Digital Visualization as a Tool to Bridge Science and Policy: Examining the Long-term effect of Phosphorus on the Everglades Ridge and Slough Landscape

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Summary and Objective

Everglades restoration remains one of the largest ecosystem-level restoration projects ever attempted. The underlying message to “Get the Water Right” was that both water quality and hydrology, including timing, flow and quantity, were being optimized to the extent possible to assure the best outcome for a naturally functioning Everglades ecosystem. Today, more than 15 years since the restoration was approved, there has been criticism by some for its slow pace, while others applaud the successes. The former would like to increase the pace of restoration, which has inevitably resulted in debate among scientists regarding water quality and quantity tradeoffs. This technical discussion among scientists makes it difficult for decision makers, who ultimately are responsible for moving the restoration forward. The central Everglades is dominated by a ridge and slough ecosystem and is the focal area of much of the debate. Here we present a digital animation based on peer-reviewed data that demonstrates visually a cross-section of a representative ridge and slough system through various stages of total phosphorus (TP) enrichment. The objective of the animation, presented previously in a beta version, is to provide context to the complex interactions that occur in the ridge and slough with increasing TP concentrations, with the primary intent to facilitate a more holistic understanding of the system as one tool that could be used by decision-makers, but also for ongoing communication among the scientific community.

Background

In the 1940’s an immense project was undertaken to manage the movement of water in southern Florida. It was designed to provide flood protection and fresh water for the human population, yet it resulted in severe ecological degradation of the natural ecosystem. To address the obvious negative environmental impacts, the Water Resources Development Acts of 1992 and 1996 gave authority to the U.S. Army Corps of Engineers to re-evaluate the original project. In essence, the Corps was mandated to develop a Comprehensive Plan that would at least partially restore the natural ecosystems of southern Florida. The objectives were encapsulated in the primary goals of enhancement of ecological and economic values, and social well-being. For six years the Corps, in cooperation with more than 30 federal, state, tribal and local agencies, developed a Comprehensive Plan to meet these goals. To achieve these goals and objectives, it was determined that the remaining natural system should be changed in the direction of its pre-drainage wetland character through modifications of the hydrologic features. Specifically, the C&SF Project Comprehensive Review Study (1999) states that the "*recommended Comprehensive Plan achieves the restoration of more natural flows of water, including sheetflow, improved water quality, and more natural hydroperiods in the south Florida ecosystem. Improvements to native flora and fauna, including threatened and endangered species, will occur as a result of the restoration of hydrologic conditions*.” Yet, technical discussions among scientists can result in mixed messages that in turn make it difficult for decision makers who are largely responsible for advancing the restoration. One of these critical areas of scientific communication involves the importance of conveying the scientific knowledge underlying the development of the phosphorus criteria for the Everglades and that the technical complexity that underlies the phosphorus rule not be lost. Thus, the goal of our project was to create a short animation, with real data at its foundation that can be used to instruct managers regarding the ecological changes caused by phosphorus enrichment in the ridge and slough system as well as their importance.

Changes over time in the ridge and slough ecosystem from phosphorus enrichment

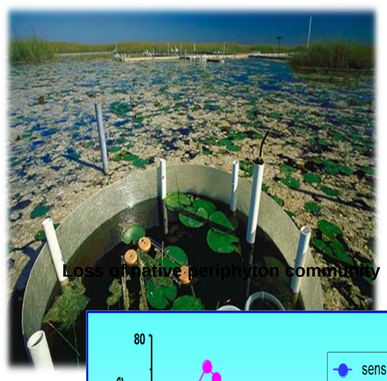
Historical Data

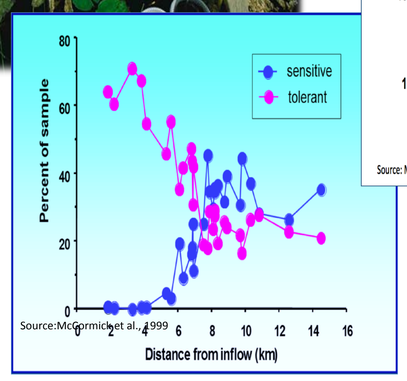
Transects along the Phosphorus Gradient

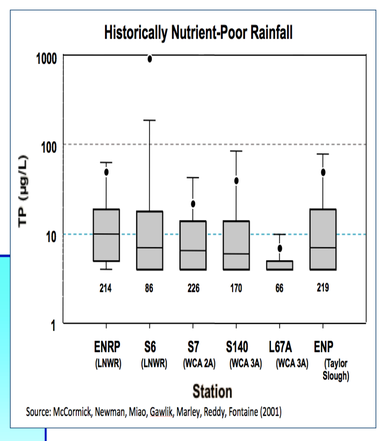
Phosphorus enrichment

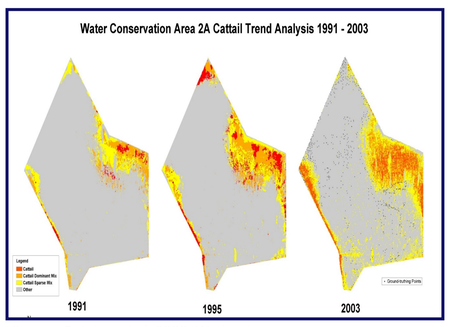
Field Dosing Studies

Controlled Studies

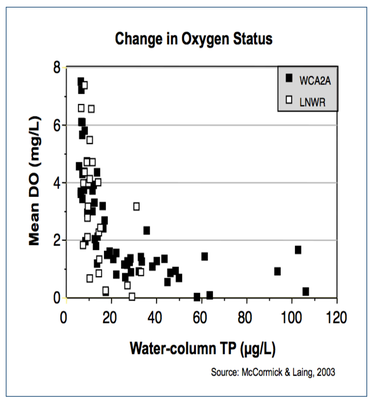


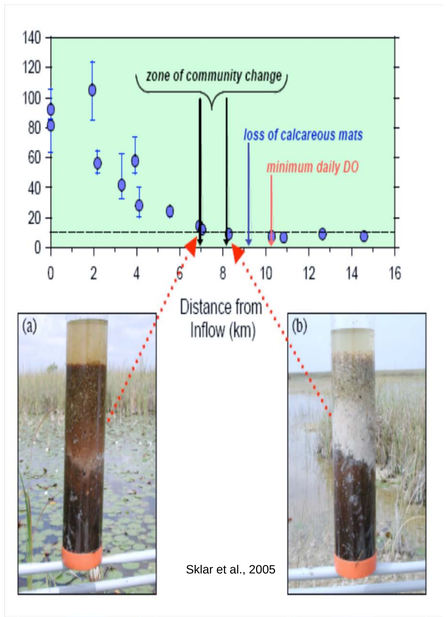






Source: Rutchey et al, 2008, Wetlands





- Loss of key native species-plants, algae, invertebrates
- Change in water and soil chemistry
- Dominance of pollutant tolerant species
- Change in landscape pattern - loss of ridge and slough

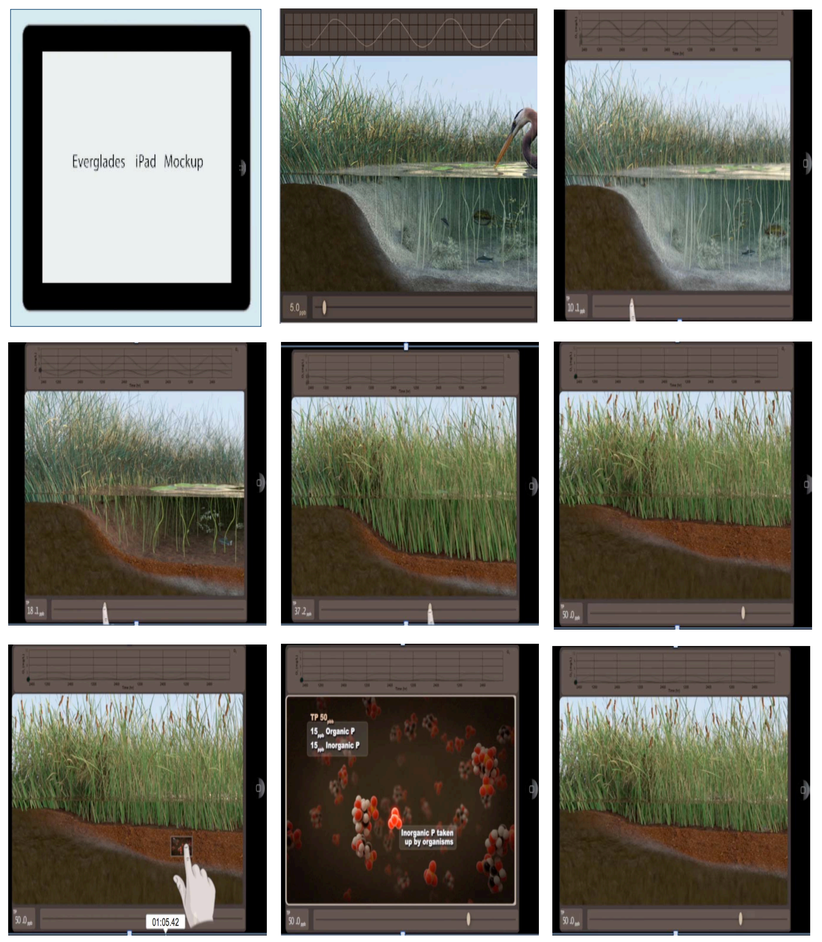
  -Dense vegetation
  -Reduced light through canopy
  -Reduced foraging by wading birds
- Low to no oxygen in water column

Historical Data led to Phosphorus Criterian

The Class III narrative nutrient criterion (Rule 62-302.530(48)(b), Florida Administrative Code) states that: “*in no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna.*”

Phosphorus criterion of 10 µg/L was established

Animation Constructed Using Historical Data



View Animation during Poster Presentation

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