2017 STATE OF NARRAGANSETT BAY AND ITS WATERSHED – MAPPING DRIVERS OF CHANGE AND VARIATION

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The poster presented at the 2017 NEARC Fall Conference "*2017 State of the Bay and Its Watershed, Mapping Drivers of Change and Variation"* was awarded People's Choice and Best Overall. This poster showcases and summarizes the most compelling results documented in 2017 *State of Narragansett Bay and Its Watershed* report by the Narragansett Bay Estuary Program (NBEP). The Narragansett Bay Watershed is bi-state (MA and RI), which creates inherent challenges for compiling and harmonizing data in a seamless way across political boundaries for which data are not consistent, insufficient, or not comparable in terms of what data is collected, data definition, and temporal and geographic-scale. These challenges are compounded when dealing with an extensive range of environmental indicators, of which 16 of 24 were GIS driven. It is generally not possible to generate a bi-state report that measures environmental stressor and condition indicators, with stakeholder and scientist acceptance with off the shelf, existing data.

The Narragansett Bay and its Watershed is divided into sections to display key indicators in areas where results are more meaningful. Starting with population, the main driver of changes in the landscape, depicts population increases and decreases in one of the most populated areas historically; followed by watershed stressors such as land use changes and percent of impervious cover; wastewater infrastructure represented by sewered and unsewered areas from high to low density of buildings that rely on onsite systems, and location of wastewater treatment facilities representing actual nitrogen loading contribution and trends. These stressors are linked to the conditions of water and habitat quality, which are represented by categories (i.e. waterbodies acceptable for swimming or aquatic life) or gradient of conditions (i.e. high quality natural lands protected and unprotected as open space). The flow of information walks you through the data and methods, as well as key findings, and incorporates results from other non-GIS indicators such as trends of climate change and estuarine conditions.

How did we do this? 1) Partnerships and scientific vetting; 2) Data representativeness and 3) Metrics calculated at different geographical scales.

First, an inclusive partnership-driven process with key expertise from all relevant interdisciplinary backgrounds from both states were brought together, to methodically resolve the challenge of data comparability and consistency across state boundaries for all indicators. Partners across the board assisted in identifying data sources, streamlining data sharing, validating methods for comparability, and providing feedback. This process was backed up by a volunteer GIS expert group representing federal, state and academic institutions (see authors) to validate the methods and data resulting to validate the geospatial portion of this effort, in particular for creating indicators with harmonized data at various geo-scales.

Second, data were selected through the lens of spatial and temporal scales, and representativeness, using several criteria: a) national and regional datasets with enough spatial resolution, seamless across state boundaries both categorically and temporally (i.e. land use); b) state datasets that can be compared consistently based on a cross-walk categories (i.e. water quality conditions); c) local datasets that were comparable enough for analysis, to create unique and non-existing datasets (i.e. areas served by sewer or onsite systems).

Third, GIS methods varied by indicator, and metrics were calculated at different geographical scales. The Estuary Program developed protocols and methods to bring together and standardize all GIS datasets at the watershed and bay scales. An array of advanced geospatial tools in ArcMap such as Kernel Analysis, Model Builder, and methods such Dasymetric Analysis, were used for these multiple GIS analyses. For calculating metrics at different geospatial scales, the silver lining tools were Tabulate Intersection for vector data, and Zonal Statistics for raster data.
The process of building sound indicators for the bi-state watershed and shared GIS databases continues moving forward. It is the goal of the Estuary Program to continue bringing harmonized data together and developing sound science and data for management using GIS and other state of the art tools, and to be the open-access portal of the bi-state Narragansett Bay and its watershed environmental database.

Data Sources: Narragansett Bay Estuary Program (NBEP); US Environmental Protection Agency (EPA); Rhode Island Department of Environmental Management (RIDEM); Massachusetts Department of Environmental Protection (Mass DEP); RIGIS; MassGIS; Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA), UMass Amherst, US Census Bureau; National Land Cover Dataset (NLCD); Eastern Brook Trout Join Venture (EBTJV); USGS National Hydrography Dataset (NHD); USGS National Elevation Dataset (NED); NOS Hydrographic Survey Department.