

# Florida Specifier

Practical Information For Environmental Professionals

## Pilot study in Jacksonville tests floating mats to treat stormwater

By MELORA GRATTAN

**R**educing nutrients discharged from stormwater systems is a priority for environmental regulators via ongoing rule revisions and treatment technology evaluations.

One of the new technologies currently under evaluation involves a system of floating wetland islands—mats of vegetation—that are suspended in the water to absorb nutrients naturally through the root systems. The plants are harvested after they collect nutrients, namely nitrogen and phosphorus, and then replaced with new plants.

The technology came to the attention of officials with the state Department of Environmental Protection during the Statewide Stormwater Rule Technical Advisory Committee meetings, said Eric Livingston, program administrator with the agency's NPDES Stormwater Section.

Based on some initial research conducted at Clemson University, the technology appeared "very promising and cost-effective," said Livingston.

DEP is now partnering with the city of Jacksonville to monitor a pond where a floating wetland system was installed.

The monitoring effort will help regulators to better understand the nutrient reduction benefits of the floating islands, said Livingston.

"Additionally, the technology looks promising as a way for local governments and others to meet stormwater load reductions required by total maximum daily loads," he said.

The pond being used for the monitoring project is at the seven-acre Upper Deer Creek Regional Stormwater Facility, which provides retrofit quality treatment to 516 acres of urban, commercial and industrial areas of downtown Jacksonville.

The facility was built in 2006 with financial assistance from DEP. In compliance with the grant, the city conducted monitoring in 2007 and 2009, providing a base of nutrient data for comparison.



Photo courtesy of BEEMATS

Craig Harris (left) and Felix Hernandez, both with Beemats, move a section of floating vegetative mat into place as part of a pilot project in Jacksonville gauging its effectiveness for nutrient removal. Greg McGrath, CDM, looks on.

"It seemed like a good fit to evaluate this since we had data," said Vince Siebold, chief of city's Environmental Quality Division.

The city conducts capital projects to meet nutrient load reduction goals for total nitrogen under a basin management action plan.

"There are a lot of tools to reduce 150 metric tons of total nitrogen and we would like to do anything we can to enhance the effectiveness of stormwater ponds."

The city is handling the field work and analytical sampling, while its contractor, CDM, is doing the number crunching and comparison work.

The floating wetland system was installed earlier this summer and the city recently received preliminary results from the first of four storm events. The chemistry consists of volume-weighted composite samples that are downloaded through te-

lemetry to CDM, said Dana Morton, an aquatic biologist for the city.

"We anticipate the performance to increase as the plant grows and develops massive root systems," Morton said. "Some of the nutrient removal isn't available until the plant biomass is removed from the pond in the end."

Even if results show that the plant system is more valuable for nutrients other than nitrogen, the study should benefit other municipalities, Morton added. "The real goal is to have a better understanding of what the statewide benefits would be."

The sampling work should last about another six months in order to obtain data from seven to 10 storm events.

This particular study is using 12,000 square feet of floating mats—about 5 percent of the pond's surface area. The mats are clustered around the outfall structure to capture everything treated by the pond,

explained Steve Beeman, co-owner of BEEMATS, which donated the floating wetland system for the project.

Beeman said he is hoping the results will prompt the state to significantly increase the technology's current 20 percent BMP credit in the stormwater treatment Applicant's Handbook.

His personal testing in 2009 involved analyzing the dry weight of plants they started with and then, after six months to a year of growth, reanalyzing for dry weight and composition of nitrogen and phosphorus.

The plants averaged about 10 grams per square meter of phosphorus per year and 125 grams per square meter of nitrogen.

To ensure objective data, Beeman donated numerous plants and mats several years ago to a research project at Clemson University.

Sarah White, PhD, an assistant professor of environmental horticulture there, began testing the floating wetland system in the spring of 2008. In her small experimental pond set up, White tried to replicate condi-

tions more of concern in stormwater management areas (versus nurseries) to determine how effective they would be in Florida conditions.

"Basically, we found the floating wetlands were very efficient when nutrient concentrations were very low," White said.

With an initial total phosphorus count of 75 ppb, the average was found to drop to 30 ppb. For nitrogen, the loading coming in was about .55 ppm for the ponds and the three troughs had 0.7 ppm. After treatment, the ponds had 0.12 ppm and the troughs were about 0.03 ppm.

"The phosphorus numbers for me were huge since it is hard to clean it further once the water is relatively clean," White said.

She attributes this success to harvesting the plants, which removes the nutrients entirely unlike a constructed wetlands system where the plants can decay and release some of the nutrients they have absorbed.

The system, she said, is sustainable and provides habitat. It has improved water clarity in several weeks and can be an alternative to chemical treatments for algae

control that doesn't have toxic effects on the invertebrate population.

White said she is continuing her research to determine when the plants are at their peak in terms of nutrient intake, and confirming how much surface coverage is needed to provide adequate nutrient removal. The current premise is 5 to 10 percent of the surface.

While other similar methods may be more aesthetically pleasing, White said using the mats is cost effective in terms of covering a large area.

The technology is promising with a lot of applications, she added. For example, adding the floating wetland to existing ponds is a cheaper alternative to building more ponds or as a retrofit when there isn't a lot of real estate for expansion.

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