Florida Department of Transportation Research

Innovative and Integrative Best Management Practices (BMPs) for Surface and Groundwater Protection

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Current Situation

Florida lakes, rivers, and springs are vital sources for human and environmental health, agriculture, recreation, and tourism. Many activities generate pollutants that can damage water bodies. Fertilizers and nutrients carried by rain runoff to local waters bring excess nutrients and promote excessive plant growth that depletes oxygen for fish and other aquatic life. The Florida Department of Transportation (FDOT) has a continuing commitment to reduce harmful runoff from roads and other transportation facilities and use right-of-way to proactively clean water.

Research Objectives

University of Central Florida researchers developed innovative methods to evaluate landscapes designed to reduce nutrient impacts on surface and groundwater. They also tested and evaluated nutrient-reducing materials that can be used in these landscaping plans.

Canoers share the Silver River with a manatee.

Project Activities

The researchers studied the effectiveness of nutrient-removing materials called biosorption-activated media (BAM) in field-scale experiments. They expanded the widely used BMP Trains model to include roadway runoff and to allow for more complicated landscapes. Using the improved software, the researchers examined the impact of nutrient-removing materials on Silver Springs near Ocala, FL. They also developed and tested a series of promising new nutrient-removing materials called chemically activated media (CAM).

The researchers tested BAM in filter banks installed in full-scale models of roadway shoulders to evaluate nutrient removal. Both control and experimental shoulders were built with vegetative filter strips that can also remove nutrients; the control used only the vegetative filter strip; the experimental shoulder included the BAM filter in addition. Both setups removed a similar amount of phosphorus, but the BAM setup removed significantly more nitrogen.

Data from the BAM testing were used with the improved and expanded BMP Trains 2020 model to study the use of BAM filters in a region with complex limestone and soil structure, common in Florida. The researchers evaluated a number of possible landscape designs that use BAM filters near Silver Springs and estimated the resulting nutrient concentrations in the springs. Results indicated only modest improvements in water quality could be expected. Given the complex environment and range of nutrient sources, BAMs alone are unlikely to help the State of Florida to meet its restoration goals for Silver Springs. To do so, it will be important to manage non-transportation sources of nutrients as well, such as agriculture and septic fields.

The researchers developed five new CAM based on iron or aluminum-iron materials. Each CAM was characterized for hydraulic conductivity, surface area, and other functional properties. The two most effective CAM were determined in experiments and were further tested for nutrient recovery ability, with promising results. Additional research is planned.

Project Benefits

The results of this research advance Florida's goals for restoration of Silver Springs and, more broadly, to protect waters throughout Florida.

For more information, please see www.fdot.gov/research/.