



**US Army Corps  
of Engineers**

Jacksonville  
District

# Fact Sheet

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## Periphyton-based Stormwater Treatment Area Technology (PSTA)

### Background

The Everglades ecosystem is unique in many ways. One important characteristic of the ecosystem is that it is "oligotrophic." That is, the Everglades is characterized by unusually low levels of nutrients such as phosphorous.

The delicate balance of the Everglades ecosystem is dramatically altered by the introduction of nutrients. One of these nutrients, phosphorous, is a pollutant that has been introduced in high levels from farms and urban areas.

Much research has been conducted to identify ways to reduce the concentrations of phosphorous to levels that will not damage the Everglades. The Florida Environmental Regulatory Commission recently set the long term standard for phosphorous entering the Everglades at 10 ppb (parts per billion).

### Research done to date by others

The South Florida Water Management District has conducted extensive investigations of water treatment technologies. The options originally considered covered a broad range of technologies including chemical addition and solids separation, microfiltration, submerged aquatic vegetation (SAV) and periphyton-based stormwater treatment areas. Evaluation of results based on performance, cost and feasibility have focused current and future investigations on the use of SAV and PSTA.

### Corps PSTA design efforts

The PSTA technology was proposed in 1996 to the Corps by Dr. Ron Jones, former Director of the Southeastern Environmental Research Program at Florida International University. The design proposal suggested that in order to reduce levels of phosphorous to 10 ppb in stormwater treatment areas, the phosphorous containing peat floor of the treatment areas would have to be replaced by or covered with a calcium-based substance such as lime rock or sand. Furthermore, a mat-like assemblage of microorganisms called periphyton would have to be a dominant component of the stormwater treatment areas.

The Corps design team, lead by Dr. Ron Jones, utilized a group of 4 test cells. The test cells were designed and constructed and were fully operational by November 2002. Four 10-foot by 100-foot cells were tested. The floor of each cell was lined with a different substance. The substrates used were lime rock, riviera sand, lime rock over peat and peat.

The testing strategy was to create a calcareous periphyton mat similar to periphyton found in the natural Everglades marsh. After establishment of the periphyton mat, a process that took 6 to 8 weeks to complete, the testing of phosphorous reducing capability of the cells was begun.

The Corps' studies have shown that phosphorous can be reduced from 80 ppb to less than 10 ppb within a flow distance of 100 feet and a retention time of 7 days. The results are 20 to 30% lower than those achieved by researchers of other technologies.

### The role of PSTA in Everglades restoration

The Comprehensive Everglades Restoration Plan contains a fundamental principle - the process of restoring the Everglades must be flexible and able to adapt to new scientific information and unanticipated responses from the ecosystem. As it now appears, based on design and testing, PSTA may be a critical component of the Everglades restoration program.

### Advancing to the next step in PSTA technology

The promising small-scale test results led the Corps and the South Florida to agree on investigating ways to test the technology in a larger scale field test. The Corps designed a proposal for proceeding with a test at Stormwater Treatment Area-1 E, which will discharge water to the Loxahatchee National Wildlife Refuge. The proposal was submitted to the Assistant Secretary of the Army (Civil Works) for approval. It was approved by Assistant Secretary John Paul Woodley in November 2003. As described in the proposal, the estimated cost of the field test would be \$5 million, an amount that would be fully funded by the Federal government.

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