An overabundance of nutrients in water bodies can lead to explosive growth in plants like duckweed, which crowd out other species.

Are We Making the Right Investment in Nutrient Removal?

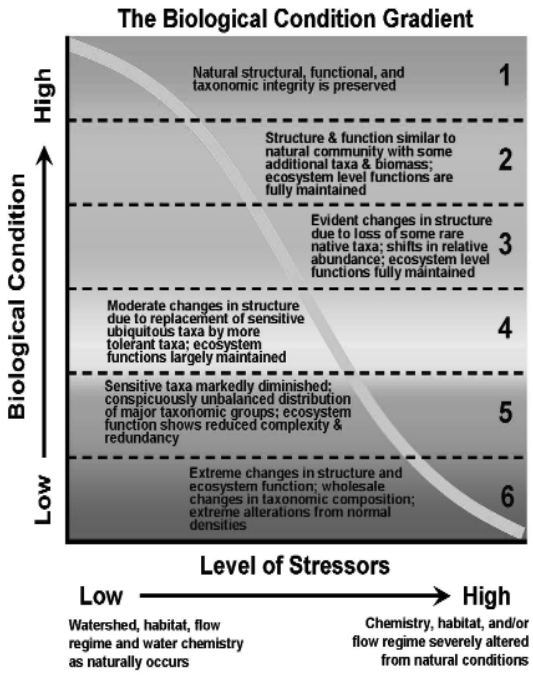
By Paul Hogan

Effective monitoring is needed to determine whether the investment in nutrient control is improving impacted water bodiies.

Duckweed so thick that dogs can walk across it, toxic algal blooms, and the disappearance of aquatic species such as eel grass in coastal waters—these are just some of the problems cropping up in rivers, lakes, and bays across the country due to inadequate nutrient controls in America's aging wastewater infrastructure. Many water bodies fail to meet the federal Clean Water Act standards, with high levels of nutrients damaging fisheries and aquatic habitats and leading to restricted recreational use. Few doubt that these are serious issues, though there are still many legitimate questions about the details, what the right regulatory approach is, and what course of action will yield the improvements in water quality that everyone wants to achieve.

As Total Maximum Daily Loads (TMDLs) are ratcheted down, the cost of meeting permit limits shoots up. Nationally, the investment in treatment systems and nonpoint source controls needed to comply with strict TMDLs is estimated to be in the hundreds of billions of dollars. In the Chesapeake Bay watershed it is estimated to be $28 billion. On Cape Cod in Massachusetts, 15 communities will share a $3- to $5-billion burden. But what does the money buy? Will reduced nutrient levels in wastewater treatment plant discharges and other nutrient reduction programs really lead to improved water quality?

The scale of the investment makes it even more critical that there is a plan in place to ensure that all that public money is spent wisely. It would be a



The Tiered Aquatic Life Use (TALU) approach is a more comprehensive, flexible way to address water quality standards than the standard TMDL approach. (Image courtesy of U.S. EPA)

tragedy if billions of dollars of taxpayer money were poured into projects that failed to improve water quality or were aimed at the wrong targets.

As federal and state regulatory agencies, communities, and businesses continue to work to address nutrient enrichment of water bodies, it is critical that policy steps are taken to ensure that the goals of the effort are clear and that provisions are made to integrate effective monitoring into the process. This means building consensus on water quality standards, taking a hard look at updating the Clean Water Act, and committing to fund a monitoring program that provides feedback and helps constantly redefine the direction of the effort in individual communities and across the nation.

The Clean Water Act was an ambitious piece of legislation when it was enacted, and it has had a huge positive impact on water quality in America, but it needs to be updated to better define goals, establish acceptable variability in water quality, and to integrate both cost and benefit into the requirements of the act. In addition, because each state sets its own standards for surface water quality that the EPA approves, there is a nation-wide patchwork system of standards that is looking increasingly out of touch with the current understanding of how to best manage water quality. Most troubling is that these standards are often too vague and ignore incremental progress made by applying an inflexible evaluation process. This leads to situations where utilities may make great progress towards a goal, but are punished for falling just short. Instead of being rewarded for their effort, they are considered in non-compliance based on a single sample over the limit among potentially dozens that meet criteria.

Another shortcoming of the current system is that it does not include wet weather standards or make allowances for changing conditions in a water body due to seasonal weather patterns, storm events, or climate effects. Water quality standards are currently an all-or-nothing proposition. Nutrient levels can change from day to day based on weather and other factors, but the standards do not account for these variations and permit holders are frequently punished for transitory issues.

The current approach also rarely, if ever, accounts for the costs and likely benefit of the prescribed solution. Expensive treatment system upgrades are often mandated despite the fact that it is not clear that they will provide the water quality improvement they are intended to foster. When deciding where to invest in treatment system upgrades or other controls, decision makers need to be able to prioritize based on the expected benefit.

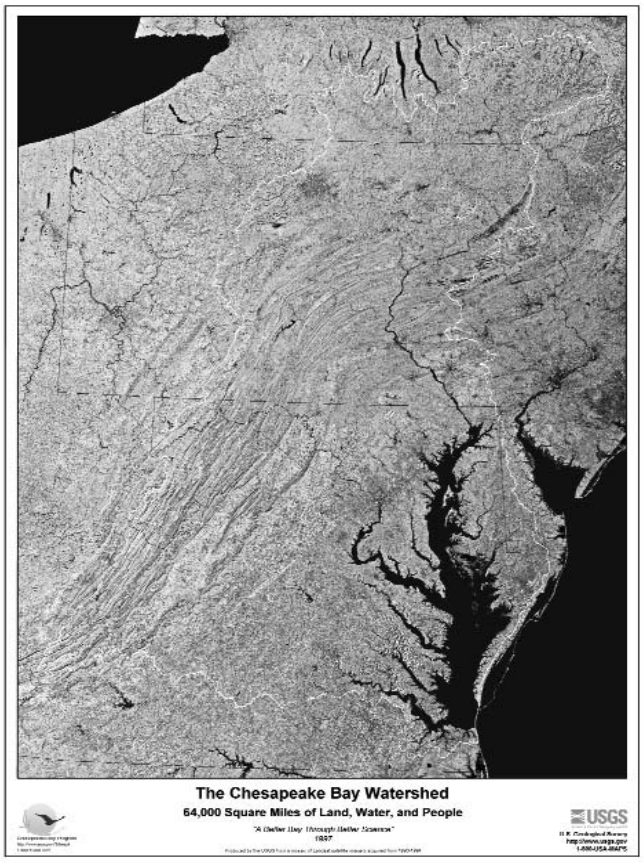
Updating water quality standards to reflect a more holistic view of what a healthy water body looks like should be a priority. EPA and some states are working on a "Tiered Aquatic Life Use" (TALU) approach, which is a step in the right direction. The TALU approach applies a Biological Condition Gradient that describes how an ecosystem changes in response to increasing stresses. Using ten attributes, water quality is judged holistically, where the TMDL approach is far less comprehensive. Maine and Ohio have been using this approach for years, and many others are integrating it into their water quality standards.

The TALU approach is not the only viable option, but it represents an attempt to move from a system that relies solely on nutrient levels towards one that also considers benthic population and composition, primary productivity in the water body, and other indicators, and can accommodate variability due to weather, climate, and other influences.

Effective Monitoring and Accountability

"A solid monitoring program provides accountability," says Dr. Richard McVoy, of the Massachusetts Department of Environmental Protection and with over 30 years of experience with water quality issues. "It tells you whether the changes implemented are working and allows you to check on progress towards a water quality goal while still having time to adjust your approach."

Unfortunately, when funding is tight, monitoring programs are often the first to go. It is all too easy to decide that a monitoring program is not contributing to achieving the goal and to reduce the budget or eliminate it all together. Without a monitoring program, however, it is impossible to know whether the nutrient controls implemented are effective and whether water quality is actually improving. It also means there is no



The Chesapeake Bay watershed covers 64,000 square miles and includes parts of Delaware, Maryland, New York, Pennsylvana, Virginia, and West Virginia, and the entire District of Columbia. Addressing nutrient loading in the bay will cost an estimated $28 billion. (Courtesy of U.S. Geological Survey)

way to know if the massive investments in treatment system upgrades and other control measures are doing any good.

Since the disappearance of federal grants for clean water projects, state revolving fund (SRF) loans have become the primary funding mechanism for nutrient control projects. Creating a requirement that a small percentage, around five percent, of SRF loans for these projects be committed to a monitoring program would ensure they are implemented. Alternatively, reestablishing a federal grant program for this purpose would take some of the burden off states and municipalities and accomplish the same goal. A third approach, which has been used effectively in North Carolina, is to require permit holders to pay into a fund to support a third party monitoring program.

Once a strong commitment to funding has been established, careful attention needs to be paid to the design of monitoring programs. Such programs should, as a first critical step, establish a matrix of definable and measurable goals that will reflect real changes in water quality. It should not simply be a measure of how much a particular nutrient level is reduced. A detailed, long-term monitoring program should incorporate key areas within the affected watershed and must be both spatial and temporal in nature.

The monitoring elements should include at a minimum: the level of the nutrient of concern; the flow dynamics of the study area; a determination of the nutrient loading to the system; regular profiles of the dissolved oxygen dynamics within the system; the evaluation of the biomass (plants, algae) and indicators of primary productivity (chlorophyll); a determination of the benthic population and the tracking of how the population changes as the nutrient reduction program is implemented; and the composition of the benthic materials.

Water quality is not static and it can be expected to have variability due to climate, flow dynamics, and biological reactions of the many controlling elements in the bio-system. It is crucial to set definable "measures" of improvement, regularly test those versus the observed results, and have the ability to change the course of the nutrient control programs if indicators are given that the original goals of the TMDL are not being met. The proposed program should be peer reviewed and subject to public discussion and debate.

Well-designed and properly funded monitoring programs are the key to measuring real water quality improvements, and a vital mechanism for ensuring the public money dedicated to this issue is wisely spent.

There is much work to do to improve water quality and address high nutrient loads in this country's rivers, lakes, and oceans. Fortunately, everyone involved in the effort wants the same thing: the best quality water possible. The debate lies in how to define that goal, how best to achieve it, and how to make sure that public money is wisely spent. The path forward relies on cooperation among regulatory agencies, municipalities, industry, scientists, and other stakeholders.

Bringing all these parties together on an approach that reflects the current understanding of how to judge the health of the nation's waters with the strict limits represented by TMDLs offers the best chance of a nutrient control program that achieves tangible results and ensures money is not poured into measures that do not work. This will require a firm commitment to monitoring progress and incorporating results back into continuously revised planning. It will require willingness on the part of many stakeholders to adapt and adjust their approach. It is not simple, but it is flexible enough to be applied well across the country.

With so much money on the line, it is especially critical that standards be updated to reflect a holistic view of water quality, that strong monitoring programs are put in place, and that everyone involved is willing to adapt their approach as the process evolves. These elements can form the basis of a truly effective nutrient control effort.

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