Indicator: Salt marsh habitat in the Great Bay and Hampton-Seabrook Estuaries

Question

How many acres of salt marsh habitat are there in the towns of the Piscataqua Region Watershed?

Short Answer

As of 2017, there are 5,521 acres of salt marsh habitat in the Piscataqua Region Watershed, with these acres distributed amongst 17 municipalities. Hampton and Seabrook have the most salt marsh habitat, with 1,342 and 1,140 acres, respectively. This baseline will be monitored in the future in order to track changes in the amount, location and characteristics of salt marsh habitat in the Piscataqua Region.

Figure SM-1. Map of salt marsh coverage, showing marsh habitat in New Hampshire only.

PREP Goal
Goal is under development.

Why This Matters

Salt marshes are among the most productive ecosystems in the world and provide many services, such as: habitat, food web support, and buffering from storms and pollution. Most salt marshes in the Piscataqua Region Watershed have been degraded over time due to development and past management activities. Also, as the rate of sea level rise increases, salt marshes will experience impacts that will change marsh composition, cause erosion or force these marshes to migrate landward.

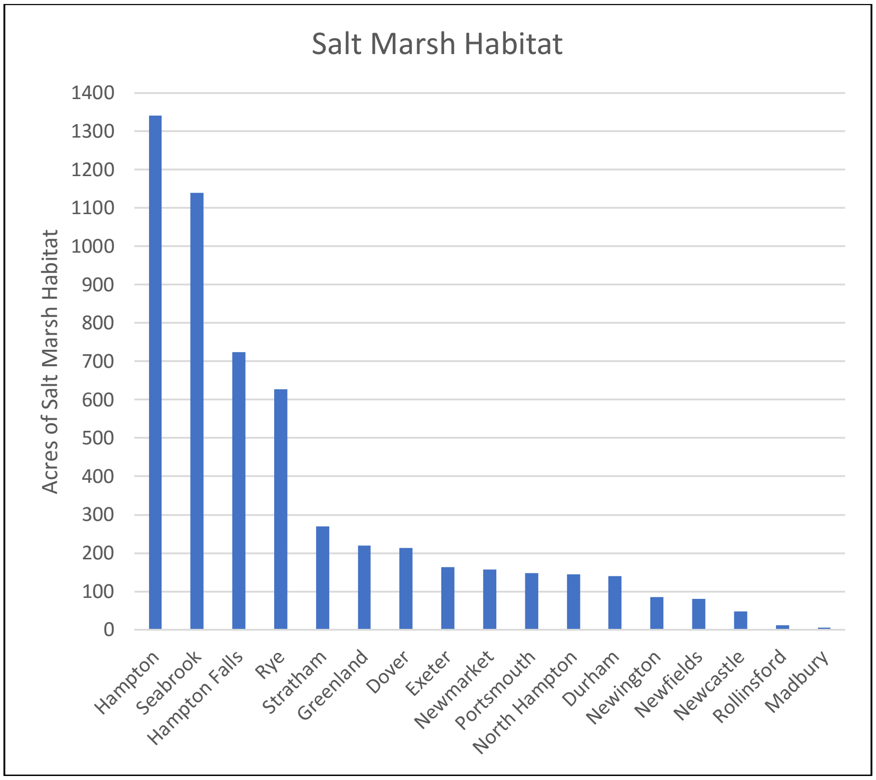

Figure SM-2. Number of acres of salt marsh habitat in 2017, by town/city within the Piscataqua Region Watershed. Data Source: Great Bay National Estuarine Research Reserve; Kappa Mapping, Inc. (2013 Flight); USGS LIDAR Data (2011 and 2014); NOAA Office of Coastal Management, and NHDES Coastal Program.

Explanation (from 2018 State of Our Estuaries Report)

As of 2017, there are 5,521 acres of salt marsh habitat in the Piscataqua Region Watershed (Figure SM-1) with these acres distributed amongst 17 municipalities (Figure SM-2). The area surrounding the Hampton-Seabrook Estuary has the greatest amount of salt marsh habitat. Hampton had the most acres of salt marsh (1,342 acres), followed closely by Seabrook (1,140 acres). Hampton Falls and Rye had 725 and 627 acres, respectively. Great Bay Estuary municipalities, such as Stratham, Greenland and Dover, had less than half the salt marsh acreage of Rye (Figure SM-2).

Between the early 1900s and 2010, an estimated 431 acres of salt marsh area was lost in the Great Bay Estuary, and in the Hampton-Seabrook Estuary, 614 acres (or 12% of the historic salt marsh) was lost (PREP

2010). As these habitats experience continued pressures from development and impacts related to climate change, such as sea level rise, it will be important to assess changes in marsh location, total acreage and salt marsh structure. For example, one possible reaction to sea level rise, forecasted to be between 6 and 11 mm/ year, is that plant species that are less tolerant to flooding, such as high-marsh grass (*Spartina patens*) will be replaced by low-marsh grass (*Spartina alterniflora*) and the boundary between high and low will shift upslope. In addition, the lower edge of the marsh will migrate landward as the marshes literally drown and pannes (depressions in the marsh that do not tend to retain water) and pools (which do retain water) are likely to expand (Smith et al. 2017).

Acreages presented in this report represent a new baseline that will be monitored consistently into the future. The 2017 baseline assessment is the first to use standardized digital methods, which are being employed across the nation by NOAA and the National Estuarine Research Reserve (NERR) system. Although this report focuses only on number of acres, future years will include other salt marsh categories, such as: acres of high marsh versus low marsh, pannes and pools, and amount of invasive species such as *Phragmites australis*. PREP anticipates that the new baseline will be used to track the area of marsh lost to sea level rise, the area of marsh gained by landward migration as well as the conversion of high marsh to low marsh.

Methods and Data Sources

The goal for this project, and this new indicator, was to create a new habitat mapping system, based on high resolution source data and semi-automated classification routines, calibrated through on-the-ground field verification. The specific objective of this new approach is to facilitate the development of finely detailed habitat delineations that will provide a baseline representation of salt marsh habitats in New Hampshire and will be suitable for change analysis in the future.

Data mining was initiated during the fall of 2015 and several critical input data sets were identified and acquired. Partners (Great Bay NERR, NOAA Office for Coastal Management and NH DES) worked together to create a standardized salt marsh classification system, which includes 24 unique classes that differentiate habitats (species, species assemblages, and physical environments) from the salt marsh terrestrial border to open water. Significant class types include tall form and short form *Spartina alterniflora*, lower and upper salt meadow, upper brackish meadow, pannes and pools, and *Phragmites australis*.

Initial field work was performed in 2016. Field calibration points were recorded at hundreds of reference sites covering most of the state's tidal wetlands. Georeferenced photographs were also acquired to support the ongoing quality control process. The initial classification phase produced draft maps and classifications. These were reviewed and merged with additional training data into a comprehensive database in order to improve the semi-automated classification routines.

NOAA OCM generated draft habitat layers and published them to NOAA's ArcGIS online account (NOAA GeoPlatform) for external reviewers to access and submit comments. Comments were incorporated and revised habitat maps were generated for a second round of review. This was followed by the second round of field verification to calibrate the semi-automated analysis and to perform an accuracy assessment for the final product.

Data Sources

NOAA OCM compiled existing 2004 and 2012 NH wetlands datasets, from Normandeau and US Fish and Wildlife Service, respectively. These datasets, along with a modeled mean higher high water tidal surface, were used to establish the project mapping boundary.

Primary mapping imagery was provided by PREP (Orthoimagery, 1- foot resolution, 4-band imagery collected on August 24, 2013 at low tide.) Ancillary elevation data included 2011 and 2014 USGS lidar data, which were downloaded from NOAA's Digital Coast and were processed to generate digital terrain models and digital surface models.

Ancillary water surface data included four different tidal surfaces; highest annual tide, mean higher high water, mean high water, and mean tide level were generated using model output from VDatum, the lidar data, and NOAA OCM's water surface mapping methods.

References Cited

PREP. 2010. Piscataqua Region Comprehensive Conservation and Management Plan, Piscataqua Region Estuaries Partnership: D.B.Truslow Associates, Mettee Planning Consultants, 2010, Durham, NH. scholars.unh.edu/prep/22/.

Smith SM, Tyrrell M, Medeiros K, Bayley H, Fox S, Adams M, Mejia C, Dijkstra A, Janson S, Tanis M. 2017. Hypsometry of Cape Cod Salt Marshes (Massachusetts, U.S.A.) and Predictions of Marsh Vegetation Responses to Sea-level Rise. *Journal of Coastal Research*. (33) 3: 537 – 547