CESI Final Report
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Project: Landscape Model of Ridge and Slough Topography: Landscape Modeling of Ridge and Slough Topography

Contract Number: H5284 02 0171

Location: Northeastern Shark River Slough, Central and Southern Water Conservation Areas 3A and 3B

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Summary of activities

- We developed a conceptual model to account for self-assembly of the slough-ridge-tree island patterned landscape of the Central Everglades in southern Florida via feedbacks among landforms, hydrology, vegetation, and biogeochemistry. We test aspects of this model by analyzing vegetation composition in relation to local and landscape-level drivers.

- We quantified vegetation composition and environmental characteristics in central Water Conservation Area (WCA) 3A, southern WCA-3A, and southern WCA-3B in southern Florida, based on their divergence in water management and flow regimes over the past 50 years.

- In 562 quadrats, we estimated species coverages and quantified maximum, minimum, and average water depth, soil depth to bedrock, NDVI, and proximity to the nearest tree island. We used non-metric multi-dimensional scaling to relate compositional variation to local and landscape factors, and evaluated environmental differences among eight *a priori* vegetation types via ANOVA.

- Water depth and hydroperiod decreased from sloughs to tree islands, but regions also differed significantly in the abundance of several community-types and the hydroregimes characterizing them. NMS revealed two significant axes of compositional variation, tied to local gradients of water depth and correlated factors, and to a landscape-scale gradient of proximity to tall tree islands. Sawgrass height and soil thickness increased toward higher ridges, and NDVI was greatest on tree islands.

- This study supports four components of our model, involving positive feedback of local substrate height on itself; woody plant invasion and subsequent P fertilization on taller tree islands; compositional shifts in sites close to tree islands due to nutrient leakage; and relaxed negative feedback against total raised area in the absence of flow. The non-equilibrium relationship of community-types to current hydroregimes appears to reflect a lag of a few years behind shifts in water management; a much longer lag would be expected for shifts in landscape patterning.

- We are collaborating with Dr. Karl von Ellenrieder of Florida Atlantic University on a computer simulation of the self-assembly of patterned landscapes based on our conceptual model. Our analyses thus far have focused on the interaction of landforms, hydrology, biogeochemistry, and surface hydrodynamics in the formation of streamlined tree islands.