

What's the Status of Point Source Nitrogen Reduction in the Chesapeake Bay Watershed?



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What reductions have been achieved?

As of 2001, point sources represent 21% of the total nitrogen load (or 59 million pounds per year) delivered to the Chesapeake Bay from all sources in the 64,000 square mile Chesapeake Bay watershed. There are 368 point source municipal and industrial wastewater treatment facilities that contribute significant amounts of nutrients to the Chesapeake Bay (58 are industrial and 310 are municipal). Since 1985, these point sources achieved a 32% reduction (26 million pounds per year) in total nitrogen being delivered to the Bay.

How were these reductions achieved?

These reductions were accomplished by the voluntary implementation of nutrient reduction technology (NRT) and/or pollution prevention measures at approximately one third of the 368 facilities. Industrial reductions have been primarily due to pollution prevention although some end-of-pipe technology has been employed. For municipal facilities, which contribute the bulk of the point source nitrogen load, the percentage of flow currently operating under NRT from all facilities is approximately 55%. Several of the Bay jurisdictions have instituted a variety of innovative incentive-based programs to implement NRT at municipal wastewater treatment plants generally via 50% state cost share grants. To date, Maryland has spent approximately \$190 million, and VA approximately \$99 million in capital cost share funding for NRT design, construction and installation. PA has allocated funds both under their Growing Greener initiative for NRT upgrades as well as by providing creative opportunities through their SRFs and Sewage Act Planning Program. A handful of these facilities were required to implement NRT or have nitrogen limits under a state NPDES permit. However, facilities were accountable for the performance of the technology generally through cost share contractual agreements. For the few facilities that do have nitrogen limits in their permits, this is primarily a result of the recent institutions of local TMDLs for many Bay sub-basins.

How much does it cost?

NRT technology is advancing at an exponential rate: Less than 10 years ago reductions to 8 mg/l were state-of-the-art for this region and it cost about \$35/lb of nitrogen removed. Now, reductions down to 3 mg/l are entirely feasible, and the costs are less than \$10/lb for facilities that have no NRT in place, and an average of \$4/lb for the many facilities that have some form of nutrient removal operating now. In 2002, the Chesapeake Bay Program assembled a broad stakeholder task force including academia, state agencies, and municipal experts to estimate the cost of implementing NRT to 3 mg/l for all 368 point sources in the watershed. They estimated that \$4.7 billion in capital expenditures would be required for all facilities to go beyond their current operating conditions, or plans, to get to discharge levels of 3 mg/l TN (\$4.5 of this would be to upgrade the 310 municipal facilities). However, this was a conservative estimate. A recent engineering study of Maryland's 66 major municipal facilities, concluded that the cost of implementing NRT to 3 mg/l would be 32% less than the previous Chesapeake Bay Program study. Additionally, a recent study by Virginia's Hampton Roads Sanitation District developed revised

costs for NRT to 3 mg/l for their 8 facilities which resulted in estimates that were 23% less than the Bay Program estimated for those same plants.

What contributions can point sources make toward restoring the Chesapeake Bay?

In March 2003, the Bay Program adopted new nutrient reduction goals, calling for Bay watershed jurisdictions to reduce the amount of nitrogen entering the Bay from the current 285 million pounds to no more than 175 million pounds per year (or a 110 million pound per year reduction). Estimates have been made of the potential for point source reduction at various levels of treatment. Results of this analysis were that point sources could conceivably contribute either 13, 26, or 37% of the total reductions needed for the Bay if all facilities reduced their discharges to total nitrogen concentrations of 8, 5, or 3 mg/l respectively by 2010. But rather than a one size fits all approach, Bay jurisdictions will determine the required reduction levels on a facility-by-facility basis during implementation of their respective tributary strategies and water quality standards.

What is in store for the future?

Nutrient removal continues to advance for the Bay's point sources. By 2010, current plans are that the total flow from municipal facilities treated by NRT will rise from 55% to 81% which equates to an additional reduction of 3.1 million pounds per year from 2001 levels. Industries, through pollution prevention or end-of-pipe treatment are expected to also contribute an additional 500,000 pound reduction by 2010. Each of the Bay jurisdictions are in the process of developing tributary strategies to achieve their respective nutrient allocations. These strategies will include a facility-by-facility assessment of what additional actions will be required for point sources. Virginia has announced a Notice of Intent for Regulatory Action (NOIRA) to develop technology based limits and all states are also in the process of developing their nutrient related water quality standards. These standards together with the tributary strategies will form the basis for decisions on NPDES permitting requirements for point source facilities. It has been agreed that annual average limits for nitrogen are appropriate as the Bay's response is linked not to monthly discharges, but to long term loads. Additionally, innovative approaches to permitting such as watershed-based permitting and trading are being considered by the Bay partners. At the same time, technology regarding both performance and affordability continues to advance.

Table 1: Chesapeake Bay Point Source Profile

Point Source Category	# Facilities in Bay Watershed	Cumulative Millions of Pounds Reduction from 2001 levels of Total Nitrogen Delivered by 2010 (% reductions of total watershed load contribution)				Costs to go to 3 mg/l (billions of dollars)**
		As Planned*	All to 8 mg/l	All to 5 mg/l	All to 3 mg/l	
Municipal	310	2.6	12.9	26.9	36.8	\$4.5
Industrial	58	0.5	1.0	1.7	3.8	\$0.2
Total	368	3.1(3%)	13.9(13%)	28.6 (26%)	40.6(37%)	\$4.7

* For the municipal facilities to increase flow under NRT from 55% to 81%, and additional reductions known as planned for industries.

** According to conservative Bay Program 2002 estimates although recent studies in MD and VA show that these costs could be 23% - 32% lower.

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