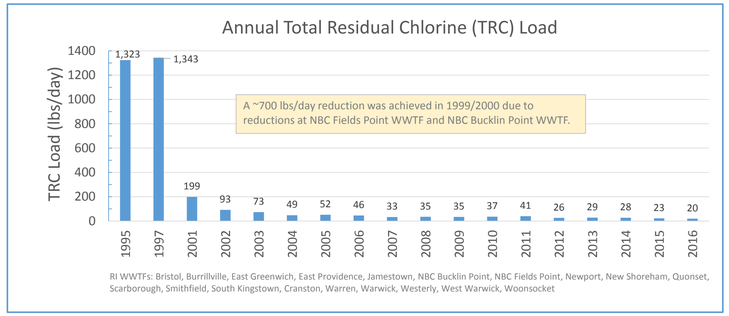
Major Rhode Island WWTF Pollution Reduction Efforts[1]

Progress Since Meeting Secondary Treatment Standards

Total Residual Chlorine (TRC)

Treating wastewater with chlorine is the most common practice for wastewater disinfection in the United States. As a result of discharge limits established in the early 1990s to protect aquatic life, the harmful effects of TRC from every Rhode Island wastewater treatment facility (WWTF) have been eliminated for more than 15 years. The greatest reductions occurred between 1997 and 2001. In 2016, Rhode Island WWTFs released 20 lbs/day of TRC, less than a tenth of permitted levels and a 98% reduction from the late 1990s.



How RI WWTFs Achieved Reductions

In response to discharge limits set to protect the health of aquatic life, Rhode Island WWTFs developed Facility Plans to evaluate the cost and effectiveness of alternative treatment methods. As a result, most facilities minimized the overall amount of chlorine used and added sodium bisulfate to neutralize (or dechlorinate) TRC. Three WWTFs (East Greenwich, NBC Bucklin Point, and West Warwick) opted to switch to ultraviolet light, completely eliminating the need for chlorine.

Dechlorination

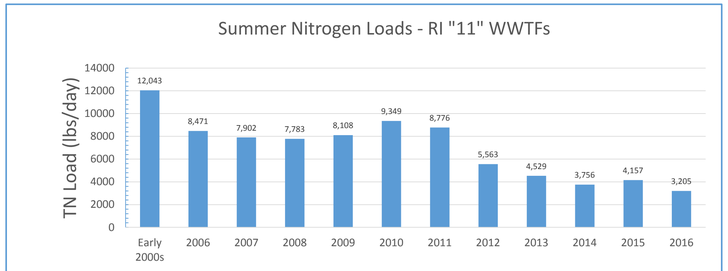
The dechlorination process occurs when sodium bisulfate neutralizes chlorine by reducing and preventing chlorinated compounds, resulting in the discharge of sulfate. The concentration of sulfate naturally occurring in seawater is 1000 times higher than that of dechlorinated wastewater. Tests of Rhode Island WWTF effluent have found chlorinated effluent to be highly toxic; however dechlorinated samples resulted in little-to-no toxic effects.

WWTFs check the toxicity of their discharge to aquatic life with standard tests, known as Bioassay Tests. A review of Bioassay Tests conducted over the last three years found the compliance rate from WWTFs for chronic (i.e. sub-lethal) effects beyond the mixing zone to be 93%. Six of the 9 samples that violated criteria were from a single WWTF that traced the source to an industrial user.

Nitrogen

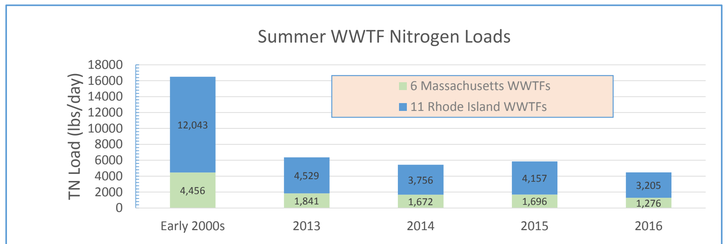
Research since the early 1980s has found that the health of Narragansett Bay north of Prudence Island and Greenwich is negatively impacted by excessive nitrogen. The results of which are excessive phytoplankton and algae growth that cause the loss of seagrass habitat, poor benthic habitat and low dissolved oxygen levels. Various studies have tied the majority of nitrogen discharged to waters with low dissolved oxygen to Rhode Island and Massachusetts WWTFs.

As a result, a Rhode Island state law (RIGL § 46-12-2(f)) enacted in 2004 codified the Governor's Narragansett Bay and Watershed Planning Commission's goal to reduce Rhode Island WWTF nitrogen loads by 50% for waters north of Prudence Island and Greenwich Bay. In addition, consistent with RIGL § 46-12-3(25), DEM developed permit limits to reduce nitrogen from 11 Rhode Island WWTFs that maximized nutrient reductions relative to implementation cost and environmental impact. These limits apply May through October (i.e. summer). While limits are not in place from November through April, WWTFs reduce nitrogen to the maximum extent practicable. Winter reductions vary between plants. The EPA required similar reductions from six Massachusetts WWTFs within the Upper Narragansett Bay watershed. The most significant reductions were achieved in 2006, 2012, and 2016.



Upper Bay Annual Nitrogen Load Reduced 51%

Summer nitrogen loads from 6 Massachusetts and 11 Rhode Island WWTF have been reduced 64.3% which when coupled with changes to other loads to rivers has resulted in a 51% reduction in the total annual load to the Upper Bay. WWTFs constitute 51.5 % of the remaining annual load to the Upper Bay.[2,3]

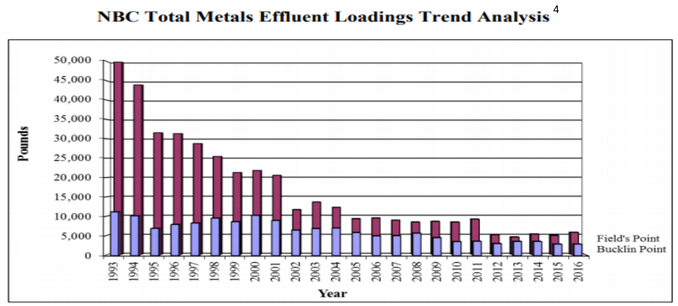


Bay-wide Annual Nitrogen Load Reduced 49%

Reductions to Upper Bay and the Taunton River (including WWTFs) have resulted in a 49% reduction in total annual loading to Narragansett Bay. WWTFs constitute 55% of the remaining load to the entire Bay.[2]

Metals

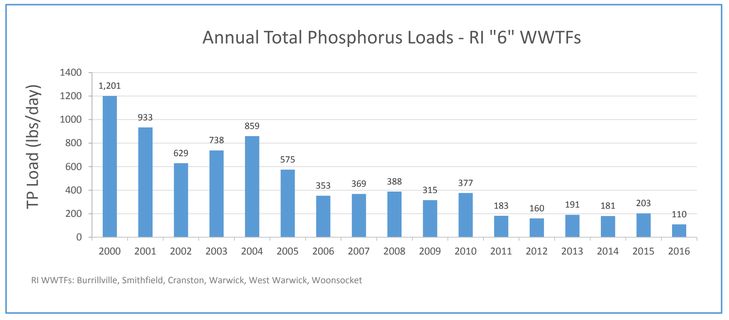
DEM began establishing discharge limits to eliminate acute and chronic effects for toxic metals in the early 1990s. WWTFs primarily achieved compliance by requiring pretreatment by industries connected to their sewer system. Historically, the NBC Fields Point and Bucklin Point WWTFs were the largest sources of metals from Rhode Island WWTFs. Overall since 1993, effluent metals (Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver and Zinc) from Bucklin Point have decreased by 74.0% and at Field's Point by 89.4%.



Phosphorus

Excessive phosphorus in freshwater systems promote the growth of nuisance algae and rooted aquatic plants which result in reduced water clarity, poor aesthetic quality and low dissolved oxygen levels that impact aquatic life.

Six Rhode Island municipal WWTFs are located along freshwater rivers. All 6 facilities reduced total phosphorus to 1 mg/L by the mid-2000s and to 0.1 mg/L by 2017. Massachusetts facilities along freshwater rivers have also been required to significantly reduce their phosphorus contributions.



Bay-wide Annual Phosphorus Load Reduced 37%

Rhode Island and Massachusetts WWTFs along the Blackstone, Pawtuxet, Taunton, Ten Mile, and Woonasquatucket have been required to address and reduce phosphorus loads. The resulting reductions from these facilities contributed to a 37% decline in Bay-wide phosphorus loads between the early 2000s and 2013-15.[2]

References

[1]Rhode Island Department of Environmental Management. 2017. Summary of Major Wastewater Pollutant Reduction Efforts in RI. Providence, RI.
[2]Narragansett Bay Estuary Program. 2017. State of Narragansett Bay and Its Watershed (Chapter 8, Nutrient Loading, pages 166-189). Technical Report. Providence, RI.
[3]Rhode Island Department of Environmental Management. 2017. Estimated Nitrogen Loads to Upper Narragansett Bay (early 2000s versus 2014): Adapting Nixon et. al. (1995, 2008) Bay-Wide Estimates to Upper Bay. Providence, RI
[4]Narragansett Bay Commission. 2017. Pretreatment Annual Report January 1, 2016 – December 31, 2016 (Figure 23, Page 132). Providence, RI.