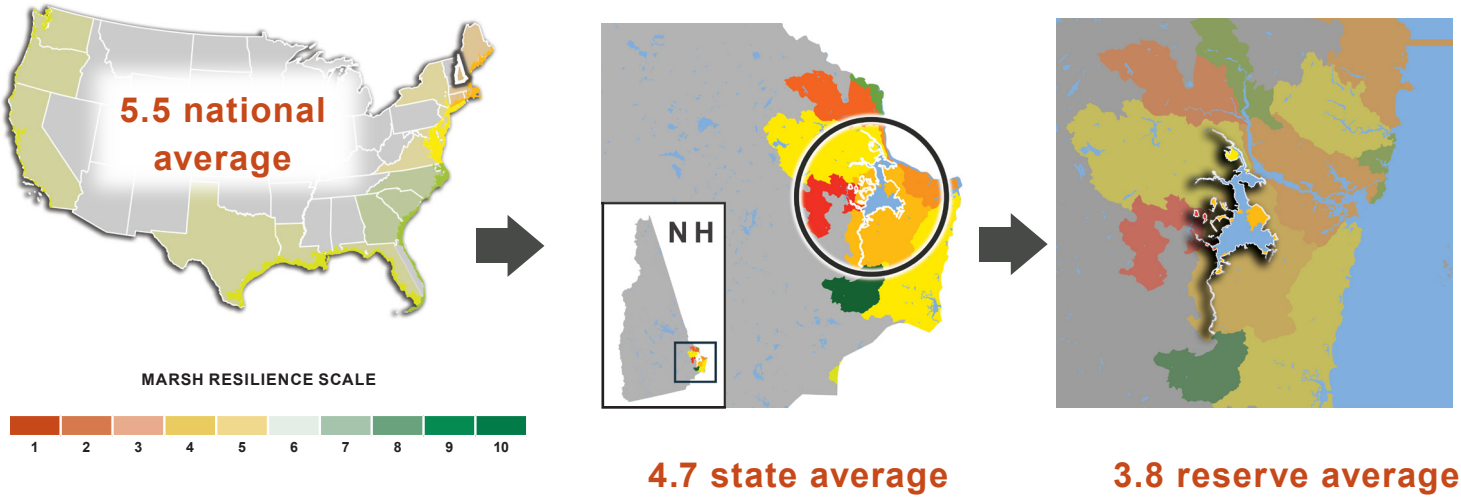

MARSH RESILIENCE AT THE LANDSCAPE SCALE

How does Great Bay Research Reserve compare?

Low current condition of marshes at Great Bay, primarily due to the amount of surrounding agriculture, gives the area a resilience lower than the state, Northeast and national averages.

Management recommendations: Several opportunities for restoration or adaptation projects that aim to enhance marsh resilience exist. Those that convert surrounding agriculture to natural buffer are likely to be particularly beneficial.

Current conditions

Marsh resilience depends largely on current composition and exposure to stressors such as development and agriculture.

The current condition of tidal marshes in and around Great Bay Reserve are poorer than marshes in the rest of New Hampshire, the Northeast, and the nation. This is primarily due to the very high amount of agricultural lands surrounding these marshes and conversely the relatively low amount of natural surrounding lands. Also, these marshes have more relative edge than core, even though the much of that edge was vegetated versus unvegetated.

Vulnerability

Marshes are more vulnerable to sea level rise when more of their vegetation is lower in the tidal frame and they have soils that are likely to erode.

Tidal marshes in and around the Great Bay Reserve and throughout New Hampshire are slightly less vulnerable than marshes throughout the Northeast and the nation. The high tidal range in these marshes are offset by more erodible soils and more vegetation below the mean tide level.

Adaptive capacity

Marshes with more space and fewer barriers to migration have a greater capacity to survive sea level rise.

The capacity for tidal marshes in and around the Great Bay Reserve to adapt to future sea level rise is on par with marshes throughout New Hampshire and the nation, and slightly better than marshes throughout the Northeast. Marshes in this area tended to have more hardened shoreline and less shoreline complexity than all other scales.

	TOTAL (1 TO 10)
National average	5.65
Northeast	4.46
State of New Hampshire	4.77
Great Bay Reserve	3.80

	TOTAL (-10 TO -1)
National average	-5.21
Northeast	-5.97
State of New Hampshire	-4.92
Great Bay Reserve	-5.00

	TOTAL (1 TO 10)
National average	5.65
Northeast	4.83
State of New Hampshire	5.23
Great Bay Reserve	5.20

CURRENT CONDITIONS | VULNERABILITY | ADAPTIVE CAPACITY

LESS RESILIENT — MORE RESILIENT

ABOUT THIS PROJECT

What do we mean by tidal marsh resilience?

Tidal marshes buffer against storm surge, reduce erosion, fortify upland property, and—together with other wetlands—provide an estimated $23.2 billion in storm protection annually. Marshes also improve water quality, create habitat for fish and wildlife, provide opportunities for outdoor recreation, and boost local economies.

These coastal ecosystems are characterized by hypoxic and saline soil conditions with plant communities that are largely driven by precipitation and flooding regimes. Small changes in these regimes—for example, in inundation duration—can have large impacts on marsh composition. The ability of marshes to resist or recover from such changes is an indication of their resilience. Sea level rise is a significant, long-term disruption that affects most tidal marshes. In this assessment, resilience is an integrative measure of a marsh's capacity to persist as rates of sea level rise accelerate into the future.

Where do the scores and maps come from?

Rankings for tidal marsh resilience to sea level rise at the landscape scale were calculated using GIS-based metrics of current marsh condition, vulnerability to sea level rise, and potential for adaptation. The assessment protocol used standardized comparisons over consistent watershed areas (HUC 12) along all coastal areas that contained salt marshes.

- Current marsh conditions included measures of a marsh's core area compared to its exposed and unvegetated edges and the surrounding impervious, agricultural, and natural land cover. More edges, especially if not vegetated, expose more of the marsh to potential erosion. Impervious and agricultural cover can contribute to runoff and pollutants that degrade marsh conditions, while increased natural cover mitigates those effects. Based on NOAA's Coastal Change Analysis Program (C-CAP) 2011 land cover data.
- Vulnerability included soil erodibility, total tidal range, and the percentage of marsh below mean high water and mean sea level. Marshes are more vulnerable to sea level rise when more of their vegetation is lower in the tidal frame, especially when that frame is not large. Erosion of marsh soils could increase with more frequent inundation. Based on NOAA Sea Level Rise viewer elevation data and NRCS SSURGO soils.
- Adaptive capacity included shoreline sinuosity and armoring (hardening), available space for migration, and future marsh connectedness. The more complex, (sinuous) a shoreline, the more protection it provides, while a hardened shoreline impedes migration. The more connected a marsh is, the higher its adaptive capacity. By combining elevation with projected sea level rise scenarios, we estimate available space for migration. Based on NOAA C-CAP and elevation data combined with Environmental Sensitivity Index (ESI) shoreline data.

NOAA | National Estuarine Research Reserve System

SCIENCE & TOOLS FOR COASTAL COMMUNITIES NATIONWIDE

How can I use this information?

To find the detailed scores and supporting data for the marshes in your Reserve or state, visit the Digital Coast. Being able to compare the vulnerability, current condition, and adaptation potential of individual marshes across the country allows users to conduct comparative studies, analyze how watershed and marsh level conditions impact vulnerability, and develop consistent approaches to ensuring tidal wetlands can adapt to sea level rise. The scores are derived from consistent data over broad geographies, making them useful for screening large areas for marshes with particular characteristics, targeting fieldwork and monitoring, and strengthening experimental design. Because they take future conditions into consideration, they can be used to identify marsh restoration and migration pathway conservation opportunities that are cost effective and sustainable for the long term. The results can be used to assess the degree to which site-specific data represents other marshes in the state or region and to prioritize sites for new Reserves or new components of existing Reserves. Used in tandem with other NERRS-based marsh assessment tools, these rankings provide an integrated continuum of assessment to inform efforts to study, restore, or protect tidal marshes at the local, state, regional, and national scales.

What should I keep in mind?

This assessment is based on data from the coastal areas of the lower 48 United States. It does not include the Great Lakes. The results are regional in scope and should be used as screening level information at the local scale. The team has created a framework to perform similar assessments using more detailed local data and information. With high resolution data, the same protocol can be implemented at the local level to inform site specific decision making and support long term marsh resilience strategies.

WHERE CAN I LEARN MORE?

This user-friendly report includes more information about this assessment, its methods, and its results. Project partners include the National Estuarine Research Reserve System, National Oceanic and Atmospheric Administration's Office for Coastal Management, the University of New Hampshire, and the National Estuarine Research Reserve Association.

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