Research Priorities from the NC Coastal Habitat Protection Plan

NC Coastal Habitat Protection Plan Team
NC Department of Environmental Quality

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NORTH CAROLINA
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2022 CHPP Research Needs

The NC Coastal Habitat Protect Plan (CHPP) is a Department of Environmental Quality (DEQ) document that requires all the DEQ divisions with authority over coastal habitat and water quality management to assist with its drafting (G.S. 143B-279.8). The statute requires the plan be reviewed and amended as necessary on five-year cycles with the goal of long-term enhancement of coastal fisheries associated with each coastal habitat. Habitat-related information gaps and research needs are identified through the plan update process. These may relate to habitat value and condition, as well as linkages between habitats and specific fish species. Research is also needed on the effect of factors influencing habitat condition, including hydrological or physical alterations, and water quality degradation.

The 2021 CHPP Amendment includes five priority issues with recommendations to focus efforts over the next five years. Research needs related to furthering progress on these issues and their recommended actions are the highest current priorities. The research needs below were included as recommended actions in the Amendment or identified in the supporting issue paper text. Additionally, a subset of important remaining research needs from the 2016 CHPP are included. The research recommendations in the Amendment also help implement the NC Risk and Resilience Plan 2020, the Natural Working Lands Action Plan 2020, the NC Oyster Blueprint 2021-2025, the Action Plan for Nature-Based Stormwater Strategies, and the State Water Infrastructure Authority Report. The priority issues and research needs are not listed in order of preference.

Priority Issue: Submerged Aquatic Vegetation Protection and Restoration through Water Quality Improvements

Amendment Research Recommendations:

- Determine the loading and sources of nutrients and sediments, their quantitative linkages to chlorophyll *a* concentrations, and their effect on water quality and SAV. This should include runoff and subsurface flow of nutrient enriched groundwater from all land use activities.
- Obtain updated accurate estuarine bathymetry data from the National Oceanic and Atmospheric Administration (NOAA).
- Investigate the impacts of agricultural practices and land use change on water quality within SAV waterbody regions, to determine types and location of BMPs needed to effectively improve water quality.

Other Research Needs:

- Determine the relationship between SAV species extent, distribution, and composition, and the effect of climate change.
- Assess the relationship between light attenuation and concentrations of CDOM, turbidity, and chlorophyll a in oligohaline waters so that an accurate bio-optical model for low salinity SAV can be developed.

Priority Issue: Wetland Protection and Restoration through Nature-Based Solutions

Amendment Research Recommendations:

- Conduct or complete coastal vulnerability assessment tools for the NC coastal plain, such as living shoreline siting, potential marsh migration corridors, and wetland restoration prioritization.
- Determine optimal parameters for thin layer sediment deposition to ensure wetland success.
- Assess trends in salt marsh elevation, inundation, and distribution to prioritize areas for wetland restoration.

- Determine the impact of degrading plastics and marine debris on wetlands, sediment, and the benthos.
- Research the nutrient (nitrogen, phosphorus) reduction benefits provided by living shorelines and use that information to provide incentives for living shoreline projects.
- Study the effects of silvicultural timber harvesting in bottomland swamp forests on hydrology, water quality, and wetland condition; include assessment on the efficacy of forestry BMPs to minimize ecological impacts.
- Incorporate Coastal Plain wetlands and other coastal habitats into NC's Greenhouse Gas (GHG) Inventory.

Other Research Needs:

- Conduct pilot studies using emerging mapping technologies to map and assess change in coastal wetlands efficiently and accurately.
- Evaluate the efficacy of existing development buffer rules and whether they provide sufficient coastal resilience under current and expected sea level rise and other climate conditions.
- Investigate the use of emerging technologies such as data fusion or deep learning neural networks, that rely on a combination of satellite imagery, drone imagery, and field verification for Coastal Plain wetland mapping and change analyses.

Priority Issue: Wastewater Infrastructure Solutions for Water Quality Improvement

Amendment Research Recommendations:

- Research alternative wastewater collection system designs that may be better suited for coastal conditions (i.e., alternative sewer systems, composting toilets).
- Evaluate the feasibility of re-designing and re-engineering existing systems that are inadequately protecting ground and surface water quality.

Other Research Needs:

- Research the contribution of sewage spills on localized impacts to water quality, particularly in areas with waters designated as NSW, HQW, nursery/spawning area, etc.
- Research the impact of SLR on SSOs and sites most likely to be impacted to prioritize management strategies.

Priority Issue: Coastal Habitat Mapping and Monitoring to Assess Status and Trends

Amendment Research Recommendations:

- Identify key indicator metrics for assessing status and trends of each coastal habitat and identify data gaps and monitoring needs.
- Examine the feasibility of expanding the benthic macroinvertebrate sampling to address spatial gaps in assessing the estuarine soft bottom benthic community condition.
- Evaluate and prioritize DWR's estuarine ambient monitoring system sites to address gaps in spatial, habitat, or parameter coverage.

Other Research Needs:

- Evaluate the ability of using drones to detect changes in intertidal oyster reef viability, density, size-frequency demographics, and reef footprint over time.
- Evaluate efficacy of side-scan sonar and other remote sensing technologies to map subtidal oyster reefs.

RESEARCH NEEDS FROM 2016 CHPP

There are several remaining research needs associated with priority issues from the 2016 CHPP. Refer to the CHPP 2016 Research Priorities document for the entire list. Some research needs under Oyster Restoration and Living Shorelines are also addressed in the NC Oyster Blueprint. There are also research needs for living shorelines incorporated in the 2021 CHPP Wetlands Restoration Issue Paper. A few of the research needs are being carried over into the 2021 Research Priorities as a reflection of the continuing need to address these information gaps.

- Determine the effect of sedimentation in the upper estuaries on primary and secondary productivity and juvenile nursery function.
- Encourage research for innovative and effective sediment control methods in coastal areas.
    - Enhancing monitoring capabilities for local and state sediment control programs (eg. purchase turbidity meters for testing turbidity coming off site and train staff to use).
    - Work with NCDOT to identify road ditches that drain to estuarine waters. Prioritize those that are contributing significant amounts of sediment to waterbodies with sensitive resources, such as designated nursery areas, oyster reefs, or submerged aquatic vegetation.
- Collect data on fish and habitat condition within identified coastal strategic habitats to verify condition of SHAs and relative impact of known alterations.
- Assess fish use (abundance, diversity, seasonality) in low-salinity SAV habitat (native and non-native) in North Carolina to better understand the importance of this habitat in oligohaline systems, and how fish respond to inter-annual fluctuations.
- Assess anthropogenic and environmental factors restricting successful river herring migration to spawning grounds.
- Quantify the extent and frequency that bottom in Pamlico Sound is trawled and the effect on benthos.
- Assess effect of agricultural flood control (diking, drainage canals, and active pumping of stormwater) on the condition of designated Primary Nursery Areas in Hyde County; whether conditions in the creeks and upper ditched waterbodies are still suitable and being utilized as nursery areas.
- Assess the effect of mine dewatering (associated with mines or rapid infiltration systems) on estuarine nursery area habitat and floodplain wetlands.
- Conduct research on low-impact development, best management practices, and other strategies to reduce nonpoint runoff to shellfish waters.
- Assess concentration, and prevalence of endocrine disrupting chemicals in estuarine waters, fishery species, particularly blue crab and oysters.