ANNUAL REPORT
N.H. Coastal Marine Natural Resources and Environment Commission
(COMNARE)
November 1, 2017 – November 1, 2018

The Coastal Marine Natural Resources and Environment Commission (COMNARE or "the Commission") was established by the NH Legislature in 2016 to (6, p.2):

I. *Investigate, monitor, and propose prevention and mitigation strategies for emerging environmental threats in coastal and Great Bay waters, including but not limited to warming of waters, ocean acidification, sedimentation, and nutrient loading, which impact fish, shellfish, and the food chain thereof.*

II. *Identify gaps and recommend improvements in water quality monitoring, including monitoring pH and evaluating its impact on the impaired waters designation of water bodies.*

III. *Recommend strategies for enhancing capacities for improving water quality.*

IV. *Examine the Blue Carbon credit program for sea grass promotion and oyster bed restoration.*

V. *Report annually on November 1 to the chairpersons of the house and senate committees with jurisdiction over issues affecting coastal marine resources and the environment, the president of the senate, the speaker of the house of representatives, and the governor*

After a first-year focus on the potential impacts of ocean acidification, the Commission shifted its focus in 2017-2018 to better understand the status of nutrients in NH's estuaries and coastal marine resources.

The Commission framed its exploration of the topic around the following observations:

- There is a vast amount of research and regulation related to nutrients already underway through United States Environmental Protection Agency (US EPA), Piscataqua Region Estuaries Partnership (PREP), New Hampshire Department of Environmental Services (NHDES), municipalities, and others – the Commission does not have the capacity to study this issue comprehensively but can assess where there are areas with legislative implications;
- While both phosphorus and nitrogen are nutrients of concern, nitrogen is the primary concern in estuarine ecosystems;
- Because nitrogen discharges from wastewater treatment facilities are regulated by US EPA, the Commission has focused on nitrogen loading from stormwater and septic systems.

Seven speakers were invited to share their perspectives on the impacts of nitrogen and stormwater on NH's coastal resources:

September 11, 2017	**Kalle Matso**, Coastal Science Program Manager, Piscataqua Region Estuaries Partnership (PREP) "Turning the corner to nutrients and NH estuaries"
January 22, 2018	**Fred Short**, Jackson Estuarine Lab, UNH "Eelgrass & nitrogen: The good, the bad and the algae"

March 5, 2018	**Ken Edwardson**, NH Department of Environmental Services "2016 Section 303(d) surface water quality list relevant to estuaries"
	Kalle Matso, Piscataqua Region Estuaries Partnership **"**Nutrients and NH estuaries – overview of relevant indicators following publication of the State of Our Estuaries 2018 report"
May 7, 2018	**Cory Riley**, Reserve Manager, Great Bay National Estuarine Research Reserve "Buffers and living shorelines in NH; their ecological function with respect to nutrient loading, landscape trends, and potential mitigation"
	Julie LaBranche, Senior Planner, Rockingham Planning Commission "Southeast Watershed Alliance model stormwater standards - implications for nutrient loading in NH estuaries"
	Ted Diers, Watershed Management Bureau Administrator, NH DES **"**Municipal Separate Storm Sewer Systems Permits in NH"
August 13, 2018	**Gretchen Young**, PE, Dover Asst. City Engineer and Chair, Seacoast Stormwater Coalition "Seacoast Stormwater Coalition's efforts to assist municipalities with MS4 permit requirements"

SUMMARY OF FINDINGS RELATIVE TO NITROGEN and STORMWATER

Based on presentations in 2017-2018 from leading local experts on the state of the estuary, the Coastal Marine Natural Resources and Environment Commission (COMNARE) learned that the Great Bay Estuary is showing negative and/or cautionary trends for 12 of 16 indicators. (5) While there are positive trends for nutrient loads due to improvements at several wastewater treatment facilities, the State of Our Estuaries 2018 report states:

> *"Nutrient loading is a critical stressor. Although we have been making impressive improvements since 2012, nutrients remain of high concern, particularly during rainy years where more runoff leads to increased loading."* (5, p.6)

Data presented in the State of Our Estuaries 2018 report indicates that nitrogen levels in the Great Bay Estuary are extremely high relative to other estuaries in the Northeast.

> "*At 43.6 tons per square mile (of tidal estuary surface area), nitrogen levels between 2012 and 2016 were much higher than the 14 tons per square mile threshold for eelgrass health indicated in a 2010 study of 62 New England estuaries. While the Great Bay Estuary may have traits that make it more tolerant of high nutrient levels (such as high flushing rates), our system has three times the threshold level from that study.*" (5, p.8)

Why does this matter? Eelgrass is a foundational plant species in healthy estuaries, providing a myriad of ecosystem benefits including oxygen production, fish and wildlife habitat, stabilizing sediment, utilizing excess nitrogen, and sequestering carbon. Multiple peer-reviewed scientific publications concur that eelgrass decline is correlated with increasing nitrogen loads (1, 2) and that "*at higher loading rates, eelgrass coverage decreases markedly, with essentially no eelgrass at loading levels 100 Kg ha1 yr1.*" (2, p.1) Because the Great Bay Estuary has annual nitrogen loads of 150-200 kilograms per hectare, (5) the Commission concurs with the scientific consensus that achieving significant reductions in nitrogen load is a necessary precursor to ecological recovery and resilience of the Great Bay Estuary.

Nitrogen enters the Great Bay Estuary from a myriad of sources. According to the State of Our Estuaries 2018 report, the 18 wastewater treatment facilities throughout the watershed contribute 33% of the nitrogen load in the estuary. (5, p.17) While there are still very high nutrient loads coming from Exeter and Portsmouth, both municipalities are constructing new plants that will come on line in 2019 and 2020 respectively. Dover and Rochester—the two highest-volume discharges in the estuary—have made substantial upgrades at their wastewater facilities resulting in 75-80% reductions of nutrient discharge into the Cocheco and Piscataqua Rivers. Newmarket's new wastewater plant became operational in 2017 resulting in significant nutrient reductions into the Lamprey River, and Newington has upgraded its facility on the Piscataqua River.

These investments in improved municipal wastewater treatment are beginning to show results.

> "*The nitrogen load from WWTFs for 2012-2016 was 296.4 tons, a decrease of 24% since the 2009 - 2011 period. In 2015 and 2016, the nitrogen load from WWTFs was 264.3 and 256.2 tons per year, respectively*." (5, p.17)

Yet point sources account for only one-third of the nitrogen in the Great Bay Estuary, with two-thirds — 68% —coming from non-point sources. The 2014 Great Bay Non-Point Source Study (GBNPSS) identifies the non-point sources of nitrogen as follows: 42% from atmospheric deposition, 29% from human waste primarily via septic systems, 15% from chemical fertilizers from agricultural and residential use, and 14% from farm animals and pet waste. (3) These sources of nitrogen are conveyed to the estuary either by stormwater that picks up pollutants on the land surface with every rain event, or directly by groundwater flow (i.e. septic systems).

With US EPA's Municipal Separate Storm Sewer System (MS4) program now in effect in most of the larger communities in the estuary, there is increased focus on improving stormwater management and reducing discharges of nutrients, sediments and other contaminants that are carried by rainwater into wetlands, rivers and bays. Over the coming years, MS4 communities have permit requirements for public education and outreach, eliminating storm and sewer connections, construction site runoff control, post-construction runoff reduction, and other pollution prevention and pollution reduction accounting measures. (7) However, there is no federal — and limited state — support for communities to implement MS4 requirements.

COMNARE recognizes the limitations of the MS4 program in effectively managing stormwater pollution from all coastal communities. The commission has identified several opportunities to reduce nitrogen while providing additional benefits such as reducing flooding, increasing resilience, removing sediment and toxics, and cooling water before it runs into streams, wetlands and the estuary. Such measures include:

- Systematic state and municipal investment in stormwater management measures for capital improvement projects in areas with extensive impervious surfaces such as roads and public facilities.
- Stormwater management improvement in private redevelopment projects involving parking lots, shopping centers and corporate buildings.
- Larger and more widespread vegetated buffers along wetlands, streams and other water bodies.
- Encouraging more widespread adoption of residential low-impact practices to reduce volume and pollutant load of stormwater runoff through programs such as NHDES's Soak Up The Rain.

Many communities in the Great Bay watershed have adopted stormwater management practices through model planning and zoning ordinances developed by the Southeast Watershed Alliance (SWA), but they are being implemented and enforced variably. To significantly reduce stormwater impacts on the Great Bay Estuary, enhanced stormwater management needs to become more normalized and widespread throughout the region for all new development, and retrofit into existing development and infrastructure whenever major upgrades are underway.

Likewise with more than 50% of the population in the Great Bay Estuary watershed using "onsite waste treatment" rather than municipal wastewater treatment, septic systems are a significant (30%) source of the non-point nutrient load in the estuary. Septic systems are designed to break down pathogens in fecal matter and prevent them from moving into groundwater, but conventional systems are not designed to reduce nitrogen. Indeed, septic systems are highly efficient at letting nitrogen-rich effluent

move through both the septic tank and leach field directly into groundwater and receiving surface waters. There are an increasing number of relatively low-cost retrofits and designs that can dramatically reduce the nitrogen concentrations in on-site treatment systems that could have significant benefits for water quality.

Given the significant impact that non-point source and stormwater pollution has on the health of the estuary, COMNARE will continue to focus on specific concerns during 2019 including septic systems and fertilizers. Additionally, the Commission will explore blue carbon initiatives that create a marketplace for funding habitat restoration and other projects that build, restore or protect the capacity for ecosystems to both trap carbon and other greenhouse gasses, and also take up nitrogen.

Copies of presentations and detailed notes from speakers discussed in this summary can be accessed on the Commission's website https://seagrant.unh.edu/comanare-meetings

RECOMMENDATIONS FROM COMNARE

1. US EPA, NHDES, University of New Hampshire (UNH), PREP, Great Bay National Estuarine Research Reserve (GBNERR) and others should continue developing more comprehensive, continuous and coordinated monitoring of water quality parameters and ecological indicators throughout the Great Bay Estuary, as per the recommendations of the State of Our Estuaries 2018 report.
2. Encourage systematic state and municipal investment in stormwater management measures for capital improvement projects in areas with extensive impervious surfaces such as roads and public facilities.
3. SWA should update stormwater management standards to increase both pollution reductions and resilience to increasingly frequent and intense rain events.
4. Encourage new funding mechanisms for stormwater investments, such as municipal or regional stormwater utilities as authorized by RSA 149-I:10-a Stormwater Utility Fund. (4)
5. Provide funding for UNH Stormwater Center to identify stormwater-related nutrient-loading hotspots throughout the Great Bay Estuary and focus additional resources on enhancing infiltration and reducing impervious surfaces.
6. Require stormwater management improvement in private redevelopment projects involving parking lots, shopping centers and corporate buildings.
7. Develop regulatory and/or incentive mechanisms to expand and enhance vegetated buffers throughout the coastal watershed.
8. Establish a legislative commission to examine the regulatory framework for septic system permitting, and to explore revised septic codes that require denitrification.
9. Provide support for a regional stormwater inspector for Southeast Watershed Alliance to provide technical assistance and compliance review to highly developed municipalities.

10. Encourage all watershed communities to incorporate good stormwater-related asset management in municipal planning through NHDES's Pollutant Tracking and Accounting Project (PTAP).
11. Support more widespread adoption of residential low-impact practices to reduce volume and pollutant load of stormwater runoff through programs such as NHDES's Soak up the Rain.
12. Improve understanding of nutrient flows in Hampton-Seabrook Estuary.
13. Establish a partnership of federal, state, university and non-profit organizations to develop a 5-10 year master plan for eelgrass and oyster recovery/restoration.
14. Explore opportunities to expand shellfish aquaculture in the Great Bay estuary and other parts of coastal NH to help stimulate commercial operations and enhance water quality.

This is not intended to be a comprehensive set of recommendations for restoring the health of Great Bay and Hampton-Seabrook estuaries. Additional recommendations from the State of Our Estuaries 2018 report are available at https://www.stateofourestuaries.org/2018-reports/

References

1. Hauxwell J, Cebrian J, Furlong C, Valiela I. 2003. *Eelgrass Zostera marina* loss in temperate estuaries: relationship to land-derived nitrogen loads and effect of light limitation imposed by algae. Mar Ecol Prog Ser 247: 59-73
2. Latimer J.S. and S.A. Rego. 2010. Empirical Relationship Between Eelgrass Extent and Predicted Watershed-derived Nitrogen Loading for Shallow New England Estuaries. Estuarine, Coastal and Shelf Science 90: 231-240.
3. NH DES. 2014. Great Bay Nitrogen Non-Point Source Study. NH Department of Environmental Services. http://scholars.unh.edu/prep/381
4. NH Rev Stat § 149-I:10 (2015)
5. Piscataqua Region Estuaries Partnership. 2017. State of Our Estuaries Report 2018. PREP Reports & Publications. 391. https://scholars.unh.edu/prep/391
6. SB 375, Chapter 485-G Coastal Marine Natural Resources and Environment Commission. 2016 Reg. Sess. (NH 2016)
7. US EPA. 2016. Compendium of MS4 Permitting Approaches. Part 1- Six Minimum Control Measures. EPA-810-U-16-001

APPENDIX

1. Letter to Governor from COMNARE on oil drilling