North Carolina Coastal Reserve & National Estuarine Research Reserve

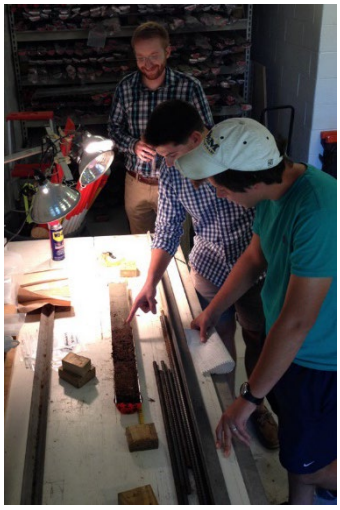
Research and Monitoring Priorities

Purpose: This document is a composite of research and monitoring priorities identified for one or more of the ten sites that make up the North Carolina Coastal Reserve and National Estuarine Research Reserve. The list of priorities is organized into twelve broad topical areas (in no order of importance). The list is not intended to be exhaustive, but a representative depiction of priorities identified by Reserve staff. We encourage researchers to contact reserve staff to discuss interests and further refine research projects. Please direct inquiries and questions regarding this list to Justin Ridge (justin.ridge@deq.nc.gov), the Reserve's Research Coordinator. A Reserve research permit (link), as well as necessary state and federal permits are required to conduct research within the Reserves.

Topical Areas

1. **Non-native and invasive species** (e.g., Phragmites, feral horses, feral pigs, nutria, alligatorweed, French Tamarisk, red fox, beach vitex, Gracilaria, privet)
    a. Distribution and abundance
    b. Impacts on native flora and fauna
    c. Impacts on ecosystem services
        i. Horse impact on nutrient cycling and budget
    d. Effectiveness of management and eradication
2. **Species and habitat restoration**
    a. Best restoration practices and ways to prioritize restoration and conservation
        i. Oysters
        ii. SAV
        iii. Marshes
        iv. Hydrology
    b. Benefits and impacts of restoration on natural habitats and species (e.g., oysters and SAV or beach nourishment and sea turtle nesting)
    c. Benefits and impacts of thin layer deposition (and beneficial use) for restoring salt marsh elevation
    d. Development of indicators of restoration success

3. **Climate change**
    a. Impact of climate change (e.g., precipitation, temperature changes, phenology, sea level rise) on estuarine systems
        i. Impacts on wetland habitat and function
        ii. Impact on shorelines and erosion
        iii. Impacts of changing carbonate chemistry on marine organisms
    b. Strategies for mitigating the effects of sea level rise and other climate change stressors on estuarine habitats.
    c. Synergistic effects of climate change, as well as natural and anthropogenic stressors on habitats and ecosystem function
4. **Water quality**
    a. Impacts of human activities (e.g., land-use change, population increase, dredging) on water quality
    b. Impacts of water quality on species and habitats
    c. Changes in groundwater level and salinity
    d. Sources, transport, fate, and impacts of stormwater runoff and non-point source pollution
    e. Impacts of short-term stochastic and long-term, large-scale climate events on coastal ecosystems and human communities
    f. Development of indicators of ecosystem condition/health
    g. Contaminant load in sediments and surface water
5. **Estuarine shoreline stabilization**
    a. Ecological and resilience benefits of 'living' shorelines
    b. Factors to consider for site selection and appropriate performance measures for determining success
    c. Effectiveness of alternative materials in a variety of environmental settings
    d. Consequences of converting subtidal to intertidal habitat and soft-bottom intertidal habitat to hardened habitat
6. **Ecosystem services**
    a. Intrinsic and monetary valuation of NCNERR natural resources
    b. Carbon storage and sequestration rates in variety of habitats (subtidal to upland)
    c. Impacts of climate change, invasive species, and coastal development on ecosystem services



7. **Vulnerability and resilience**
    a. Strategies to increase resilience of coastal ecosystems and human communities to coastal hazards (e.g., flooding, storms, shoreline erosion, sea-level rise).
    b. Identify stressors and associated impacts on ecosystems and integrate within vulnerability assessments
        i. Interactive effects of stressors on vulnerability
        ii. Develop forecasting models to assist long-term planning and management
    c. Vulnerability assessments of Reserve habitats to various stressors
8. **Marine debris**
    a. Sources, fates, impacts, and composition
9. **Habitat utilization, function and ecology**
    a. Habitat connectivity between maritime forest and marsh
    b. Importance of Reserve habitats for bird nesting, foraging, and migration stopovers
    c. Competition analysis for Atlantic White Cedar hardwood and comparison of success of Atlantic White Cedar across its distribution
    d. Factors impacting maritime forest regeneration, and changes to forest coverage through time
    e. Ecology of community secession on dredge spoil islands
    f. Ecology of seagrass and marsh habitats
        i. Factors affecting nesting success of American Oystercatchers
10. **Hydrology and transport processes**
    a. Hydrologic study for Zeke's Basin
    b. Dye study of tidal creek influence on Masonboro Island
    c. Larval transport/recruitment
    d. Sediment transport and sediment budgets
11. **Surveys and monitoring**
    a. Species surveys and inventories (e.g., threatened and endangered species, amphibians, Atlantic White Cedar, diamondback terrapins, fish and benthic species, birds)
        i. Species richness and biodiversity
    b. Water quality
    c. Marsh and Land-use and cover change analysis for Reserve watershed
        i. Benthic habitats
        ii. Barrier island and shoreline change in response to natural (e.g., storms) and anthropogenic (e.g., dredging) drivers and impacts on species
    d. Development of indicators of ecosystem condition/health
    e. Monitoring recovery/eradication post-disturbance (e.g. fire)
    f. Comparison of species and genetic diversity between maritime forests in different reserves