Growth can move forward while preserving the quality of surface water resources?

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Minnesota, the land of 12,000 lakes and 92,000 miles of streams and rivers, is a land blessed with water. With such an abundance of surface water, one can understand how it might be easy to take this precious resource for granted. However, a recent lawsuit brought by a state environmental group has placed the issue of the quality of Minnesota's surface waters squarely in the limelight. The lawsuit, brought by the Minnesota Center for Environmental Advocacy (MCEA) against the Minnesota Pollution Control Agency (MPCA), was brought when the MPCA granted a new sewage discharge permit to the Cities of Annandale and Maple Lake. According to the MCEA, the MPCA erred in granting a new permit for discharging phosphorus to the North Fork of the Crow River, a tributary of the Mississippi River, which flows into Lake Pepin—a water body listed as an impaired water body under the Federal Clean Water Act.

The lawsuit has resulted in the stoppage of at least 60 development projects across the state. The economic impact of these stoppages is significant. Will these projects be delayed for months? Years? Can Minnesota both grow and preserve the quality of its surface water, one of its most treasured resources? Could similar issues slow growth in other states where treated wastewater is discharged into surface water bodies?

At issue in Minnesota is the application of the Federal Clean Water Act to Lake Pepin, a portion of the Mississippi River into which the Minnesota, St. Croix and upstream portions of the Mississippi Rivers all flow. Lake Pepin has been listed as an impaired water body under the Clean Water Act. In short, the lake contains too much phosphorus, a nutrient that is a component of treated wastewater and runoff from both agricultural and non-agricultural lands. The MPCA must complete a study of the river basin that allocates the amount of phosphorus that each wastewater treatment plant can discharge, called a "total maximum daily load", or TMDL. However, an extensive TMDL study is not expected from the MPCA until 2009. Until then, no new sources of surface water phosphorus discharge to these rivers and tributaries are allowed in the watershed, which encompasses a significant portion of the state. Although the Minnesota Supreme Court is due to deliver a ruling on a challenge to the lawsuit that created this "no new source" situation, the fact remains that fewer than 20 percent of Minnesota's lakes and river miles have been assessed by the MPCA for their impairment status under the Clean Water Act for phosphorus, mercury, bacteria, and other pollutants. Furthermore, according to the Minneapolis Star-Tribune (April 9, 2006) while more than 2,200 Minnesota waters have been listed as "impaired", only five cleanup plans have been completed, 50 are being developed, and the 150 presently on the waiting list are expected to increase to 600 in the next four years. The future of discharging treated wastewater to Minnesota's surface waters may be in doubt.

Much of Minnesota's population relies on the Mississippi River for the discharge of treated wastewater. But Minnesota is not unique in that regard. Many other American cities, large and small, discharge to the Mississippi River and its tributaries from wastewater treatment plants ranging in size from 320 million gallons per day (MGD) in Saint Louis, Missouri to 2.5 MGD in St. Cloud, Minnesota to even smaller flows from smaller cities. The City of Chicago is also a contributor, with its 1,500 MGD being discharged to the Des Plaines and Illinois River basins--which flow into the Mississippi. Numerous American cities discharge to major rivers and the Great Lakes. Since wastewater is an "out of sight, out of mind" issue for many people, it is easy to take for granted the seemingly inexhaustible capacity of receiving water bodies to do just that: receive treated wastewater.

However, these receiving water bodies are not inexhaustible. Of note is that only 3% of the water on our planet is fresh water. Moreover, *only 0.266% of all fresh water is contained in lakes and rivers*, with approximately one-fifth of that contained in the Great Lakes, a water resource of increasing ecological concern. Many American wastewater treatment plants discharge to freshwater rivers or (to a lesser degree) lakes. As the U.S. population continues to increase, water demand will continue to rise, as will wastewater discharge volumes. Maintaining optimal levels of wastewater treatment will gain in importance as demands on our waters, from both wastewater and water supply standpoints, continue to increase.

As the Minnesota case illustrates, the listing of a receiving water body as "impaired" can immediately bring to this issue to the forefront. Under section 303(d) of the 1972 Clean Water Act, states are required to develop lists of impaired waters, defined as those waters that do not meet state water quality standards. States must establish priority rankings and develop TMDLs for these waters. The TMDL specifies the maximum amount of a pollutant that a water body can receive and still meet water quality standards. The TMDL also allocates pollutant loadings among point and nonpoint sources. Partially due to increased legal action by citizens groups, the EPA is under court order or consent decrees in many states to ensure TMDL establishment. Under 1997 EPA guidance, states should develop schedules for establishing TMDLs within 8 to 13 years of listing as an impaired water body. Over 35,000 impaired waters have thus far been listed. The six most common causes of impairment nationwide are pathogens (14.6% of impaired waters), mercury (14.3%), nutrients (8.8%), metals (other than mercury; 8.3%), sediment (8.2%), and oxygen depletion (6.7%). Since January 1, 1996, 19,543 approved TMDLs have been reported to EPA.

It is clear that a significant amount of work remains to be done in assessing water bodies for impairment and completing TMDLs for those water bodies. What is not clear is how many more legal situations similar to that occurring in Minnesota will occur elsewhere. The lawsuit in Minnesota serves as a wake-up call for those who have assumed that growth can continue as it has before, under the assumption that an increase in population and water use will simply require a concomitant increase in wastewater treatment capacity and discharge. If the receiving water body for wastewater is or is likely to be placed on the impaired waters list, it may be time to investigate alternatives. With the U.S. population expected to increase from 300 million persons this year to 400 million in 2050, the time for action is fast approaching.

For municipalities large and small, both engineering and behavioral water conservation measures can be implemented to reduce per capita water use. According to the EPA, in urban areas, residential use accounts for three-fourths of all water use, highlighting the importance of such measures. Engineering measures can include low-flush toilets, toilet tank displacement devices, low-flow showerheads, water-efficient washing machines, faucet aerators, xeriscape landscaping, and grey water recycling. Behavioral measures can include running the dishwasher only when full, taking short showers and turning off the shower while not rinsing, watering lawns and plants only in the early morning or late evening, and sweeping off, not hosing down, sidewalks and driveways.

Large municipalities which produce large volumes of treated wastewater may be able to reuse their water or to implement aquifer recharge practices. For example, the City of Las Vegas, Nevada and the Las Vegas Valley Water District have partnered to build the Durango Hills Water Resource Center, a wastewater treatment and reuse facility that can treat up to 10 MGD of water for reuse as irrigation water.

However, are such options feasible for smaller and mid-sized communities? Are there disposal or reuse options for communities that may not have the financial resources of a city such as Las Vegas? Can the growth of small and mid-sized municipalities continue in the face of the TMDL challenge?

The answer is yes. Growth can move forward while preserving the quality of surface water resources. Solutions that allow for growth while preserving surface water quality are readily available from firms such as North American Wetland Engineering (NAWE) that are committed to protecting the economic and environmental health of Minnesota and other states. Low-energy, sustainable technologies such as engineered wetland treatment systems, soil disposal systems, and water reuse can significantly reduce the ecological impact of wastewater treatment and disposal on the environment.

The design of wastewater treatment and disposal systems that use proven technologies to distribute treated water to the native soil, thereby eliminating the need to discharge to surface waters, is a practicable solution for many communities. These technologies may include soil infiltration beds, infiltration trenches, and drip irrigation disposal fields, which are combined with low-energy, ecologically-sound engineered wetlands to treat wastewater to state-required levels. Infiltration beds and trenches utilize pressure distribution to disperse treated wastewater over a specified surface area of native soil. Unlike a traditional septic system, with these technologies the native soil is not relied upon for biological oxygen demand (BOD) treatment since an upstream engineered wetland or mechanical treatment plant has already accomplished this task. Drip irrigation disposal fields utilize proven drip irrigation technology to pressure distribute treated wastewater to native soil through buried tubing. Numerous infiltration bed, trench, and drip irrigation disposal systems are in operation in Minnesota, proving their worth day in and day out for developments and communities throughout the state, and returning the water to the subsurface for future use.

Water reuse can easily be incorporated into an engineered wetland treatment system to complete the cycle of low-energy, ecologically-wise technologies. For example, at an Oak Grove, Minnesota development named The Ponds, an engineered wetland has been installed to treat up to 86,300 gallons per day of domestic wastewater. The treated water is then stored in a reclaim pond and used to irrigate an 18-hole golf course, thereby recycling one of Minnesota's greatest treasures back to the land. Soil disposal

and water reuse are viable options for avoiding the issue of TMDLs entirely—and for preserving the quality of surface water resources. Such solutions may be workable in your community, too.