@drna.pr.gov, 787-853-4617 x3161*
Understanding environmental responses to climate and anthropogenic pressure: The Jobos Bay reserve has a long-term monitoring program that gathers water quality, meteorological, and biological data. This information could help identify processes and drivers of environmental response. The reserve is interested in projects that analyze the data for trends and model the impacts of management actions. *Reserve Contact: Angel Dieppa, adieppa@drna.pr.gov, 787-853-4617 x3161*

Great Lakes Region

Lake Superior Reserve, Wisconsin
The invasive emerald ash borer (EAB) is affecting black ash-dominated forested wetlands in the St. Louis River estuary, and will likely cause shifts in species composition and wetland function. To maintain these habitats the reserve has begun restoration projects, but the extent of the ecological impacts of this invasive in a Lake Superior estuarine environment is unknown, especially in the context of daily, seasonal, and long-term water level fluctuations and flooding. Robust analysis of the ecological function of these forested wetlands in Lake Superior estuaries may help inform future restoration and management efforts. *Reserve Contact: Kirsten Rhude, kirsten.rhude@wisc.edu*
Lake Superior coastal zones are experiencing numerous stressors, all of which complicates efforts to mitigate adverse impacts on human and natural communities. In particular, impacts from climate change and other sources of anthropogenic stress, such as legacy contaminants, affect estuarine processes, species, and human communities, is poorly understood. Research is needed to inform successful management and restoration activities regarding these stressors. *Reserve Contact: Kait Reinl, kreinl@wisc.edu*

Lake Superior Reserve, Wisconsin

Cyanobacterial harmful algal blooms (cHABs) are becoming increasingly common in the Great Lakes region, and have recently emerged in the St. Louis River estuary and coastal Lake Superior. However, these two locations represent very different environments than those typically associated with cHABs and thus, environmental drivers are not well understood. A better understanding of the drivers, phenology, traits, and impacts of cHABs on ecological and public health is therefore needed to better understand, prevent, and mitigate cHABs now and in the future. *Reserve Contact: Kait Reinl, kreinl@wisc.edu*

Despite historical assumptions to the contrary, recent research has shown considerable physical and biochemical activity in freshwater ecosystems in the winter, including under ice. This research reserve wants to better understand the dominant ecological processes during winter and their influence on ecosystem function at the seasonal and interannual scale. *Reserve Contact: Kait Reinl, kreinl@wisc.edu*

The ongoing need for restoration work in the St. Louis River estuary is strong and clear, but approaches centered on biocultural restoration and Indigenous knowledge are not common, despite their long standing presence. The communities invested in the St. Louis River estuary, including Ojibwe nations, would benefit from dialogue and applied learning that invites Indigenous practitioners and knowledge-holders to advance their shared understanding of restoration practice and outcomes. *Reserve Contact: Deanna Erickson, deanna.erickson@wisc.edu*

Old Woman Creek Reserve, Ohio

Great Lakes coastal communities are struggling to mitigate impacts of nutrient loading, greenhouse gases, and sedimentation. Wetland soils and sediments influence water column processes, and the reserve is interested in learning more about how the soils may influence carbon, nutrient, and sediment transport with the estuary, how this influence varies over space and time, and how this compares to other wetland and coastal ecosystems. *Reserve Contact: Steve McMurray, steven.mcmurray@dnr.ohio.gov*

Coastal landowners along the Lake Erie shoreline are hardening their shorelines against increased erosion. In response, the Ohio Coastal Training and Management Programs have partnered together to develop a Nature-based Shoreline Certification Training Program. But there are at least two problems: site selection for effective nature-based shorelines is challenging given high wave energy systems, as is the diversity of landowner goals. An inventory of suitable sites that also identifies hurdles for local landowners would be helpful. *Reserve Contact: Emily Kuzmick, emily.kuzmick@dnr.ohio.gov*

Invasive species negatively affect ecosystem structure and function. The reserve is engaged in a number of invasive species management efforts, but the resulting ecosystem benefits of such programs has yet to be evaluated. There is therefore a need to quantify changes in ecosystem services (e.g., biodiversity, water quality) that result from invasive species management programs to both evaluate the success of such efforts and identify best practices for invasive species removal. *Reserve Contact: Steve McMurray, steven.mcmurray@dnr.ohio.gov*

Understanding drivers behind temporal variation in water quality is important for predicting impacts of future environmental changes. The reserve has been measuring water quality since 1980, and is interested in quantitative analyses synthesizing long-term monitoring data, with the goal of predicting how parameters will respond to future environmental changes. The resulting information will benefit management at this reserve and throughout the Great Lakes region and beyond. *Reserve Contact: Jacob Cianci-Gaskill, jacob.cianci-gaskill@dnr.ohio.gov*

Anecdotal reports indicate changes in the fish species using the reserve for habitat. The reserve, however, has no ongoing program assessing which species use the reserve, habitat suitability, and how habitat quality will change over time. This information is important to fishery management here and within the larger Lake Erie region. *Reserve Contact: Steve McMurray, steven.mcmurray@dnr.ohio.gov*

Gulf Coast Region

Apalachicola Reserve, Florida
The reserve's Sentinel Sites for Climate Change Program works to better understand the long-term impacts of climate change on habitats by collecting monitoring data - marsh elevation, water and air temperature, rainfall, river flow, sea level rise, and vegetative tropicalization (e.g., transition from marsh to mangrove forest). The data is useful for addressing small-scale changes over longer time frames, but the reserve needs information about how these changes manifest over shorter time frames, particularly how climate change may impact marsh migration, habitat cover, and estuarine and tidal freshwater communities (herpetological, fish, and macroinvertebrate communities) in the Apalachicola system. Proposed projects should address how the aforementioned may impact the socioeconomic structure of the local human community. More specifically, how will changes in habitat affect changes to the local population, resource management decision-making processes, and risk and resilience assessments at the local community level. *Reserve Contact: Jason Garwood, jason.garwood@floridadep.gov, 850-670-7705*
We can link climate change, riverine input, and other monitoring program data to biological monitoring data. Doing so shows significant relationships in spatial and temporal distributions in mid-trophic level communities in relation to water quality parameters. However, we have limited information on the lower-level trophic interactions of species within the system. We need better resolution on the connection between water quality, quantity, and connection to primary and secondary productivity of the estuarine food web. This reserve has developed a coupled hydrodynamic and trophic model, but this model requires continued upgrading as more data become available. The best study proposals will build on and improve the current work. *Reserve Contact: Jason Garwood, jason.garwood@floridadep.gov, 850-670-7705*
Fisheries habitat and resources in the Apalachicola Bay system have changed with riverine input and anthropogenic impacts. However, we lack a good understanding of how the resources can be managed more effectively from a biological and socioeconomic standpoint. Extensive study has been conducted on the imperiled oyster fishery, but comprehensive stock assessments of other significant fisheries species that spend all or a significant portion of their life cycle in the estuary (Penaeid shrimp, blue crabs) are needed. These studies can assist the reserve and local community with the development of a system-wide management and recovery plan. Projects should produce a final product that will help our local human community become more resilient to future impacts. *Reserve Contact: Jason Garwood, jason.garwood@floridadep.gov, 850-670-7705*
The reserve has documented a net loss of sediment from existing shoreline and marsh habitats, and needs to analyze and test eco-friendly techniques to stabilize these areas. A systematic approach to this management need must assess 1) best methods for stabilization, and provision of ecosystem services and longevity, and 2) factors or considerations (shore slope, natural community type, physical processes) of greatest importance for shoreline stabilization success. Proposals should include a multidisciplinary approach that also addresses the need for community buy-in. Cost to implement the techniques should be considered. *Reserve Contact: Jason Garwood, jason.garwood@floridadep.gov, 850-670-7705*
The reserve wants to interject existing behavioral change science into the reserve's education and coastal training programs. Activities may include direct visitor and resident interactions with reserve staff or volunteers, communication campaigns, professional training, citizen science, or K-12 programs. Proposed projects should aim to increase environmentally-friendly behavior in visitors and residents that interact with the Apalachicola estuary, and should be tailored to address locally relevant issues. Examples include, but are not limited to, creating a new program, improving existing programs, and designing a framework to better understand the mechanisms of behavioral change in the community. All proposals should consider the inclusion of diverse audiences. *Reserve Contact: Jason Garwood, jason.garwood@floridadep.gov, 850-670-7705*

Grand Bay Reserve, Mississippi

Restoration effectiveness monitoring: Coastal habitats are being restored with a variety of methods. Many have well-defined end points and criteria useful for determining restoration success, but effectiveness monitoring is rarely conducted and monitoring data often is not available for synthesis. Prescribed fire is a particularly important method in Grand Bay's wet pine savanna uplands, but it is costly and difficult to implement. The reserve would like more information about how alternatives, such as mechanical clearing or conservation grazing, could be useful in maintaining habitats and how endpoints differ. Proposals may also address restoration monitoring for invasive species management and living shorelines. *Reserve Contact: Ayesha Gray, ayesha.gray@dmr.ms.gov*

Physical and hydrological processes: The reserve's marshes are affected by many ecological and physical processes, all of which are impacted by restoration actions, infrastructure, and climate change. The reserve seeks projects that investigate overland and groundwater flow, marsh migration, water quality (e.g., contaminants) and circulation patterns (e.g., quantification of inputs from Mobile Bay vs. Mississippi Sound, possible impacts from Bonnet Carre spillway openings including HABs), and sediment dynamics (e.g., composition, erosion, transport, deposition). The goal: improving management actions to better conserve estuarine ecosystem function as conditions change. *Reserve Contact: Ayesha Gray, ayesha.gray@dmr.ms.gov*

Species population distribution, abundance, and ecology: The reserve is a reference site for many research studies and ongoing restoration projects across the Mississippi Coast, but questions remain about various issues, including feral hog management; terrapin nesting success; the extent of submerged aquatic vegetation; prey species in carnivorous plant bogs; and the occurrence of rare and endangered species. Because information about species population distribution, abundance, and ecology provides baseline information and informs management decisions, the reserve is seeking population distribution and ecological studies for terrestrial and aquatic flora and fauna. The goal is to increase understanding of these species' population dynamics in this location and support the site's role as a reference estuary. *Reserve Contact: Ayesha Gray, ayesha.gray@dmr.ms.gov*

Socio-economic impacts of ecosystem restoration: There has been increased effort in recent years to restore coastal habitats and recover ecological processes. Typical habitat restoration projects evaluate the impact on environmental conditions, but generally do little to examine socio-economic impacts. Green infrastructure projects often include specific objectives designed to recover degraded ecosystem services lost to development. The reserve is interested in projects that examine whether and how habitat restoration and green infrastructure projects impact local communities and economies. *Reserve Contact: Ayesha Gray, ayesha.gray@dmr.ms.gov*

Habitat functions and trophic flows: How energy moves through ecosystems is important knowledge for restoration work. There are a range of interconnected habitat types throughout the Grand Bay research reserve: emergent marsh; wet pine savannas under different management regimes; bog habitats; tidal bayous; fringing oyster reefs; constructed inter- and subtidal reefs; submerged aquatic vegetation; and open water. Understanding trophic links is essential to understanding habitat function and energy flow, but this is not an area of research commonly pursued in Grand Bay. Projects are therefore encouraged that enable a better understanding of habitat functions and trophic interactions. This information will be used to inform resource management decisions. *Reserve Contact: Ayesha Gray, ayesha.gray@dmr.ms.gov*

Mission-Aransas Reserve, Texas

Marine debris research: A 2017 study shows the Mission-Aransas reserve's Gulf-facing beaches have 10 times the amount of trash accumulation as compared to shorelines located along the eastern side of the Gulf of Mexico. Marine debris, including microplastics, is a growing concern, and the reserve seeks studies that look at the ecological impacts of plastics on the environment and biological communities. *Reserve Contact: Ed Buskey, ed.buskey@utexas.edu*

Mission-Aransas Reserve, Texas

Climate change impacts: The reserve is subjected to numerous impacts from climate change, including: tropicalization of plant species; alterations in contaminant bioavailability and toxicity; a relative sea level rise rate of 5.2mm per year; precipitation variation from intense drought to heavy rain; and more intense hurricanes. The reserve needs to identify the predicted impacts of climate change, determine mitigation strategies from the impacts of the "Coastal Bend," and relay that information to decision makers. *Reserve Contact: Ed Buskey, ed.buskey@utexas.edu*

Protect key habitats: Wave, current, and ship wake erosion. Subsidence. Sea level rise. Storms. Climate change. Human development. All have changed the landscape of the reserve. An examination of the most vulnerable habitats in decline (such as oyster reefs, fresh- and saltwater marsh, rookery islands, tidal flats, seagrass beds, coastal prairie) is needed, to include identifying the associated stressors and risks, and the work needed to protect these habitats in sustainable ways. The work should include determining the reasons behind specific species population decline, and strategies to protect these species from further decline, including habitat protection in key spawning, nesting, or feeding locations. *Reserve Contact: Ed Buskey, ed.buskey@utexas.edu*

Rookery Bay Reserve, Florida

Arthropods are a diverse and dominant component to terrestrial ecosystems as well as an integral part of the natural food web, with roles in nutrient cycling, pollination, and pest-control. This resource is also a valuable asset when studying the efficacy of restoration efforts. To protect habitat heterogeneity, Rookery Bay needs an assessment of the abundance, richness, and diversity of the terrestrial arthropods within its boundaries. *Reserve Contact: Jay Black, jay.j.black@floridadep.gov, 239-530-5964*

Benthic estuarine habitats provide significant ecosystem services for estuarine wildlife and human communities. These habitats may be affected by chronic and acute change agents such as sedimentation, freshwater inputs, and hurricane damage. Limited resources and information have deterred effective monitoring and restoration programs; additional information is therefore needed to better understand the distribution, historic decline, and restoration options for habitats such as seagrass, macroalgae, live bottom and bivalves (oyster and clam), as well as the ecosystem services they provide. *Reserve Contact: Jill Schmid, jill.schmid@floridadep.gov, 239-530-5968*

The distribution and diversity of native flora in the reserve is heterogeneous and depends on many factors such as hydrology, soils, and natural fire regimes. Tropicalization and sea level rise are just two of several drivers leading to changes in terrestrial vegetation communities, species distribution, and habitat mosaics. To meet the resilience goal in this reserve's management plan (science-to-management connections to ensure that ecosystems and communities are resilient and adaptable to environmental change and episodic events), an analyses of the site's ~37,000 acres of upland habitat is needed to develop and recommend best practices to enhance current and future landscape-level habitat conservation and management. *Reserve Contact: Danielle Orgurcak, danielle.ogurcak@floridadep.gov, 239-530-5987*

Multiple watersheds that connect to the Rookery Bay and Ten Thousand Islands embayments have been modified by canals and control structures, which affects seasonal freshwater input. These changes may have an impact on important nursery habitats, biodiversity, and community structure. Rookery Bay has several freshwater restoration projects currently under design or in the implementation phase. It is unknown what effects these projects will have on the coastal ecosystem, including fisheries. Research assistance is sought to bring about a greater understanding of the integrative impacts of freshwater management and other changes (e.g., nutrient input, sea level rise) on coastal habitat, salinity regimes, community structure, and production. *Reserve Contact: Jay Black, jay.j.black@floridadep.gov, 239-530-5964*

Rookery Bay Reserve, Florida

In the Gulf, there is a need to create new or make improvements to existing programs that strive to increase the environmentally friendly behavior of visitors (e.g., communication campaigns, professional training, citizen science, K-12 education). Also needed: to bring current behavior change research to the programs. This request seeks evaluations regarding behavior change impacts for new or existing programs, and the establishment of a framework to better understand mechanisms of behavior change in the community, with an emphasis on the inclusion of diverse audiences or other studies to relate environmental use and studies back to our communities. *Reserve Contact: Marissa Figueroa, marissa.b.figueroa@floridadep.gov, 239-530-5952*

Weeks Bay Reserve, Alabama

The reserve has many over-water structures on the shoreline, and is interested in research that explores various issues related to the management of the habitat and species in these areas under climate change. A research topic could be focused on the relative effectiveness of various popular methods of shoreline protection and green infrastructure, the resistance to adoption of more natural and sustainable methods, and ways to overcome this resistance such as incentive programs, improving the permitting process, training, and ways to improve coastal homeowner buy-in to nature-based solutions to resiliency and shoreline stabilization. Another could be the impact of over-water structures on benthic primary productivity. A third could be small-scale modeling of shoreline habitat changes under sea level rise. *Reserve Contact: Scott Phipps, scott.phipps@dcnr.alabama.gov, 251-278-7748 (or 251-928-9792)*

Coastal ecosystems provide many benefits, yet current conservation strategies are unable to cope with the acceleration of human-caused environmental degradation. Additionally, lack of compliance with management policies, and failure to consider the social dimensions and realities of local communities, have hindered the success of conservation initiatives. This project would explore producing more effective and integrated coastal management strategies for this region by using social science to better understand human-nature connections and values. *Reserve Contact: Johanna Gertsch, johanna.gertsch@dcnr.alabama.gov, 251-928-9792*

Alabama adopted new abandoned and derelict vessel regulations in 2019, but there have been many economic problems associated with enforcement. Several solutions have been suggested, including a vessel turn-in program and investigation into the social science behind what causes people to discard trash and abandon their vessels. This request involves determining solutions to clean up coastal habitats, and social solutions to prevent future marine debris in all forms. Proposals should also address the willingness of coastal residents to support these efforts and to fund them via taxes. *Reserve Contact: Angela Underwood, angela.underwood@dcnr.alabama.gov, 251-928-9792*

The reserve clears habitat for a variety of important management needs, including increasing ecological diversity and resilience, reducing unwanted species in bog and marsh habitats, increasing the ability of marsh habitats to migrate upslope under pressure of sea level rise, and reducing the risk of wildfire in an increasingly urban habitat. We are interested in research that explores these methods and the impacts on ecosystems. For example, there are significant knowledge gaps regarding how prescribed fire intensity, periodicity, and seasonality of application affect the ecology of coastal habitats and carbon and nutrient cycling. We are also interested in determining the feasibility of alternate methods such as conservation grazing. *Reserve Contact: Eric Brunden, eric.brunden@dcnr.alabama.gov, 251-928-9792*

Mid-Atlantic Region

Chesapeake Bay Reserve, Maryland
The State of Maryland is prioritizing tidal wetland restoration and conservation to enhance ecological and community resilience, but questions remain about regional tidal wetland health and the intricacies of new management and restoration designs and methods. There is therefore a need to investigate new and existing wetland conditions and management actions. *Reserve Contact: Kyle Derby, kyle.derby@maryland.gov, 410-260-8724*
Submerged aquatic vegetation (SAV) is critical to the health of the Chesapeake Bay and its fisheries. This valuable ecosystem service also provides the region with carbon sequestration benefits, water quality improvements, and more. In recent years, shifts in SAV density, coverage, and dominant species have been observed across the bay and the reserve, but the causes of these shifts, and their impacts to ecosystem services, are not well understood. More data collection and analysis of the benthic habitats in the reserve are needed to inform appropriate management and restoration strategies. *Reserve Contact: Becky Swerida, rebecca.swerida@maryland.gov, 410-260-8722*
A variety of natural and nature-based living shoreline and stream enhancement techniques are used in the Chesapeake Bay to control erosion and increase community and ecological resilience. Relatively little quantitative understanding of the effects of different living shoreline and stream restoration designs are known. The reserve is interested in proposals that investigate new techniques, their long-term impacts, and management trade-offs. This information will be used to better inform regulations and policies, especially in reference to sea level rise. *Reserve Contact: Becky Swerida, rebecca.swerida@maryland.gov, 410-260-8722*
Marsh migration is affecting human and natural communities through saltwater intrusion, wetland habitat loss, and increased flooding risk. The reserve is interested in proposals that evaluate the risks of marsh migration and the potential of equitable adaptation options. *Reserve Contact: Kyle Derby, kyle.derby@maryland.gov, 410-260-8724*

Chesapeake Bay Reserve, Virginia
The reserve is interested in expanding habitat restoration and monitoring, and testing new technologies and adaptive restoration management techniques designed to mitigate current and anticipated stressors and enhance tidal wetland and seagrass resiliency (and associated ecosystem services) within the York River estuary. Projects may include the identification, quantification, valuation, and socialization of ecosystem services of tidal wetlands and seagrasses (e.g., water quality, carbon sequestration, storm buffering, erosion control) under different environmental conditions and climate change scenarios. *Reserve Contact: Carl Friedrichs, carl.friedrichs@vims.edu, 804-684-7303*
Harmful algal blooms (HABs) have become more common within the York River estuary, and resulting toxins can have detrimental effects on shell and finfish, shallow water ecosystems, and humans. Although a topic of active study, information regarding bloom initiation, dynamics, and impacts on water quality and natural resources is limited. The reserve is interested in projects that include a synthesis of York River estuary observing network data and focused field and modeling studies to provide guidance for reducing HAB occurrence, assessing toxin production dynamics and impacts, and informing strategies to counter detrimental effects on estuarine aquatic biota and human ecologies and economies (e.g., aquaculture). *Reserve Contact: Carl Friedrichs, carl.friedrichs@vims.edu, 804-684-7303*

Chesapeake Bay Reserve, Virginia
The York River estuary suffers from chronic water quality issues driven by excessive loads of sediment, nutrients, and oxygen-consuming material, resulting in intense algal blooms, low oxygen, and reduced water clarity. The reserve's ability to explain observed variability in estuarine response to watershed loads, internal cycling, episodic events, and longer-term climatic changes is somewhat limited. The reserve is interested in projects that use syntheses of long-term meteorological, water quality, physical, and biological datasets in the York and other water bodies to develop empirical (data-driven) models and verify theory-based models. Reserve Contact: Carl Friedrichs, carl.friedrichs@vims.edu, 804-684-7303
The reserve recently developed a Diamondback Terrapin management plan, and is interested in further supporting conservation and protection efforts for additional target species or groups, especially marsh birds (waterfowl, wading birds, secretive marsh birds, and colonial waterbirds). We seek research on the abundance, distribution, and population trends for most marsh bird species at the reserve, as well as the potential role of community science programs in these assessments. *Reserve Contact: Carl Friedrichs, carl.friedrichs@vims.edu, 804-684-7303*
The reserve is interested in human dimensions projects that examine how existing programs and interpretation affect participant knowledge and change attitudes and behavior in coastal stewardship. Programs and interpretation include: classroom and field experiences, professional training and workshops, community engagement, community science, signage, and formal K-12 programs for teachers and students. Suggested projects include: 1) program evaluations and behavior change assessments; 2) frameworks to better understand the mechanisms of behavior change and programming impact in our focal area; and 3) social science and education-based research projects exploring coupled human and natural systems. An emphasis on underrepresented audiences is welcomed. *Reserve Contact: Carl Friedrichs, carl.friedrichs@vims.edu, 804-684-7303*

Delaware Reserve, Delaware
Wetland ecosystems are changing in response to climate change and sea level rise, and the National Estuarine Research Reserve System implements a variety of long-term monitoring programs that encourage the use of the reserves as reference sites. The reserve is interested in projects that examine the sustainable use of wetlands, the carrying capacity for expanding research, and how to balance wetland ecosystem needs with management goals to enhance the long-term stewardship and use of reserves. *Reserve Contact: Christina Whiteman, christina.whiteman@delaware.gov*
The Delaware reserve hosts hundreds of visitors each year that are engaging in research, education, and recreation onsite, but the reserve lacks the capacity to quantitatively assess how the participants heard about the reserve, how they use its resources, how they deem the accessibility, and how visitors could be better served. We are interested in a visitor use study to measure the value the Delaware reserve is bringing to the community and identify ways to better meet community needs. *Reserve Contact: Laurel Sullivan, laurel.sullivan@delaware.gov*
The reserve is interested in connecting with local Indigenous tribes to inform land management and restoration decisions, provide meaningful and inclusive educational programming, and better understand cultural practices, but the reserve has limited tribal knowledge and community contacts. A project is requested that includes identifying local Indigenous history, finding community connections and methods of communication, undertaking a needs assessment of the tribal community, and developing an engagement plan. *Reserve Contact: Lynne Pusey, lynne.pusey@delaware.gov*
The Delaware reserve has been monitoring marsh birds since 2012, and data analysis has concluded that species abundance has been declining. Marsh birds can be a potentially valuable indicator for the ecological integrity of salt marshes due to their sensitivity to habitat changes, but research is needed to better understand marsh bird population dynamics, stressors, and the causes of declining abundance. *Reserve Contact: Christina Whiteman, christina.whiteman@delaware.gov*

Hudson River Reserve, New York

The reserve conducts local outreach and education events. While the audience includes several minority groups, we don't know how effectively we are communicating our core messages about climate or how successfully we are reaching environmental justice communities of color, low-income families, or members of the LGBTQ+ community. We are interested in projects that develop an assessment tool for the exchange of information with marginalized groups to help us improve this outreach so that Hudson Valley environmental justice communities are informed and better able to withstand climate change stressors. *Reserve Contact: Chris Bowser, chris.bowser@dec.ny.gov*

Submerged aquatic vegetation (SAV) provides important ecosystem services in the Hudson River estuary, but SAV decreased by ~64% after two powerful storms in 2011. More than a decade has passed, but SAV monitoring efforts continue to show that some areas are still unvegetated or support SAV beds with low genetic diversity. The reserve is interested in identifying SAV restoration techniques that are feasible and effective within the specific environmental conditions of the Hudson, such as side channels. Research is also needed on greenhouse rearing of Hudson-specific genotypes of *Vallisneria americana* for efficient large-scale planting efforts. *Reserve Contact: Brian DeGasperis, brian.degasperis@dec.ny.gov*

Mean high water (MHW) and mean higher high water (MHHW) lines published by NOAA establish jurisdictions for Hudson River estuary regulatory decisions. These lines are used by consulting engineers and designers as references for determining elevations for structures that are over or near water, but depending on meteorological conditions, the actual, observed daily water levels vary widely. To properly design and regulate shoreline and nearshore projects, we are interested in research about the range of 'normal' water elevations around MHW and MHHW lines and the drivers of short- and long-term water level deviation from published tidal predictions. *Reserve Contact: Dan Miller, daniel.miller@dec.ny.gov*

Blue carbon is a valuable but unleveraged estuarine ecosystem service that can help policymakers prioritize protection. Reserve partners are supporting the state's Climate Action Council's scoping plan (which originated via the Climate Leadership and Community Protection Act) by investigating current carbon budgets and best practices for enhancing carbon storage, resilience, and the adaptive capacity of estuarine habitats. However, controls on the storage and greenhouse gas emission, uptake rates, and projected rate changes over time are poorly understood. The reserve seeks projects focused on the effects that management strategies and climate change-driven perturbations (sea level rise, storm surge) have on carbon sequestration, methane emissions, and wetland resilience. *Reserve Contact: Sarah Fernald, sarah.fernald@dec.ny.gov*

Several faunal invasive species of concern are emerging in the Hudson River estuary (round goby, carp, snakehead, bass, channel catfish, pike, mitten crabs). We know these species could impact the ecosystem negatively, but many of them have not been mapped using the best available technology (i.e., eDNA). In addition, the impacts of these species and effective control strategies in novel contexts are often not well understood. That's why this reserve is interested in research on the population size and distribution of invasive species, including the role of impoundments and contaminants, the impacts of emerging species, and effective control methods. *Reserve Contact: Lindsay Charlop, lindsay.charlop@dec.ny.gov*

Jacques Cousteau Reserve, New Jersey

The reserve implements robust vegetation and elevation change monitoring, but this monitoring does not include information on changes in both land and marine animal composition. Project proposals are needed for bioacoustic research (using recorded sound, including hydrophones to describe a habitat's biodiversity) to analyze changes to species biodiversity and engage and inform community partners about faunal composition changes in local habitats. *Reserve Contact: Thomas Grothues, 609-296-5260 ext. 262*

Jacques Cousteau Reserve, New Jersey
Tidal wetlands and other estuarine ecosystems are threatened with increasing rates of loss due to sea level rise and more intense coastal storms. The reserve supports statewide efforts to increase resilience through nature-based solutions, including living shorelines and beneficial use of dredged sediment, but knowledge gaps regarding the implementation and efficacy of these techniques limit their widespread use. The research reserve's request is to test the hypotheses for these projects to address knowledge gaps. The information will be used to develop standards and best practices for nature-based solutions for increasing the resilience of tidal wetlands. *Reserve Contact: Andrea Habeck, habeck@marine.rutgers.edu, 609-249-8823*
The water and habitat quality of the pristine Mullica River-Great Bay estuary are excellent, but periodic upwelling, ocean acidification, saltwater intrusion, increased precipitation, and storms are changing estuary dynamics. This research reserve is interested in research and modeling for changing ecosystem dynamics and the changing range of habitats and species. *Reserve Contact: Mike De Luca, deluca@marine.rutgers.edu, 908-217-5641*
Communities bordering the Jacques Cousteau Reserve, such as Atlantic City and Pleasantville, New Jersey, are "overburdened communities" – low-income, minority and limited English-speaking families subject to environmental and public health stressors, making them potentially more vulnerable to climate change impacts. New cross-curricular, K-12 state standards regarding climate change provide an ideal opportunity to engage with these teachers and students. However, it is unclear if students and teachers are aware of local climate change-related impacts, how these topics are being incorporated into curricula, and what climate vulnerabilities mean for the future of their communities. The reserve is interested in projects that assess what K-12 teachers within these overburdened communities are currently teaching, how the Jacques Cousteau Reserve can provide support regarding content knowledge about local climate change impacts and community resiliency, as well as appropriate resiliency solutions teachers and students can engage in within their schools and community. Reserve Contact: Kaitlin Gannon, gannon@marine.rutgers.edu, 609-812-0649
Shellfish farms which are expanding in the Barnegat Bay estuary, are low-impact forms of coastal food production, and they provide ecosystem services such as nutrient reduction and habitat provisioning. Unfortunately a thorough understanding of the types of fish and wildlife interactions that occur at these farms is lacking. The reserve is interested in proposals to collect data about fish habitat on these farms, and how the farms influence fish and wildlife communities in the bay. *Reserve Contact: Mike De Luca, deluca@marine.rutgers.edu, 609-812-0649*

Northeast Region

Connecticut Reserve, Connecticut
The reserve and its community partners are interested in applied research and demonstration projects regarding the restoration and management of eelgrass, sea level rise impacts on natural and built infrastructure, and the role techniques such as living shorelines or thin-layer placement in marshes may play in mitigating climate-related impacts. *Reserve Contact: Jamie Vaudrey, jamie.vaudrey@uconn.edu*
Continuing attention to water quality is necessary to support habitat integrity in an era where climate change can act synergistically with nutrient pollution to impair water quality. Recent nitrogen loading estimates, high resolution land-use mapping, and planned modeling of embayments advance the information available to inform decision makers and the public. However, habitat assessments related to water quality and habitat integrity within the reserve boundaries are intermittent or lacking. A broadscale assessment of water quality or habitat integrity (particularly of eelgrass and marshes) within the reserve's fresh- and saltwater environments is requested to help make the link between nutrient loading and land-use data and eutrophication in the estuary. *Reserve Contact: Jamie Vaudrey, jamie.vaudrey@uconn.edu*

Connecticut Reserve, Connecticut

Blue carbon in coastal forests, marshes, and seagrass beds is a potentially valuable pathway for reducing greenhouse gases. Recommendations from Connecticut's Governor's Council on Climate Change included preserving and restoring forests and coastal wetlands as a tool for achieving the targeted 45% reduction in greenhouse gases by 2030. However, relatively few habitats within Connecticut have been assessed for carbon storage capacity. Research and monitoring that assesses the boundaries, typology, and carbon sequestration capacity in these habitats is critical and will be helpful for evaluating preservation priorities, assessing the contribution of these habitats to the state goal, and setting restoration targets within the reserve area. *Reserve Contact: Jamie Vaudrey, jamie.vaudrey@uconn.edu*

Estuarine habitats and coastal communities are threatened by climate change. Distressed municipalities are often disproportionately impacted by these effects, with 44% of Connecticut's environmental justice communities located within the reserve's watershed. Nature-based infrastructure is promoted as a method of increasing community resilience to climate change, but the ecosystem services provided and the impact on local communities is largely under-assessed at the local level. The reserve's partners need more research on the ecological and socio-economic efficacy of these mitigation strategies, as well as social science research to better understand the barriers to adopting nature-based strategies. *Reserve Contact: Jamie Vaudrey, jamie.vaudrey@uconn.edu*

Great Bay Reserve, New Hampshire

Key sub- and intertidal estuarine habitats (e.g., saltmarsh, eelgrass, oyster beds) in Great Bay are facing unprecedented impacts from land use and climate change. Further understanding is needed around how human-induced changing conditions are impacting how habitats function and ways to mitigate these impacts through management actions (e.g., restoration, regulation, land protection). *Reserve Contact: Chris Peter, christopher.peter@wildlife.nh.gov*

Fish and wildlife in Great Bay are under pressure from climate change and direct human impacts such as habitat alteration, pollution, harvest, and invasive species. Because of this the estuary is experiencing shifts in physical and chemical conditions that impact the biota and their associated ecosystem functions. Further research is needed to advance the science and management options regarding indirect and direct human impacts to Great Bay's fish and wildlife. *Reserve Contact: Chris Peter, christopher.peter@wildlife.nh.gov*

To inform how to best manage permitted and unpermitted pollutants, research about the impact and interaction of anthropogenic stressors (nutrients, disease, emerging contaminants, sedimentation) on water quality and biota in Great Bay is needed. Water quality is of particular interest. The reserve and its partners work to track and understand trends which inform point and nonpoint pollution management, but further research is necessary to understand the impacts of pollutants on human and biological communities and to increase the effectiveness of water quality management approaches. *Reserve Contact: Chris Peter, christopher.peter@wildlife.nh.gov*

Research reserves are natural places where visitors come to explore, study, recreate, rest, and learn about coastal ecosystems. The Great Bay Discovery Center and associated reserve properties have a variety of indoor and outdoor spaces that visitors are interested in experiencing, which makes it difficult to count, categorize, and capture visitation data. This reserve has a need for innovative ways to accurately quantify how many people visit the sites. More understanding regarding visitor motivations are also needed to improve visitor management and programming. *Reserve Contact: Lynn Vaccaro, lynn.e.vaccaro@wildlife.nh.gov*

Great Bay Reserve, New Hampshire

The reserve and its natural resource management partners are interested in better integrating the unique perspectives, values, and knowledge of local Indigenous communities into the site's land conservation, land stewardship, and research and education programs. Although the stories of Indigenous communities are woven into the reserve's educational programs, the site doesn't have a process for consulting with local Indigenous leaders and integrating their priorities into the programs and management decisions. Research and research partners are sought to help move the reserve toward more inclusive and holistic approaches. Examples include studying the pre-colonial history and ecology of Great Bay, further mapping cultural resources, or exploring how traditional ecological knowledge could influence the way the reserves practices stewardship of reserve lands and waters. *Reserve Contact: Lynn Vaccaro, lynn.e.vaccaro@wildlife.nh.gov*

Narragansett Bay Reserve, Rhode Island

Sea level rise and other climate change stressors (changes in precipitation, temperature, interspecific competition, phenology, etc.) are negatively impacting habitats and threatening coastal communities in Narragansett Bay and its watershed. Coastal decision makers need information to help them prioritize locations and approaches for habitat preservation. Research efforts may focus on the impacts of climate change on coastal and estuarine habitats and communities; the costs and methodologies of different adaptation approaches, and their efficacy in improving the resilience of habitats and communities; or the social and economic barriers (and opportunities) to sound decision-making related to climate change adaptation and increased community resilience. *Reserve Contact: Kenneth Raposa, kenneth.raposa@dem.ri.gov*

The value (monetary or non-monetary) that humans place on natural resources and processes can influence management strategies and build a case for investment in natural systems. To advance this concept, the community needs a better understanding of the value placed on ecosystem services such as carbon sequestration, storm buffering, wildlife habitat, recreation, and cultural identity of various coastal and estuarine habitats, particularly salt marshes; how ecosystem services valuation studies may support protection and restoration efforts; if and how increased awareness and understanding of ecosystem services results in behavior change; and what frameworks could be used to understand behavior and to design behavior change programs. *Reserve Contact: Kenneth Raposa, kenneth.raposa@dem.ri.gov*

Restoration and adaptation projects have taken place in a variety of habitats within the reserve and throughout the Narragansett Bay region, but there is limited information regarding the results. Restoration practitioners and coastal decision makers need to better understand the effects of climate change stressors on upland to subtidal coastal habitats and how habitat functions and values change as a result of restoration and adaptation projects; which techniques are the most effective at increasing habitat resilience to climate change stressors; and what lessons learned from implemented projects can be shared to increase the likelihood of success of future projects; and how wildlife use of habitats varies by condition and vulnerability to climate change; and effects of adaptation projects on wildlife community structure and function. *Reserve Contact: Kenneth Raposa, kenneth.raposa@dem.ri.gov*

This reserve has led the establishment of salt marsh monitoring within the national system, but more refined user-based products from the monitoring program and sentinel sites are needed. The program wants to better understand end user needs related to the information, products, and tools people need as they work to increase coastal resilience. Also needed to determine trends and patterns: further analysis of Narragansett Bay water quality and other long-term datasets. While there are various reports and data summaries for some datasets, there has been little long-term trend analysis. *Reserve Contact: Kenneth Raposa, kenneth.raposa@dem.ri.gov*

Narragansett Bay Reserve, Rhode Island

Stormwater continues to be a key issue throughout the Narragansett Bay region. Increased storm intensity due to climate change, along with high percentages of impervious cover in many communities, is driving the need for additional tools to help mitigate the negative effects on coastal habitats and communities. Coastal decision makers need information to help them assess implementation barriers for best management practices, particularly low impact development and green infrastructure; and a better understanding of the efficacy of education and engagement strategies to advance the adoption of stormwater best management practices, particularly at the local level. *Reserve Contact: Kenneth Raposa, kenneth.raposa@dem.ri.gov*

Wells Reserve, Maine

Non-Native Species Interactions: Anthropogenic and climate-mediated processes are driving shifts in the distribution of invasive and range-expanding species (e.g., green crab, blue crab); estuarine systems are especially vulnerable to high invasion rates. However, interactions between native vs. non-native species in estuaries and coastal waters remain poorly understood. We seek to leverage novel technologies (e.g., eDNA, telemetry) to advance ongoing and future bio-monitoring programs that expand our understanding of invasive species and their impacts on native population dynamics and ecosystem services. *Reserve Contact: Jason Goldstein, jgoldstein@wellsnerr.org, 207-646-1555 x136*

Healthy and Sustainable Fisheries in the Gulf of Maine: Ocean climate change is already having adverse impacts on economically and ecologically important marine species in the Gulf of Maine, and we expect stressful environmental conditions (e.g., thermal stress, coastal acidification, disease) to persist or intensify over time. We seek to expand empirical studies and predictive modeling to inform coastal resource stakeholders of how such stressors affect finfish and shellfish species, especially for early life history stages that are considered data-poor (e.g., larvae, post-larvae). *Reserve Contact: Jason Goldstein, jgoldstein@wellsnerr.org, 207-646-1555 x136*

Coastal Resiliency: Shorelines are increasingly vulnerable to storms, sea level rise, and erosion. In response, vulnerable coastal communities are making complex management and policy decisions, but one issue remains difficult to discuss: relocation. Relocation raises hard questions about financing, property rights, and emotional attachments to place. Research is needed to better understand these challenges and methods for engaging communities in dialogues that build resilience. *Reserve Contact: Christine Feurt, cfeurt@wellsnerr.org, 207-646-1555 x111*

SWMP Data Science and Synthesis: The System-wide Monitoring Program (SWMP) measures long-term changes and short-term variability in water quality, weather, and sea level. We seek to better synthesize these data, but we lack the analytical tools to comprehensively analyze such large datasets. This research reserve is therefore interested in projects that include the development of novel tools and robust analyses to efficiently summarize trends from these data, and to facilitate the future incorporation of other parameters, particularly aspects of carbonate chemistry. *Reserve Contact: Jason Goldstein, jgoldstein@wellsnerr.org, 207-646-1555 x136*

Ecosystem Services and Sentinel Site Data Science: Current research reserve and sentinel site programs document tidal marsh conditions and responses to environmental change, but the findings are not always useful for decision makers because the findings are not connected to the ecosystem services provided by the marsh. New research is needed to identify and, where possible, quantify the ecosystem services (and disservices) related to the tidal marsh. The information will support decision making about tradeoffs for conservation, nature-based solutions, restoration, and planned relocation of human and natural infrastructure. *Reserve Contact: Jason Goldstein, jgoldstein@wellsnerr.org, 207-646-1555 x136*

Waquoit Bay Reserve, Massachusetts
Research is needed to better understand climate change impacts on estuarine systems, including, but not limited to, water quality, ecosystem service provision, habitat change and recovery, nutrient cycling, and species response. We also invite research that examines the effects of changes in freshwater inputs and other factors on salinity and flow regimes, as well as the impact of climate and other drivers on nutrient management models. This information will be useful for informing restoration and remediation efforts within Waquoit Bay and the surrounding watershed. We also seek research focused on analyzing data such as data from the reserve's System-Wide Monitoring Program (SWMP) to inform effective resource management. *Reserve Contact: Megan Tyrrell, megan.tyrrell@mass.gov, 857-378-1858*
As coastal ecosystems become increasingly stressed, the need for restoration to bring back healthy functions and essential ecosystem services has never been greater. Many restoration projects have been successful in achieving discrete habitat or species goals, but there is incomplete understanding of how these projects affect larger ecosystem processes and functions. We seek research projects to further explore the impacts of restoration projects on biogeochemical processes and other ecosystem functions. The resulting information will be used to help guide resource management decisions, enhance restoration science, and increase restoration success. In addition, to address ecosystem concerns and local stakeholder needs, the reserve also invites research regarding methods and approaches to stem the decline of submerged aquatic vegetation. *Reserve Contact: Ryan Clark, ryan.d.clark@mass.gov, 774-255-4241*
Addressing pollution from excess nutrients and contaminants is a pressing coastal management issue. Managers have prioritized the need for research-based information on the efficacy of watershed and embayment solutions, including non-traditional methods of nutrient remediation (e.g., shellfish aquaculture, floating and constructed wetlands, reactive barriers, phytoremediation, etc.) to restore water quality. There is also growing interest in the impact of plastics on water quality and ecosystem health. We invite research on these topics to help inform adaptive management. We also invite social science and education research to better understand the human dimensions of these issues, inform development of effective policies and successful outreach and community engagement strategies, and address socioeconomic factors that affect public acceptance and implementation of management solutions. *Reserve Contact: Tonna-Marie Rogers, tonna-marie.surgeon-rogers@mass.gov, 860-280-1864*
Many municipalities are dealing with intensifying impacts from coastal hazards. State and local officials support efforts to strengthen community and habitat resilience, and the reserve is working with partners to educate and equip stakeholders to reduce vulnerability. Decision-makers need additional information regarding where and how nature-based solutions and resilience-focused information and tools can best be applied. To be more specific, the reserve seeks research to inform effective coastal resilience planning; to enhance adoption of best management practices; and to identify effective ways to implement risk communication strategies in the community to get more people involved in planning efforts. A focus on reaching and addressing the needs of under-served and traditionally under-represented community groups is also requested. *Reserve Contact: Tonna-Marie Rogers, tonna-marie.surgeon-rogers@mass.gov, 860-280-1864*
Rising sea levels are threatening salt marshes across New England. Locally, impacts such as an increase in the size of pools and declining abundance of vulnerable marsh species have been observed. Research is needed to better understand and respond to changes occurring in marsh environments, as well as identify effective management and restoration strategies. Also needed: research on adaptation strategies such as marsh migration as well as studies that demonstrate the value of salt marshes and assess true costs if marsh ecosystem services (e.g., blue carbon) are lost or impacted. *Reserve Contact: Megan Tyrrell, megan.tyrrell@mass.gov, 857-378-1858*

Pacific Region

He‘eia Reserve, Hawaii
Across the research reserve system, staff and partners have expressed a need for a deeper understanding regarding the role and application of Indigenous science when it comes to restoring social-ecological estuarine systems. But these learning opportunities are scarce. The reserve is interested in exploring in-depth, experiential learning related to these approaches to better support thriving estuaries and just coastal communities. *Reserve Contact: Shimi Rii, shimi@hawaii.edu, 808-783-9621*
As a participant in the system’s national monitoring program, the reserve collects long-term monitoring data, including data about the people and their relationships to the place. These data are stored in different databases that are not easily retrievable for comparison or modeling purposes. The reserve is interested in a collaborative project that will synthesize historical and current cultural and scientific data, with the goal of creating adaptable and accessible products and models that can be used to guide restoration and adaptive biocultural resource management. *Reserve Contact: Shimi Rii, shimi@hawaii.edu, 808-783-9621*
Changes in land-use, development, and Indigenous resource management practices have drastically altered the reserve’s landscapes. Baseline measurements of biophysical, social, economic, and behavioral impacts of habitat change are available, but still unknown is how the watershed responds to climate change (more intense and frequent storms, rising sea level and frequent king tides, warming temperatures, decreasing pH, and subsequent effects on groundwater, nutrient dynamics, and the food web). The reserve is requesting a project that provides additional knowledge about the environmental drivers of spatial and temporal patterns of biodiversity and productivity in the watershed, with the long-range goal of supporting habitat resilience in the face of climate change. *Reserve Contact: Shimi Rii, shimi@hawaii.edu, 808-783-9621*
The reserve’s education program aims to increase student, educator, and community understanding of coastal ecosystems and Hawaiian resource management, and enhance the coordination and effectiveness of their education and training programs. Projects are sought that 1) enhance the site’s capacity to develop, coordinate, and assess multi-site programming and collaboration among the various program providers and participants (e.g., place based education professionals, research reserve graduate assistants, and TOTE teacher-participants) and 2) increase the capacity to translate knowledge among multiple domains and promote “dual fluency” among different audiences. *Reserve Contact: Shimi Rii, shimi@hawaii.edu, 808-783-9621*
The reserve provides training and opportunities that integrate Indigenous and conventional scientific knowledge. Other community organizations and networks throughout the state are developing tools to promote Indigenous resource management practices. The reserve is interested in engaging with these organizations to learn about novel technologies and tools and find new approaches that may be useful for He‘eia and local decision makers. The reserve seeks projects that enhance the transfer of knowledge between different organizations through collaborative workshops and training within He‘eia and with the broader state and national network. *Reserve Contact: Shimi Rii, shimi@hawaii.edu, 808-783-9621*

Southeast Region

ACE Basin Reserve, South Carolina
Long-term monitoring data have been collected at the reserve. The site is interested in projects that will integrate and synthesize the meteorological, water quality, and biological datasets to better understand the ecological implications of climate change. *Reserve Contact: Denise Sanger, sangerd@dnr.sc.gov, 843-953-9074*
ACE Basin salt marshes are vulnerable to sea level rise, and coastal land managers are only beginning to understand the consequences of these changes, as little research has been done at the reserve to assess impacts. This site is interested in projects that help them understand how the dominant ecosystems will change, and help them develop effective adaptation or mitigation strategies. *Reserve Contact: Denise Sanger, sangerd@dnr.sc.gov, 843-953-9074*

ACE Basin Reserve, South Carolina

The South Carolina coast is threatened by changing environmental conditions, including sea level rise, flooding, storm surge, shoreline erosion, and changing weather and storm patterns. Coastal development is modifying how these threats change the coast. To increase the resiliency of the built and natural communities, the reserve is interested in projects that study the impact of acute and long-term hazards on our coast. *Reserve Contact: Denise Sanger, sangerd@dnr.sc.gov, 843-953-9074*

Guana Tolomato Matanzas (GTM) Reserve, Florida

At this reserve, one finds a bar-built estuary with a dynamic coastline. An increasing population, coupled with more frequent storm events, has led to an increase in dredging, shoreline armoring, thin-layer sediment placement, and beach nourishment projects, yet local impacts on estuarine structure and function are unknown. To investigate the trade-offs from different management options, the region needs studies focused on sediment transport, hydrodynamic, and ecosystem function (e.g., fisheries, carbon storage, nutrient cycling, wildlife use, etc.). *Reserve Contact: Nikki Dix, nikki.dix@floridadep.gov*

The research reserve's monitoring program has amassed high-quality water quality, weather, and wetland data over the last 10-20 years. The next step is to synthesize and leverage these data to inform a broader picture of estuarine impacts and responses, or lack thereof, to disturbances and changes. Proposals are sought for projects that link patterns in estuarine structure observed via these data to patterns in estuarine functions such as fisheries, carbon storage, nutrient cycling, wildlife use, etc. *Reserve Contact: Nikki Dix, nikki.dix@floridadep.gov*

The estuary at this reserve receives pollution from nutrients, bacteria, heavy metals, and other emerging contaminants. To design and prioritize management options to address water quality concerns, more local data from the reserve is needed. Investigations focused on pollution levels, sources, loads, and ecosystem-level impacts are sought. *Reserve Contact: Nikki Dix, nikki.dix@floridadep.gov*

North Carolina Reserve, North Carolina

Ecosystem Services: To inform future coastal management strategies, the reserve is interested in projects that quantify ecosystem services and help us better understand how these services may change in response to climate change, invasive species, and coastal development. Potential study projects include better quantification of ecosystem services provided by oyster reefs and marshes related to wave dampening, shoreline protection, and maintenance of water quality; and comparative analyses of ecosystem services provided by wetland or aquatic non-native and native species. *Reserve Contact: Justin Ridge, justin.ridge@ncdenr.gov*

Vulnerability and Resilience: Habitats at the reserve are vulnerable to climate change impacts (e.g., sea-level rise, increases in storminess and temperature), and their vulnerability is influenced by human activities (e.g., sand placement, dredging). The reserve is interested in projects that provide more information about habitat vulnerability and potential actions to increase resilience. Possible projects include: evaluating the potential for habitat migration; building upon current resilience work at the Rachel Carson Reserve; and understanding the vulnerability of ocean beach and marsh habitats at the Masonboro Island Reserve, and recommending opportunities to enhance resilience. *Reserve Contact: Justin Ridge, justin.ridge@ncdenr.gov*

North Carolina Reserve, North Carolina

Habitat Mapping and Assessment: As part of the System-Wide Monitoring Program, reserve habitats are mapped from the uplands to the intertidal marsh-water edge. We have used remote sensing, including aerial imagery and drones, to map select areas of intertidal habitats, and we continue to expand the integration of remote sensing tools. The reserve is interested in proposals to develop novel methods and workflows to remotely assess intertidal-to-subtidal habitat components at user-defined spatial (e.g., patches to landscape) and temporal scales (e.g., before and after events, seasonal, and annual cycles) to better monitor wetland, oyster, and submerged aquatic vegetation habitats and integrate with broader-scale mapping efforts. *Reserve Contact: Justin Ridge, justin.ridge@ncdenr.gov*

Zeke's Island Reserve Assessments, Water Quality, Monitoring Data Synthesis: The reserve has identified sedimentation, degraded water quality, sea-level rise, and invasive species as stressors for the Zeke's Island Research Reserve in their 2020-2025 management plan. Causes and extent of changes at the site, however, are not well understood. We seek research partnerships to help us better understand water quality trends and other contributing factors that may be influencing changes in water depth and water quality, including ecosystem metabolism, episodes of hypoxia, and algal mat growth. The project will use the reserve's monitoring data and other relevant data. *Reserve Contact: Justin Ridge, justin.ridge@ncdenr.gov*

Connection with Underserved Communities: The reserve has connected with nearby, historically underserved communities through our education programs (i.e., school field trips to the Rachel Carson Reserve and Masonboro Island Reserve), but we lack an understanding of how these communities use the reserve sites and how to meaningfully connect with and serve these communities. We are seeking proposals for research and partnerships that will help us better understand the underserved communities located near reserve sites and design an effective engagement strategy. *Reserve Contact: Justin Ridge, justin.ridge@ncdenr.gov*

North Inlet-Winyah Bay Reserve, South Carolina

Estuaries are highly productive ecosystems, but studies indicate that the diverse habitats within estuaries (e.g., salt marsh, oyster reef, tidal creeks, among others) are experiencing a variety of changes as a result of sea level rise, warming temperatures, and increasing urbanization. Projects are being sought that provide a better understanding of the effects of these changes on ecosystem services and functions, and ways to develop potential adaptation and mitigation strategies. *Reserve Contact: Robert Dunn, robert@baruch.sc.edu*

Provision of nursery habitat is a key ecosystem service provided by estuaries, but changing climate conditions and growing human populations may be stressing key species. To implement ecosystem-based management, improved understanding of the situation is needed. Projects should assess the impacts of natural resource use (e.g., harvest of bivalves, crustaceans, or finfish, among others) and shifting species distributions in response to climate change. Comparative studies with other reserves or nationally would be appreciated, too. *Reserve Contact: Robert Dunn, robert@baruch.sc.edu*

South Carolina has some of the fastest development growth rates in the nation. Effective stormwater management is essential for sustainable coastal development, but for downstream water quality protection, the effectiveness and cumulative impacts of various stormwater control measures and development practices is unknown. This project request is for studies focused on how land use, development practices, and stormwater management affect the transport, transformation, and fate of stormwater pollutants. The information will be used to inform effective management of non-point source pollution. *Reserve Contact: Robert Dunn, robert@baruch.sc.edu*

North Inlet-Winyah Bay Reserve, South Carolina

Various coastal habitats, such as marshes and oyster reefs, can enhance coastal resilience. Providing these benefits could require the preservation, restoration, or creation of such habitats, but more research is needed to better understand how biotic and abiotic ecosystem components influence the effectiveness of these techniques, and to evaluate the efficacy of new monitoring techniques (e.g., comparative assessments of eDNA, bioacoustics, stable isotopes or others along with traditional monitoring approaches). Also needed: an assessment of potential opportunities for integration of nature-based techniques in local development. Reserve Contact: Robert Dunn, robert@baruch.sc.edu

Numerous stressors, including climate change, eutrophication, and overfishing, are expected to impact coastal zones. Understanding and communicating drivers of short- term variability and long-term change in coastal ecosystems across spatial scales is essential for effective coastal management. In particular, how the interactions between climate change and other sources of anthropogenic stress may affect estuarine processes, species, and communities is poorly understood. For this project, the reserve has long-term datasets that could be used to better understand how interacting stressors within estuaries affect the dynamics of coastal habitats and biota, as well as inform habitat assessment tools and future monitoring efforts. *Reserve Contact: Robert Dunn, robert@baruch.sc.edu*

Sapelo Island Reserve, Georgia

Sapelo Island has small freshwater wetlands that support a variety of coastal flora and fauna species. These wetlands are potentially threatened from climate change, (e.g., saltwater intrusion by sea level rise) and decreased aquifers from increased groundwater withdrawal. Many of the large freshwater swamps were drained by extensive ditching carried out in the past; with sea level rise, some of the ditches may be facilitating the flow of salt and brackish tidal waters into upland natural habitats. We don't know what characteristics make the existing freshwater habitats important or vulnerable compared to their mainland counterparts, nor which ditches are having the most significant impacts and would therefore be the most important to target for restoration or improved management. Research is needed that characterizes the ecological importance and resilience of the island's freshwater habitats, as well as research on patterns of altered hydrology and how impacts might best be mitigated. *Reserve Contact: Rachel Guy, rachel.guy@dnr.ga.gov, 912-485-2251*

The first two living shorelines constructed in Georgia were built on Sapelo, near the reserve office and more than a decade ago. The reserve has not implemented other nature-based solutions, yet shoreline erosion continues to be a serious but unquantified and unmapped problem. Sea level rise is causing numerous old drainage ditches and causeways through marshes to flood. State-owned infrastructure and private properties also are increasingly at risk of flooding, from both extreme precipitation events and rising tidal waters. Research is needed that identifies vulnerable sites, characterizes the scope and magnitude of threats, and determines priorities for appropriate and feasible application of new nature-based solutions. *Reserve Contact: Brittany Dodge, brittany.dodge@dnr.ga.gov, 912-485-2251*

Sapelo Island Research Reserve has been collecting continuous water quality data since 2004, and we know climate change will play a role in shifting water quality values. However, we don't know how such changes might affect estuarine organisms, populations, communities, and their interactions. Research is needed that expands our knowledge of relationships between local water quality and patterns in the composition, abundance, and persistence of estuarine aquatic biota and habitats. *Reserve Contact: Rachel Guy, rachel.guy@dnr.ga.gov, 912-485-2251*

Sapelo Island Reserve, Georgia
The private community on Sapelo Island affects water quality, habitat integrity, and ecosystem functions. The community has been affected by major land use changes in the past and continues to be affected by ongoing socioeconomic and demographic changes, and increasingly by sea level rise and nuisance flooding. To enhance the resilience of the community and the multiple state agencies and institutions on the island, research is needed to better understand these complex, interacting factors. *Reserve Contact: Doug Samson, doug.samson@dnr.ga.gov, 912-485-2251*
There have been significant changes in regards to residents and short-term visitors to the island over the last twenty years. The number of private companies offering tours of Sapelo has increased. Many of the new property owners are building houses on previously undeveloped lots, and some of these new property owners are leasing their homes as short-term vacation rentals. The increase in unstructured, overnight visitation has potential implications for long-term research deployments and research and management activities, as well as impacts on island infrastructure such as transportation, solid waste management, fuel services, and emergency response. There has been no quantification or assessment of new visitor impacts to the island's natural resources, public infrastructure, or DNR-managed facilities. Research is needed to understand the scope, magnitude, and extent of current and future ecological and environmental impacts of a growing island population with increased visitors and tourism. *Reserve Contact: Rachel Guy, rachel.guy@dnr.ga.gov, 912-485-2251*

West Coast Region

Elkhorn Slough Reserve, California
The reserve restores various coastal habitats (e.g., salt marsh, coastal prairie, freshwater wetlands) to support the recovery of key coastal species (e.g., oysters, otters, amphibians). While we collect monitoring data, there are still many uncertainties about the best restoration methods and barriers to success. We are interested in research proposals that would lead to improved restoration success in the reserve. *Reserve Contact: Kerstin Wasson, kerstin.wasson@gmail.com, 831-728-2822*
The reserve is impacted by a variety of anthropogenic activities (e.g., nutrient loading, diking, invasive species). While we collect monitoring data characterizing indicators of estuarine health and anthropogenic disturbance, the mechanisms of impacts and how they have changed over time or vary spatially under different conditions are poorly understood. We are interested in research about the impacts of these anthropogenic activities on ecosystem functions, and how these impacts vary across time and space. *Reserve Contact: Kerstin Wasson, kerstin.wasson@gmail.com, 831-728-2822*
Responding to climate change and other stressors requires cooperative and collaborative planning among the reserve, many government agencies, and local communities. The reserve has made some progress in marsh restoration projects that are sea level rise-resilient, but future restoration and adaptation efforts within and beyond the reserve's boundaries will require expanded partnerships and collaborative planning, and strengthened understanding of local community priorities. We are interested in projects that investigate the human dimensions of coastal management, including community characterization (e.g., stakeholders, values, attitudes, beliefs, and social networks), resilience and adaptation, policy analysis, and impacts to coastal economies. *Reserve Contact: Kerstin Wasson, kerstin.wasson@gmail.com, 831-728-2822*

Kachemak Bay Reserve, Alaska

Understanding environmental change in Alaskan coastal ecosystems requires approaches that can assess and address both climate and human drivers. The Kachemak Bay Research Reserve has well-established watershed, nearshore, and ocean ecology programs. These programs provide platforms for innovative methods that capture and interpret data about habitat change and human dynamics, but information from these programs should be used more often in locally relevant climate and management scenarios. We request project proposals that include techniques for applying ecological data (for example - to mariculture approaches), and novel techniques for environmental monitoring, remote sensing, and community monitoring. This information would be used to expand the information and skill sets available to coastal decision-makers. *Reserve Contact: Lauren Sutton, lsutton7@alaska.edu*

Healthy ecosystems provide commonly recognized natural benefits to coastal communities in the form of jobs, food, and recreational opportunities. Coastal stakeholders are aware of these benefits, but there is often a disconnect between behaviors and decision-making around long-term sustainability and maintaining functional ecosystems. We have a need for a deeper understanding of the ways human and natural systems interact through an ecosystem service approach, as well as community-relevant engagement that links local values and conservation options. *Reserve Contact: Syverine Bentz, syverine@alaska.edu*

The Kachemak Bay Research Reserve has years of research outlining how connectivity from the landscapes around headwaters to the nearshore is critical to salmon productivity. In a low regulatory environment, growing populations and industries mean intact systems are at risk of disconnection. To preserve the ecologically intact systems of the Kachemak Bay area, and serve as examples for other parts of Alaska, decision-makers require an understanding of land use change and human impacts, coupled with information about hydrology and nutrient cycling to select management and mitigation strategies. *Reserve Contact: Syverine Bentz, syverine@alaska.edu*

Kachemak Bay Research Reserve's long-term ecosystem monitoring programs include environment (water quality, nutrients, and weather) and biological monitoring (salt marsh vegetation, marine primary productivity, harmful algae, and invasive species). These datasets can potentially be developed into sentinel site applications to better understand seasonality and trends, and plan for future change relevant to the Gulf of Alaska bioregion. The reserve is interested in projects that analyze these datasets and design outreach to utilize them for developing coastal management priorities for stakeholders in subarctic ecosystems. *Reserve Contact: Lauren Sutton, lsutton7@alaska.edu*

Padilla Bay Reserve, Washington

Despite the diverse research and monitoring efforts at Padilla Bay, we often lack precise, measurable, and reliable metrics regarding the emergent effects of climate change and increasing CO_2 on local waters. We need to predict how the reserve ecosystem will change over time, identify means of promoting resilience in natural habitats, and assist local and regional stakeholders in identifying strategies to protect or increase threatened habitats and species. We therefore seek projects that help us understand how climate change will alter species, ecosystem services, and the human communities connected with and reliant upon our coastal ecosystem. Projects can also develop management and conservation tools and guidance that identify sociocultural vulnerabilities to climate change, and web-based platforms to be populated with K-12 curriculum materials that incorporate climate science and monitoring data activities. *Reserve Contact: Sylvia Yang, syang@padillabay.gov*

Padilla Bay Reserve, Washington

Padilla Bay comprises native and non-native eelgrass, wetland and estuarine habitats, and agricultural lands that represent a valuable ecological, economic, and cultural resource for the region. Although these resources are changing dramatically, we lack quantitative evidence connecting ecosystem functions with ecosystem services. Processes of particular interest here include utilization of eelgrass by fish, eelgrass-shellfish interactions, and carbon sequestration. We seek projects that use an ecosystem service approach to understand the socioecological systems of Padilla Bay, and use this information to guide protection and restoration of local and regional estuarine ecosystems so that cultural, ecological, and economic resources can be maintained in the face of global change. Projects may also develop tools that incorporate existing data on blue carbon (stocks, sequestration, etc.) into predictive decision tools or visualizations to inform management, planning, restoration and conservation efforts, or identify sociocultural vulnerabilities as a result of ecosystem service losses. *Reserve Contact: Sylvia Yang, syang@padillabay.gov*

The reserve is interested in projects about habitat resilience that focus on sediment dynamics, which are critical to restoration and long-term resilience of our coastal habitats; eelgrass habitat restoration; and the ecosystem-scale effects of invasive invertebrate and plant species that can alter biodiversity, sediment processes, and food web dynamics. Projects can also test restoration methods to address these topic areas. Our 100 acre demonstration farm could be used to explore the relationship between agricultural practices, carbon sequestration, and nutrient delivery to coastal waters and develop best-practices related to agricultural land use in coastal watersheds. *Reserve Contact: Sylvia Yang, syang@padillabay.gov*

The reserve seeks proposals for quantitative analyses (e.g., multivariate, time-series, spatial) that synthesize long term, system-wide monitoring data collected at Padilla Bay and across the reserve system, specifically when applied to investigate natural and anthropogenic drivers of variability in estuarine responses (e.g., in eelgrass, water quality, productivity). We are particularly interested in analyses conducted within the context of coastal habitats and land-use, and leverage existing data resources such as the reserve system's Classifying Land-Use and Ecosystems (CLUE) classification tool. *Reserve Contact: Sylvia Yang, syang@padillabay.gov*

The Padilla Bay watershed includes natural areas, pastures, agricultural fields, hobby farms, and older homes with compromised septic systems. Fecal coliform contamination is a recurring problem in the bay and the surrounding waters, leading to the closure of local shellfish beds. The lands surrounding Padilla Bay, and particularly Bayview Ridge, are seeing the effects of development and land use change. The implications for water quality, community resilience, and landscape estuary interactions is unclear. The reserve wants to identify causes of fecal coliform contamination, assist local stakeholders and management agencies to reduce these inputs, and explore linkages between large-scale changes in land use and water quality. Our 100 acre demonstration farm could be used to explore the relationship between agricultural practices, carbon sequestration, and nutrient delivery to coastal waters and develop best-practices related to agricultural land use in coastal watersheds. *Reserve Contact: Sylvia Yang, syang@padillabay.gov*

San Francisco Bay Reserve, California

Nature-Based Adaptation Strategies. We support research on nature-based solutions for the resilience of the San Francisco estuary and its human-built environment. The reserve and partners plan, undertake, and assess projects and develop guidance and policy documents around a variety of nature-based projects, but there are gaps in learning from adaptive management and integrating findings into regional efforts. We are interested in proposals that address this gap by gathering new data, working with existing data, collaborating with planners and researchers to develop "lessons learned," and applying them to policy, planning, and new projects. *Reserve Contact: Stuart Siegel, siegel@sfsu.edu, 415-299-8746*

San Francisco Bay Reserve, California

Indigenous Knowledge. The two component sites of the reserve have a long history of human occupancy and use. We are interested in how past and current uses of the sites can inform and improve current land management, habitat restoration, understanding of cultural practices, and inclusive education programs. We have limited tribal contacts and expertise in this area; we therefore would like a focused project to be conducted on this topic and educational courses to be developed to increase knowledge at either or both of the two reserve sites. *Reserve Contact: Stuart Siegel, siegel@sfsu.edu, 415-299-8746*

Invasive Species. The tidal marshlands at the Rush Ranch component of the reserve are impaired ecologically by active feral pigs and extensive stands of the invasive plant perennial pepperweed (*Lepidium latifolium*). In recent years, the problem has increased, and past, limited control efforts have not proven effective. The reserve, in partnership with the Solano Land Trust, seeks proposals for studies to elicit expert information on how to address these invasive species and develop and test control or management options. *Reserve Contact: Stuart Siegel, siegel@sfsu.edu, 415-299-8746*

Aquaculture. Oyster farming is a growing part of the sustainable food economy in Northern California, and is included within the targeted watershed of the reserve. Conservation of native, Olympia oysters is a priority for supporting healthy ecosystem function and living shoreline restoration. We seek projects that would help the reserve understand how high variability throughout the oyster life cycle in different estuarine environments affects native populations and the oyster farming industry. *Reserve Contact: Matt Ferner, mferner@sfsu.edu, 415-338-3724*

South Slough Reserve, Oregon

Climate change is expected to alter South Slough habitats, negatively impact native species, and facilitate establishment of invasive species. We are beginning to monitor these impacts, yet we do not fully understand the potential effects of climate change or management actions to mitigate impacts. In addition, knowledge and action are essential for building communities resilient to climate change, but our impact on necessary behavior change is unknown. We need additional biophysical and social science research to understand the effect of climate change on habitats and species (particularly upland forest wildfire risk and observed declines in estuarine fish communities), as well as to assess the best ways to engage and communicate climate change effects to diverse community audiences. *Reserve Contact: Shon Schooler, shon.schooler@dsl.oregon.gov*

Humans benefit from the ecosystem services related to native species and estuarine habitats (including the connected watershed habitats: uplands, streams, riparian areas, and freshwater wetlands). However, people often do not appreciate the magnitude of these services and the need to manage them effectively and sustainably. What's needed is additional research to: 1) measure ecosystem services, 2) identify and prioritize management needs, and 3) communicate the valuable services functioning estuarine habitats provide to Pacific Northwest coastal communities. *Reserve Contact: Shon Schooler, shon.schooler@dsl.oregon.gov*

Human-induced stressors (i.e., changing climate, land-use practices, introduced species) can degrade water quality, affect the health of animal and plant communities, and reduce the quality of life for humans. In some cases, multiple stressors, such as green crabs, sediment, high temperature, and chemical pollutants potentially interact to affect essential habitat, such as eelgrass beds. These effects then affect estuarine fish communities and sustainable fisheries. To effectively manage estuary species and functions, research is needed regarding the measuring, predicting, and managing of these stressors and how they interact. *Reserve Contact: Shon Schooler, shon.schooler@dsl.oregon.gov*

South Slough Reserve, Oregon

The reserve is restoring wetlands and thinning dense re-growth forests for late-successional old-growth forest conditions. However, we don't know the effects of restoration thinning on habitat resilience, on faunal communities (e.g., birds), or how restoration projects contribute to bio-cultural resources. In addition, invasive species (e.g., green crab, reed-canary grass, and Port-Orford-cedar root pathogen) are affecting habitats and native species and impeding restoration activities. Since we don't fully understand their impacts or know what management strategies will be effective, we need research on restoration trajectories in wetlands and forests; social and cultural impacts of restoration; and the ecology, impacts, and management of native and invasive species. *Reserve Contact: Shon Schooler, shon.schooler@dsl.oregon.gov*

The reserve has data from long-term monitoring programs, and we would like to better understand environmental change over time within the reserve and in comparison to other reserves. Because we don't have the capacity to synthesize and interpret the data to identify environmental degradation issues and improvement opportunities, we need research assistance to: 1) analyze and summarize monitoring data, 2) provide decision-making tools (including modeling outputs) to meet the needs of coastal managers and decision makers, and 3) produce education tools for use by formal and non-formal educators. *Reserve Contact: Shon Schooler, shon.schooler@dsl.oregon.gov*

Tijuana River Reserve, California

The Tijuana estuary is the largest, most intact coastal wetland left in Southern California. Ongoing restoration and conservation efforts have resulted in a system that supports a diversity of habitats and species, but stressors such as biological invasions, habitat degradation, and pollution remain. More restoration and conservation work is being planned, and we need research related to processes that support native biota and habitats (including marshes, dunes, and transitional areas), as well as approaches for tracking a wide variety of ecological and social indicators (e.g., biocultural ecosystem services) that might change in response to management action. *Reserve Contact: Jeff Crooks, jcrooks@trnerr.org*

Excessive sedimentation is one of the principal threats to the integrity of the Tijuana River Valley, and efforts are underway to capture and effectively manage this material. But we lack a full understanding of local sediment dynamics and how these dynamics might respond to short- and long-term management interventions and environmental change. The reserve is interested in research related to the role of sediment in coastal ecosystems, as well as approaches for sediment management and coastal resilience such as natural and nature-based solutions (e.g., beneficial use in restoration and nourishment). *Reserve Contact: Jeff Crooks, jcrooks@trnerr.org*

Debris is a significant source of impairment in the Tijuana Estuary. We have learned lessons related to its management and impacts, but there is still more work to be done in this complex, international setting. The reserve needs a deeper, socio-ecological assessment of the role of debris, and to identify behaviors and barriers that would inform training and technical assistance strategies. Additionally, we are interested in understanding the reserve's niche in a marine debris community of practice and in areas such as research, training, stewardship, and education. *Reserve Contact: Jeff Crooks, jcrooks@trnerr.org*

Many Southern California lagoons, such as the Tijuana estuary, are characterized by small, dynamic river mouths that connect to the sea. The nature of these inlets fundamentally shapes both estuarine and nearshore ecosystems, but changes in hydrology, tidal action, wave climate, and beach processes can dramatically affect inlet functioning. We need studies of estuary-ocean connections (physical, chemical, and biological) and how these might change under varying conditions (including sea level rise). *Reserve Contact: Jeff Crooks, jcrooks@trnerr.org*

Tijuana River Reserve, California

Climate change will affect virtually every aspect of the natural systems and coastal communities in the Tijuana River watershed. In this highly complex socio-ecological setting, three nations meet (the U.S., Mexico, and Indigenous Kumeyaay). Climate impacts are being experienced disproportionately by marginalized communities on both sides of the border, and occur against a backdrop of many other changes and intersectional stressors. We are interested in assessing how to improve both ecosystem and pyscho-social resilience, including the practice of boundary-spanning (both physically and disciplinary) in coupled human and natural communities. *Reserve Contact: Jeff Crooks, jcrooks@trnerr.org*