LONG ISLAND SOUND STUDY

A Partnership To Restore And Protect The Sound

UPDATE

SPRING 1998

MESSAGE FROM THE DIRECTOR

The topic for the Spring ***UPDATE*** is an obscure provision in section 303(d) of the Clean Water Act which describes the requirements for Total Maximum Daily Loads (or TMDLs, as it will be mercifully referred to throughout the rest of the newsletter). What is a TMDL? Why is it in the news now? And what does it mean for Long Island Sound? This issue of the ***UPDATE*** will try to answer these questions. First some perspective.

The 1972 Clean Water Act required EPA and the states to issue permits telling point source dischargers what technologies to use to reduce pollution. Section 303(d) then required each state to identify waters for which these national, technology-based requirements were not stringent enough to achieve water quality standards. States would then develop a TMDL identifying additional point and nonpoint source pollution controls necessary to comply with standards.

Well, the past 25 years have been spent implementing the technology-based requirements, often with great success. Since 1972, the federal government has invested more than $66 billion in municipal wastewater treatment. Millions more have been invested by state and local governments. Nationally, wastewater treatment prevents more than 900 million pounds of sewage and more than one billion pounds of toxic chemicals from entering waterways. Water quality has improved. But (and this is a big and obvious but), many waterways are still polluted, often from pollutants or activities not regulated directly under the Clean Water Act -- such as nitrogen in Long Island Sound. As a result, we're back to Section 303(d) of the Clean Water Act. EPA and the states are now faced with developing plans for more aggressive efforts to clean up waterways. Mel Cote's article, *What is a TMDL?*, provides detail on this evolution of water quality management.

So what does this mean for Long Island Sound, where we know that the water quality standards for dissolved oxygen are not met for much of the summer? Since 1990, the Long Island Sound Study has been implementing a phased plan to improve oxygen levels in the Sound, with Phase III, which set a 58.5 percent nitrogen reduction target, adopted this past February by EPA, New York and Connecticut. The plan recognized that administering and enforcing the nitrogen reduction targets consistent with the Clean Water Act would require developing a TMDL to meet standards for dissolved oxygen in Long Island Sound. The New York State Department of Environmental Conservation (NYSDEC) and Connecticut Department of Environmental Protection (CTDEP) will publish the TMDL for dissolved oxygen in Long Island Sound by August 1998. Al Bromberg describes some of the issues associated with doing this in *TMDLs and the Long Island Sound Problem*. And Paul Stacey in his article describes how controlling nonpoint sources of nitrogen fits into all this. For good measure there are also articles on how a TMDL was prepared for Lake Onondaga, NY and on how the criteria for our dissolved oxygen water quality standard may be revised in the near future.

Maybe this all sounds great to you but a word of caution, a TMDL prepared under the Clean Water Act doesn't magically implement itself, creating new regulatory authorities that erase all existing obstacles and challenges. Cleaning up Long Island Sound will still require public support and action, government funding and enforcement to restore our infrastructure, local watershed planning and protection, habitat restoration, and open space protection...you know the list. A TMDL is the overall plan, but to fully restore Long Island Sound and other waterways, we'll still need to deal with pollution watershed by watershed. So where does that bring us? Right back to the Long Island Sound Study and your continued involvement.

Mark Tedesco

In This Issue

A CAC Message to Congress

by David J. Miller

The Long Island Sound Study is one of the most successful programs under the National Estuary Program. After years of study and public participation, it has not only completed a comprehensive plan for action but also has begun implementation. New York and Connecticut have committed hundreds of millions of dollars to the clean-up of Long Island Sound and municipal leaders are willing to pay their fair share. The federal government through the EPA has played a vital role in coordinating these efforts. Now what is truly needed is a federal commitment to help with the costs of restorating Long Island Sound.

As a member of the Citizen Advisory Committee of the Long Island Sound Study for close to a decade, I have seen coalitions form for the clean-up of the Sound. One of the most impressive of these efforts is the Clean Water/Jobs Coalition, which was founded on the principle that the clean-up of Long Island Sound made good environmental and economic sense. For every billion dollars invested in Clean Water infrastructure, 50,000 jobs are created according to a report by Apogee, Inc.. The Coalition continues to point out that investing in Long Island Sound needs to be a partnership from all levels of government if both the environmental and economic promises are to be met.

As you are aware, much progress has been made regarding Long Island Sound. The Long Island Sound program has provided measurable improvements to the quality and habitats of Long Island Sound. Last February, the Policy Committee of the Long Island Sound program adopted two critical elements of the clean-up and restoration effort. The Phase III nitrogen reduction plan and the habitat restoration plan provide the necessary public policy initiatives to return Long Island Sound to its past glory. These initiatives, as well as other portions of the Long Island Sound comprehensive plan, are scheduled to be implemented over the next fifteen years.

The most costly of these programs is the nitrogen reduction plan for Long Island Sound with an estimated price tag of $650 million dollars over the next fifteen years. Some estimates have increased this number to close to one billion dollars. The plan calls for a 58.5% reduction in nitrogen loading over the next fifteen years, nearly eliminating Long Island Sound of hypoxia.The States have answered this challenge with their own funding. Connecticut has pledged $60 million of their Clean Water Fund financing to implement the Phase III program. New York State has made Phase III a priority for funding with the $200 million earmarked for Long Island Sound under its Clean Water/Clean Air Bond Act. (Not all of this money is earmarked for Phase III.) Isn't it time for the federal government to in turn be a funding partner in the clean-up of Long Island Sound?

Municipalities need federal grants to match the state funds to meet the challenges of the Long Island Sound program. The State Revolving Fund program continues to help sewage treatment plants with their on-going capital maintenance costs, capacity expansion projects, and combined sewer outflow abatement needs. However, grants are needed to help municipalities expand their treatment levels and technologies to meet the demands of nitrogen reduction. The federal government should be, like the states, a funding partner in this program.

Long Island Sound is an excellent example of communities, businesses, labor organizations, governments and environmental groups coming together for a common purpose. The fact that New York City has endorsed the Phase III nitrogen reduction plan is a testament to this effort. What the people of Long Island Sound are asking for is an equitable distribution of the cost to implement the nitrogen reduction plan. There are two Congressional actions that can be taken. First, citizens have urged Congress to pass the Lowey-DeLauro Shays Estuary Restoration Act (H.R.2374), which provides a more equitable distribution of State Revolving Funds to implement national estuary programs. Second, citizens of the Sound need Congressional leadership to establish an annual appropriation of $75 million dollars a year for four years for the restoration of Long Island Sound. These grant funds would be divided between New York and Connecticut to match their bonds dedicated for the Sound. This is critical to help municipalities implement the Phase III nitrogen reduction plan. It is important to provide a federal grants program for Long Island Sound for these new treatment costs at the true time of need. In recent years under the President's Clean Water Initiative, even greater sums of dollars were allocated for San Francisco Bay and the Everglades. Chesapeake Bay has also been a long standing recipient of federal grant funds for clean water. It is time Long Island Sound reached that level of support.

Long Island Sound looks to Washington in its time of need. We are confident that Congress, with the help of its citizens, will see the wisdom of investing federal dollars in the implementation of a program when it counts most. Invest in Long Island Sound.

David Miller is the Executive Director of the New York State National Audubon Society and is the New York Co-Chair of the LISS's Citizens Advisory Committee.

What is a TMDL?

by Mel Cote

It's rare to attend a meeting or workshop these days without hearing the latest bureaucratic buzzword, or in this case, acronym, being bandied about as if it were the best thing since sliced bread (or, to be more contemporary, pita pockets!). Contrary to some beliefs, TMDL does not stand for "too many damn lawyers," and it doesn't stand for "tons of modeling and developing a list," although in many respects it has resulted in both. Actually, the term TMDL stands for total maximum daily load, and it is the latest, greatest weapon in the national campaign for clean water.

A TMDL is a tool for implementing state water quality standards. A TMDL establishes the maximum amount of a pollutant that may be introduced into a water body while ensuring attainment of water quality standards. It is based on the relationship between pollution sources and in-stream water quality conditions. A TMDL must take into consideration seasonal variability, and provide for a margin of safety (MOS), that accounts for the uncertainty of how pollutant loadings may impact receiving water quality. However, a TMDL is more than just the maximum allowable pollutant loading; it also must specify pollutant load allocations among sources. The total of all allocations, including waste load allocations (WLAs) for point sources, load allocations (LAs) for nonpoint sources, natural background, and the MOS, cannot exceed the maximum allowable pollutant load, such that:

TMDL=WLAs+LAs+ Background + MOS

To understand the significance of TMDLs, one must first be familiar with the concept and application of state water quality standards. Prior to 1972, water quality standards were the centerpiece of state water quality management programs. Under this system, state and local authorities:

(1) determined the use, e.g., recreation or waste assimilation;
(2) determined what biological criteria, e.g., 5 mg/l of dissolved oxygen, were needed to support the use;
(3) assessed the impact of dischargers on these criteria; and
(4) treated or eliminated those discharges that caused the criteria to be exceeded.

According to Oliver Houck, in *Environmental Law Reporter*, "This was the nation's first strategy for pollution control, and it was an approach that states, municipalities, and industrial dischargers could all support. It relied on the preferences and decisions of local authorities, staffed agencies of water quality technicians, empowered water pollution control boards, and limited pollution controls to those that were needed to meet a proven problem. It was elegant, straightforward, and logical. Unfortunately, it did not work very well."

By the early 1970s, the American public had grown weary of multi-colored rivers and chronically closed swimming beaches, and called upon Congress to take a new tact. The result was the Federal Water Pollution Control Act Amendments of 1972, and with it, the advent of technology-based treatment standards. This approach essentially prescribed a minimum level of treatment for all municipal sewage and industrial wastewater discharges above a certain quantity threshold. These treatment requirements were embodied in discharge permits issued under another creation of the 1972 Act, the National Pollutant Discharge Elimination System (NPDES).

The 1972 amendments did, however, at the insistence of state and industrial interests, retain the vestiges of the water quality-based approach in an under-utilized, and, until recently,little-known provision of the Act - section 303(d). In brief, section 303(d) requires states to:

(1) identify waters that are or will remain polluted after the application of technology standards;
(2) prioritize these waters, taking into consideration the severity of their pollution; and
(3) establish "total maximum daily loads" for these waters at levels necessary to meet applicable water quality standards, accounting for seasonal variation and with a margin of safety to reflect lack of certainty about discharges and water quality.

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GLOSSARY

Best Management Practices (BMP): A method of preventing or reducing the pollution resulting from an activity.

Combined Sewer Overflows (CSO): Discharges from a sewer system that carries both sewage and storm water runoff. Normally, its entire flow goes to a wastewater treatment plant but, during a heavy storm, the storm water volume may be so great as to cause overflows.

Dissolved Oxygen: The oxygen freely available in water.

Hypoxia: Low concentrations of dissolved oxygen in water (less than 3.5 mg/l)

Load Allocations (LA): The specific load allowed for nonpoint sources.

Margin of Safety (MOS): A safety factor that accounts for the uncertainty of how pollutant loadings may impact receiving waters.

National Pollutant Discharge Elimination System (NPDES): A provision of the Clean Water Act that prohibits discharge of pollutants into waters of the US unless a special permit is issued by EPA, a state, or a tribal government on an Indian reservation.

Nonpoint source: Pollution sources that are diffuse or are not introduced into a receiving stream from a specific outlet. The pollutants are normally carried off the land by stormwater.

Point Source: A stationary location or fixed facility from which pollutants are discharged or emittted.

Total Maximum Daily Load (TMDL): Establishes the maximum amount of a pollutatnt that may be introduced into a waterbody while ensuring that water quality standards are met after the application of technology-based or other controls.

Waste Load Allocation (WLA): The maximum load of pollutants each discharger of waste is allowed to release into a particular waterway.

Water Quality Standards: State-adopted and EPA approved ambient standards for water bodies. The standards cover the use of the water body and the water quality criteria which must be met to protect the designated use or uses.

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States are then required to submit their 303(d) "lists" of impaired waters biennially, and TMDLs upon completion, to EPA for approval. Failure to comply or gain approval will result in EPA developing the list and associated TMDLs for state implementation. Failure by EPA to enforce the 303(d) requirements could result in a lawsuit...and it has, with the majority of them filed by citizen groups. In fact, since 1984, there have been 32 separate TMDL-related lawsuits (including several recent "notices of intent to sue" [NOIs]) filed against EPA for such reasons as failing to procure lists and TMDLs from states, and approving incomplete or otherwise inadequate lists. These lawsuits, combined with EPA's desire to solve the nation's remaining water quality problems, have been a driving force in EPA's renewed interest in section 303(d), and to the consternation of the regulated community, have resulted in stepped up efforts by states to produce lists of impaired waters, identify priorities for TMDL development, and actually develop TMDLs. There also is a growing recognition that the implementation of Water Quality Management Plans to meet the TMDLs will be under very close scrutiny.

Houck says, "The TMDL process represents, in the short life of environmental law, an ancient approach to pollution control...From the very first hint of federal involvement in water pollution control 50 years ago, states and pollution dischargers have fought a running battle to defend, and where lost, return to the local primacy and utilitarianism of regulation by water quality standards. Whatever else might be said about the ineffectiveness and difficulties of this regulation in practice, this has been their Camelot, the land from which we were unceremoniously wrenched and to which we should return. To their dismay, we have."

Why the dismay? The answer lies, in part, in the fact that most remaining water quality problems are caused by either the cumulative impact of many individual, permitted discharges that, individually, are meeting their technology-based permit requirements, or by nonpoint source pollution resulting largely from land use. Addressing the former requires a substantial financial investment in advanced treatment technologies, some of which have not been fully tested and proven, and without any guarantee of long-term success in achieving water quality standards.Controlling nonpoint source pollution is even more uncertain relying to a great extent on having some level of regulatory authority over land use and development, which, for the most part, state and federal government do not have. Herein lies the quandary. Federal water pollution control law mandates establishment of, and compliance with state water quality standards. States, in turn, have numerous statutory authorities to regulate many of the obvious, "point" sources of pollution, including municipal sewage treatment plants, industrial dischargers, and hazardous and solid waste facilities. But they don't have the authority, (and in New England, with its long tradition of "home rule," they may never have the authority) to regulate the very land uses that are the root cause of nonpoint source pollution.

How the TMDL program plays out will be a major factor in determining whether these heretofore intractable water quality problems can be solved. EPA and the states have been fairly successful in utilizing TMDLs to develop NPDES permit limits for various chemical pollutants. The true test is whether TMDLs that include load allocations for nonpoint sources can be successfully implemented without the same level of regulatory authority afforded under the NPDES permitting program.

Mel Cote works in the US Environmental Protection Agency, New England Regional Office as the Regional Program Manager for the Long Island Sound Study and Connecticut Nonpoint Source Program.

TMDL FOR AMMONIA AND PHOSPHORUS IN ONONDAGA LAKE

by Hank Samide

The New York State Department of Environmental Conservation(NYSDEC) has developed total maximum daily load (TMDL) analyses for phosphorus and ammonia in the Onondaga Lake drainage basin and has submitted the resulting documents to EPA for approval. Onondaga Lake is also a designated hazardous waste remediation site under Superfund. TMDLs for toxics will undoubtedly be incorporated as part of the remediation plans that will be developed for sites in and around the Lake.

Onondaga Lake is located in central New York State, on the northern edge of the City of Syracuse, and has the dubious distinction of having been referred to as "one of the most polluted lakes in the United States." The Lake's condition is the combined result of its small size and the large municipal and numerous and varied industrial pollutant loads it has been subjected to for more than a century. The discharge from the Metropolitan Syracuse Sewage Treatment Plant (METRO) can, for example, represent as much as half of the Lake's inflow during a dry summer.

The Onondaga Lake Monitoring Program, conducted by Onondaga County, has tracked the Lake's quality and the tributary (including METRO) loadings since 1970. The data indicate that even though an approximate twenty-fold reduction in the in-Lake phosphorus concentration has occurred since 1970, the New York State phosphorus criteria of 20 ug/l continues to be exceeded. The data also indicate that the in-Lake ammonia concentration has not significantly changed since 1970 and that it routinely exceeds the ammonia standard (which varies with pH and temperature). The sampling results further indicate that some 90 percent of the ammonia and some 70 percent of the phosphorus reaching the Lake, on an average annual basis, are coming from METRO.

In order to address these continuing water quality concerns, predictive water

quality models have been developed for both ammonia and phosphorus. The NYSDEC utilized these models for the TMDL analyses and is proposing a phased TMDL/staged implementation approach to achieving the water quality requirements for ammonia and phosphorus in Onondaga Lake. The EPA guidance documents dealing with the TMDL process recognize that, for receiving waters with serious and complex water quality problems, pollutant reduction strategies can be implemented in stages.

The TMDLs that have been developed (Phase I) define the limits that would, based on the models' projections and the currently applicable water quality criteria, be necessary to satisfy the respective water quality requirements for ammonia and phosphorus in Onondaga Lake. However, it is expected that EPA will modify its ammonia criteria in the near future and that the NYSDEC will undertake evaluation/development of a site-specific guidance value for phosphorus. These two factors along with the likelihood of model refinement (i.e., the plan is to compare model predictions against the actual in-Lake improvements resulting from the Stage II measures and to modify the models, as appropriate) are expected to lead to a revised (Phase II) TMDL. Additionally, METRO is to conduct pilot plant studies to "push the envelope" for additional phosphorus removal. Developments in treatment technologies will also be tracked to evaluate the feasibility of new and innovative techniques for further phosphorus and ammonia removals.

Implementation is to occur in stages. Stage 1 represents a "no net increase" over existing loads. This is intended to "hold the line" on the METRO loads while the Stage 2 facilities are being designed and constructed. Stage 2 consists of applying the limits of current treatment technology at METRO (scheduled completion dates are May 2004 for ammonia and April 2006 for phosphorus). This would result in an approximate 80 percent reduction in METRO's ammonia and phosphorus loads. Stage 2 combined sewer overflow (CSO) improvements are also expected to result in a 13 percent reduction in nonpoint source phosphorus. Additional nonpoint phosphorus reductions (not quantifiable at this time) are expected from the remainder of the watershed. Stage 3 of the implementation plan will result in achievement of either the Phase I TMDL requirements, the Phase II (revised) TMDL requirements, or the diversion of METRO from the Lake. The schedule calls for the Phase II TMDL to be completed by January 2009 and for Stage 3 to be completed no later than December 2012.

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Dissolved Oxygen Criteria

by Mark Tedesco

The Clean Water Act calls for information on the conditions necessary "to restore and maintain biological integrity of all ... waters, for the protection and propagation of shellfish, fish, and wildlife, to allow recreational activities in and on the water, and to measure and classify water quality." The U.S. Environmental Protection Agency (EPA) is charged with developing criteria to help define these conditions. Adequate amounts of oxygen dissolved in the water is one of the most important criteria used to define a healthy aquatic ecosystem. To date, however, EPA has not issued saltwater criteria for dissolved oxygen because of insufficient information. As a result, the states of New York and Connecticut have adopted saltwater protection limits for dissolved oxygen based on criteria developed from research done on freshwater organisms. In Connecticut, the highest use waters in the Sound have a protection limit for dissolved oxygen of not less than 6.0 mg/l at any time. In New York, the highest use waters of the Sound have a protection limit of not less than 5.0 mg/l at any time.

To provide a better basis for assessing whether dissolved oxygen conditions are sufficient to protect aquatic life in marine environments, the EPA's Office of Research and Development Laboratory in Narragansett, RI has been working to develop saltwater dissolved oxygen criteria. For more than ten years, with partial support from the LISS, scientists have researched the effect of low dissolved oxygen conditions on aquatic life along the Atlantic coast from Cape Cod, MA to Cape Hatteras, NC. Field studies conducted by the Connecticut Department of Environmental Protection were reviewed along with other lab studies. The information from these studies were used by the LISS to characterize the impacts from low dissolved oxygen in the Sound. (See the LISS Fact Sheet *How Low Dissolved Oxygen Conditions Affect Marine Life in Long Island Sound*.)

As a result of this research, EPA has developed a draft document that provides guidance on developing saltwater dissolved oxygen criteria. The draft document recommends that criteria consider how low dissolved oxygen concentrations get *and* how long those conditions persist to more fully assess effects on aquatic life. The document is currently under review by a panel of experts outside of EPA. Depending on the results of the review, EPA may publish the document for public comment later this year. This is important for a number of reasons. First, the criteria will provide a sounder scientific basis for planners, regulators, and the public to address the question "What dissolved oxygen conditions are sufficient to protect aquatic life in Long Island Sound and provide for a healthy, diverse aquatic community?" Second, the criteria will provide guidance for Connecticut and New York to evaluate the current protection limits for dissolved oxygen within their water quality standards. The LISS is committed to reevaluating management goals and actions every five years to incorporate new information. The saltwater dissolved oxygen criteria will be assessed as part of the evaluation. One thing that won't change is the commitment to achieve conditions that " ...restore and maintain biological integrity... for the protection and propagation of shellfish, fish, and wildlife..."

TMDLs and the LONG ISLAND SOUND PROBLEM

by Al Bromberg

Now that we have learned a little about the TMDL process, and have seen how that process has been applied to another water body in New York State (Onondaga Lake), lets try to explain how we could apply the concept to Long Island Sound.

Remembering what a TMDL is suppose to do (identify the point source and nonpoint source load reductions to achieve the total maximum allowable load, i.e., meet water quality standards), lets summarize what we have learned after sampling, studying, modeling and dissecting Long Island Sound for over 10 years. First, both New York and Connecticut have water quality standards for dissolved oxygen for marine waters. Second, we know that we are not meeting the dissolved oxygen standard for the Sound. In the western Sound, we are experiencing hypoxia, or dissolved oxygen values less than 3.0 mg/l. Third, we have carefully measured the chemical dynamics and hydrology of the Sound and developed two water quality models. The first is a simple 24 segment model which was used to get a rough assessment of the models response to gross load reductions. The second model is a complex, detailed, 2300+ segment model which has served as the tool to evaluate nitrogen reduction/response scenarios for various categories and types of loading sources. Lastly, information has been gathered on the cost of nitrogen reduction for the different loading categories which have been ranked to identify a "cost effective" scenario to improve water quality. Note that I did not write "scenario to meet water quality standards," because, as of today, we do not yet know how to meet that objective.

Using the model, the LISS has evaluated certain nitrogen reduction configurations. These analyses have revealed that nitrogen removal technology for point and nonpoint sources, as we know and understand it today, cannot remove enough nitrogen to meet the current dissolved oxygen standard. The Study then estimated the non-anthroprogenic nitrogen (or natural loads from a forested watershed) and, using the model, calculated the dissolved oxygen concentrations that might have existed before Europeans colonized America. Evaluating the results of these calculations revealed that:

1) the standards that we are expected to meet today may not have been met in pre-colonial times, and
2) to meet current standards, nitrogen sources other than the traditional point and nonpoint sources will have to be addressed, such as atmospheric deposition sources or sources in the upper Connecticut River basin or sources outside the the boundaries of the study (model).

Partially as a result of the LISS, a re-evaluation of the marine water dissolved oxygen criteria for the northeast coast of the US is underway. This revised criteria, which has been released for peer review by EPA, will likely be less stringent that the current standards and offer greater flexibility of application as a time-weighted average rather that as an absolute number.

As we now know, the LISS Policy Committee has endorsed Phase III of the nitrogen reduction implementation program. This program calls for staged reduction of nitrogen of 58.5% over 15 years for point and nonpoint sources within the New York and Connecticut portions of the LIS watershed.

The Study is now at the point of preparing the TMDL analysis. Most of the technical work has already been done, so it is just a matter of presenting the results in a logical, coherent manner. The ultimate question is, given the uncertainties about how to achieve the necessaryreduction of nitrogen, and knowing that revised marine water dissolved oxygen criteria are forthcoming, how should the States develop a total maximum daily load plan which will serve as the basis for establishing wasteload allocations (permits) and load allocations (nonpoint reductions)?

The approach that has been chosen is to develop the TMDL now based on available information and the existing standard. The TMDL will describe in detail each States' process for implementing the Phase III nitrogen reductions while outlining the steps to be taken in preparation for additional reductions and control actions. These additional steps would include coodination with other stakeholders in the upper Connecticut River basin and areas adjacent to Long Island Sound to implement nitrogen reduction, discussion with our partners who are implementing the Clean Air Act to control gaseous nitrogen emissions to reduce atmospheric deposition, and evaluation of alternative actions like reaeration to disrupt stratification during critical periods of water quality in Long Island Sound.

During the first five year implementation cycle of Phase III and until the revised dissolved oxygen criteria are finished, progress in nitrogen reduction implementation and water quality response in the Sound will be monitored. This information will be used in the preparation of a revised TMDL analysis based on the new marine water dissolved oxygen standard after adption by both States.

Al Bromberg works for NYSDEC, Division of Water.

Nonpoint Source Pollution TMDL

by Paul Stacey

Although the TMDL process is as old as the federal Clean Water Act, the coupling of waste load allocations (WLA) for point sources with load allocations (LA) for nonpoint sources presents new challenges for state water quality managers. For two decades, Connecticut and New York have successfully developed TMDLs in the form of WLAs for their impaired waters. And water quality has improved dramatically under that approach. The most serious point source problems, such as inadequately treated municipal sewage and industrial discharges, have been corrected. Nonpoint sources, i.e. polluted storm water runoff and groundwater transport, were generally left out of the mix. This created a somewhat lopsided, albeit effective, TMDL that clearly favored point source management for a lot of reasons.

Which costs less to manage: point sources or nonpoint sources? Which is easier to manage? Which is easier to measure? Back when there were more uncontrolled point sources than you could shake a stick at, the decision was easy. In our densely-populated region, point sources were the dominant sources of pollution and easily quantified. There were technologies to control them. The cost was (and remains) significant, but far more reasonable and predictable than nonpoint source control. And point source control led to measurable water quality improvements. The WLA approach clearly won out over the LA approach as a practicable water quality improvement policy.

National statistics now suggest that progress is stalled because impaired fishability and swimability are increasingly caused by nonpoint sources. That's not hard to imagine after a drive through an urban area where storm sewers quickly deliver every pollutant that falls from the sky or is dripped onto the streets to the nearest stream or harbor. It's less visible in suburbia, but pet wastes, lawn fertilizers and pesticides, detergents from washing the car, oil, grease, septic system discharges, sediments, de-icing compounds, and so on can and do wash off lawns, driveways and streets directly into streams or storm sewers. Storm water that does infiltrate through soils to groundwater may eventually emerge in surface waters. While farms are not as prominent in this region as they once were, they are another potential source of nutrients, sediment, pesticides, and bacteria.

As described in the previous article, the LISS is developing a TMDL for nitrogen to control hypoxia (low dissolved oxygen) in the Sound. The excess nitrogen (more than twice as much nitrogen is delivered to the Sound today than during pre-colonial times) fuels the growth of algae, which eventually dies and decays, consuming oxygen in the process. Focusing in on Connecticut's and New York's nitrogen contributions, point sources, primarily publicly-owned sewage treatment plants, dominate the load. They contribute over 80% of the states' nitrogen enrichment. Not unlike triage in medical emergencies, we should first stanch the flow of nitrogen from point sources as the quickest, most cost effective way to improve oxygen levels in the Sound. But, that will not bring oxygen levels up to state water quality standards. More than a point source WLA is needed, and the next most significant sources from the Connecticut and New York domain are atmospheric deposition and nonpoint sources.

Combined, nonpoint source runoff and atmospheric deposition on the land and directly on the Sound's surface contribute less than 20% of the human-derived nitrogen from Connecticut and New York. The LISS recommends an "aggressive" nonpoint source control program that would remove about 10% of the nitrogen (excluding deposition directly on the Sound). This means roughly 500 tons of nitrogen each year would be removed by nonpoint source controls, or "best management practices" (BMP). For perspective, the New Haven sewage treatment plant discharges about that much nitrogen each year and is less than 2% of the combined Connecticut and New York point source load.

The disparity between programs to address point and nonpoint nitrogen sources is compounded by a marked disparity in costs. Sewage treatment plant nitrogen removal costs well under $5 per pound, averaging less than $2 per pound for the Connecticut retrofit program, for example. According to LISS reports and Chesapeake Bay Program studies, nonpoint source management easily costs in excess of $100 per pound of nitrogen removed in urban areas, at least 20 times more expensive than point source technologies. In view of this, should we forget the nonpoint source LA? No. First, there are multiple benefits from application of BMPs. Other pollutants are controlled and some BMPs, stream bank vegetated buffers for example, also provide habitat for wildlife. Second, state water quality standards for dissolved oxygen in the Sound will not be met with a WLA alone. A nonpoint source LA needs to be part of the TMDL. In fact, we will need to look beyond the borders of Connecticut and New York and to atmospheric nitrogen controls to come closer to meeting water quality standards.

How large will the LA in the Long Island Sound nitrogen TMDL be? We don't know right now and probably won't know until at least that time when management zone plans are drafted, or even until implementation is well under way. The reason is, the TMDL will probably not call for a set percent reduction by means of a WLA or a LA. Rather, it will likely call for a percent *combined* point and nonpoint source reduction. For example, the 58.5% reduction used in the Phase III strategy would be applied to the combined point and nonpoint source nitrogen

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UPDATE

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If you would like to be placed on the mailing list or make changes to your address please contact the NY LIS Office or E-mail: kzimmer@cce.cornell.edu

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loads. Cost and technical ability to manage will determine how the states and municipalities divide reductions between point and nonpoint sources. Consequently, point sources are likely to bear the majority of the reduction share. While municipalities may even elect to attain the whole 58.5% reduction from point sources, we do expect to see progress in nonpoint source nitrogen reductions.

In both states there are many regulatory and technical tools available to manage nonpoint sources of pollution. As required by the Coastal Zone Act Reauthorization Amendments (Section 6217), Connecticut and New York developed Coastal Nonpoint Pollution Control Programs that identified the multitude of authorities at the disposal of federal, state and local regulators for nonpoint source control. Progress has been made in storm water management as well, with the relatively new storm water permitting programs in both states under the National Pollutant Discharge Elimination System (NPDES). Municipalities are increasingly aware of local storm water management needs and the Clean Air Act will help reduce atmospheric sources of nitrogen.

The remaining hurdle, and perhaps the most vexing but important one, is measuring changes in nonpoint source nitrogen loads over time to assure attainment of management goals. Stream monitoring and watershed modeling will help quantify change, but changes in runoff can't be effectively measured with certainty. We will have to rely on estimated reductions for specific BMPs and calculate total reductions based on a surrogate measure, such as the number of acres treated. While this is probably satisfactory in areas where BMPs are aggressively applied, we must be certain that gains in one area are not offset by new development elsewhere. The states and municipalities will have to be diligent in their efforts to ensure nonpoint source nitrogen reduction goals are met given the complexities of application, cost, and measurement.*Paul Stacey works for Connecticut Department of Environmental Protection.*

LONG ISLAND SOUND STUDY

A Partnership To Restore And Protect The Sound

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