Looking upstream: Canal inputs of water and nutrients to oligotrophic marshes in the Florida Coastal Everglades

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Abstract

The Florida Coastal Everglades is a phosphorus limited oligotrophic wetland system. In this system, the hydrological cycle is driven by rainfall and by inflow from canals that redistribute that water across the landscape. Canal inflows dominate phosphorus inputs. We will conduct this study along the Eastern boundary of Everglades National Park (ENP), in marshes receiving overflow from a retention pond associated with a canal pump station, S332-B. Our objective is to quantify how these freshwater marshes mediate potential canal phosphorus inputs before these waters reach downstream estuaries of the southern Everglades and Florida Bay. Soil core samples were collected in a stratified random manner from a roughly 20 ha marsh area in early June 2003 (fig. 1.) and May 2004 (fig. 2.). Relatively high soil phosphorus concentrations were evident downstream of the canal input, so soils along this transect will be resampled in 2005. Interestingly, water quality stations located in this area showed no pattern of high phosphorus in surface waters. One possible explanation is that the phosphorus was not transported to the marsh via overland flow but rather by groundwater inputs. Alternatively, microbial mats may have acted as a biological barrier preventing transfer to the overlying water column.

Introduction

Water management is a vital issue in South Florida. Freshwater supply comes from rain on the Kissimmee River basin. The flow is slow and water generally builds up in Lake Okeechobee which averages 12 meters deep and expands over 730 sq. mi. and proceeds to the greater Everglades. S332-B is on the boundary line between Everglades national park and a water retention pond. Doing this experiment will help in the detection of a possible negative impact due to nutrient loading of phosphorus.

Changes in freshwater flow and nutrient enrichment have affected nutrient and organic matter input to the Florida Everglades (Turner *et al.*, 1999). The aforementioned changes have had a direct impact on the flora and fauna of the marsh ecosystem. Phosphorus (P) is a potentially limiting nutrient in the Everglades. Elevated porewater concentrations of phosphorus in soil core samples relative to surface water concentrations suggests an input from a ground water nutrient source.

Research Questions

Working questions for this research are:

1. Is the water retention pond a source of phosphorus into the Everglades.

2. Can nutrient loaded ground water seep under the levee wall.

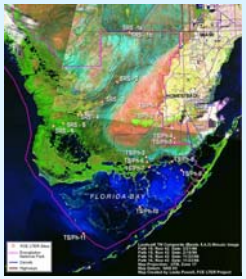

Figure 1.

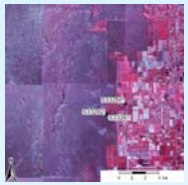

Figure 2.

Site Description

Water flows southward from canal inputs as sheetflow across the sawgrass dominated marsh through the mangrove dominated ecotone to Florida Bay. Seasonal wet and dry seasons are an important factor in the everglades driving the origin of water coming from rain or via canals. S332-B has organic poor marl soil. The S332-B pumping structure is located 3 km from the research site, on the northern end of Taylor Slough.

Figure 3.

Figure 4.

Arial view of the S332 Canal

Methods

We will collect 24 soil core samples 2.5 X 10 cm deep in a non-random stratified manor. These collections will occur annually every June. The cores will be collected in conjunction with the south-central portion of the S332-B spillway and along the hot spots found in 2003. The cores will then be returned to the lab and analyzed for total phosphorus using the Solórzano and Sharp (1980) method. And then graphically represented using a spatial distribution diagram.

Preliminary Findings

Figure 5 and Figure 6 are GIS maps of phosphorus gradients across the S332-B transect. In 2003 a distinct path of phosphorus was seen coming from the direction of the levee wall and continuing into the Everglades National Park. In 2004 when resampled there was no such trend found. This may mean that the water retention pond is a nutrient source into the Everglades, and possibly being such by seeping under the levee wall. The purpose of this research is to determine spatial and temporal patterns of phosphorus gradients to explain these trends.

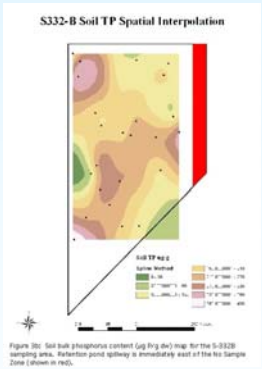

Fig. 5: 2003

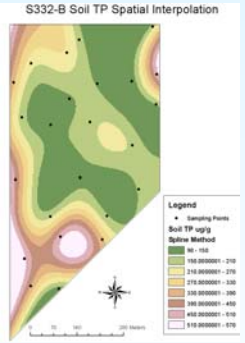

Fig. 6: 2004

Acknowledgments:

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You guys rock!

Literature Cited

Sharp L., and Solórzano J.H., 1980, Determination of total dissolved phosphorous and particulate phosphorous in natural waters, Limnol. Oceanogr., 25, pp. 754-758.

Turner A. M.; Joel C. Trexler; C. Frank Jordan; Sarah J. Slack; Pamela Geddes; John H. Chick; William F. Loftus, 1999, Targeting Ecosystem Features for Conservation: Standing Crops in the Florida Everglades, *Conservation Biology*, Vol. 13, No. 4., pp. 898-911.