Trend analysis of stressors and ecological responses, particularly nutrients, in the Narragansett Bay Watershed

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Current and historic impacts of nitrogen on water quality were evaluated and relationships between nutrients and ecosystem structure and function were developed for Narragansett Bay, RI. Land use land cover change analysis from 1985 thru 2005 resulted in a 7% increase in urban land and a decrease of 9.7% and 3% in forested and agricultural land, respectively; this increase was not uniform across the watershed. Roughly 70% of Total reactive Nitrogen (TN) entering the Bay is from waste water treatment facilities (WWTFs), and a number of actions have been taken to reduce point source loads. Eastern oysters were the most harvested shellfish species in Rhode Island in the late 1800s, but by 1953, had been surpassed by the hard clams. Preliminary examination of trawl data from 1980-2012 indicated no spatial patterns in fish abundance, but a temporal decline in several demersal species and replacement by pelagic species. This observation was unrelated to TN but positively related to cormorants and the Atlantic Multidecadal Oscillation index. Core profiles of molybdenum, a proxy for hypoxia, show frequent hypoxia in the Providence River at the turn of the century decreased following installation of WWTFs, but increased in late century as release of untreated sewage increased. Outside the river, hypoxia was not frequent at the turn of the century, but steadily increased from mid- to late century and appears to have decreased since 2000. Eutrophication-driven organic matter over-enrichment of sediments and seasonal hypoxia of the bottom water affects benthic community structure and function, but analyses suggest that management changes will continue to improve the health of these communities within the Bay. Seagrass and benthic habitat data show a recent recovery in seagrass, consistent with improving environmental conditions in the Bay. Results indicate that changes in TN loading appear to influence some, but not all, aspects of the Bay's structure and function.