NHDES Research, Data and Assessment Priorities

Background: Developed by staff of the watershed Management Bureau. This includes representatives from the Coastal Program, Shellfish Program, Watershed Assistance Section, and Water Quality Assessment and Reporting Section.

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1. **Healthy Coastal Ecosystems**
    a. Soil budget. Soil health in areas of existing and lost eelgrass. Rates of soil aggradation/degradation (isotope studies, cores, POC, sulfides, etc.)
        i. Delineate sediment cells in order to understand sediment circulation and its influence on shoreline erosion
    b. Eelgrass—carbon nitrogen levels and isotopes for N to determine anthropogenic influence. Wasting disease index (tracking stressor difference—wasting disease versus other stressors)
    c. Nitrogen reduction rates from oyster aquaculture--- need reduction estimates from Little Bay add reduction rates to PTAP
    d. Examine the intensity of GHG emissions due to tidal restriction in salt marshes, as well as the potential for emissions reductions through tidal restoration
    e. Develop a blue carbon calculator to quantify the GHG sequestration potential that arises from activities like shellfish restoration, aquaculture, eelgrass restoration, marsh migration pathway creation, and living shoreline creation
    f. Water quality impact with high tide flooding (pollutant loads and trash)—citizen science and research
    g. Evaluate effectiveness of resilience restoration efforts (living shoreline and thin layer deposition
    h. Maps of existing oyster reefs (comprehensive)
    i. Evaluate and implement methods to reduce the impact of invasive species
    j. Quantify the relationships between fish stocks, crustacean stocks, and eelgrass cover.

2. **Environmental Literacy and Workforce Development**
    a. Assess differential social impacts of storm surge, sea-level rise, and extreme precipitation and adaptation strategies needed to better prepare socially vulnerable populations
    b. Identify vulnerable populations and develop guidance for including social vulnerability information into local planning

3. **Coastal Resiliency and Economies**

    a. An expert panel process for fine tuning non-structural load reduction (LR) estimates for leaf litter and catch basin cleaning. The MS4 permit provides a

method for quantifying LRs for these activities, but there is a collective sense that these numbers are low. Developing more accurate estimates could have significant cost considerations for municipalities since costs to do these BMPs are lower than structural BMPs.

b. **Septic Systems**---vulnerability of septic systems. What are the potential impacts under sea level rise conditions?
c. **Regional Groundwater---**monitoring of influence of sea level rise on groundwater over time and understand changes in salinity.
    - Determine the magnitude and extent of SLR-induced groundwater rise, including the effects of a migrating shoreline as sea level rises and the combined effects of SLR and seasonal fluctuations of groundwater levels.
    - Assess vulnerability of public/private drinking water supplies and potential sources of contamination
    - Identify vulnerable areas for potential septic system failure and resulting nutrient loading to Great Bay
d. Freshwater/tidal confluence—specific flood impact understanding.
e. Wave and hydrodynamic modeling and associated impacts.
    - Coastal hydrodynamic flood risk modeling for all of New Hampshire that includes all significant physical processes that affect water levels (e.g., riverine flows, tides, currents, waves, winds, tropical and extra-tropical storm surge, sea-level rise, wave set-up, etc.), accounts for variations in topography, bathymetry, and land cover, and can simulate flow/flood control structures, etc. Desired outputs include: coastal flood exceedance probability and estimated flood depth maps
    - Quantifying First Finished Floor Elevation to Assess Flood Risk for Individual Buildings in Coastal New Hampshire Municipalities
f. Shoreline change within estuaries and Atlantic coast
g. Related to costs of doing nothing over various sea level rises. And also economic costs of different planning/mitigation options.
h. Evaluate NH's potential to be a player in the blue carbon market
i. Assess potential for wetland expansion and water-depth changes within wetland
j. Assess climate vulnerability of state and municipal structures and facilities at regional, municipal, and site-specific scales (e.g., roads, bridges, tidal culverts, dams, wastewater treatment plants, sewer systems, seawalls, shale piles, nuclear power plant, harbors, emergency services and evacuation routes, emergency communications systems, etc.)
k. Quantify total post-storm damage to transportation infrastructure (i.e., total cost to get a system back up and running, including employee overtime, etc.)
l. Research case studies and evaluate land use planning options for dealing with increases in impervious cover in context of climate change based on differing demographics
m. Investigate how our coasts change in response to extreme storms and how to predict and respond to those changes (e.g., what are the impacts of large storm events on living shorelines and how can they be designed appropriately to withstand those impacts?)
n. Document coastal and riverine shoreline conditions (e.g., areas of shoreline erosion/instability)

o. Assess vulnerability of economic assets to storm surge, sea-level rise, and extreme precipitation (e.g., property values, tax base, workforce/ jobs, insurance costs, trade facilities, public recreational facilities, municipal budgets, fishing industry). Research case studies and evaluate options for maintaining vulnerable property/meal and rooms tax base and/or reforming current tax system to continue funding essential community services
p. Understand avoidance costs, not just cost of damage (e.g., avoidance cost of adopting updated stormwater ordinance)

4. Sustainable Fisheries and Aquaculture

a. Oyster restoration/oyster aquaculture eelgrass interaction
b. Assess the vulnerability of lobster, commercial and recreational fisheries, and oyster farming industry in the Great Bay Estuary to decreasing pH levels
c. Improve our understanding of Omega variability in N.H. waters and where these vulnerabilities overlap with biological processes related to ecosystem services such as oyster farming, oyster restoration, and fish biology
d. Explore relationships between male specific coliphage (viral indicator) and viruses commonly found in municipal sewage, excluding norovirus (hepatitis, adenovirus, etc.).
e. Develop screening tests for presence of okadaic acid (toxin associated with Diarrhetic Shellfish Poisoning) that are effective in Gulf of Maine waters
f. Support research that enhances our understanding of the ecology of various species of *Pseudo-nitzschia* in the Gulf of Maine, particularly *Pseudo-nitzschia australis,* including an understanding of the factors that stimulate production of domoic acid.
g. Support development of shellfish/phytoplankton monitoring strategies and tools that can predict the development of dangerous levels of domoic acid in shellfish.
h. Support development of monitoring strategies and tools that can predict the development of dangerous levels of pathogenic *Vibrio* in oysters and hard clams.
i. Support development of treatment methodologies for use in commercial aquaculture operations that can reliably reduce pathogenic *Vibrio* levels in oysters and hard clams.
j. Support research to document and track new/emerging strains of *Vibrio* in the northeast region.
k. Feasibility of drift Gracilaria aquaculture