S O C I E T Y   O F   W E T L A N D   S C I E N T I S T S

SWS Research Brief

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Defining the Present Before Restoring the Past: Everglades Vegetation Communities

Background

The Florida Everglades, one of the largest relatively intact wetands in the world, is the largest restoration project in the world. The goal of Everglades restoration is to return the area to a more natural state by reestablishing approximate historic water quantity, quality, and timing, while still providing flood control and water storage for south Florida (http://www.evergladesplan.org). An important indicator of restoration success will be the response of vegetation communities (groups of plant species) to the proposed hydrologic alternatives. A project of this size requires a substantial amount of information about the plant communities and environmental factors shape them to guide the path of restoration.

The Everglades is especially hard to define because of the incredible diversity of plant communities within relatively small areas. One acre of land could hold up to 10 different communities, each providing a particular service to the animals living there.

Despite the extent of environmental monitoring that has been done in the Everglades, it is difficult to pinpoint direct causes of plant community changes over such a large area. Defining large areas of plant communities can be difficult and incredibly time consuming. One of the last landscape-level inventories of communities was performed in 1959 by Loveless and water management strategies have changed considerably since that time.

Study Goal

We believe the vegetation in this region has shifted from that described by Loveless to vegetation types formed by the present deeper water depths, and that identifying the current communities— and specific hydrologic variables that affect them—is the initial step needed before restoring vegetation of the past. We defined the existing vegetation communities of a central, impounded Everglades remnant, described how both present and historic hydrology affect these communities, and documented the change from communities described in previous studies. This provides baseline knowledge for Everglades restoration.

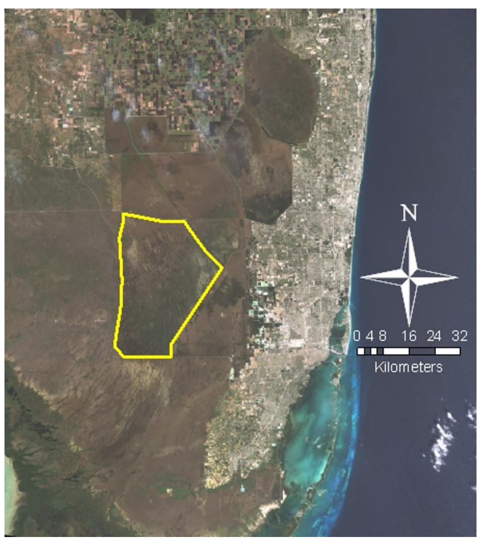

Figure 1: A satellite view of south Florida and the Everglades with Water conservation Area 3A South outlined in yellow.

Study Area

Our study area was a portion of the Everglades in the peninsular region of Florida, USA. The Everglades used to be one continuous wetland from Lake Okeechobee to Florida Bay. Water would flow very slowly (sheetflow) across the landscape at a rate of 3-5cm/second. It has now been compartmentalized by canals and levees to reduce flooding and to provide water for the cities of south Florida.

Water Conservation Area 3A (WCA 3A) is the largest remnant of the original Everglades, approximately 200,000 ha (Figure 1). Our study area, the southern half of 3A (3AS), is a matrix of tree islands, sawgrass strands, and sloughs (Figure 2). Water Conservation Area 3AS is the main focus of Everglades restoration for the next 30 years.

The Decompartmentalization and Sheetflow Enhancement Project (DECOMP—http://www.evergladesplan.org/pm/projects/proj_12_wca3_1.aspx) will eliminate much of the levee and canal system that now restricts sheetflow in these areas.

Figure 2: An example of open water sloughs fringed by dense sawgrass strands. Small tree islands are visible in the background.

“PREVIOUS STUDIES OF VEGETATION ARE NO LONGER RESPRESENTATIVE OF CURRENT COMMUNITIES”

The Florida Snail Kite

This vegetation work has been done as part of a larger project monitoring the Florida Snail Kite, an endangered bird species, and its habitat. The Snail Kite was one of the first species listed in the Endangered Species Act in the 1960s. It has a very specific range from the Kissimmee Chain of Lakes to the Everglades. Most recently,

their population was hit by a severe drought in 2001, and numbers have continued to decline. This may be due, in part, to flooding of their preferred nesting and foraging habitat within southern Water Conservation Area 3A and other major habitat alterations within their range.

They are monitored with a combination of radio tracking and mark-resighting techniques to estimate population size and reproductive success. The population has halved each year since 2006 and is down to a record low of approximately 700 birds. Functional extinction is expected in 50 years with a ‘best case’ scenario. The Snail Kite’s fate is tightly intertwined with that of the Everglades and restoration actions are of great importance.

Figure 3: Vegetation sampling on a transect in 3AS

Approximately 70% of the eastern levees and canals in 3AS will be removed, and the highway which forms the southern barrier will be raised to restore natural flow. This is an area that will see radical hydrologic changes in the future and is a critical region for restoration monitoring.

Methods

Vegetation for this analysis was sampled from 2002-2005 within 20 plots in 3AS. Vegetation was cut along transects (Figure 3) that ran from one previously identified type (slough, sawgrass, or wet prairie) into another type. The samples were sorted to species in a lab and dried and weighed to provide biomass measures. We took over 10,000 quarter-meter-squared samples, which, if lined up end to end, would stretch the length of 250 football fields.

We defined vegetation communities by the amount and type of species present, and linked them to water levels at each site.

We also separated samples into the three different vegetation types (slough, sawgrass, wet prairie) and did an identical analysis. This was to reduce the noise associated with grouping very different types together and get a more refined idea of communities and hydrologic/community relationships.

Findings

There were ten communities within 3AS (Figure 4): shrub island, deteriorated island, sawgrass, cattail, strand/slough transition, wet prairie, shallow peat prairie,

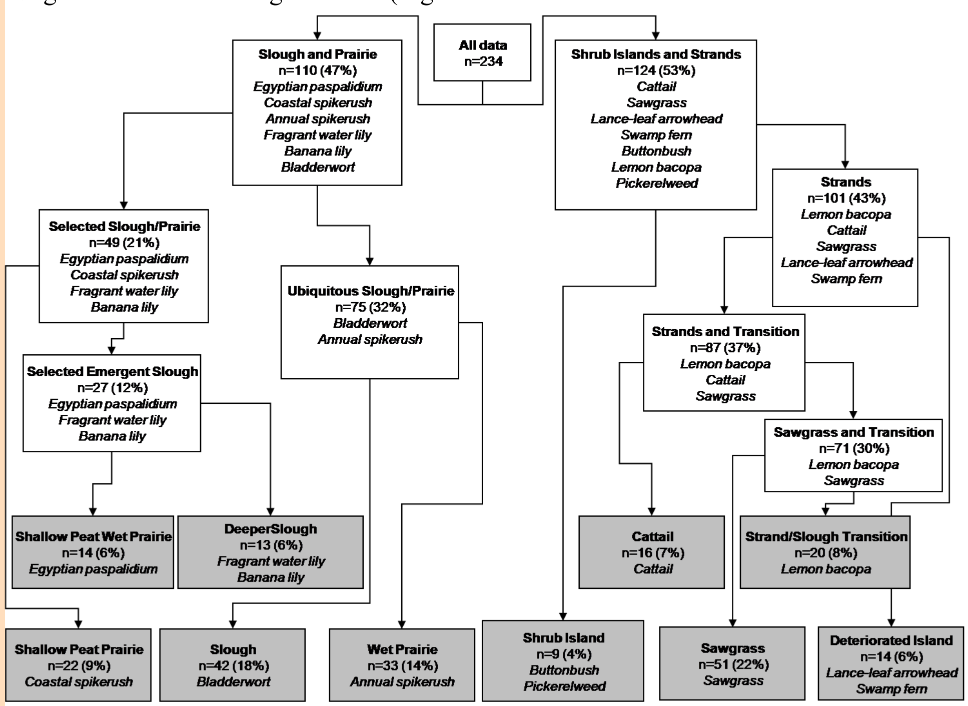

Figure 4: Community analysis flowchart. Grey boxes are final 10 communities.

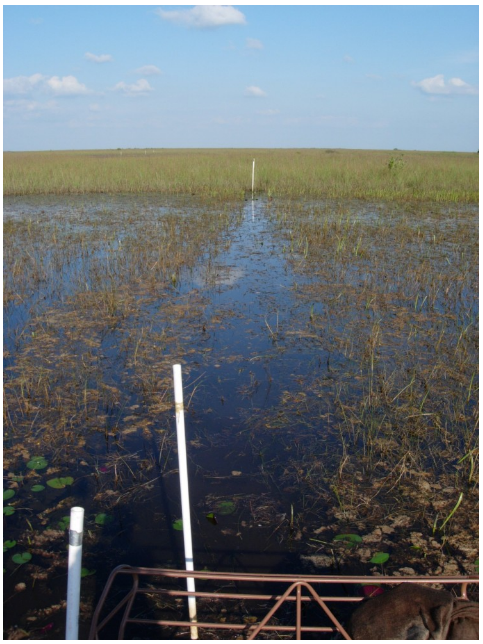

Figure 5: Picture of a transect through a slough into sawgrass vegetation.

shallow peat wet prairie, slough, and deeper slough. Communities are not necessarily differentiated from one another by absence or presence of a species, but by the proportion of species present. Sloughs (dominated by lilies and submerged aquatic plants) are the deepest community, followed by wet prairies (beakrush and maidencane communities). Slough/strand transitions (dominated by lemon bacopa) are less deep than prairies and sawgrass, cattail, and deteriorated islands are more dry. Shrub islands (dominated by buttonbush and pickerelweed) are the driest communities in our study area. Determinants of community composition included peat depth and water depths up to 5 years previous to when the sample was taken. This indicates that there is a lag between hydrologic events and the plant's response to them. Some species react more quickly than others with sawgrass being one of the slowest to respond.

From the separate analysis, sawgrass communities were influenced by water depths in the dry seasons up to 4 years previous to the sample. Sloughs were influenced by both the wet and dry seasons up to 5 years before, and wet prairies were influenced by water depths in the wet season only.

Figure 6: Slough community with a spider lily in the foreground

Vegetation Communities: Past, Present, and Future

The communities we encountered within 3AS were quite different than those described by Loveless in 1959—some had disappeared completely. Instead of being dominated by beakrush and maidencane, the wet prairies in our study area were characterized by spikerush and egyptian paspalidum, which can be considered deeper water species. The three sawgrass communities that Loveless observed are not as evident now, with the woody species he mentions within them, wax myrtle and dahoon holly, being completely absent from our study sites.

Significance

This research provides a technique to explore subtle changes in community states and link them to hydrologic data.

The communities and correlating hydrologic gradients described in this analysis could be used in future management decisions for 3AS.

We also provide a snapshot of vegetation communities of a remnant of the Everglades in present-day conditions. It is important to have a solid foundation of where restoration will begin to better understand where we are going.

Figure 6: Early morning on a transect in the Everglades

Additional Information

Zweig, C. L. and W. M. Kitchens. 2008. Effects of landscape gradients on wetland vegetation communities: Information for large-scale restoration. Wetlands 28: 1086-1096.

Loveless, C. M. 1959. A study of the vegetation of the Florida Everglades. Ecology 40:1-9.

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