Phosphorus Enrichment and Everglades Restoration:

The Cattail Habitat Improvement Project

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INTRODUCTION 1

The Everglades developed as an oligotrophic phosphorus (P)-limited ecosystem, with rainfall providing the nutrient source. However, four decades of anthropogenic nutrient inputs have caused extensive changes in the structure and function of these wetlands. While restoration efforts have focused on reducing concentrations and loads to the region via the implementation of stormwater treatment areas and on-farm management techniques, a significant portion of the Everglades ecosystem remains impacted with high levels of P ***(Fig. 1)***. Phosphorus enriched areas are readily evidenced by the over 11,000 ha of monotypic cattail (*Typha* spp.) stands that have replaced the original sawgrass and slough mosaic ***(Fig. 2)***. This has resulted in considerable attention on removing cattail as a restoration approach, despite the recognition that cattail removal is addressing the symptom as opposed to solving the problem. Large-scale cattail removal may be detrimental because the dense cattail areas adjacent to inflow points currently serve an important ecosystem function; protecting downstream pristine areas through their rapid plant growth and P removal. However, rehabilitation of ecosystem function could occur by removing the constraints inherent in a monotypic cattail community ***(Fig. 3)***. One key constraint is the density of the vegetation, resulting in net heterotrophic production and limited access by wildlife. Thus, a large-scale *in situ* field study, using fifteen 250 x 250 m plots, in a replicated factorial design, has been initiated to test our ability to rehabilitate cattail areas ***(Figs. 4 & 5)***.

Soil Phosphorus Impacts 2

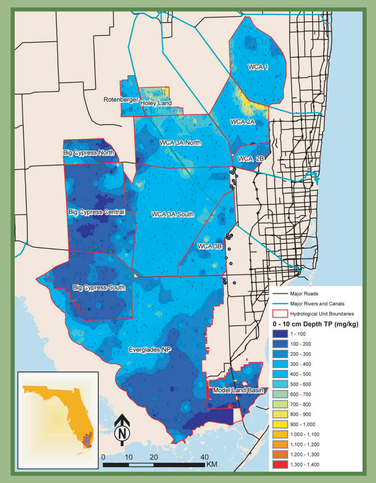

Figure 1 – Source: UF & SFWMD

Summary of P Induced Ecological Changes in WCA 2A 3

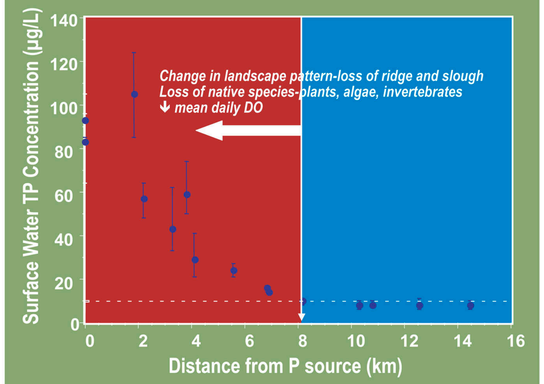

Figure 2

Structural & Functional Changes 4

Dense Emergent Vegetation & Phosphorus Storage

Adaptive Management - Increased Habitat Complexity and Quality - Simulate Ridge and Slough?

Jump Start Restoration Towards Native Everglades Sawgrass Ridge & Slough Landscape?

Figure 3

Project Objectives 5

1. Assess whether we can adaptively manage dense cattail areas to alter trophic dynamics such that wildlife diversity and abundance is increased.
2. To what extent do these created open areas' functions compare to the natural Everglades.

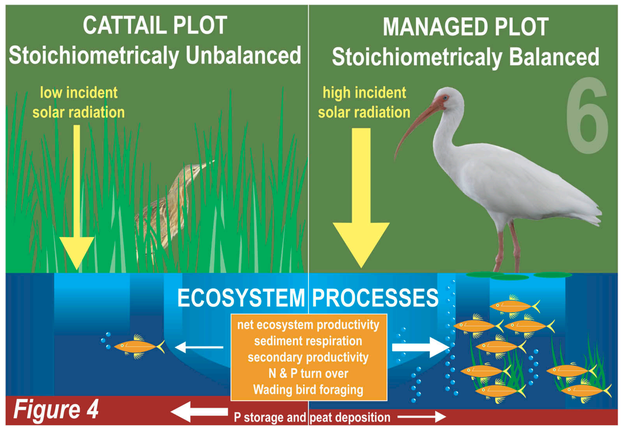

Figure 4

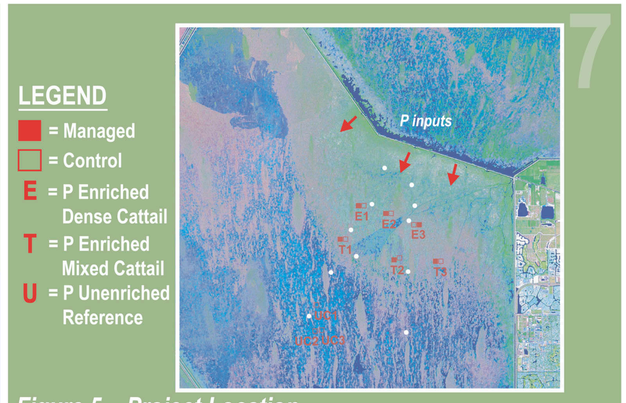

Figure 5 – Project Location

Hypotheses 8

Managed plots will be
- Comprised of more nutritional plants (i.e., algae compared to emergent macrophytes)

Therefore, compared to **control** and **reference** plots,
- Lose a higher percentage of production to herbivores
- Support higher wading bird foraging
- Channel lower percentages of production as detritus
- Experience faster decomposition rates
- Experience greater nutrient flux
- Store smaller amounts of carbon and nutrients

Ecosystem Analyses 9

Structure
- Chemistry-soil and water
- Bacterial Composition
- Periphyton Compostion and Toxicity
- Macrophyte Composition-(SAV and emergent)
- Invertebrate Composition
- Fish Composition
- Wading Bird Composition
- Secretive Bird Composition
- Other Vertebrates

Function
- Nutrient Storage and Flux (P)
- Ecosystem Metabolism
- Primary Production (periphyton and macrophytes)
- Secondary Production (invertebrates & fish)
- Decomposition
- Wading Bird Foraging Success
- Enzyme Kinetics

SUMMARY 10

Measures of ecosystem structure, ecosystem function, and ecosystem stoichiometry will be simultaneously made within the cattail habitat improvement project to discern the food web dynamics and compare among treatments. Because of the interdependency of community structure and ecosystem function, it is important to link nutrient supply and food web structure together. Using a stoichiometric approach, we will couple traditional methods of assessing the food web (species composition and density) with the nutrient status and elemental composition of various components of the ecosystem to define food web dynamics. Results from this study will allow us to make recommendations to management on this approach as a means to accelerate ecosystem recovery. Assuming these managed areas are sustainable after the first three years, then further studies, such as the interaction of vegetation mosaics, can be explored in subsequent years.

ACKNOWLEDGEMENTS

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