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— such as EPA's Integrated Compliance Information System database and the Clean Watersheds Needs Survey database — do not contain the level of detail on treatment processes or coverage of small- and medium-sized plants needed to develop a baseline of nutrient removal capabilities, Lee said. "For example, basic nutrient discharge information and paired influent and effluent data from POTWs with secondary treatment are generally not available in any database."

Claudio Ternieden, director of government affairs at the Water Environment Federation (Alexandria, Va.), said EPA's survey would provide the needed statistically representative data for determining how far nutrient control limits could be reasonably pushed. "The EPA is lacking thoroughly in concrete data as to the technology performance that currently exists at secondary facilities for removing nutrients," Ternieden said. "Comprehensive

data at this level would effectively provide an understanding of what facilities can realistically be expected to accomplish."

Importantly, this information could enable EPA to determine if a facility is doing everything it can, given the resources and technology available to it, Ternieden said. "Ultimately, this would help establish goals within a permit that are achievable."

— **Jeff Gunderson, WE&T**

## Nutrients in Illinois

### Loss reduction through stakeholder planning

#### **Nathan Davis**

It's no secret that excess nutrients within natural aquatic systems are an on-going concern across the country. This is especially true in the Mississippi River Basin and requires action from multiple states.

Illinois has recognized the importance of managing nutrients to mitigate the potential on local and national water quality, and has undertaken efforts over the last decade to control the loss of nitrate-nitrogen and total phosphorus into Illinois waterbodies. These efforts have led to comprehensive state nutrient loss reduction strategy that includes two new special conditions for some Illinois facilities to complete.

#### **Illinois efforts and accomplishments to date**

Illinois has adopted numerical water quality criteria for total phosphorus for lakes and a narrative standard to prevent discharges from causing unnatural plant and algae growth within streams. In addition, Illinois adopted numerical effluent phosphorus limitations for all discharges from point sources to lakes, and effluent limitations for all water resource recovery facilities (WRRFs) with flows greater

than 3785 m<sup>3</sup>/d (1 mgd) that undergo an expansion.

Illinois has also seen many volunteer planning efforts within specific watersheds. These efforts typically are comprised of clean water utilities, environmentalists, and

water quality experts who work together to identify water quality issues and needs basinwide. These efforts have a history of successfully prioritizing projects based upon the maximum benefits provided per finding utilized. Recognizing this fact, the



**Maximizing the use of existing wastewater treatment structures is a consideration when addressing phosphorus requirements. In Salem, Ill., an existing tank was elevated and repurposed as an anaerobic reactor. CMT**

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Illinois Environmental Protection Agency (IEPA) has encouraged stakeholders to participate in watershed groups and even allowed flexibility when crafting National Pollutant Discharge Elimination System (NPDES) permit language to address stream impairments within these areas.

## Heeding a national call to action

The U.S. Environmental Protection Agency established the Gulf of Mexico Hypoxia task force in 1997 to study the hypoxic zone and its causes and to coordinate action to reduce its severity and effects. The task force published an action plan in 2001, and a revised plan in 2008. Recognizing the scope of the problem, the 2008 report called on 12 of the states within the Mississippi River Basin to develop and implement plans to provide a minimum target reduction of 45% of the nutrients load exiting their states.

Heeding this call to action, Illinois assembled a diverse group of stakeholders, including point source dischargers, environmental groups, agricultural leaders, regulators, and others to serve on a policy working group. This group was charged with collaborating on the development of a statewide strategy to build upon existing efforts, and the latest science and technology, to provide a long-term reduction in the nutrients entering Illinois waterways.

The Illinois Nutrient Loss Reduction Strategy was prepared with the primary goals of reducing the annual loading of nitrate-nitrogen and total phosphorus to the Mississippi River in accordance to the 2008 Gulf Hypoxia Plan. The strategy also addresses the effects of nutrients on local water quality. The final 2015 strategy includes the following key components:

- Build upon existing regulatory and voluntary efforts.
- Prioritize watersheds for nutrient loss reduction efforts.
- Establish a council charged with

coordinating water quality monitoring efforts.

- Convene a nutrient science advisory committee to develop scientifically defensible numerical nutrient criteria for Illinois waters.
- Create the Urban Storm Water Council to reduce nonpoint source loading through improvements to state stormwater programs.
- Develop strategies for improved collaboration among stakeholders.
- Establish the Agricultural Water Quality Partnership Forum for outreach and education.
- Develop a process for regular review and revision, including continued meetings by the policy working group.

## New special conditions for Illinois WRRFs

The nutrient reduction loss strategy does not immediately impose new discharge requirements for nutrients. It does, however, highlight the likelihood of new regulatory requirements on top of the current existing standards.

The nutrient science advisory committee was formed shortly after the publication of the final strategy, and is expected to present their recommendations for numerical nutrient water quality standards in Illinois in late 2017. In addition, there is the possibility of a modification to the current point source effluent standards as the collaboration among stakeholders continues.

As a recommendation of the strategy,



Illinois adopted numerical effluent phosphorus limitations for all point sources discharges to lakes, and effluent limitations for all water resource recovery facilities with flows greater than 3785 m<sup>3</sup>/d (1 mgd) that undergo an expansion, such as the Spring Creek Plant operated by the Sangamon County Water Reclamation District. CMT

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two new special conditions are being included during NPDES permit renewals for all facilities larger than 3785 m<sup>3</sup>/d (1 mgd).

These conditions require permit holders

- to prepare phosphorus removal optimization plans and
- to conduct feasibility planning in anticipation of future changes to their existing phosphorus limits.

The optimization plans are being required to ensure that sufficient steps are being undertaken to reduce nutrients discharge with existing infrastructure. The plans focus on means of implementing source reductions of phosphorus loading to facilities and methods for increasing the level of phosphorus removal by the facilities.

The influent sources of phosphorus, such as industrial or commercial users, should be identified, and a plan developed to reduce significant contributions. This can

be accomplished through a combination of pretreatment program tools or encouragement of best management practices. The plans should include an examination of the existing facilities at the WRRF and evaluate opportunities to provide a greater level of nutrient treatment within the existing footprint without undertaking major facility upgrades. This should include operational changes and low-cost modifications to the existing facilities.

The feasibility studies are being required to ensure that permit holders proactively plan and prepare for future phosphorus limits. The studies will examine effluent phosphorus limitations of 1 mg/L, 0.5 mg/L, and 0.1 mg/L. The studies should identify the capital and operational costs for providing each of these three levels of phosphorus removal on a monthly average, seasonal average, and an annual average basis.

The preparation of these plans provides

both the clean water utility and IEPA with an appreciation for what improvements will be required, the required time for implementation, and total costs for meeting any future proposed permit limits.

Illinois has taken a big step forward in improving the quality of its water by addressing excessive nutrients. By engaging all of the stakeholders, water professionals have obtained a more balanced view of the issue, one that considers all sources of nutrients and identifies the best opportunities for mitigation.

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## Fighting drought on several fronts

### Diversified water supplies can help better cope with water limitations

Challenges related to water stress have mainly concerned arid and drought-prone regions, but based on recent trends in climate variability, population growth, and intensifying global water demand, the struggles of ensuring water supply are becoming more widespread. These concerns are placing greater significance on sustainable water management approaches that can reduce water scarcity risks and contribute to more reliable water supplies.

A prime example of how supply distributions have spurred actions to develop more resilient water systems is California, where persistent dry conditions have caused one of the most severe multiyear droughts in the state's history. Now 5 years long, California's water crisis, which includes the lowest ever-recorded snowpack in 2015,

spurred Governor Jerry Brown that year to issue an executive order mandating a 25% reduction in the amount of water consumed statewide in urban areas.

Although water supply conditions improved in 2016, November data from the U.S. Drought Monitor still showed that extreme to exceptional drought remained deeply entrenched across 43% of the state.

With the threat of drought conditions continuing into 2017 and beyond, California has placed greater emphasis on making regions and communities more self-reliant through the pursuit of diversified water supplies.

"Diversification will play a huge role in the future of California's water system, but it's important that it be done in a non-prescriptive way – depending on the region, the most viable options can be very different," said Newsha Ajami, director

of Urban Water Policy with Stanford University's Water in the West.

In developing regional water management strategies, Ajami said municipalities and water utilities should prioritize solutions that incorporate an integrated approach. "By managing water resources in a more holistic and collaborative way, we can maximize our opportunities and better control costs," she said.

Examples of different initiatives in California that reflect an integrated and sustainable methodology to managing water supplies are currently under way.

### Economic model helps cope with water scarcity

As a future mechanism to help conserve freshwater supplies and maximize water reuse opportunities, researchers at the University of California (Riverside) have developed an