Florida Department of Transportation Research

Optimal Design of Stormwater Basins with Bio-Sorption Activated Media (BAM) in Karst Environments — Phase II: Field Testing of BMPs

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Current Situation

Florida is well-known as the Sunshine State, but ironically, at an average of 54 inches of rainfall per year, Florida is one of the top five rain states in the U.S. The combination gives Florida its lush environment, its vast agricultural sector, and its beautiful rivers and lakes. Florida also has one of the most extensive roadway systems in the U.S. Runoff from roads can carry pollutants, and runoff from landscaped areas can carry excess nutrients. Protecting Florida's vital waters is a subject of continuing research for FDOT.

Florida's water are essential to the life and health of the state, for wildlife, drinking, irrigation, and recreation as well as their sheer beauty.

Research Objectives

University of Central Florida researchers tested and implemented two new Best Management Practices (BMPs) designs for use of biosorption activated media in the treatment of stormwater runoff.

Project Activities

The researchers constructed blanket filters and vertical reactors containing biosorption activated media (BAM) in a stormwater management basin and systematically tested over 11 discrete storm events for efficiency in capturing roadway runoff and removing nitrogen. Two blanket filters were constructed in a stormwater management basin. One filter consisted of a one-foot layer of sandy soil over a three-foot layer of BAM, and the other consisted of a three-foot layer of topsoil over a three-foot layer of BAM. At the same site, six vertical reactors were constructed with different depths and layering of BAM, an iron-based environmental medium, or both.

The researchers measured the amounts of total nitrogen, nitrite plus nitrate (NOx), and ammonia in the roadway runoff captured by the basins where the filters and reactors were located. They compared these measurements at the base of each of the filters and reactors and at a comparable depth of soil to determine the effectiveness of each filter or reactor configuration in removing nitrogen nutrients. Among the vertical reactors, the most effective configuration had a four-foot depth of BAM, removing 49% of total nitrogen and 53% of NOx. The blanket filters indicated that the greater depth of soil over the BAM layer increased the effectiveness of nitrogen removal.

This project is one of the first field-scale tests of BAM-based stormwater BMPs, and the first testing of the blanket filter and vertical reactor designs. The researchers recommended additional testing to further verify the nitrogen-removing capacity of these constructions. They also supplied construction details and estimates of the cost per pound of nitrogen removed.

Project Benefits

The technology explored in this research project holds promise for further reducing runoff nitrogen the reaches Florida waters.

For more information, please see fdot.gov/research