

Annual Summary of Reserve Management and Knowledge Exchange Needs

Compiled January 2026

This document is a compilation of the current management and knowledge exchange needs within NOAA's reserve system. These needs are submitted by the reserves and updated on an annual basis.

This reserve management and knowledge exchange needs summary supports the development of collaborative science projects, provides insight to important and timely issues at the reserves, and assists in identifying systemwide topics of interest.

Science Collaborative research priorities and reserve needs reflect both NOAA and reserve priorities set forth in the [NERRS strategic plan](#) (climate change, water quality and habitat protection) as well as individual reserve needs at the local level.

Science Collaborative Research Priorities:

These management needs are consistent with one or several of the Science Collaborative research priorities, which are:

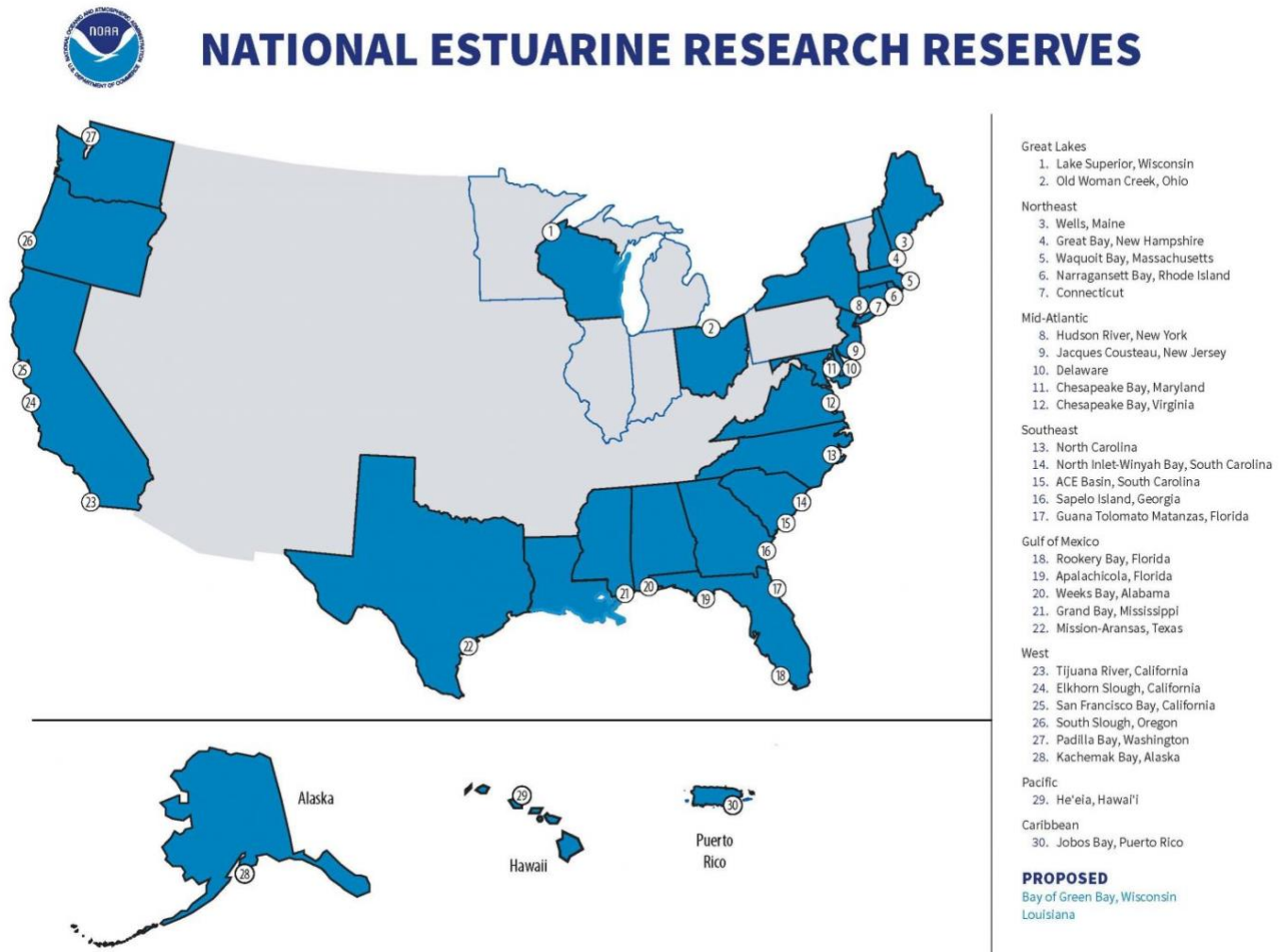
- **Community Resilience and Adaptability** - Understanding how communities rely on and engage with estuarine systems, particularly aspects of human dimensions and cultural ecosystem services, and what behavior changes may enhance resilience to changes to those systems.
- **Habitat Adaptability** - Investigating options for improving estuarine habitat resilience and migration, including response to habitat stressors (e.g., sea level rise, marine debris, invasive species, coastal development, native species displacement, climate change); processes for identifying, prioritizing, and restoring sites; and monitoring and evaluating success.
- **Watershed Dynamics** - Understanding the impacts to water quality and quantity from land use, excessive nutrient pollution (eutrophication), and contamination in estuarine ecosystems, and the options for management and mitigation; investigating drivers of change on the watershed scale and impacts to biogeochemical cycles and substrates.
- **Change Analysis** - Investigating and understanding marsh health through research using long-term monitoring data and information, originating from programs such as the NERRS System-wide Monitoring Program and associated monitoring efforts; conduct estuary condition analyses.

For questions about this summary, please contact:

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Please use the NERRS national map to identify regions and reserves of interest.



Management and Knowledge Exchange Need Keywords

Keywords for each reserve's management and knowledge exchange needs are listed below. Each reserve provided up to 5 priority needs for either management or knowledge exchange. Click on a reserve's name to jump to their need statements.

Caribbean Region

- [Jobos Bay, Puerto Rico](#)
 1. Seagrasses; Invasive Species; Microplastics; Anoxia and Hypoxia
 2. Coral Reefs; Restoration; Invasive Species
 3. Mangroves; Resilience; Socioeconomic; Services
 4. Restoration; Resilience; Living Shorelines.
 5. SWMP; Water Quality; Data Management; Modeling

Great Lakes Region

- [Lake Superior, WI](#)
 1. Wetlands; Invasive Species; Restoration, Coastal Forests
 2. Collaborative Research/Co-Production; Education and Outreach; Impacts; Evaluation
 3. Climate Adaptation; Living Shorelines; Nature-Based Solutions; Wetlands; Traditional Ecological Knowledge
 4. Biocultural Restoration; Resilience; Traditional Ecological Knowledge; Collaborative Research/Co-Production, Transdisciplinary Research
 5. Harmful Algal Blooms; Freshwater Ecosystems; Impacts; Monitoring; Water Quality
- [Old Woman Creek, OH](#)
 1. Biogeochemistry; Data Analysis and Visualization; Nutrient Cycling; Wetlands
 2. Nutrient Cycling; Sediment Transport; Carbon; Hydrodynamics and Hydrology
 3. Nature-Based Shorelines; Living Shorelines; Erosion; Coastal Engineering
 4. Marine Debris; Microplastics; Water Quality
 5. Restoration; Ecosystem Services; Management; Invasive Species

Gulf Region

- [Apalachicola, FL](#)
 1. Habitat; Coastal Flooding; Tropicalization; Resilience
 2. Hydrodynamics and Hydrology; Nutrient Cycling; Carbon
 3. Plankton Ecology; Phytoplankton; Hydrodynamics and Hydrology; Nutrient Cycling
 4. Humanities/Human Dimensions; Education and Outreach; Assessment
 5. Ecosystem Services; Economy/Economics; Humanities/Human Dimensions; Collaborative Research/Co-Production
- [Grand Bay, MS](#)
 1. Restoration; Research; Effectiveness Monitoring
 2. Physical Processes; Ecological Processes; Sediment Dynamics; Populations

3. Contaminants; Impacts; Mitigation
4. Population Distribution; Population Ecology; Ecology
5. Socio-Economic Impact; Ecosystem Restoration; Coastal Habitats
- [Mission-Aransas, TX](#)
 1. Climate Change; Sea Level Rise; Communication; Impacts
 2. Habitat, Mapping, Remote Sensing, SWMP
 3. eDNA; Monitoring; Invasive; Bioacoustics
 4. SWMP; SET; Anthropogenic Impacts; Data Analysis, Data Mining, and Visualization
 5. SWMP, Seagrass, Management, Monitoring
- [Rookery Bay, FL](#)
 1. Mangrove Forest; Migration; Uncrewed Aircraft Systems/Drones; Set/Surface Elevation Tables/Change
 2. SWMP; Data Analysis/Data Mining and Visualization; Fisheries; Assessment
 3. Monitoring; Indicators; Invertebrates; Biological Invasions/Invasive Species
 4. History; Community Science; Traditional Ecological Knowledge; Education and Outreach
 5. Benthic Ecology; Oyster Reefs; Seagrasses and Other Submerged Aquatic Vegetation; Environmental DNA (eDNA)
- [Weeks Bay, AL](#)
 1. Living Shoreline; Nature-Based Solutions; Resilience; Education and Outreach
 2. Marine Debris/ Marine Plastic Pollution; Policy; Humanities/ Human Dimensions
 3. Management; Other (Prescribed Fire); Education and Outreach
 4. Anthropogenic Impacts; Watershed Ecology; Emerging Contaminants; Water Quality
 5. Spatial Ecology; Wildlife; Migrations; Habitat

Mid-Atlantic Region

- [Chesapeake Bay, MD](#)
 1. Data Analysis, Data Mining, and Visualization; Wetlands Indicators; Impacts;
 2. Restoration; Migration; Wetlands; Coastal Forests
 3. Benthic Ecology; Seagrasses and Other Submerged Aquatic Vegetation; Ecosystem-Based Management; Monitoring
 4. Humanities/Human Dimensions; Education and Outreach; Art; Local Ecological Knowledge
- [Chesapeake Bay, VA](#)
 1. Groundwater; Hydrodynamics and Hydrology
 2. Seagrasses and Other SAV; Marshes; Ecosystem Services; Restoration
 3. Harmful Algal Blooms; Water Quality; Aquaculture; Economy
 4. Nutrients; Sediment; Modeling; Eutrophication
 5. Community; Communication; Human Dimensions
- [Delaware, DE](#)

1. Monitoring; Habitat; Ecosystem; Indicators
 2. Bioacoustics; Wildlife; Community Ecology; Monitoring
 3. Climate Change; Habitat Resilience; Ecosystem Services; Water Quality
 4. Climate Change; Habitat Resilience
 5. Climate Change; Habitat Resilience; Ecosystem Services; Water Quality
- [Hudson River, NY](#)
 1. Education and Outreach
 2. Submerged Aquatic Vegetation; Fish Ecology; Ecosystem Services; Restoration
 3. Data Analysis, Data Mining, and Visualization; Fisheries; Habitat; Water Quality
 4. Submerged Aquatic Vegetation; Restoration; Data Analysis, Data Mining, and Visualization
 5. Blue Carbon; Tidal Freshwater Ecosystems; Biogeochemistry
 - [Jacques Cousteau, NJ](#)
 1. Human Dimensions; Communication; Impacts
 2. Ecological Modeling; Water Quality; Habitat; Migration
 3. Nature-Based Solutions; Living Shorelines; Thin Layer Placement; Restoration
 4. Resilience; Climate Change; Evaluation
 5. Bioacoustics; Habitat; Migration; Fish Ecology

Northeast Region

- [Connecticut, CT](#)
 1. Seagrasses and Other Submerged Aquatic Vegetation; Management; Other-Shellfish; Ecosystem Services
 2. Data Analysis, Data Mining, and Visualization; Water Quality; Habitat; Anthropogenic Impacts
 3. Nature-Based Solutions; Monitoring; Resilience; Socioecology
 4. Habitat; Anoxia and Hypoxia; Water Quality; Eutrophication
 5. Ecosystem Services; Nutrient Cycling; Wetlands; Coastal Forests
- [Great Bay, NH](#)
 1. Monitoring; Transdisciplinary Research; Communication; Data Analysis, Mining and Visualization
 2. Restoration; Marshes; Migration; Monitoring
 3. Humanities/Human Dimensions; Education and Outreach; Management; Policy
 4. Oyster Reefs; Restoration; Aquaculture; Seagrasses and Other Submerged Aquatic Vegetation
 5. Hydrodynamics and Hydrology; Infrastructure; Dams; Connectivity
- [Narragansett Bay, RI](#)
 1. Climate Change; Resilience; Habitat; Community
 2. Ecosystem Services; Behavior Change; Management
 3. Habitat; Resilience; Wildlife; Restoration

4. Stormwater; Water Quality; Management; BMPs
5. Monitoring; Trends Analysis; Management; SWMP; Data Synthesis
- [Waquoit Bay, MA](#)
 1. Water Quality; Emerging Contaminants; Management; Education and Outreach
 2. Resilience; Ecosystem Services; Nature-Based Solutions; Blue Carbons
 3. Climate Change; Anoxia and Hypoxia; Biological Invasions/Invasive Species; SWMP
 4. Restoration; Biogeochemistry; Seagrasses and Other Submerged Aquatic Vegetation; Benthic
 5. Human Dimensions, Community Science, Education and Outreach
- [Wells, ME](#)
 1. Nature-Based Solutions; Coastal Resilience; Ecosystem Services; Equity
 2. Sea Level Rise; Coastal Resilience; Community Engagement; Human Dimensions
 3. Submerged Aquatic Vegetation; Best Practices; Long-Term Monitoring; Environmental Drivers
 4. Biophysical Monitoring; Invasive Species; Anthropogenic Impacts; Edna
 5. System Wide Monitoring Program; Environmental Drivers; Spatio-Temporal Changes; Teachers On The Estuary

Southeast Region

- [ACE Basin, SC](#)
 1. Ecosystem Services; Communication; Education and Outreach; Human Dimensions
 2. Communication; Nature-Based Solutions; Anthropogenic Impacts; Urban Coastal and Estuarine Ecosystems
 3. Communication; Nature-Based Solutions; Anthropogenic Impacts; Urban Coastal and Estuarine Ecosystems
 4. Sea Level Rise; Habitat; Restoration; Climate Change
 5. Data Analysis; Estuarine and Coastal Modeling Integrated Ecosystem Assessment; Data Visualization
- [Guana Tolomato Matanzas, FL](#)
 1. Fisheries; Water Quality; Wetlands
 2. Aquaculture; Ecosystem Services
 3. Sediment Accumulation/Accretion; Sediment Transport; Hydrodynamics
 4. Phytoplankton; Monitoring
 5. Transdisciplinary Research; Integrated Ecosystem Assessment; Ecological Modeling; Data Analysis, Data Mining, and Visualization
- [North Carolina, NC](#)
 1. Mapping, Remote Sensing, Seagrasses and Other Submerged Aquatic Vegetation, Oyster Reefs
 2. Community Ecology, Environmental DNA (eDNA). Stable Isotopes, Ecosystem Services
 3. Water Quality, Sea Level Rise, Monitoring

4. Resilience, Sediment Transport, Restoration, Modeling
5. Data Analysis, Data Mining, and Visualization, Water Quality, SWMP
- [North Inlet-Winyah Bay, SC](#)
 1. Marsh; Sea Level Rise; Spatial Variability; Adaptation
 2. Habitat Provisioning; Natural Resource Use; Ecosystem-Based Management;
 3. Stormwater; Water Quality; Sustainable Development
 4. Oysters; Habitat Provisioning; Reef Biota; Assessment
 5. Climate Change; Eutrophication; Estuarine Fauna; Coastal Habitats
- [Sapelo Island, GA](#)
 1. Green Infrastructure; Community Resilience; Economic
 2. Mangroves; Range Expansion; Climate Change
 3. Water Quality; Coastal Development; Impervious Surface
 4. SWMP; Climate Change; Biota; Communities

West Coast Region

- [Elkhorn Slough, CA](#)
 1. Restoration; Resilience, Nature-Based Solutions
 2. Eutrophication; Biological Invasions; Dikes
 3. Sea-Level Rise; Resilience; Climate Adaptation
- [Kachemak Bay, AK](#)
 1. Education; Other: Workforce; Applications; Change
 2. Community Ecology; Community Science; Habitats; Intertidal
 3. Community Ecology; Ecosystem Services; Biocultural; Other: Tribal Engagement
 4. Monitoring; Data Analysis; Education and Outreach; Other: Synthesis
 5. Education and Outreach; Evaluation; Other: TOTE, Cultural Ecosystem Services
- [Padilla Bay, WA](#)
 1. Climate Change; Eelgrass; Sociocultural Systems; Resilience; Agriculture
 2. Ecosystem Services; Land Use; Eelgrass; Agriculture; Carbon Sequestration
 3. Data Synthesis; Data Literacy; Education; Land Use
 4. Biocultural Restoration; Communities; Resilience; Ecosystem Services
 5. Remote Sensing; Eelgrass; Resilience; Change Analysis
- [San Francisco Bay, CA](#)
 1. Aquaculture; Larval Ecology/Transport; Oyster Reefs; Water Quality
 2. Biological Invasions/Invasive Species; Resilience; Conservation; Wildlife
 3. Connectivity; Culverts; Ecological Modeling; Hydrodynamics and Hydrology
- [South Slough, OR](#)
 1. Environmental Challenges; Environmental Justice
 2. Indigenous; Knowledge; Biocultural; Resilience
 3. Restoration; Resiliency; Invasive Species
 4. Humans; Climate Change; Behavioral Change
 5. Monitoring; Data; Education; Water Quality

- [Tijuana River, CA](#)
 1. Restoration; Water Quality; Habitats; Species
 2. Sediment; Beneficial Re-Use; Restoration
 3. Marine Debris; Plastics; Watershed
 4. Tidal Prism; Inlet; Ocean-Estuary Exchange
 5. Climate Change; Tribal Engagement; Cultural Heritage

Pacific Islands Region

- [He'eia, HI](#)
 1. Socioecology; Humanities/Human Dimensions; Local Ecological Knowledge; Ecosystem Services
 2. Local Ecological Knowledge; Collaborative Research/Co-Production; Other: Indigenous Resource Management; Other: Community-Based Planning
 3. Co-Production; Evaluation; Traditional Ecological Knowledge; Education and Outreach; Humanities/Human Dimensions
 4. Environmental DNA; SWMP; Assessment; Data Analysis, Data Mining, and Visualization
 5. Climate Change; Nutrient Cycling; Plankton Ecology; Food Web Ecology

National

- [All Reserves \(set 1\)](#)
 1. Data Analysis, Data Mining, and Visualization; SWMP; Water Quality
 2. Mapping; Uncrewed Aircraft Systems; Environmental DNA; Monitoring
 3. Resilience; Wetlands; SET; Data Analysis, Data Mining, and Visualization
- [All Reserves \(set 2\)](#)
 1. Coastal Resilience; Humanities / Human Dimensions; Ecosystem-Based Management
 2. Water Quality; Monitoring; Indicators; Humanities/Human Dimensions
 3. Resilience; Humanities / Human Dimensions; Climate Adaptation; Education and Outreach

Regional

- [West Coast](#)
 1. Oyster Reef; Restoration

Caribbean Region

Jobos Bay

Need Description	Need Alignment by Research Priority		
Need 1: Ecological-economic-livelihood assessment of SAV (seagrasses, Sargassum): One important resource at JBNERR is its extensive seagrass meadows, which provide crucial ecosystem services. Our reserve has been impacted by the invasive seagrass <i>Halophila stipulacea</i> for over a decade, and sargassum influxes also threaten this ecosystem. We aim to address their effects on native seagrasses and associated species through effective management. BUT little is known about how these stressors affect native species, benthic and demersal fauna. THEREFORE, JBNERR seeks research partnerships to investigate these impacts and develop strategies to support the resilience and sustainability of the reserve's coastal ecosystems. Contact: Angel Dieppa, adiemma@drna.pr.gov; 787-853-4617 Keywords: seagrasses; invasive species; microplastics; anoxia and hypoxia		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 2: Coral reef resilience and recovery:		Management	Knowledge Exchange

Our reserve includes mangroves, seagrasses, and coral reefs ecosystems interconnected by biodiversity and health. Coral reef recovery through restoration and management of threats like invasive species and diseases are a priority. BUT managing these challenges requires the wider scientific community's expertise and capacity. THEREFORE, our reserve aims to build research partnerships to develop and apply best management practices across coral reefs, mangroves, and seagrasses ensuring long-term resilience and sustainability of these vital ecosystems within JBNERR. Contact: Angel Dieppa, adieppa@drna.pr.gov; 787-853-4617 Keywords: coral reefs; restoration; invasive species	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 3: Ecological-economic-livelihood assessment of mangroves: Mangroves are critical coastal ecosystems providing essential services and maintaining connections with seagrasses and coral reefs through nutrient cycling and faunal linkages. They stabilize shorelines and support biodiversity AND are vital for ecosystem balance. BUT mangroves face significant threats from human activities and climate change, requiring both ecological and social understanding, including community knowledge and valuation, for effective conservation. THEREFORE, our reserve seeks interdisciplinary partnerships in ecology, social sciences, and economics to assess		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓

community perceptions and develop inclusive, science-based management strategies that bolster the resilience and sustainability of mangroves and associated coastal ecosystems at JBNERR. Contact: Angel Dieppa, adieppa@drna.pr.gov; 787-853-4617 Keywords: mangroves; resilience; socioeconomic; services	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 4: Habitat restoration: Mangroves provide vital socio-economic and ecological benefits as natural buffers, supporting coastal communities and ecosystem health. They interact dynamically with seagrass and coral reefs through nutrient cycling and faunal connectivity AND are essential for stabilizing shorelines. BUT mangroves in JBNERR are increasingly threatened by poor watershed management, storms, sea-level rise, sediment changes, and land use pressure, which affect their ability to regenerate and sustain ecosystem services. THEREFORE, our reserve seeks interdisciplinary partnerships to assess resilience factors and human dimensions, developing integrated, evidence-based strategies to restore mangroves and strengthen the resilience of coastal ecosystems and communities within JBNERR.		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓

Contact: Angel Dieppa, adieppa@drna.pr.gov; 787-853-4617 Keywords: restoration; resilience; living shorelines.	Change analysis	✓	✓
		Management	Knowledge Exchange
Need 5: Understanding environmental responses to natural and anthropic pressure: JBNERR runs a long-term monitoring program collecting water quality, meteorological, and biological data, integrating robust datasets essential for understanding estuarine and coastal dynamics. This analysis supports adaptive ecosystem management AND informs resilience strategies amid climate variability and human impacts. BUT despite extensive data collection, challenges remain in fully elucidating complex environmental responses and drivers across diverse habitats. THEREFORE, JBNERR seeks collaborative research partnerships to enhance data analysis, fill knowledge gaps, and advance ecosystem management techniques that promote the resilience, health, and sustainable stewardship of coastal and estuarine ecosystems within the reserve. Contact: Angel Dieppa, adieppa@drna.pr.gov; 787-853-4617 Keywords: SWMP; water quality; data management; modeling	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis	✓	✓

Great Lakes Region

Lake Superior			
Need Description	Need Alignment by Research Priority		
Need 1: The invasive emerald ash borer is causing widespread black ash tree mortality in the St. Louis River Estuary's forested wetlands and Reserve and partners are actively planting trees to maintain this habitat, but the ecological significance of this tree die-off and impacts of restoration efforts are unknown, especially in the context of daily, seasonal, and long-term water level fluctuations and increasing flood events. Therefore, restoration practitioners and watershed managers need robust analyses and tools to better understand potential species composition shifts, ecological function changes, and the impacts of restoration efforts to better steward forest wetland habitats in Lake Superior estuaries. Contact: Kirsten Rhude, kirsten.rhude@wisc.edu; 715-399-4091 Keywords: wetlands; invasive species; restoration, coastal forests		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics		
Need 2: The Lake Superior Reserve's Teachers On The Estuary program successfully incorporates local outdoor learning, increasing teachers' and students' knowledge and appreciation of estuarine environments and that success results from proven educational practices identified through robust Reserve-specific evaluation. The	Change analysis		
		Management	Knowledge Exchange
	Community resilience and adaptability		✓

Reserve System leads in estuary-related teacher professional development nationwide but Reserves do not evaluate TOTE programs similarly nor holistically and have few opportunities to share findings. Therefore, we need coordinated evaluation approaches built by collaborative learning, sharing, and training. Contact: Luciana Ranelli, luciana.ranelli@wisc.edu; (715) 399-4085 Keywords: collaborative research/co-production; education and outreach; impacts; evaluation	Habitat adaptability		
	Watershed dynamics		
	Change analysis		
Need 3: Nature-based stormwater solutions are well-established in the Lake Superior region and changing precipitation patterns call for investment in resilient infrastructure solutions, but practitioners identify a lack of core botanical knowledge as a barrier to successful green infrastructure implementation. Therefore, there is a need to build capacity for place-based professional training that deepens understanding of plant characteristics and sources, ecological preferences, and cultural significance of plants to build practitioner confidence and decision-making in applied green infrastructure projects. Contact: Karina Heim, karina.heim@wisc.edu; (715) 399-4089		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability		
	Watershed dynamics		

Keywords: climate adaptation; living shorelines; nature-based solutions; wetlands; traditional ecological knowledge	Change analysis		
Need 4: Indigenous knowledge, biocultural restoration, and historical ecological research is imperative when considering effective stewardship (e.g. understanding past fire regimes), research and education actions that advance resilience and sustain reciprocal relationships between humans to the natural world. However, authentically co-developing projects and generating solutions that bridge environmental and human well-being requires sustained partnership and collaboration. Therefore, knowledge exchange between NERRS and Tribal Nations is fundamental to the continuance and expansion of these approaches, and community-based research on topics identified collaboratively by Indigenous land stewards, Reserve staff, and partners will illuminate vital approaches across NERRS. Contact: Deanna Erickson; deanna.erickson@wisc.edu; 715-399-4086 Keywords: biocultural restoration; resilience; traditional ecological knowledge; collaborative research/co-production, transdisciplinary research		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis		
Need 5: Harmful algal blooms (HABs) are increasing in intensity and frequency in the St.		Management	Knowledge Exchange

Louis River Estuary, creating public health risks and the Lake Superior Reserve and partners have piloted real-time HAB detection with promising results but there is no unified, cross-agency strategy for tracking blooms, testing for toxicity, and communicating risks to the public THEREFORE local and regional management agencies need coordinated research and tools to implement real-time detection systems and effective public communication protocols. Contact: Hannah Nicklay; hannah.nicklay@wisc.edu; (715) 399-4088 Keywords: harmful algal blooms; freshwater ecosystems; impacts; monitoring; water quality	Community resilience and adaptability	✓	✓
	Habitat adaptability		
	Watershed dynamics	✓	
	Change analysis		

Old Woman Creek			
Need Description	Need Alignment by Research Priority		
Need 1: Understanding what drives spatiotemporal changes in water quality is essential for predicting future environmental impacts. Since 1980, the reserve has been monitoring nutrient levels at upstream and downstream sites in Old Woman Creek and is seeking quantitative analyses that combine these long-term data. Such analyses could reveal historical trends, predict responses to upcoming environmental changes, estimate nutrient budgets for Old Woman Creek, or evaluate the wetlands' capacity to sequester nutrients. This information will aid management efforts both at the Reserve and throughout the Great Lakes region and beyond. Contact: Jacob Cianci-Gaskill, jacob.cianci-gaskill@dnr.ohio.gov		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability		
	Watershed dynamics		
	Change analysis	✓	✓

Keywords: biogeochemistry; data analysis and visualization; nutrient cycling; wetlands			
Need 2: Great Lakes communities are struggling to mitigate the impacts of nutrient loading, greenhouse gases, sedimentation, and environmental change. The ecological functions of wetlands are known to be influenced by soil, sediment, and hydrological characteristics; however, little is known about how these characteristics, associated processes, and functional properties may vary over space and time, and particularly under increased weather variability. Therefore, OWC NERR seeks a greater understanding of how specific wetland characteristics, including soil and sediment heterogeneity and hydrological dynamics, influence ecosystem function over space, time, and increasingly variable weather conditions. Contact: Steve McMurray, steven.mcmurray@dnr.ohio.gov Keywords: nutrient cycling; sediment transport; carbon; hydrodynamics and hydrology		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability		
	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 3: Many coastal states implement nature-based shoreline techniques because they offer sustainable erosion control alternatives to hardened shorelines. These methods also have the potential to reduce the impacts of increased storm intensity in the Great Lakes. However, a limited understanding of long-term resilient design features suitable for high wave energy systems hampers broader adoption. Therefore, Old Woman Creek Reserve aims to collaborate with partners to assess the effectiveness of nature-based shoreline techniques, their placement across various shoreline types, and long-term maintenance needs to enhance guidance and		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis		

understanding of the return on investment for future Lake Erie projects. Contact: Emily Kuzmick, Emily.Kuzmick@dnr.ohio.gov Keywords: nature-based shorelines; living shorelines; erosion; coastal engineering			
Need 4: Lake Erie faces serious threats from marine debris on land and water. It ranks second in microplastic levels, raising concerns for local health, ecosystems, and the economy. Current research indicates a lack of effective prevention and outreach, especially among urban communities that are both heavily impacted and major sources of single-use marine debris. Therefore, Old Woman Creek Reserve aims to conduct social science research, enhance marine debris monitoring, and expand outreach programs that involve diverse coastal populations in reducing marine debris in Lake Erie. Contact: Jennifer Buehert; Jennifer.Buehert@dnr.ohio.gov Keywords: marine debris; microplastics; water quality		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability		
	Watershed dynamics		
	Change analysis		
Need 5: Habitat restoration and invasive species management have traditionally focused on increasing ecosystem resilience. However, many restoration projects lack monitoring to evaluate their success in maintaining, restoring, or improving ecological health and diversity, while also preventing the spread of invasive species. As a result, the Reserve plans to collaborate with researchers to review current habitat restoration plans, explore new restoration methods, identify best practices, and encourage the adoption of effective techniques to enhance ecosystem services in the Lake Erie watershed.		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis		

Contact: Veronica Hardy, Veronica.Hardy@dnr.ohio.gov Keywords: restoration; ecosystem services; management; invasive species			
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Gulf Region

Apalachicola Bay

Need Description	Need Alignment by Research Priority		
Need 1: Habitats within the Reserve are facing changes in weather pattern and other inputs due to climate: namely extreme weather including floods, drought, increasing temperatures, changing weather patterns, coastal flooding events, salt water intrusion, and more. Currently much is unknown about ongoing changes in the coastal ecosystem structure, response of habitat extent and structure throughout the watershed to these variable stressors, and corresponding changes in ecosystem services. The Reserve includes many significant habitat types throughout the watershed and all are of interest, including submerged or emergent habitat types, and single habitats or interactions between more than one type (e.g. seagrass, SAV, marsh, marsh-mangrove, marsh-upland, sediments, open water, oyster reefs, ecotones and transition zones between communities, and more). The Reserve is interested in both local dynamics within our watershed and in how these habitat types may be affected more broadly across the region. Outcomes could include the synthesis and standardization of monitoring data. Contact: Megan Lamb, megan.lamb@floridadep.gov Keywords: habitat; coastal flooding; tropicalization; resilience		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis	✓	✓
Need 2: The hydrology and energy flows of the Apalachicola watershed are nuanced and		Management	Knowledge Exchange

complex. A greater understanding of nutrient and/or carbon cycling dynamics, how they interact with and move throughout the watershed, floodplain, coastal marshes and forests, and potential influence on trophic dynamics of the floodplain and/or bay is needed. Characterizing current conditions will help inform management needs, future projections, and inform how estuaries in general and the Apalachicola basin specifically fit in with the larger global nutrient exchanges and carbon budget. Contact: Megan Lamb, megan.lamb@floridadep.gov Keywords: hydrodynamics and hydrology; nutrient cycling; carbon	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis		
Need 3: Greater understanding of the primary productivity in the Apalachicola Bay is needed, including effect of hydrology and nutrient inputs on distribution, species occurrence and distribution in the bay area. While the Reserve's System-Wide Monitoring Program monitors gross primary productivity (ie chlorophyll-a) on a monthly basis, other projects that have looked to species level and distribution have been short-term and not addressed all knowledge gaps. The Reserve has a FlowCam 8000 instrument that can be utilized for this project and desires a phytoplankton library and classification scheme be developed for the local area.		Management	Knowledge Exchange
	Community resilience and adaptability	✓	
	Habitat adaptability	✓	

Outcomes could include the synthesis and standardization of existing monitoring data and the collection of new data. Contact: Megan Lamb, megan.lamb@floridadep.gov Keywords: plankton ecology; phytoplankton; hydrodynamics and hydrology; nutrient cycling	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 4: The Apalachicola watershed has a rich anthropological history, and the Reserve includes more than one hundred documented archaeological sites though the presence of additional sites is suspected. The Reserve, managing partners, and collaborators continue to assess and protect these sites as possible and following guidance from the Florida Division of Historical Resources. However more assessment and planning information is needed, including but not limited to: documentation of unreported sites, updated assessments and study of known sites, assessment of threats and impacts events such as coastal flooding and erosion on these sites which would help prioritize future management needs. A second and equally important need related to the Reserve's cultural resources includes updating the education and outreach tools related to these resources, including Nature Center displays and other educational programs and resources to further the Reserve's mission to educate the public about these significant resources and how past inhabitants of the area are tied to the present.		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability		
	Watershed dynamics		

Contact: Megan Lamb, megan.lamb@floridadep.gov Keywords: humanities/human dimensions; education and outreach; assessment	Change analysis	✓	✓
		Management	Knowledge Exchange
Need 5: The Reserve desires to better understand and quantify the ecosystem service (ES) provided by the Apalachicola Bay watershed and linkages to local community well-being and values. A comprehensive ES analysis is needed, to provide more comprehensive understanding of the ES currently provided by the watershed, and as a point of reference for consideration of how changes to the watershed would affect the ES and the community. Outcomes could include: Establish metrics/measures of ES provided by the Apalachicola Bay watershed. Develop detailed socio-economic data. Convene a social science working group. Grow capacity to conduct ongoing and demographically diverse social science research in the Apalachicola watershed and potentially across the Gulf. And more. Contact: Megan Lamb, megan.lamb@floridadep.gov Keywords: ecosystem services; economy/economics; humanities/human dimensions; collaborative research/co-production	Community resilience and adaptability	✓	✓
	Habitat adaptability		
	Watershed dynamics		
	Change analysis	✓	✓

Grand Bay			
Need Description	Need Alignment by Research Priority		
Need 1: Restoration effectiveness monitoring: Coastal habitats are being restored throughout the northern Gulf of Mexico, and many of these efforts have well-defined end points that can be used to determine restoration success, but effectiveness monitoring is rarely conducted and/or monitoring data is not often available for synthesis. Therefore, more information on the effectiveness of restoration approaches in both upland and estuarine systems to guide future management efforts in the region is needed. Contact: NA Keywords: restoration; research; effectiveness monitoring		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 2: Physical and ecological processes: The GNDNERR marshes are affected by several ecological and physical processes, and are slowly being converted to open water, but the physical processes driving this conversion and how critical ecological functions are affected is not well understood. Therefore, studies to better understand overland flow, water circulation patterns, and sediment dynamics (e.g., erosion, transport, deposition) in the GNDNERR are needed to assess management actions with the potential to better conserve estuarine ecosystem function. Contact: NA		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓

Keywords: physical processes; ecological processes; sediment dynamics; populations	Change analysis	✓	✓
Need 3: Sources and impacts of contaminants: The GNDNERR has experienced impacts from contaminants (industrial spills, see Water Quality) and the waters are currently closed to oyster harvest due to fecal coliform bacteria loads in excess of acceptable levels (per the National Shellfish Sanitation Program). While some sources and problems are understood (e.g., MS Phosphates), sources of fecal contamination or the potential impacts of contaminants from other nearby sources are not well understood; therefore, better information about the sources and impacts of contaminants across the reserve are needed to develop effective mitigation strategies. Contact: NA Keywords: contaminants; impacts; mitigation		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability		
	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 4: Population distribution and ecology: The GNDNERR is a reference site for many research studies and on-going restoration projects across the Mississippi Coast, but management questions remain specifically in terms of feral hog management, terrapin nesting success, mammal populations and interactions, seed bank dynamics, occurrence of rare and endangered species, etc. Therefore, population distribution and ecological studies for plants and terrestrial and aquatic vertebrates are needed to increase understanding of these species' population		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓

dynamics in GNDNERR and allow GNDNERR to serve in its role of a reference estuary. Contact: NA Keywords: population distribution; population ecology; ecology	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 5: Socio-economic impacts of ecosystem restoration: Due to the impacts of the Deepwater Horizon oil spill, restoration of coastal habitats is occurring throughout the northern Gulf of Mexico, and many of these efforts are expected to improve the socio-economic condition of the Gulf Coast communities as well as the environmental condition. However, few research efforts focus on ecosystem valuation in terms of the socio-economic impacts of restoration; therefore, more information is needed on how and if restoration to the local environment impacts local communities and economies. Contact: NA Keywords: socio-economic impact; ecosystem restoration; coastal habitats		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis	✓	✓

Mission-Aransas			
Need Description	Need Alignment by Research Priority		
Need 1: The Reserve is subjected to numerous impacts from climate change,		Management	Knowledge Exchange

including: tropicalization of plant and animal species, relative sea level rise rate of 6.4mm per year, and changes in climate patterns such as more intense droughts followed by heavy rains is frequent, and more intense hurricanes. The Reserve needs to identify the predicted impacts of climate change and determine mitigation strategies from the impacts of the Coastal Bend and to subsequently relay that information to decision makers. Contact: Katie Swanson, katie.swanson@utexas.edu Keywords: climate change; sea level rise; communication; impacts	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 2: Place-based managers rely on accurate habitat maps for decisions in resource management, conservation, and species designation. To date, a comprehensive high-resolution habitat map of the entire MAR has not been created, which would greatly benefit natural resources and communities by supporting informed environmental policy. This is a priority across the NERR system and a near-term focus for MAR. Furthermore, integrating standardized habitat mapping protocols across the NERRs that detail the process, from data and image acquisition to preferred software analysis type to results dissemination, will increase efficiency of habitat mapping in the future, rendering change analyses more feasible and attainable.		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics		

Contact: Zoe Ruben, zoe.ruben@austin.utexas.edu Keywords: habitat, mapping, remote sensing, SWMP	Change analysis	✓	✓
Need 3: Changes in species composition of our natural communities is going unnoticed. The use of DNA barcoding and eDNA should be utilized to assess biodiversity of all biota within the reserve, understand trophic relationships, monitor for species range extensions driven by climate change and for invasive species. The use of bioacoustic monitoring allows Reserves to gather baseline data and analyze changes to habitat biodiversity both geographically or temporally. Creating an ecoacoustic community of practice for the Reserve System that would develop standard protocols, gather baseline and change analysis data, would benefit Reserves as well as engage and inform community partners. Contact: Katie Swanson, Katie.swanson@utexas.edu Keywords: eDNA; monitoring; invasive; bioacoustics		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 4: Natural and anthropogenic factors act at multiple scales to drive change in estuarine ecosystems. Understanding how drivers interact at different temporal (e.g., short-to-long term, acute vs chronic) and spatial (e.g., bay-to-watershed, watershed-to-global) scales is essential for addressing management needs, however, our understanding of these		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓

drivers is a knowledge gap. Therefore, we are interested in quantitative analyses (e.g. multivariate, time-series, spatial) that synthesize long-term, system-wide monitoring data, collected at the Mission-Aransas Reserve, around the state of Texas, and across the NERRS, specifically when applied to investigate natural and anthropogenic drivers of variability in estuarine responses (e.g., wetland vegetation, water quality, productivity). Contact: Victoria Congdon, vcongdon@utexas.edu Keywords: SWMP; set; anthropogenic impacts; data analysis, data mining, and visualization	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 5: Submerged Aquatic Vegetation (SAV) is a vital component of estuarine ecosystem health, but SAV is either changing or in decline across the NERRS (2022 NERRS SAV Assessment Report). While many Reserves conduct some SAV monitoring, there is no standard monitoring protocol across the system. This inhibits national analysis of SAV trends over time or drivers of change. Therefore, in-depth analysis is needed to compile and synthesize SAV data and SAV monitoring methods from across the NERRS and recommend best practice monitoring protocols that suit research and management needs at the local and national scale. At the MA-NERR, natural resource management agencies need to understand why some SAV have declined, and how SAV will respond to future climate conditions and extreme weather events.		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis	✓	✓

Contact: Victoria Congdon, vcongdon@utexas.edu Keywords: SWMP, seagrass, management, monitoring			
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Rookery Bay			
Need Description	Need Alignment by Research Priority		
Need 1: Rising seas, storm surge, changing climate, and coastal development can result in coastal squeeze, by which halophytic species, including mangroves, expand into interior marshes while upland habitats transition to freshwater wetlands. AND RBNERR has initiated a vulnerability assessment, BUT still requires synthesis and standardization of monitoring data, and holistic assessments of how ecotones will change with these stressors. THEREFORE, RBNERR seeks to assess habitat shifts to inform strategies for habitat resilience and migration. We seek interdisciplinary partners to combine tools of ecological modeling, hydrology, stable isotopes biochemistry, SET, and remote sensing to develop data synthesis tools and techniques for early detection of vegetation stress to inform strategies for habitat migration. Contact: Nerea Ubierna, Nerea.Ubierna@FloridaDEP.gov, 235-530-5964 Keywords: mangrove forest; migration; uncrewed aircraft systems/drones; set/surface elevation tables/change		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis	✓	✓
Need 2: Florida is conducting large-scale restoration projects to fix altered hydrology.		Management	Knowledge Exchange

One of these, the Picayune Strand Restoration, is located upstream of RBNERR, and restoration is nearly complete. AND RBNERR has conducted extensive long-term monitoring to provide a baseline for pre-restoration conditions, including SWMP water quality data, aquatic fauna, and DEAR programs, BUT still requires post-restoration monitoring of environmental and biological components and analysis of pre-restoration baseline data. THEREFORE, RBNERR seeks partners to: develop data analysis tools; assess the impact of restoration on watershed biochemical cycles, terrestrial and aquatic flora and fauna; develop outreach materials to inform best management practices. Contact: Nerea Ubierna, Nerea.Ubierna@FloridaDEP.gov, 239-530-5964 Keywords: SWMP; data analysis/data mining and visualization; fisheries; assessment	Community resilience and adaptability		
	Habitat adaptability		
	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 3: RBNERR is home to a diverse flora and fauna, inclusive of imperiled species with limited range (e.g., American crocodiles, Florida thatch palms) to invertebrates that serve as indicators of habitat recovery after invasive species control. AND RBNERR manages invasive species and recognizes the need for monitoring the fate of imperiled species, particularly after episodic events (e.g., hurricanes). BUT Reserve's assets (staff, funds) limit timely monitoring of these species after management or disturbances. THEREFORE, RBNERR seeks to develop innovative monitoring tools to assess the link between exotic species control and arthropod communities, and for quick post-disturbance assessment of imperiled species.		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis	✓	✓

Contact: Nerea Ubierna, Nerea.Ubierna@FloridaDEP.gov, 239-530-5964 Keywords: monitoring; indicators; invertebrates; biological invasions/invasive species			
Need 4: RBNERR is inextricably linked to the livelihood of local communities: it covers 40% of the Collier County coastline, protects aquatic and terrestrial flora and fauna, includes over 100 archeological sites, and supports the local economy (e.g., tourism, fishing). RBNERR preserves cultural and natural resources by documenting archeological sites, monitoring flora and fauna, and learning from indigenous communities. BUT there are limited products to communicate this vast heritage to the community. THEREFORE, RBNERR seeks to develop educational products to communicate its rich cultural and natural resources to visitors, and to implement community science to engage local communities in working towards resilient estuaries for future generations. Contact: Nerea Ubierna, Nerea.Ubierna@FloridaDEP.gov, 239-530-5964 Keywords: history; community science; traditional ecological knowledge; education and outreach		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability		
	Watershed dynamics		
	Change analysis		
Need 5: Benthic estuarine habitats are affected by chronic and acute drivers of change (sedimentation, freshwater, boating, hurricanes, tropicalization). Knowledge of the distribution and species composition of critical habitats such as Submerged Aquatic Vegetation (SAV) is essential for establishing restoration targets. AND the RBNERR 2015		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓

benthic habitat mapping quantified that SAV occupied over 3000 acres, BUT current observations suggest a significant decline in SAV and bivalves. THEREFORE, RBNERR seeks to: create new eDNA informed benthic habitat maps; understand drivers behind SAV decline and how this decline impacted imperiled and commercial species; develop restoration strategies for seagrass, macroalgae, live bottom and bivalves. Contact: Nerea Ubierna, Nerea.Ubierna@FloridaDEP.gov, 239-530-5964 Keywords: benthic ecology; oyster reefs; seagrasses and other submerged aquatic vegetation; environmental DNA (eDNA)	Watershed dynamics		
	Change analysis	✓	✓

Weeks Bay			
Need Description	Need Alignment by Research Priority		
Need 1: Weeks Bay Reserve is faced with the problem of managing a narrow but critical marsh habitat under the increasing impact of sea level rise. This need has produced a preliminary body of research that has increased our knowledge of the ecology of these critical habitats, but Weeks Bay Reserve and other sub-estuaries in the Mobile Bay system need design guidance and shoreline protection plans for restoration and living shorelines in relation to wave climate, sediment budgets and rising seas. In addition, we are motivated to improve community focused conservation and general stewardship. Therefore, we need research in the areas of the relative effectiveness of various popular methods of shoreline protection and green infrastructure; community resistance to adoption of more natural and sustainable methods; and ways to overcome		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis		

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. Contact: Angela Underwood, angela.underwood@dcnr.alabama.gov Keywords: living shoreline; nature-based solutions; resilience; education and outreach			
Need 2: Many coastal habitats along the northern Gulf Coast are impacted by marine debris, including abandoned and derelict vessels. This problem has been addressed in Weeks Bay through short-term grant funding to remove derelict vessels and by Abandoned and Derelict Vessel regulations passed by Alabama in 2019. There have been many economic problems associated with the new regulations' enforcement. Several solutions to address the problems have been suggested including a Vessel Turn-In Program (VTIP) and investigation into the social science behind what causes people to discard trash and debris, and to abandon vessels. Therefore, we need to determine solutions to clean up our coastal habitats and social solutions to prevent future deposition of marine debris in all its forms. This social science study would also address the willingness of coastal residents to support these efforts and to fund these efforts through taxes. Contact: Angela Underwood, angela.underwood@dcnr.alabama.gov Keywords: marine debris/ marine plastic pollution; policy; humanities/ human dimensions		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis		

Need 3: Weeks Bay Reserve uses prescribed fire for a variety of management needs including increasing ecological diversity and resilience, reduction of unwanted species in bog and marsh habitats, and for increasing the ability of marsh habitats to migrate upslope under pressure of sea level rise - as well as the reduction of the risk of wildfire in an increasingly urban habitat. We have increased our knowledge of fire effects on habitats through interactions with other land managers, professional training, tracking vegetation response to application of prescribed fire, and collection of short-term measurements of carbon dioxide release and uptake in burned and unburned marshes on a preliminary scale. However, there are significant gaps in our knowledge of how prescribed fire affects the coastal habitats that we manage. Therefore, we need research to determine how fire intensity, periodicity and seasonality of application affect the ecology of our coastal habitats. Additionally, we need efficient tools and methods to educate local youth and adult audiences on the benefits of prescribed fire and the dangers of wildfire in an increasingly urban environment. Contact: Angela Underwood, angela.underwood@dcnr.alabama.gov Keywords: management; other (prescribed fire); education and outreach		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis		
Need 4: Rapid development within Baldwin County, AL, exists and likely affects water and habitat quality within Weeks Bay and its tributaries. But there is a lack of knowledge on the impacts of these changes on habitat quality and species richness within the watershed. Therefore, further research is needed to understand changes in land-		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓

use/land-cover, potential ecological impacts (i.e., aquatic species population shifts, water quality impairments, etc.), and options for management and mitigation. Contact: Angela Underwood, angela.underwood@dcnr.alabama.gov Keywords: anthropogenic impacts; watershed ecology; emerging contaminants; water quality	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 5: WBNERR hosts research studies and on-going restoration projects within the watershed, but management questions remain specifically in terms of floral and faunal species abundance, distribution, and habitat suitability for restoration efforts. Examples include bird (resident and migratory), pollinator, bat and carnivorous plant surveys. Therefore, further research is needed to increase understanding of species population dynamics in Weeks Bay NERR and recommended management actions to improve ecological function and biodiversity. Contact: Angela Underwood, angela.underwood@dcnr.alabama.gov Keywords: spatial ecology; wildlife; migrations; habitat		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis	✓	✓

Mid-Atlantic Region

Chesapeake Bay MD

Need Description	Need Alignment by Research Priority		
Need 1: Natural and anthropogenic factors act at multiple spatiotemporal scales to drive change in estuarine ecosystems and understanding how varying drivers interact at different temporal (e.g., short-to-long term) and spatial (e.g., watershed-to-global) scales is essential for addressing management needs, but our understanding of drivers at varying spatial and temporal scales is lacking. Therefore, we are interested in quantitative analyses (e.g. multivariate, time-series, spatial) that synthesize long-term, system-wide monitoring data collected at the Chesapeake Bay MD reserve and across the NERRS, specifically when applied to investigate natural and anthropogenic drivers of variability in estuarine responses (e.g. vegetation, water quality, productivity, elevation, etc). Contact: Kyle Derby, Kyle.Derby@maryland.gov Keywords: data analysis, data mining, and visualization; wetlands indicators; impacts;		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 2: Prioritizing tidal wetland and shoreline restoration and conservation to enhance coastal resilience, is needed not only at the local level, but at a regional scale as well. Research and decision-making tools are needed to inform marsh persistence and marsh migration strategies through land acquisition, restoration, and partnership		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓

opportunities. Research is needed in: 1) The effects of marsh migration on human and natural communities; 2) Strategies and research needs to inform approaches to addressing saltwater intrusion and salinization impacts in the State and Mid-Atlantic region; 3) Approaches to determine focus and prioritization areas for wetland migration in the Chesapeake Bay Region. Contact: Kyle Derby, Kyle.Derby@maryland.gov Keywords: restoration; migration; wetlands; coastal forests	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis	✓	✓
Need 3: Submerged Aquatic Vegetation (SAV) is a vital component of estuarine ecosystems, but SAV populations are widely in decline across the NERRS. While many Reserves monitor SAV, monitoring protocols vary, limiting the scope of potential national and regional analysis to inform management. Therefore, in-depth analysis is needed to synthesize SAV data and monitoring methods to establish system wide protocols that suit research and management needs at the local, regional, and national scale. In the Chesapeake Bay region, natural resource managers need a greater understanding of SAV species distribution, condition and dynamics to inform management, regulation and restoration efforts. Contact: Rebecca Swerida, Rebecca.Swerida@maryland.gov Keywords: benthic ecology; seagrasses and other submerged aquatic vegetation; ecosystem-based management; monitoring		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis	✓	✓

Need 4: The Chesapeake Bay MD (CBNERR-MD) reserve is spread across three unique locations, spanning a vast geographic distance with very different landscapes, ecosystems, and community composition. Developing a shared identity across these landscapes and communities of what it means to be part of CBNERR-MD is a challenge. A shared identity will facilitate a greater connection to the reserve and allow staff to better serve the surrounding communities and ecosystems. Therefore, there is a need to employ social science tools and techniques (such as PhotoVoice) and art to understand how staff, partners, visitors, researchers and students interact with the CBNERR-MD. Contact: Christine Burns, christine.burns1@maryland.gov Keywords: humanities/human dimensions; education and outreach; art; local ecological knowledge		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis		

Chesapeake Bay VA			
Need Description	Need Alignment by Research Priority		
Need 1: Naturally occurring patterns of freshwater inflow are important for maintaining the structure and function of estuarine ecosystems. A growing population combined with increasing water-based industry needs and changing precipitation patterns, have demonstrated impacts on freshwater and estuarine water resources. Given increasing		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓

demand, and concern over planning for the many potential and varied water users and strategies (e.g., inter and intra surface and groundwater water use and/or transfer driven by industry such as data center development; post water treatment injection, facility operations, agricultural use) additional research addressing water quality, biogeographical integrity, hydrological regimes, estuarine processes and ecosystems, and local water-based economies within the York River system is warranted. Contact: William Reay; wreay@vims.edu Keywords: groundwater; hydrodynamics and hydrology	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 2: Research that advances the identification, quantification, valuation, and socialization of ecosystem services of tidal wetlands and submerged aquatic vegetation (SAV) (e.g., water quality, carbon sequestration, storm buffering, erosion control) under changing environmental conditions and climate change scenarios is a continuing Reserve priority. CBNERR-VA needs to expand their role in habitat restoration and monitoring of reserve properties and test new technologies and adaptive management techniques designed to mitigate current and anticipated stressors and enhance tidal wetland and SAV resiliency to climate change impacts such as salinization, temperature, and sea level rise. This information would inform future management and communication strategies at the Reserve and elsewhere. Contact: Scott Lerberg; lerbergs@vims.edu		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓

Keywords: seagrasses and other sav; marshes; ecosystem services; restoration	Change analysis	✓	✓
		Management	Knowledge Exchange
Need 3: Harmful algal blooms (HABs) have become more common within the York River system, and resulting toxins can have detrimental effects on shell and finfish, shallow water ecosystems, and humans. Although a topic of active study, our understanding of bloom initiation, dynamics, and impacts on water quality, natural resources and economies are limited. Therefore, synthesis of York River system observing network data and focused field and/or modeling studies are needed to provide early detection and guidance on reducing HAB occurrence, assess toxin production dynamics and impacts, and inform strategies to counter their detrimental effects on estuarine aquatic biota and human ecologies and economies (e.g., aquaculture). Contact: William Reay; wrey@vims.edu Keywords: harmful algal blooms; water quality; aquaculture; economy	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis	✓	✓
		Management	Knowledge Exchange
Need 4: The York River estuary suffers from acute and chronic water quality issues driven		Management	Knowledge Exchange

by excessive loads of sediment, nutrients, oxygen-consuming material along with elevated climatic stresses have resulted in elevated eutrophication, (e.g., intense algal blooms, low oxygen), reduced water clarity, and elevated temperature stress. The ability to explain observed variability in estuarine and ecosystem response to watershed loads, internal cycling, episodic events, and longer-term climatic changes is somewhat limited. Moreover, while the York River basin remains among the lowest contributors of nutrients, sediments and phosphorus in the Chesapeake Bay, little is known about the influence of factors at play (e.g. hydrogeologic framework, land use patterns, etc.). Therefore, syntheses of long-term meteorological, water quality, physical, and biological datasets that provide greater understanding and predictability of estuarine response in the York River basin and other water bodies to multi-factor drivers through the development of empirical (data-driven) models and verification of theory-based models is a priority. Contact: David Parrish; Parrishd@vims.edu Keywords: nutrients; sediment; modeling; eutrophication	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 5: Human dimensions projects will allow CBNERR-VA to better understand how		Management	Knowledge Exchange

existing programs and interpretation in coastal Virginia result in participant knowledge, as well as attitudinal and behavioral change, benefiting stewardship of community resources. Related reserve and partner efforts include advisory service, professional development and community engagement endeavors. Projects and/or activities focused on benefiting Reserve and partner programs in this vein include: 1) program evaluations (e.g. audience needs assessments; market analyses; broader impacts studies, including economic valuations); 2) behavior change assessments and framework development; 3) social science/educational research studies exploring coupled human and natural systems; and 4) development of data- driven and technology-based interpretive and experiential exhibits focused on Reserve science, resource stewardship, and community resilience. Contact: Cirse Gonzalez; cagonzalez@vims.edu Keywords: community; communication; human dimensions	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis	✓	✓

Delaware			
Need Description	Need Alignment by Research Priority		
Need 1: There are several long-term monitoring programs at the DNERR that collect data for understanding coastal ecosystems. Natural and anthropogenic factors at multiple spatiotemporal scales to		Management	Knowledge Exchange
	Community resilience and adaptability		

drive change in coastal ecosystems. Understanding how varying drivers interact at different temporal (e.g. short-to-long term) and spatial (e.g. watershed-to-global) scales is essential for addressing management needs, but our understanding of the drivers is lacking. Therefore, DNERR would be interested in projects that investigate natural and anthropogenic drivers of variability in coastal ecosystems (e.g. wetland vegetation, marsh birds, habitat migration, anthropogenic debris, bioacoustics ect.). Ideally research from these projects would improve the DNERR's understanding of balancing ecosystem needs with management goals to enhance long-term stewardship of the reserve and implement sustainable use of coastal ecosystems. Contact: Christina.Whiteman@delaware.gov Keywords: monitoring; habitat; ecosystem; indicators	Habitat adaptability	✓	
	Watershed dynamics	✓	
	Change analysis		
Need 2: The DNERR implements a robust monitoring program to track vegetation, elevation changes and long-term biotic monitoring programs (nekton and marsh bird point counts) at specific Reserve components; but the monitoring programs lack comprehensive data on changes to land and marine species composition. The Reserve is seeking new ways to monitor, understand, analyze and communicate about environmental change. Therefore, the addition of bioacoustics research at the DNERR would allow research and stewardship sectors to analyze changes to species biodiversity and engage with community partners about faunal composition changes in local habitats. Contact: Christina.Whiteman@delaware.gov		Management	Knowledge Exchange
	Community resilience and adaptability	✓	
	Habitat adaptability	✓	
	Watershed dynamics	✓	

Keywords: bioacoustics; wildlife; community ecology; monitoring	Change analysis	✓	
Need 3: Nutrient Dynamics in Delaware Marshes - Salt marshes are a hotspot for biogeochemical cycling and can provide a range of ecosystem services such as carbon sequestration and denitrification that buffer the impacts of nutrient loading in adjacent estuarine waters. However, they are impacted by numerous stressors that can impact provision of these biogeochemical services and in some conditions can act as a source of greenhouse gasses. The Delaware National Estuarine Research Reserve seeks to advance research on nitrogen, carbon, and phosphorus dynamics within our watersheds. Understanding the complex interactions between these nutrients is crucial for managing ecosystem health and mitigating anthropogenic impacts. This research will inform decision making and support sustainable management practices aimed at improving water quality and ecosystem resilience in the face of environmental changes. Contact: Mollie.Yacano@delaware.gov Keywords: climate change; habitat resilience; ecosystem services; water quality		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability		
	Watershed dynamics	✓	
	Change analysis		
Need 4: Restoring for a changing environment - As coastal ecosystems become increasingly stressed the need for restoration to bring back healthy functions and essential ecosystem services on a watershed wide basis has never been greater. Many restoration projects that the Reserve and other partners have been involved in have been successful in achieving		Management	Knowledge Exchange
	Community resilience and adaptability		

discrete habitat or species goals. But there is incomplete understanding of how these types of projects affect larger ecosystem processes and functions of the entire watershed. We seek research projects to further explore the impacts of restoration projects on wildlife habitat corridors, surface or groundwater flow, biogeochemical processes (e.g. on carbon or nitrogen cycling), and/or other ecosystem functions in a watershed setting, to help guide resource management decisions and increase restoration success. Contact: Rachael.Phillis@delaware.gov Keywords: climate change; habitat resilience	Habitat adaptability	✓	
	Watershed dynamics	✓	
	Change analysis		
Need 5: Characterizing Anthropogenic Stressors in Delaware Marshes - Greater science is needed around the impact and interaction of anthropogenic stressors (nutrients, disease, emerging contaminants, sedimentation) on water quality and biota in the Delaware National Estuarine Research Reserve. In particular, there is a general lack of understanding of the geochemistry of many emerging contaminants, limiting our ability to characterize and predict the movement of these contaminants once they reach aquatic terrestrial margins such as marshes. Water quality is of high interest to local regulators, communities, and individuals concerned about human and ecosystem health. Further research is necessary to understand the impacts of pollutants on human and biological communities and to increase the effectiveness of water quality and marsh management. Contact: Mollie.Yacano@delaware.gov		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	
	Watershed dynamics	✓	

Keywords: climate change; habitat resilience; ecosystem services; water quality	Change analysis		
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Hudson River			
Need Description	Need Alignment by Research Priority		
Need 1: The Hudson River NERR conducts education programs that seek to reduce the barriers to inclusion for all audiences, especially environmental justice communities and historically underserved groups. We also are building relationships with indigenous tribal members of the Lenape and Mohican-Munsee Nations. We continue to explore the most effective pedagogy and best methods for collaborative development of diverse programs, and how to ensure our approaches for all audiences are culturally appropriate. HRNERR staff and partner educators within the Hudson River Estuary need an evaluation tool or process to assess our current engagement, and suggest adjustments to better serve all our participants. Contact: Sarah Fernald, sarah.fernald@dec.ny.gov Keywords: education and outreach		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability		
	Watershed dynamics		
	Change analysis		
Need 2: HRNERR collects data on submerged aquatic vegetation (SAV) habitat. State		Management	Knowledge Exchange

fisheries staff also have many decades of data on fish occurrence and distributions throughout the Hudson River Estuary. However, ecosystem services provided by SAV habitat, and how crucial those services are to fish populations, have not been quantified (e.g., the threshold for SAV density that maintains dissolved oxygen at concentrations needed to support specific fish life stages). Understanding this would enhance the management of both habitats and fisheries. Research is needed on current conditions to inform habitat restoration and to provide a baseline for monitoring potential changes from climate stressors. Contact: Sarah Fernald, sarah.fernald@dec.ny.gov Keywords: submerged aquatic vegetation; fish ecology; ecosystem services; restoration	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis		
Need 3: There are many ongoing high quality environmental data collection and monitoring programs conducted by partners throughout the Hudson River Estuary, including the multi-agency Hudson River Ecosystem Monitoring Program and Hudson River Environmental Conditions Observing System. Stakeholders value the temporal and geographic scope of the data but struggle to use it in decision making. A collaborative data management system is needed to synthesize fisheries data, habitat maps, and continuous water quality data (including NERRS System-Wide Monitoring Program data) in order to perform complex analyses and produce publicly accessible visualization tools that will inform		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability		
	Watershed dynamics		

regulatory decision making in the Hudson River Estuary. Contact: Sarah Fernald, sarah.fernald@dec.ny.gov Keywords: data analysis, data mining, and visualization; fisheries; habitat; water quality	Change analysis	✓	✓
Need 4: The 2024 HRNERR Davidson Fellow is investigating techniques for rearing and planting submerged aquatic vegetation (SAV) for habitat restoration. State Environmental Remediation staff have been working with HRNERR on a spatial analysis tool that layers SAV habitat maps with contaminant exceedances. We need to prioritize areas for SAV restoration with a high likelihood of success by considering optimal flow, depth, sediment composition, and contamination concentrations. State Regulatory staff are seeking to require mitigations in permit reviews that would fund prioritized restoration projects. In addition, project sponsors and restoration staff need a tool to identify good locations for SAV restoration projects. Contact: Sarah Fernald, sarah.fernald@dec.ny.gov Keywords: submerged aquatic vegetation; restoration; data analysis, data mining, and visualization		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis		
Need 5: Blue carbon is a valuable but underutilized estuarine ecosystem service that		Management	Knowledge Exchange

can help policymakers prioritize resource protection and support the state's Climate Leadership and Community Protection Act. HRNERR partners are investigating carbon budgets and the biogeochemical processes influencing carbon storage and resilience of tidal freshwater wetlands. However, controls on storage and emission, uptake rates, rate changes over time, and differences between habitat types are poorly understood. Policymakers need to know if carbon budgets for one local habitat can be extrapolated to other habitats within the same ecosystem to understand how management strategies impact carbon sequestration, methane emissions, and wetland resilience. Contact: Sarah Fernald, sarah.fernald@dec.ny.gov Keywords: blue carbon; tidal freshwater ecosystems; biogeochemistry	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis		

Jacques Cousteau			
Need Description	Need Alignment by Research Priority		
Need 1: Human dimensions interwoven throughout all Reserve projects, programs, and operations, but little is known (or has been recorded) about the local community: about how and why people value a Place and its natural resources, what benefits people seek and derive from those Places and resources,		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓

and how people affect and are affected by those Places, resources, and their management. Therefore, social science research is needed to understand the dynamics of the reciprocal relationship between humans and nature to inform and improve environmental policy, practice, and outcomes within the JC NERR. Contact: Mike De Luca, deluca@marine.rutgers.edu Keywords: human dimensions; communication; impacts	Habitat adaptability		
	Watershed dynamics		
	Change analysis		
Need 2: Water and habitat quality of the pristine Mullica River- Great Bay Estuary are excellent, but periodic upwelling, ocean acidification and saltwater intrusion, and increased precipitation and storms are changing estuary dynamics. Therefore, science-based information and predictive models are needed by the coastal management community to determine how and how fast this environment is changing. For		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	
	Watershed dynamics	✓	

example, Submerged Aquatic Vegetation (SAV) is a vital component of estuarine ecosystem health, but SAV is either changing or in decline across the NERRS. Modeling is also needed to identify areas suitable for future marsh migrations as sea level rises. Research and modeling of changing ecosystem dynamics and range shifts in habitats and species will help coastal managers inform future management of coastal ecosystems and communities. Contact: Mike De Luca, deluca@marine.rutgers.edu Keywords: ecological modeling; water quality; habitat; migration	Change analysis	✓	
Need 3: Tidal wetlands and other estuarine ecosystems are threatened with increasing rates of loss due to sea level rise and more intense coastal storms and our reserve supports statewide efforts to increase resilience through nature-based solutions including living shorelines, increased tidal flow and beneficial use of dredged sediment, but knowledge gaps about the implementation and efficacy of these techniques limits their widespread use. Therefore, our reserve and coastal management partners need research that tests hypotheses to address knowledge gaps and better understand processes to develop standards and best practices for nature-based solutions to increase the resilience of tidal wetlands.		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	
	Watershed dynamics	✓	

Contact: Mike De Luca, deluca@marine.rutgers.edu Keywords: nature-based solutions; living shorelines; thin layer placement; restoration	Change analysis	✓	
		Management	Knowledge Exchange
Need 4: New Jersey's coastal decision-makers have been provided with data, tools, and technical assistance to increase the resilience of built and natural communities to climate change and have used these resources to support resilience planning and actions, but the impact of these efforts on overall coastal community resilience has not been evaluated. Therefore, our reserve and coastal management partners need research to assess the effectiveness of resilience efforts, including the establishment of resilience metrics, to inform the delivery of future data, tools, and technical assistance to coastal communities. Contact: Mike De Luca, deluca@marine.rutgers.edu Keywords: resilience; climate change; evaluation	Community resilience and adaptability	✓	✓
	Habitat adaptability		
	Watershed dynamics		
	Change analysis		
Need 5: Marsh and coastal habitats are changing in response to climate change and local sea level rise and the National Estuarine Research Reserve System implements a robust monitoring program to track vegetation and elevation change, but, the monitoring program lacks information on changes in both		Management	Knowledge Exchange
	Community resilience and adaptability		

land and marine animal composition. Therefore, the addition of bioacoustic research (using recorded sound, including hydrophones to describe a habitat's biodiversity) would allow research and stewardship sectors to analyze changes to species biodiversity and engage and inform community partners about faunal composition changes in local habitats. Contact: Mike De Luca, deluca@marine.rutgers.edu Keywords: bioacoustics; habitat; migration; fish ecology	Habitat adaptability	✓	
	Watershed dynamics		
	Change analysis	✓	

Northeast Region

Connecticut

Need Description	Need Alignment by Research Priority		
Need 1: SAV research and restoration - Eelgrass and shellfish thrive in Long Island Sound and shellfish aquaculture is an important economic driver. It is important to understand these natural habitats individually and their collective benefits and challenges. But knowledge of these interactions is lacking, and existing guidance does not utilize current scientific data and analysis, including an understanding of trends across the reserve system. Therefore, by better understanding the ecological connections of these resources and the research needs of regulatory and industry communities, the Reserve can support collaborative efforts to protect the presence and growth of both eelgrass and aquaculture. Contact: Kevin O'Brien - kevin.o'brien@uconn.edu Keywords: seagrasses and other submerged aquatic vegetation; management; other-shellfish; ecosystem services		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis		
Need 2: Data analysis - Natural and anthropogenic factors act at multiple spatiotemporal scales to drive change in estuarine ecosystems. Understanding and attributing change to relevant drivers and pressures is essential for assessing current management and adapting it for greater effectiveness. Long Island Sound has a wealth		Management	Knowledge Exchange
	Community resilience and adaptability		

of relevant data. But sophisticated analyses are needed to tease out relationships. Therefore, we are interested in quantitative measures that synthesize existing data and developing an updatable approach as new data become available, both for local needs and to integrate our data with the syntheses efforts of long-term, system-wide monitoring data collected across the NERRS. Contact: Kevin O'Brien - kevin.o'brien@uconn.edu Keywords: data analysis, data mining, and visualization; water quality; habitat; anthropogenic impacts	Habitat adaptability		
	Watershed dynamics		
	Change analysis	✓	✓
Need 3: Nature-Based Infrastructure - Estuarine habitats and coastal communities are threatened by environmental changes such as flooding, and nature-based infrastructure is often promoted as a method of increasing resilience. But the ecosystem services provided and the impact on communities is largely under-assessed at the local level, and monitoring programs are often neither robust nor durationally relevant. Therefore, more research and an emphasis on monitoring is needed on the ecological efficacy of these mitigation strategies to coastal habitats - especially wetlands and intertidal areas - as well as social science research to better understand the challenges and opportunities these strategies may offer. Contact: Kevin O'Brien - kevin.o'brien@uconn.edu		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics		

Keywords: nature-based solutions; monitoring; resilience; socioecology	Change analysis		
Need 4: Land use change/eutrophication - Continuing attention to water quality and habitat quality are necessary to support system integrity. Recent nitrogen loading estimates, high resolution land-use mapping, and planned modeling of embayments advances the information available to inform decision makers and the public. But assessments related to habitat and water quality within the reserve boundaries are intermittent or lacking. Therefore, a broadscale assessment within the reserve's aquatic and terrestrial environments are necessary to make the link between loading and land-use data and expressions of impact such as eutrophication in the estuary and watershed. Contact: Kevin O'Brien - kevin.o'brien@uconn.edu Keywords: habitat; anoxia and hypoxia; water quality; eutrophication		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability		
	Watershed dynamics	✓	✓
	Change analysis		
Need 5: Ecosystem Services - Assessing the value of ecosystem services is an important part of effective resource management. Current recommendations in Connecticut include preserving and restoring forests and coastal wetlands as a means of enhancing ecosystem services. These resources are known as important sinks in biogeochemical		Management	Knowledge Exchange
	Community resilience and adaptability		

cycling but their status here is not well understood. Therefore, research and monitoring assessing the boundaries, typology, and capacity in these habitats is critical for preservation priorities, assessing their contribution to state goals, and setting restoration targets within the Reserve watershed and aquatic areas. Contact: Kevin O'Brien - kevin.o'brien@uconn.edu Keywords: ecosystem services; nutrient cycling; wetlands; coastal forests	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis		

Great Bay			
Need Description	Need Alignment by Research Priority		
Need 1: Recent innovations in monitoring have given scientists additional tools to advance our understanding of estuaries and their stressors. Examples of emerging estuarine sampling techniques include environmental DNA sequencing, bioacoustics, microbial analysis, etc. In addition to new monitoring approaches, cross-disciplinary approaches to understanding and communicating about estuarine change are critical to reaching new science, management and community partners (i.e combining local or Indigenous knowledge with NERR data, data visualizations, integrating spatial and field data, working with national data sets from multiple partners, improving data accessibility,		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓

etc.). Our Reserve is seeking new ways to monitor, understand, analyze and communicate about environmental change. Contact: Chris Peter, Christopher.R.Peter@wildlife.nh.gov Keywords: monitoring; transdisciplinary research; communication; data analysis, mining and visualization	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 2: As sea-level rise rates increase and other stressors are exacerbated by climate change, tidal wetlands face an existential challenge. To persist, tidal wetlands must be created, be restored, or migrate inland. GBNERR invested in restoration science, literature reviews, spatial mapping and modeling, monitoring protocols, and partner engagement to increase understanding of marsh resiliency. There are significant investments in the state to restore marshes; however, gaps in knowledge about factors that influence success prevent a holistic and informed approach. GBNERR seeks science to help prioritize appropriate goals, site selection, techniques and evaluation methods for saltmarsh restoration and migration projects. Contact: Chris Peter, Christopher.R.Peter@wildlife.nh.gov Keywords: restoration; marshes; migration; monitoring		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis	✓	✓

Need 3: Great Bay NERR seeks to foster environmental appreciation and support individual, municipal and state decision making that protects Great Bay. However, we know that values, interests, and level of participation in our programs varies across individuals and communities around Great Bay. In the face of shifting social values, we need to understand the mechanisms behind the motivation to care for one's environment to better understand how to structure education and training programs at the Great Bay Reserve, and how to design training and engagement to inform management decisions. Contact: Lynn Vaccaro, Lynn.E.Vaccaro@wildlife.nh.gov Keywords: humanities/human dimensions; education and outreach; management; policy		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability		
	Watershed dynamics		
	Change analysis		
Need 4: Healthy oyster and eelgrass in Great Bay provide valuable water filtration, carbon sequestration, nursery and refuge, and local food benefits to our region. These habitats face direct (ie. disease, harvesting) and indirect (ie. excess sediment or nutrients, changes in temperature, precipitation and light) threats in NH, prompting managers to invest in and support restoration and protection efforts. However, current and past efforts to restore sub-tidal habitats have had variable success. Therefore, we need research and innovative techniques that advance our understanding of stressors, identify and prioritize suitable sites, and evaluate management options (including		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓

partnerships with aquaculture) aimed at improving the long term health of critical habitats and the ecosystem services they provide. Contact: Chris Peter, Christopher.R.Peter@wildlife.nh.gov Keywords: oyster reefs; restoration; aquaculture; seagrasses and other submerged aquatic vegetation	Watershed dynamics	✓	✓
	Change analysis		
Need 5: As a river dominated Estuary, Great Bay's health is inextricably linked to the rivers, streams and inlets that drain into the bay. Tidal restrictions such as culverts, dams, and berms have drastically changed natural hydrology, water quality and quantity, fish passage, and riverine/ buffer area habitat quality and extent. Several projects are underway to remove tidal restrictions and fish passage barriers in the Great Bay watershed, however most restoration projects do not support a science element to evaluate factors that influence success and/or combine findings from tidal restriction removal projects with other disciplines, science or anthropogenic forces in the region. Contact: Chris Peter, Christopher.R.Peter@wildlife.nh.gov Keywords: hydrodynamics and hydrology; infrastructure; dams; connectivity		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis		

Narragansett Bay			
Need Description	Need Alignment by Research Priority		
Need 1: Sea level rise and other climate change stressors such as changes in precipitation, temperature, interspecific competition, and phenology are negatively impacting habitats and threatening coastal communities in Narragansett Bay and its watershed. The Reserve collects data that can help to identify impacts and trends and conducts training and outreach to disseminate that information. Practitioners and decision-makers need information to help them prioritize locations and approaches for preserving and restoring habitats such as: - The impacts of climate change on estuarine and upland habitats and communities. - The costs, effectiveness, and methodologies of different climate change adaptation approaches. - The social and economic barriers to sound decision-making related to climate change adaptation and community resilience. - Opportunities to improve policies and processes that would reduce barriers to implementing nature-based solutions. Contact: NA Keywords: climate change; resilience; habitat; community		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis		
Need 2: The value (monetary or non-monetary) that humans place on natural		Management	Knowledge Exchange

resources and processes can influence management strategies and build a case for investment in natural systems. To advance this concept, decision-makers and conservation practitioners need 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. - The sociocultural vulnerabilities that result from a loss of ecosystem services. - The socioeconomic factors that affect public acceptance and implementation of solutions. - If/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. Contact: NA Keywords: ecosystem services; behavior change; management	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis		
Need 3: 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 on the results of these interventions. The Reserve has historically played a role in restoration project monitoring; however, restoration		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability		

practitioners and coastal decision makers need a better understanding of: - Which techniques are the most effective at increasing habitat resilience to climate change stressors, and what lessons learned from implemented projects can be shared with practitioners to increase the likelihood of success of future projects. - How wildlife use of habitats varies by condition and vulnerability to climate change, and effects of adaptation projects on wildlife community structure and function. - The socio-economic impacts of restoration, whether and how restoration projects impact local communities and economies. Contact: NA Keywords: habitat; resilience; wildlife; restoration	Watershed dynamics		
	Change analysis		
Need 4: Flooding and stormwater continue to be key issues throughout the Narragansett Bay region. Increased storm intensity due to climate change along with high percentages of impervious cover in many communities are driving the need for additional tools to help mitigate negative effects on coastal habitats and communities. Practitioners and decision-makers need information to help them assess: - The barriers to the implementation of best management practices, particularly natural (e.g., land preservation/acquisition, floodplain restoration) and green infrastructure (e.g., engineered nature-based solutions) solutions. - The efficacy of education and engagement strategies to advance the adoption of stormwater best management practices, particularly at the local level.		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability		
	Watershed dynamics	✓	✓
	Change analysis		

- Public acceptance of sustainable stormwater funding mechanisms Contact: NA Keywords: stormwater; water quality; management; bmps			
Need 5: The Reserve has led the establishment of the monitoring and national metrics. However, there is a need to further develop and refine user-based products from the SWMP program as well as other Reserve monitoring efforts. We must better understand end user needs related to information, products, and tools to inform efforts to increase habitat and community resilience to the impacts of climate change. There is also a need to further analyze water quality and other long-term datasets collected at the Reserve and in Narragansett Bay to determine trends and patterns. While there are various reports and data summaries for some datasets, there has been little long-term data analysis to show changes over time. This type of analysis would help to identify impacts of climate change and other stressors and inform coastal management decision making. Contact: NA Keywords: monitoring; trends analysis; management; SWMP; data synthesis		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability		
	Watershed dynamics	✓	✓
	Change analysis	✓	✓

Waquoit Bay			
Need Description	Need Alignment by Research Priority		
Need 1: Communities in Massachusetts are grappling with degrading water quality in many		Management	Knowledge Exchange

coastal bays and freshwater ponds from nutrient pollution, harmful algal blooms, and contaminants of emerging concern. The Reserve has been providing education and training for decision-makers and the public on these issues and facilitating information sharing and research on potential solutions to restore water quality. Resource managers have prioritized the need for locally relevant research-based information on the efficacy of different management approaches including use of non- traditional methods of remediation (e.g. shellfish aquaculture, floating and constructed wetlands, reactive barriers, etc.), as well as on effective policy, regulatory, and community engagement approaches that they can apply. We invite research including social science studies that helps to address this widespread problem, identifies effective strategies that communities can apply, to plan, implement, adapt, and communicate solutions. Contact: Tonna-Marie Rogers, tonna-marie.surgeon-rogers@mass.gov, 508-457-0495 Keywords: water quality; emerging contaminants, management; education and outreach	Community resilience and adaptability	✓	✓
	Habitat adaptability		
	Watershed dynamics	✓	✓
	Change analysis		
Need 2: Sea level rise (SLR) is increasingly threatening communities and salt marshes across New England. Locally we are observing impacts such as increase in pool size and declining abundance of vulnerable species in marshes within the Reserve and elsewhere. Research is needed to help managers better understand and respond to changes occurring in marsh environments due to impact of SLR, erosion, and changes in hydrology, as well as identify effective management, adaptation, and restoration strategies to enhance marsh resilience and protect and restore ecosystem services.		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis	✓	✓

Research is also needed to better understand the value and economic and other benefits of blue carbon and other marsh ecosystem services and true costs associated with their loss. In addition, we also invite research on effective ways to enhance community resilience to SLR and other coastal hazards and on utilizing nature-based solutions. Contact: Megan Tyrrell, megan.tyrrell@mass.gov; 857-378-1858 Keywords: resilience; ecosystem services; nature-based solutions; blue carbons			
Need 3: Research is needed to better understand climate change impacts on estuarine systems, including but not limited to, water quality, ecosystem service provision, habitat and species composition change and recovery and nutrient cycling. Based on observations by managers of changes in ecosystem health, such as increasing occurrences of hypoxic/anoxic events, we invite research that examines the impact of climate and other drivers on nutrient management models, and enhances understanding of hypoxic/anoxic zones and their impacts on fisheries, aquaculture, and recreational activities, etc. In addition, we seek to better understand drivers of detrimental changes in species abundance and composition (e.g., macroalgae, <i>Sesarma</i> sp., coastal forest change caused by Southern Pine Beetle, etc.) and effective management strategies. We also invite research that analyzes monitoring data, e.g., data from the Reserve's System-Wide Monitoring Program (SWMP), to deliver information that can inform resource management.		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis	✓	✓

Contact: Megan Tyrrell, megan.tyrrell@mass.gov, 857-378-1858 Keywords: climate change; anoxia and hypoxia; biological invasions/invasive species; SWMP			
Need 4: 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 involving the Reserve and partners have successfully achieved discrete habitat or species goals. But there is incomplete understanding of how restoration projects affect larger ecosystem processes and functions. We seek research to further explore the impacts of restoration activities on biogeochemical processes and other ecosystem functions to help guide resource management and community engagement and increase restoration success in the Waquoit Bay watershed and surrounding areas. We also invite research on restoration of submerged aquatic vegetation, including eelgrass as well as on utilizing benthic mapping and data to inform habitat management and restoration efforts. Research on prescribed fires in restoration and habitat management is also desired. Contact: Ryan Clark, ryan.d.clark@mass.gov, 857-208-2677 Keywords: restoration; biogeochemistry; seagrasses and other submerged aquatic vegetation; benthic		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis		
Need 5: Reserves are special places that communities value because of the habitats,		Management	Knowledge Exchange

species, and ties to culture and history that they hold, and which give people a sense of place and belonging. As climate change and stressors like nutrient pollution continue to negatively impact these places, research is needed to better understand the cumulative impact on the health of the natural resources but also on sense of place, and on the traditional practices that members of Tribes and other community members rely on and care about. We invite research that explores these connections, examines the value of the Reserve's habitats to the community - recreational and educational offerings and cultural ties - and willingness of community members to help preserve sense of place. We also invite research that demonstrates how these connections to place can help empower the next generation of stewards. Contact: Kristen Weir, kristen.weir@mass.gov; 774-255-4263 Keywords: human dimensions, community science, education and outreach	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis		

Wells			
Need Description	Need Alignment by Research Priority		
Need 1: Support for nature-based solutions (NbS) has grown rapidly and these approaches are a promising way to enhance climate resilience. However, more work is needed to fully understand the benefits and impacts of NbS on communities and habitats. Therefore, we are interested in projects that will explore the social-ecological dimensions of NbS, such as: 1) applying and evaluating NbS at a range of scales; 2) designing engagement and planning processes to support collaborative decision-making; 3) understanding the ecosystem services		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis		

provided by NbS; and 4) assessing equity in NbS siting, implementation, and outcomes. Contact: Jessica Brunacini, Training & Engagement Director, jbrunacini@wellsnerr.org Keywords: nature-based solutions; coastal resilience; ecosystem services; equity			
Need 2: Climate change impacts pose growing risks to coastal communities and our Reserve provides technical assistance on coastal resilience to the municipalities and regional planning organizations in our region. However, there is a need to expand our work to engage with an important group of decision-makers: coastal property owners. Therefore, we seek projects that will help us to identify and better understand the needs of people living on the coast, including what types of resilience strategies they would be interested in learning more about and/or pursuing. We are especially interested in projects that will allow us to more effectively respond to the needs of socially vulnerable populations. Contact: Jessica Brunacini, Training & Engagement Director, jbrunacini@wellsnerr.org Keywords: sea level rise; coastal resilience; community engagement; human dimensions		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis		
Need 3: Submerged Aquatic Vegetation (SAV) is a vital component of estuarine ecosystem health, but SAV is either changing or in decline across the NERRS. While many Reserves conduct some SAV monitoring, there is no standard monitoring protocol across the system. This inhibits national analysis of SAV trends over time or drivers of change. Therefore, in-depth analysis is needed to compile and synthesize SAV data and SAV monitoring methods from across the NERRS and recommend best practice monitoring protocols that suit research and		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability		
	Watershed dynamics	✓	✓
	Change analysis	✓	✓

management needs at the local and national scale. Contact: Jason Goldstein, Research Director: jgoldstein@wellsnerr.org or (207) 646.1555 x136 Keywords: submerged aquatic vegetation; best practices; long-term monitoring; environmental drivers			
Need 4: Anthropogenic and climate-mediated processes are driving shifts in the distribution of invasive and range-expanding species (e.g., crabs), and estuarine systems are especially vulnerable to high rates of invasions. However, interactions between native vs. non-native species in our estuaries and coastal waters remain poorly understood. Therefore, we seek to leverage novel technologies and methods to advance ongoing and future research and monitoring programs that detect and expand our understanding of non-native species and their impacts on native population dynamics and interactions with important local fisheries, including how the economic and social consequences of these changes can be addressed to improve coastal management. Contact: Jason Goldstein, Research Director: jgoldstein@wellsnerr.org or (207) 646.1555 x136 Keywords: biophysical monitoring; invasive species; anthropogenic impacts; eDNA		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis	✓	✓
Need 5: Natural and anthropogenic factors act at multiple spatio-temporal scales to drive change in estuarine ecosystems and understanding how varying drivers interact at different temporal (e.g., short-to-long term) and spatial (e.g., watershed-to-global) scales is essential for addressing management needs, but our understanding of drivers at		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability		

varying spatial and temporal scales is lacking. Therefore, we are interested in quantitative analyses that synthesize long-term, system-wide monitoring data collected across the NERRS, specifically when applied to investigate natural and anthropogenic drivers of variability in estuarine responses. Syntheses that can be translated into educational deliverables and shared during Teachers on the Estuary workshops are of particular interest. Contact: Jason Goldstein, Research Director: jgoldstein@wellsnerr.org or (207) 646.1555 x136 Keywords: system wide monitoring program; environmental drivers; spatio-temporal changes; teachers on the estuary	Watershed dynamics	✓	✓
	Change analysis	✓	✓

Southeast Region

ACE Basin

Need Description	Need Alignment by Research Priority		
Need 1: The ACE Basin Reserve's healthy ecosystems provide vital benefits — jobs, food, carbon storage, recreation, and cultural identity — to coastal communities. Yet, their value often goes unrecognized. To strengthen understanding of human-nature connections, we need research that: 1) measures ecosystem services, 2) engages communities through social science to reveal values and connections, and 3) communicates the importance of functioning estuaries. These insights are essential for developing integrated coastal management strategies that align local values with conservation goals. Contact: Julie Binz, binzj@dnr.sc.gov Keywords: ecosystem services; communication; education and outreach; human dimensions		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis		
Need 2: The ACE Basin Reserve and South Carolina coast face climate-related threats such as sea level rise, flooding, erosion, and intensified storms, worsened by coastal development. Research is needed to improve habitat restoration and management for key ecosystems — uplands, riparian zones, tidal swamps, and salt marshes — under changing conditions. The Reserve must explore new technologies and adaptive management to		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓

reduce stressors and enhance wetland resilience and ecosystem services. This research will guide future management and strengthen communication with partners across the watershed. Contact: Jessica Kinsella, kinsellaj@dnr.sc.gov Keywords: communication; nature-based solutions; anthropogenic impacts; urban coastal and estuarine ecosystems	Watershed dynamics		
	Change analysis	✓	✓
Need 3: The rapidly developing metropolitan areas of Charleston and Beaufort surrounding the ACE Basin are contributing to water quality degradation and increased stormwater runoff. Although awareness of human impacts and the benefits of nature-based solutions is growing, significant barriers still hinder their implementation. Few local research efforts have examined these barriers or explored effective ways to communicate the socio-economic benefits of nature-based solutions to decision-makers and community members to inspire meaningful behavior change. Contact: Olivia Erskine, erskineo@dnr.sc.gov Keywords: communication; nature-based solutions; anthropogenic impacts; urban coastal and estuarine ecosystems		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability		
	Watershed dynamics	✓	✓
	Change analysis		
Need 4: ACE Basin marshes are vulnerable to sea level rise and other climate change impacts. Managers are only beginning to understand the consequences of these potential changes. Research on different		Management	Knowledge Exchange
	Community resilience and adaptability		

factors of salt marsh health, including integration and syntheses of different parameters of marsh health such as vegetation diversity, sediment transport, erosion rates, and oyster reef health need to be conducted and analyzed on a reserve-wide scale to plan for and prioritize restoration projects. Training and educational materials that can effectively communicate this research must be produced for coastal land managers in South Carolina. Contact: Denise Sanger, sangerd@dnr.sc.gov Keywords: sea level rise; habitat; restoration; climate change	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis	✓	✓
Need 5: Long-term meteorological, water quality, sediment, and vegetation data exists for the ACE Basin NERR, and analyses indicate increases in short-term variability and long-term trends occur, but integrated assessments of biological data related to (e.g., blue crabs, red drum, oysters, shrimp, marsh grasses) with meteorological and water quality data has not been conducted. Therefore, integration and syntheses of the long-term meteorological, water quality, and biological datasets to understand the ecological implications of these changes is a high priority. Data visualization and science communication products must be developed to translate this information to natural resource managers and decision-makers. Contact: Denise Sanger, sangerd@dnr.sc.gov		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓

Keywords: data analysis; estuarine and coastal modeling integrated ecosystem assessment; data visualization	Change analysis	✓	✓
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Guana Tolomato Matanzas			
Need Description	Need Alignment by Research Priority		
Need 1: Despite the waters of the GTMNERR being promoted as a world-class fishery and providing a significant source of food/nutrition, relatively minimal research has been conducted into the nekton species that inhabit the estuary. Considering recent and longstanding water quality impairments within the Reserve and ongoing habitat loss, studies investigating spatial and temporal trends and contamination in estuarine nekton are needed to both better manage GTMNERR fisheries and serve the communities that utilize the NERR. Contact: Matthew Bernanke, Matthew.Bernanke@FloridaDEP.gov Keywords: fisheries; water quality; wetlands		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics		
Need 2: In 2025, four shellfish aquaculture leases were proposed for deployment within the GTMNERR. One has already been approved, and the other three are expected to be approved shortly. This rapid increase in aquaculture is unprecedented in the area, and there is little information on how these	Change analysis	✓	✓
		Management	Knowledge Exchange
	Community resilience and adaptability		

activities interact with the natural systems that are found in this part of Northeast Florida. Thus, we invite studies evaluating the effect of shellfish aquaculture on water quality, biodiversity, sediment transport, saltmarsh retention, and other ecosystem services, as well as the transfer of relevant knowledge from Reserves which have more experience in this discipline. Contact: Matthew Bernanke, Matthew.Bernanke@FloridaDEP.gov Keywords: aquaculture; ecosystem services	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis	✓	✓
Need 3: In the dynamic GTMNERR back-barrier estuary, salt marshes are fragmenting and eroding, and piles of dead oyster shell ('oyster rakes') are building along shorelines. Mechanisms driving these foundational habitat changes are unclear, which makes designing management interventions challenging. Therefore, we need studies elucidating drivers of marsh change and oyster rake development, including sediment transport and hydrodynamics, and collaborative development of management recommendations to conserve intertidal habitats and their functions. Contact: Nikki Dix, Nikki.Dix@FloridaDEP.gov Keywords: sediment accumulation/accretion; sediment transport; hydrodynamics		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	
	Watershed dynamics	✓	
	Change analysis	✓	
Need 4: Recent analyses have shown that phytoplankton biomass measured as		Management	Knowledge Exchange

chlorophyll a has been increasing in many estuaries over time. However, pigment measurements alone do not provide enough information to understand impacts to higher trophic levels, including bivalves, fish, and humans. To directly measure ecological impacts of the changing environmental conditions already measured by the NERRS System-Wide Monitoring Program, standardized methods for monitoring all sizes of the plankton community are needed along with guidance for method usage and considerations for national level implementation and local end-user applications. Contact: Nikki Dix, Nikki.Dix@FloridaDEP.gov Keywords: phytoplankton; monitoring	Community resilience and adaptability		
	Habitat adaptability		
	Watershed dynamics		
	Change analysis	✓	✓
Need 5: Artificial Intelligence (AI) has the potential to improve the ability to identify and address significant coastal management issues by moving from purely data-driven to physics-informed models, developing decadal resilience forecasting, fusing data sources (e.g., satellites and sensors), and integrating explainable AI (XAI) frameworks so decision-makers understand the relevance of the data and models. Research and structured collaboration are necessary across NERRs and other fields making similar shifts to maximize the opportunity AI presents. [Google's Gemini assisted in writing this need] Contact: Lia Sansom, Lia.Sansom@FloridaDEP.gov Keywords: transdisciplinary research; integrated ecosystem assessment; ecological		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis	✓	✓

modeling; data analysis, data mining, and visualization			
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North Carolina			
Need Description	Need Alignment by Research Priority		
Need 1: Habitat mapping is part of the NERRS System-wide Monitoring Program, AND NCNERR has used remote sensing, including drones, to map some intertidal habitats, BUT we have not yet fully applied remote sensing approaches to 1) map/monitor SAV communities in Currituck Sound, 2) build upon drone-based metrics established through the southeast regional collaboration to further assess the 'condition' and 'function' of intertidal oyster reefs, or 3) implement and upscale drone-based SWMP biomonitoring to a landscape scale to fully capture the Masonboro Island and Zeke's Island Reserves. THEREFORE, NCNERR seeks research partnerships to further implement remote sensing applications at user-defined spatial and temporal scales. Contact: Justin Ridge, justin.ridge@deq.nc.gov Keywords: mapping, remote sensing, seagrasses and other submerged aquatic vegetation, oyster reefs		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	
	Watershed dynamics		
	Change analysis		
Need 2: NCNERR components are a mosaic of habitats that provide ecosystem services		Management	Knowledge Exchange

AND are impacted by environmental and anthropogenic factors. BUT NCNERR has limited information on component marine/estuarine biodiversity and how these factors influence the ecological community and provision of ecosystem services. There is growing potential for novel methods (e.g., eDNA, stable isotopes, acoustic imaging) to increase our capacity for ecological community analyses. THEREFORE, research is needed to better capture species richness and diversity, particularly at the Masonboro Island and Zeke's Island Reserves, and quantify and better understand the services the habitats provide and how they may change in association with environmental/anthropogenic factors to inform future management strategies. Contact: Justin Ridge, justin.ridge@deq.nc.gov Keywords: community ecology, environmental DNA (eDNA). stable isotopes, ecosystem services	Community resilience and adaptability		
	Habitat adaptability	✓	
	Watershed dynamics		
	Change analysis		
Need 3: The Currituck Banks Reserve component of the NCNERR is situated along Currituck Sound, where there are indicators of changing water quality and ecological communities. Currituck Sound has been identified by regional stakeholders as an area of interest with various impacts (including changing salinity, contaminants, harmful algal blooms), BUT there is a dearth of water quality and water level data to compare with ecological community monitoring collected by NCNERR and other regional partners. THEREFORE, the NCNERR and regional partners recognize a need to plan and test more continuous data collection methods leveraging partnerships within regional working groups to sustain capacity.		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	
	Watershed dynamics	✓	
	Change analysis		

Contact: Justin Ridge, justin.ridge@deq.nc.gov Keywords: water quality, sea level rise, monitoring			
Need 4: NCNERR shorelines and habitats are changing AND utilizing emerging methods like beneficial use of dredge materials may increase resilience at Masonboro Island, Zeke's Island, and Rachel Carson Reserves, BUT sediment dynamics around both natural and modified features are still being investigated, and limited environmental planning/assessment has been conducted to identify vulnerable habitats/locations where restoration techniques would be feasible and provide the best ecosystem outcomes. THEREFORE, the NCNERR seeks research partnerships that 1) understand spatially-explicit, landscape-scale habitat vulnerability and/or sediment dynamics at the NCNERR components, and 2) evaluate current and emerging restoration techniques like beneficial use through established frameworks (e.g., NCDCM's Thin Layer Guidance) to address identified vulnerabilities. Contact: Justin Ridge, justin.ridge@deq.nc.gov Keywords: resilience, sediment transport, restoration, modeling		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	
	Watershed dynamics		
	Change analysis		
Need 5: The NCNERR identified sedimentation and degraded water quality as stressors for the Zeke's Island Reserve in its 2020-2025 management plan, BUT the causes for changes at the site are not well understood AND this information is needed to inform restoration planning to improve habitat integrity and resilience. THEREFORE, the		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability		

NCNERR seeks research partnerships to understand water quality trends and other contributing factors that may be influencing changes in water depth and water quality at the Zeke's Island Reserve, including ecosystem metabolism, episodes of hypoxia, and algal mat growth, using System-wide Monitoring Program and other relevant data. Contact: Justin Ridge, justin.ridge@deq.nc.gov Keywords: data analysis, data mining, and visualization, water quality, SWMP	Watershed dynamics	✓	
	Change analysis	✓	

North Inlet-Winyah Bay			
Need Description	Need Alignment by Research Priority		
Need 1: Salt marshes are highly productive ecosystems yet are experiencing a variety of climate stressors. While substantial efforts have been made at understanding marsh change via plot-scale measurements, a more holistic understanding of salt marsh adaptability to climate change in South Carolina is still lacking. Therefore, we need improved techniques for upscaling local measurements and research that addresses variability at larger scales to better understand interacting effects of biotic and abiotic factors leading to changes in salt marsh ecosystem services and to develop potential adaptation and mitigation strategies in light of these changes. Contact: NA Keywords: marsh; sea level rise; spatial variability; adaptation		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis	✓	✓
Need 2: Provision of natural resources is a critical ecosystem service provided by coastal		Management	Knowledge Exchange

habitats and growing human populations along the coastlines of the southeast are likely putting increasing pressure on populations of key species, but we need improved understanding of the effects of natural resource use to implement ecosystem-based management. Therefore, assessment of the ecological effects and human dimensions of natural resource use (e.g., harvest of bivalves, crustaceans, or finfish, among others) is needed for North Inlet-Winyah Bay and could be compared among other NERRs regionally and nationally. Contact: NA Keywords: habitat provisioning; natural resource use; ecosystem-based management;	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis		
Need 3: South Carolina has some of the fastest rates of coastal development in the nation and effective stormwater management is essential for sustainable coastal development, but the effectiveness and cumulative impacts of various stormwater control measures and development practices remains a knowledge gap with regard to downstream water quality protection. Therefore, information on how land use, development practices, and stormwater management affect the transport, transformation and fate of stormwater pollutants (organic matter, nutrients, pathogens, and emerging contaminants) is needed to better inform effective management of non-point source pollution. Contact: NA Keywords: stormwater; water quality; sustainable development		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability		
	Watershed dynamics		
	Change analysis		
Need 4: Oysters are key ecosystem engineers within estuaries, but management of oysters		Management	Knowledge Exchange

as both fisheries resource and essential habitat presents unique challenges. Oyster managers and restoration practitioners need tools to quantify the 'condition' of reefs and their associated biota at relevant spatial and temporal scales. Therefore, reserves need additional research to better understand how oysters and the habitat function provided by reefs of different types are impacted by commercial and recreational harvest as well as other anthropogenic disturbances or natural stressors induced by changing environmental conditions. Contact: NA Keywords: oysters; habitat provisioning; reef biota; assessment	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis		
Need 5: Numerous stressors, including climate change, eutrophication, and overfishing, among others, are expected to impact coastal zones, including in South Carolina. Understanding and communicating drivers of short-term variability and long-term change in coastal ecosystem conditions 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 life histories, and community structure is poorly understood. NI-WB NERR has access to long-term biological and environmental datasets that could be used to better understand how stressors, acting directly and synergistically, affect the dynamics of coastal habitats and biota, as well as inform habitat assessment tools and natural resource management strategies. Contact: NA Keywords: climate change; eutrophication; estuarine fauna; coastal habitats		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability		
	Watershed dynamics		
	Change analysis	✓	✓

Sapelo Island			
Need Description	Need Alignment by Research Priority		
Need 1: Climate change will impact the community on Sapelo Island and other nearby areas on the mainland. Green infrastructure solutions have become desirable for increasing resilience of coastal communities. While living shorelines and rain gardens have been explored for coastal Georgia, few other native plant-based infrastructure options like green roofs or green walls have been examined for their ability to boost coastal community resilience, mitigate urban heat islands, and provide wildlife habitat. Focused studies on innovative green solutions that balances efficacy and economic feasibility are needed. The results of this research should provide an intuitive decision-making tool for coastal communities planning green infrastructure projects. Contact: Brittany Dodge (Brittany.dodge@dnr.ga.gov) Contact: NA Keywords: green infrastructure; community resilience; economic		Management	Knowledge Exchange
	Community resilience and adaptability	✓	
	Habitat adaptability		
	Watershed dynamics		
	Change analysis		
Need 2: Warmer winters have led to range expansion of species that have not been commonly found in coastal Georgia (e.g. mangroves). As climate change continues to increase temperatures, it is likely these species will establish in novel geographies. The effects on the ecosystems and ecosystem services for coastal Georgia is not currently known. Sapelo Island NERR has documented several range-expanding crab species with mangroves, and now mangroves are also now established in Georgia. An analysis of the impact of native range expanding species to		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	
	Watershed dynamics		
	Change analysis		

current Georgia coastal ecosystems and ecosystem services is needed. Contact: NA Keywords: mangroves; range expansion; climate change			
Need 3: Recent proposals have advocated for developing private and public lands on Sapelo Island and in the nearby communities in McIntosh County. Sapelo Island NERR has been specifically named as public lands that should be developed to increase county revenue. Current water quality around McIntosh County and Sapelo Island in the estuaries is in comparatively good standing. Additionally, the estuaries support critical habitat for commercially important species. However, it is not known how expanding development and impervious surface on Sapelo Island and in the surrounding community might impact water quality in the surrounding estuaries. Therefore, research is needed to model the impacts of proposed development on Sapelo Island NERR and the surrounding community on water quality and ecosystem services. Contact: NA Keywords: water quality; coastal development; impervious surface		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability		
	Watershed dynamics	✓	
	Change analysis		
Need 4: Sapelo Island Reserve has been collecting continuous water quality data since 2004 through the System Wide Monitoring Program and we know that climate change will play a role in shifting water quality values. But we don't know how such changes might affect estuarine organisms, populations, communities, and their interactions. Therefore,		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability		

we need research that expands our knowledge of relationships between local water quality and patterns in the composition, abundance and persistence of estuarine aquatic biota. Contact: NA Keywords: SWMP; climate change; biota; communities	Watershed dynamics		
	Change analysis	✓	

West Coast Region

Elkhorn Slough			
Need Description	Need Alignment by Research Priority		
Need 1: The Reserve is engaged in restoration of various coastal habitats (e.g. salt marsh, coastal prairie, freshwater wetlands) supporting recovery of key coastal species (e.g. oysters, otters, listed amphibians), AND collects monitoring data tracking efforts, BUT there are still many uncertainties about best restoration methods and key barriers to success, THEREFORE we welcome investigations that ultimately yield improved restoration success. Contact: Kerstin Wasson, kerstin.wasson@gmail.com Keywords: restoration; resilience, nature-based solutions		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	
	Watershed dynamics		
	Change analysis		
Need 2: The Reserve is impacted by a variety of anthropogenic activities (e.g. nutrient loading, diking, invasive species), AND collects monitoring data characterizing indicators of estuarine health and anthropogenic disturbance, BUT mechanisms of impacts and how they have changed over time or vary spatially under different conditions are poorly understood, THEREFORE we welcome investigations that reveal impacts of these anthropogenic activities on ecosystem functions, and how these impacts vary across time and space. Contact: Kerstin Wasson, kerstin.wasson@gmail.com Keywords: eutrophication; biological invasions; dikes		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	
	Watershed dynamics	✓	
	Change analysis		

Need 3: Responding to ongoing changes from climate change and other stressors requires cooperative and collaborative planning among the Reserve, many agencies, and local communities. The Reserve has made some progress in conducting SLR-resilient marsh restoration projects, BUT future restoration and other adaptation efforts within and beyond the Reserve will require expanded partnerships and collaborative planning, and strengthened understandings of local community and decision-making priorities, THEREFORE we welcome investigations of 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. Contact: Dan Brumbaugh, dan@elkhornslough.org Keywords: sea-level rise; resilience; climate adaptation		Management	Knowledge Exchange
	Community resilience and adaptability	✓	
	Habitat adaptability		
	Watershed dynamics		
	Change analysis		

Kachemak Bay			
Need Description	Need Alignment by Research Priority		
Need 1: Understanding Environmental Change Understanding environmental change in Alaskan coastal ecosystems requires a multifaceted approach to applied science and education. KBNERR has well-established watershed, nearshore, and ocean ecology programs that collect, analyze, and outreach data focused on habitat change, human		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓

dynamics, and cultural resources. KBNERR seeks to expand the impact of these programs to support informed regional decision-making and increased community engagement. Therefore, projects are needed that support techniques for applying ecological data, informed by stewardship priorities, to assist local decisionmakers in creating strategies to understand and plan for ecosystem change. Examples include ecological monitoring, remote sensing, and community monitoring (e.g., invasive species, harmful algal blooms, peatlands, fisheries, landslides). This work will focus on knowledge exchange, education, skill building and workforce development, alongside monitoring and research, supporting decision-makers and learners of all ages. Contact: Katherine Schake, kschake@alaska.edu Keywords: education; other: workforce; applications; change	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 2: Understanding Land Use and Human Impacts Community partners strive to understand how increased human pressure (e.g., port & harbor expansion, land development) combine with environmental change to impact natural and cultural resources. KBNERR seeks to develop and communicate effective management and mitigation strategies that preserve ecological		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓

function and protect key habitats for foundational intertidal, marine and freshwater species, and advance peatland conservation and freshwater source security. To accomplish this, KBNERR seeks to gain information about trophic level interactions and habitat maps of the intertidal and nearshore ecology of Kachemak Bay. Improved understanding of hydrology, nature-based infrastructure, coastal erosion, sediment deposition, and estuary connectivity for culturally and ecologically important species is key. In addition, focusing work through a social-ecological estuarine system lens and fostering meaningful connections with local communities impacted by these pressures. Contact: Katherine Schake, kschake@alaska.edu Keywords: community ecology; community science; habitats; intertidal	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 3: Community Relevant Engagement, Strengthening Relationships and Biocultural restoration Healthy ecosystems of Kachemak Bay sustain reciprocal relationships where human and natural communities thrive. Alaskan communities are aware of the ways nature contributes to economic, cultural, and other dimensions of wellbeing, but there is a		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓

disconnect between decision-making and maintaining ecosystems for generations to come. Authentically building relationships with Tribal partners and rural communities around Kachemak Bay can result in creative solutions to bolster effective stewardship, research and education while advancing the quality of coastal community livelihoods. Knowledge exchange between NERRs, Alaskan tribal entities and rural communities is fundamental to the expansion of community-based initiatives. Exploration of biocultural restoration activities is needed to co-develop projects that protect our coastlines and ways of life. Contact: Katherine Schake, kschake@alaska.edu Keywords: community ecology; ecosystem services; biocultural; other: tribal engagement	Habitat adaptability	✓	✓
	Watershed dynamics		
	Change analysis	✓	✓
Need 4: Long-Term Ecosystem Monitoring KBNERR's long-term monitoring (water quality, weather, salt marsh, marine primary productivity, harmful algae, invasive species) datasets help us understand seasonality and long term trends in the Gulf of Alaska bioregion. Data analysis and educational outreach with communities establishes a 'sense of place' and encourages co-development of research questions. Gaps in baseline species and habitat data (e.g., migratory birds utilizing salt marshes) and their social-cultural connections need to be addressed to identify and prioritize vulnerable habitats. Current and historic data sets can be synthesized and paired with new data (e.g.,		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓

Motus tower; benthic habitat maps) to detect and assess temporal and spatial change. In addition, cross-sector collaboration towards trainings and development of outreach tools are needed to create adaptable and accessible products and useful models. Contact: Lauren Sutton, lsutton7@alaska.edu Keywords: monitoring; data analysis; education and outreach; other: synthesis	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 5: TOTE Evaluation - NERR System Idea The Kachemak Bay Research Reserve's Teachers On The Estuary (TOTE) program successfully trains and inspires formal and informal regional educators on the latest research and monitoring occurring in Kachamak Bay. The Reserve System is a leader in teacher professional development nationwide. These teacher trainings lead to positive outcomes from increasing teacher confidence in outdoor education to inspiring a more sense-of-place and culturally inclusive lens to their teaching, as well as increasing teachers' and students' knowledge and appreciation of estuarine environments. Currently these outcomes are broadly measured through a reserve-wide TOTE evaluation. However, the broad range of TOTEs offered through the reserve system		Management	Knowledge Exchange
	Community resilience and adaptability		✓
	Habitat adaptability		

have such unique additional outcomes, including Cultural Ecosystem Services, teacher connection, and relationship building that have not been identified to date. Currently, Reserves do not evaluate TOTE programs thoroughly along these parameters and have few opportunities to share findings. THEREFORE, we are seeking coordinated and creative evaluation approaches built by collaborative learning, sharing, and training. Contact: Ingrid Harrauld, ieharrauld@alaska.edu Keywords: education and outreach; evaluation; other: tote, cultural ecosystem services	Watershed dynamics		
	Change analysis		

Padilla Bay			
Need Description	Need Alignment by Research Priority		
Need 1: Research and monitoring related to biophysical, social, economic, agricultural, and habitat changes resulting from climate change, sea level rise, and/or coastal development. Contact: Jude Apple, japple@padillabay.gov 360-391-5438 Keywords: climate change; eelgrass; sociocultural systems; resilience; agriculture		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	
	Watershed dynamics	✓	
	Change analysis	✓	
Need 2: Understanding how an ecosystem service approach can be utilized to support the		Management	Knowledge Exchange

protection and restoration of estuarine systems in the face of land use change, eutrophication, and contamination in estuarine ecosystems and the options for management and mitigation. Contact: Jude Apple, japple@padillabay.gov 360-391-5438 Keywords: ecosystem services; land use; eelgrass; agriculture; carbon sequestration	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	
	Watershed dynamics	✓	
	Change analysis	✓	
Need 3: Syntheses and analyses of long-term monitoring data collected through NERRS SWMP monitoring activities at Padilla Bay and across the nation, and using these analyses to conduct hypothesis-driven studies of coastal ecosystem function, variability, water quality, and response to climate change. Contact: Sylvia Yang, syang@padillabay.gov Keywords: data synthesis; data literacy, education, land use		Management	Knowledge Exchange
	Community resilience and adaptability	✓	
	Habitat adaptability		
	Watershed dynamics	✓	
	Change analysis	✓	✓
Need 4: Strengthening relationships and knowledge sharing with indigenous, local and heritage communities to restore biocultural connections to place for the purpose of detecting habitat change and resilience, and conducting analyses of long-term ecosystem-scale change. Contact: Roger Fuller, rf Fuller@padillabay.gov Keywords: biocultural restoration, communities, resilience, ecosystem services		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	
	Watershed dynamics	✓	
	Change analysis	✓	
Need 5: Mapping of eelgrass and other benthic habitats for the purpose of detecting		Management	Knowledge Exchange

habitat change and resilience, and conducting analyses of long-term ecosystem-scale change. Contact: Sylvia Yang, syang@padillabay.gov Keywords: remote sensing, eelgrass, resilience, change analysis	Community resilience and adaptability	✓	
	Habitat adaptability	✓	
	Watershed dynamics	✓	
	Change analysis	✓	

San Francisco Bay			
Need Description	Need Alignment by Research Priority		
Need 1: Oyster farming is a growing part of the sustainable food economy in northern California including within the targeted watershed of the SF Bay NERR. Conservation of native Olympia oysters is a priority for supporting healthy ecosystem function and living shoreline restoration AND previous research has improved understanding of native oyster ecology BUT more research is needed to understand how high variability throughout the life cycle of native and non-native oyster species vital to the oyster farming industry. THEREFORE, we welcome studies that examine how factors affecting oyster growth, survival and population stability impact conservation and farming in the region. Contact: Matt Ferner, mferner@sfsu.edu Keywords: aquaculture, larval ecology/transport, oyster reefs, water quality		Management	Knowledge Exchange
	Community resilience and adaptability	✓	
	Habitat adaptability	✓	
	Watershed dynamics		
	Change analysis		
Need 2: The tidal wetlands in Suisun Marsh are impaired ecologically by active feral pigs and extensive stands of the invasive plant perennial pepperweed (<i>Lepidium latifolium</i>) AND these adverse conditions have been		Management	Knowledge Exchange
	Community resilience and adaptability		

worsening in recent years BUT limited past control efforts have not proven effective. THEREFORE, we welcome studies that examine management approaches and collaborate with SF Bay NERR, the Solano Land Trust, the Suisun Resource Conservation District, and other state and federal agencies to co-develop and test control or management options. Contact: Matt Ferner, mferner@sfsu.edu Keywords: biological invasions/invasive species, resilience, conservation, wildlife	Habitat adaptability	✓	
	Watershed dynamics		
	Change analysis		
Need 3: A low-lying road and undersized culverts restrict tidal flooding and draining of significant wetlands and upland transition zones at China Camp State Park AND there are opportunities for road modifications to improve hydrologic connections to San Francisco Bay BUT the ecological impacts of restoring tidal exchange at the site have not been evaluated. THEREFORE, we welcome studies that build on existing data to examine how changes in tidal flooding and draining could impact the diverse habitats, species, and cultural resources at the site. Contact: Matt Ferner, mferner@sfsu.edu Keywords: connectivity, culverts, ecological modeling, hydrodynamics and hydrology		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	
	Watershed dynamics		
	Change analysis		

South Slough			
Need Description	Need Alignment by Research Priority		
Need 1: Community Resilience and Adaptability - Humans benefit from the		Management	Knowledge Exchange

ecosystem services related to estuarine systems and coastal watersheds (e.g., carbon sequestration, food production, water provision, timber production, recreational opportunities, and cultural identity). However, people often do not appreciate the magnitude of these services and the need to manage them effectively and sustainably. There is a lack of perception that the ecosystem services contribute to human well-being. Therefore, we need additional research to better: 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. Contact: NA Keywords: environmental challenges; environmental justice	Community resilience and adaptability	✓	✓
	Habitat adaptability		
	Watershed dynamics		
	Change analysis		
Need 2: Biocultural Restoration and Indigenous Knowledge - Biocultural restoration and Indigenous knowledge bolster effective stewardship, research and education while advancing justice and resilience, an approach catalyzed by a 2024 He'eia NERR Indigenous Knowledge Workshop. To authentically co-develop projects, challenge embedded inequitable norms, and generate solutions that bridge environmental and human well-being requires stamina fed by partnership and collaboration. Knowledge exchange between NERRS and Indigenous communities is fundamental to the continuance and expansion of these approaches, while community-based research on topics identified collaboratively by Indigenous land stewards, (e.g., applying cultural burns as a restoration technique), Reserve staff and partners illuminate new approaches or opportunities across NERRS.		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability		
	Watershed dynamics		
	Change analysis		

Contact: NA Keywords: indigenous; knowledge; biocultural; resilience			
Need 3: Habitat Adaptability -Tidal wetland restoration and thinning dense re-growth forests to improve habitat resilience and provide wetland migration pathways is occurring; however, some restored marshes haven't been evaluated and restoration thinning effects are not well understood. Invasive species (e.g., green crab, reed-canary grass) are affecting habitats and native species, but impact and how to effectively manage them is unknown. For seagrass meadows, we are exploring seed-based restoration techniques. We need research examining: 1) restoration trajectories in wetlands and forests, 2) how to evaluate success of restoration projects (including social perceptions of restoration), and 3) the ecology, impacts, and management of invasive species. Contact: NA Keywords: restoration; resiliency; invasive species		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability		
	Watershed dynamics		
	Change analysis		
Need 4: Watershed Dynamics - Human-induced stressors (i.e., changing climate, land-use practices) impact water quality and biotic populations and habitats. Both abiotic (warming air/water, hypoxia, ocean acidification) and biotic (harmful algal blooms, pathogens, invasive species) stressors impact animal, plant, and human health. In some cases, multiple stressors interact to affect essential habitat like eelgrass beds. Therefore, research monitoring estuarine conditions and communities (e.g. fish, seagrass, algae, tidal swamps) and understanding how to predict and manage these stressors and how they		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability		
	Watershed dynamics	✓	✓
	Change analysis		

interact is key for managing estuary habitats. Lastly, communicating these impacts and management practices to the public and decision makers to evoke behavioral change is critical. Contact: NA Keywords: humans; climate change; behavioral change			
Need 5: Change Analysis - The South Slough NERR has data from long-term monitoring programs (including submerged aquatic vegetation, water quality, chlorophyll, meteorological, vegetation, fish communities, invasive species, etc.), and we would like to better understand environmental change over time within and among Reserves, but we don't have the capacity to synthesize and interpret the data to identify environmental degradation issues and improvement opportunities. Therefore, we need assistance to: 1) analyze and summarize data, 2) provide decision-making tools (including modelling outputs) to meet the needs of coastal managers and decision makers, and 3) produce education tools for use by formal and non-formal educators with students. Contact: NA Keywords: monitoring; data; education; water quality		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability		
	Watershed dynamics		
	Change analysis	✓	✓

Tijuana River			
Need Description	Need Alignment by Research Priority		
Need 1: The Tijuana Estuary is the largest, most intact coastal wetland left in Southern		Management	Knowledge Exchange

California, and ongoing restoration and conservation efforts have resulted in a system that supports a diversity of habitats and species, but stressors such as wastewater pollution, habitat degradation, and biological invasions remain. Therefore, more restoration and conservation work is being planned, and we need research and sharing of information 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 that might change in response to management action. Such analyses also provide an excellent opportunity for quantitative comparisons with other systems in the region, across the NERRS, and beyond. Contact: NA Keywords: restoration; water quality; habitats; species	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 2: 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 they might respond to both short- and long-term management interventions and environmental change. Therefore, we need studies and transfer of information 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). Contact: NA Keywords: sediment; beneficial re-use; restoration		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis	✓	✓

Need 3: Debris is a significant source of impairment in the Tijuana Estuary and we have learned lessons related to its management and impacts, but there is still more work to be done in this complex international setting. Therefore, we need 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, understanding the Reserve's niche in a marine debris community of practice and in areas such as research, training, stewardship, and education is of interest. Contact: Kristen Goodrich; kgoodrich@trnerr.org Contact: NA Keywords: marine debris; plastics; watershed		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability		
	Watershed dynamics	✓	✓
	Change analysis		
Need 4: Many Southern California lagoons, such as the Tijuana Estuary, are characterized by small, dynamic river mouths that connect to the sea, and the nature of these inlets fundamentally shape both estuarine and nearshore ecosystems, but changes in hydrology, tidal action, wave climate, and beach processes can dramatically affect inlet functioning. Therefore, we need studies of estuary-ocean connections (physical, chemical, and biological) and how these might change under varying conditions (including sea level rise). Contact: NA Keywords: tidal prism; inlet; ocean-estuary exchange		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis	✓	✓
Need 5: Understanding the human dimensions of wetland and coastal resilience, including		Management	Knowledge Exchange

adaptation to climate change and intersectional stressors, is a priority in the highly complex socio-ecological setting of the Tijuana River Watershed. Here, where three nations meet (the U.S., Mexico, and Kumeyaay), examining cultural heritage will inform approaches in biocultural restoration and opportunities for healing and repair in conservation landscapes. Therefore, we are interested in ecosystem and psycho-social resilience, and practices such as boundary-spanning (both physically and disciplinary) in coupled human and natural communities. Contact: Kristen Goodrich; kgoodrich@trnerr.org Contact: NA Keywords: climate change; tribal engagement; cultural heritage	Community resilience and adaptability	✓	✓
	Habitat adaptability		
	Watershed dynamics		
	Change analysis		

Pacific Region

He'eia			
Need Description	Need Alignment by Research Priority		
Need 1: There are different understandings of how to include community perspectives and needs in restoring social-ecological estuarine systems AND NERRS has increasingly identified a need to create and foster meaningful collaborations with Local and Indigenous communities. BUT, there are still gaps in our understanding of socio-cultural impacts of biocultural restoration. THEREFORE, our reserve would benefit from collaborative work within the System and more knowledge exchange with Indigenous and local communities to facilitate experiential learning related to understanding cultural ecosystem services, human dimensions, and well-being to explore community based research and the role of stewardship that support thriving estuaries and coastal communities. Contact: Aimee Sato, aimeeys@hawaii.edu, 808-651-8283 Keywords: socioecology; humanities/human dimensions; local ecological knowledge; ecosystem services		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability		
	Watershed dynamics		
	Change analysis		
Need 2: Our Reserve provides training and engagement opportunities that weave		Management	Knowledge Exchange

Indigenous and local knowledge with conventional scientific knowledge. AND community organizations and networks throughout Hawai'i will undergo planning efforts to promote Indigenous resource management practices towards habitat resilience while adaptively managing current scenarios. BUT the Reserve needs to engage with these organizations, facilitate knowledge exchange, and provide training that communicates information to coastal decision makers to respond to these scenarios. THEREFORE, our reserve seeks projects that enhance the transfer of knowledge between organizations within He'eia and from other organizations or networks to inform community-based planning that promotes dual fluency in management. Contact: Casey Ching, caseymc@hawaii.edu, 808-295-2752 Keywords: local ecological knowledge; collaborative research/co-production; other: indigenous resource management; other: community-based planning	Community resilience and adaptability		✓
	Habitat adaptability		✓
	Watershed dynamics		✓
	Change analysis		
Need 3: The Reserve coordinates place-based education programs among multiple partners, with the goal of increasing public understanding of estuaries and Hawaiian resource management. AND the Reserve and its partners are reaching intended audiences of teachers, preK-12, college, and graduate students, and community members. BUT demand for programs is growing, and staff have limited time for enhancing depth and		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability		✓
	Watershed dynamics		

impact of their programs. THEREFORE we seek projects that expand educational offerings efficiently (e.g. peer-to-peer learning networks for teachers, interpretive trails, online materials), and that build program capacity through staff and intern recruitment and training, curriculum development, evaluation, and strategic collaborative partnerships. Contact: Fred Reppun, freppun@hawaii.edu, 808-779-9411 Keywords: co-production; evaluation; traditional ecological knowledge; education and outreach; humanities/human dimensions	Change analysis		
Need 4: SWMP and other projects have been collecting long-term environmental data, AND have amassed a large collection of information about place. BUT, data exist in different databases and are not easily retrievable for modeling or big picture assessment to inform the direction of strategic planning for the reserve. THEREFORE, cross-sector collaborative efforts, such as gatherings and innovative tools such as eDNA and geospatial capability, to synthesize and make available cultural and scientific data across historical and current timelines are needed, with the goal of creating adaptable and accessible products as well as developing useful models to guide adaptive biocultural resource management. Contact: Shimi Rii, Casey Ching, shimi@hawaii.edu, caseymc@hawaii.edu Keywords: environmental DNA; SWMP; assessment; data analysis, data mining, and visualization		Management	Knowledge Exchange
	Community resilience and adaptability		✓
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis	✓	✓

Need 5: Our reserve landscape has altered dramatically due to changes in land-use and Indigenous resource management practices AND climate change will further impact the diversity of native species and ecosystem-scale processes. BUT foundational information, such as nutrient cycling, plankton ecology, and food web dynamics, and how they respond to changes such as weather, seawater intrusion, warming temperatures, and decreasing pH at different spatial-temporal scales, is unknown. THEREFORE, our stewards of place have requested knowledge about the responses to change in our watershed, with the long-range goal of supporting native species, ecosystem resilience, and food sustainability in the face of climate change. Contact: Shimi Rii, shimi@hawaii.edu, 808-783-9621 Keywords: climate change; nutrient cycling; plankton ecology; food web ecology		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	✓
	Watershed dynamics	✓	✓
	Change analysis		✓

National			
Need Description	Need Alignment by Research Priority		
National 1 Need 1: Reserve staff have pioneered NERR syntheses, AND have led assessments of marsh resilience and crab dynamics across 15 Reserves, thin-layer sediment addition across 8 Reserves, and habitat change across all 30 Reserves, BUT there is no clear national plan for regular syntheses to be conducted repeatedly, THEREFORE we welcome multi-sectoral, collaborative efforts to develop and test templates for regular, repeated national syntheses of marsh resilience, water quality, or habitat mapping and change. Contact: Kerstin Wasson, kerstin.wasson@gmail.com Keywords: data analysis, data mining, and visualization; SWMP; water quality		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability		
	Watershed dynamics		
	Change analysis		✓
National 1 Need 2: NOVEL MONITORING APPROACHES: The Reserves conduct rigorous system-wide monitoring using selected methodologies and indicators. Newer approaches could complement existing Reserve monitoring, and eventually be incorporated systemwide. For example, unoccupied aerial vehicles can provide monitoring complementary to field vegetation		Management	Knowledge Exchange
	Community resilience and adaptability		

transects and to habitat mapping. Environmental DNA monitoring could be conducted on the same water samples collected monthly for nutrient analyses. The Reserves thus would benefit from tests of the feasibility and applications of new methodologies that would be affordable and sustainable as future components of system-wide monitoring. Contact: Kerstin Wasson, kerstin.wasson@gmail.com Keywords: mapping; uncrewed aircraft systems; environmental DNA; monitoring	Habitat adaptability		
	Watershed dynamics		
	Change analysis		✓
National 1 Need 3: WWL applications: The Reserves have developed monitoring to evaluate the resilience of coastal vegetation in the face of changing water levels, specifically to inform management and support education and outreach. As the Reserves move towards implementing this approach system-wide, it would be valuable to have templates for applications, such as for workshops for coastal managers where the new data are used for spatial planning, or for interactive activities and curriculum for students. We therefore welcome projects that design and test templates effective for Reserve use that apply NERR wetlands and water levels data to management or education needs.		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability		

Contact: Kerstin Wasson, kerstin.wasson@gmail.com Keywords: resilience; wetlands; set; data analysis, data mining, and visualization	Watershed dynamics		
	Change analysis		✓
National 2 Need 1: Enhancing Resilience in the NERRs Coastal Communities. Estuarine environments are vital to the health of coastal systems, providing essential ecosystem services such as storm protection. Coastal communities and reserves are increasingly working to build resilience to long-term change and are developing vulnerability assessments to help guide these efforts. However, translating assessment findings into on-the-ground action often proves challenging due to a variety of institutional, technical, and resource-related barriers. As a result, there is a clear management need to identify and better understand these obstacles and to establish a neutral platform where reserves and communities can share lessons learned - including successes and setbacks - to strengthen implementation efforts across the		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability	✓	✓

NERRS system and beyond. Contact: Marissa Figueroa, Rookery Bay NERR, marissa.b.figueroa@floridadep.gov Keywords: coastal resilience, humanities / human dimensions, ecosystem-based management	Watershed dynamics	✓	✓
	Change analysis		
National 2 Need 2: From Monitoring to Meaning: Connecting Ecosystem Health to Human Well-Being to Protect Lives and Livelihoods in the NERRS. Estuarine ecosystems are essential to community health, economic stability, and natural resource protection. The NERRS provides critical long-term environmental monitoring that supports these benefits. However, many communities lack the tools to translate changes in water quality, habitat, or pollution into actionable information about human health risks, such as illness from harmful algal blooms, unsafe drinking water, or impacts on fisheries and coastal livelihoods. Without linking environmental trends to measurable health and social indicators, decision-makers lack understanding of impacts on community well-being. Integrating environmental monitoring with human health and social science data is a critical management need to improve risk management, protect public health, and		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability		
	Watershed dynamics		
	Change analysis		

strengthen economic resilience. Contact: Syverine Bentz, KBNERR, syverine@alaska.edu Keywords: water quality, monitoring, indicators, humanities/human dimensions			
National 2 Need 3: Engaging Real Estate Professionals to Build Coastal Resilience: Decisions about land purchase and development near rivers, wetlands, and coastal areas shape ecosystem health and community resilience. Several NERRS are engaging real estate professionals through accredited trainings on coastal living, flood risk, and buffer regulations, recognizing their role as trusted messengers influencing choices with lasting impacts. However, these efforts remain fragmented across the system. This creates an opportunity for a catalyst or knowledge-exchange effort that would help reserves and partners to share lessons learned, co-develop new engagement and evaluation frameworks, enhance training materials, and refine social science research approaches to maximize impact with this influential audience. Contact: Whitney Jenkins, NC Reserve, whitney.jenkins@deq.nc.gov Keywords: resilience, humanities / human dimensions, climate adaptation, education and outreach		Management	Knowledge Exchange
	Community resilience and adaptability	✓	✓
	Habitat adaptability		
	Watershed dynamics		
	Change analysis		

Region: West Coast			
Need Description	Need Alignment by Research Priority		
Need 1: All five Reserves on the contiguous Pacific coast are engaged in native oyster conservation science, through monitoring and/or restoration activities. They worked together to launch the Native Olympia Oyster Collaborative, a community of practice for diverse stakeholders, from Reserves to Tribes to oyster growers to restoration practitioners. This collaborative has identified a strong need for community outreach and education, for consistent oyster monitoring protocols that could be developed and used across the Region, and for coordinated restoration experiments, to develop and test effective approaches to be implemented by Reserves and partners. Contact: Kerstin Wasson, kerstin.wasson@gmail.com Keywords: oyster reef, restoration		Management	Knowledge Exchange
	Community resilience and adaptability		
	Habitat adaptability	✓	
	Watershed dynamics		
	Change analysis		