RESTORING WETLAND FORM AND FUNCTION TO EVERGLADES BORROW PITS[1]

by

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Abstract. Miami Oolitic limestone is the only significant construction material in south Florida. Limestone was mined in Everglades National Park and used as subgrade in road construction, pads for permanent buildings, and berms and above ground bunkers at a Nike Missile Base site constructed followed the Cuban Missile Crisis. Deep lakes and borrow pits are not part of the natural landscape of the Everglades. The deep borrow pits are biologically unproductive and functionally impaired. Biological form and function are lost when deep lakes replace wet prairie and shallow marsh habitats. As part of an ongoing wetland restoration program in Everglades National Park, borrow pits in the Long Pine Key District of the Park are being restored to shallow marsh habitat using artificially created substrate. This poster paper describes the planning, engineering, construction, and environmental monitoring (wetland form and function) of a restored borrow pit in Everglades National Park.

Additional Key Words: mitigation banking, invasive exotic species, disturbance, abandoned agricultural land, succession.

Background

Everglades National Park (ENP) encompasses 608,000 ha and is the only subtropical wilderness in the continental United States. The principal ecosystem types within the Park include shallow marine habitats, saltwater wetland forests and marshes, freshwater marshes and prairies, and an upland complex of pine and hardwood forest communities. One of the major factors controlling the distribution of vegetation within the Everglades is the hydrological pattern as defined by the depth, timing, and duration of inundation, as well as the quality and salinity of the source water. Additionally, surficial geology and overlying soil types also influence plant species composition and abundance. Natural disturbances (fire, hurricanes) and anthropogenic perturbation (altered fire regimes, drainage, development, invasive exotic plants) also have powerful effects on vegetation patterns.

The invasion of exotic plant species is threatening ecosystem form and function in many natural areas throughout the United States including National Parks. The invasion of these exotic species result in changes in plant communities, from natural systems and processes to altered systems and processes. Exotic plant species can be thought of as those plants that did not originally occur in the ecosystem, and have since been introduced to the area as a result of natural and human disturbances. Exotic species are so well adapted to and opportunistic on disturbed sites that they are able to out-compete native species. The National Park Services (NPS) defines exotic plant species as those that occur in a given place as a result of direct or indirect, deliberate, or accidental actions by humans. Within ENP, at least 217 introduced plant species are known to occur. This accounts for about 25% of the total number of plant species in the Park.

A major site of exotic plant invasion within ENP is an area of former freshwater prairie and upland pine and hardwood forest known as the Hole-in-the Donut (HID). This area of about 4,050 ha of abandoned farmland has within it an area of about 2,430 ha dominated by a stand of a single exotic woody species, Brazilian pepper (*Schinus terebinthifolius*).

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Disposal of Scrape-Down Material

Implement current permit with temporary stockpile of substrate on-site: Substrate and organic materials will be temporarily stockpiled in the HID throughout the construction phase of the project, estimated completion 2010. The stockpiling of substrate and organic materials is currently permitted in the Department of the Army Environmental Assessment and Statement of Findings for Permit No. 199301691. During the construction of the first temporary stockpile on-site 1996-1998, a supplemental Environmental Assessment (EA) was conducted to assess the opportunities for developing other disposal alternatives for HID substrate and organic material. This supplemental EA addressed alternative disposal method, location, size, height, configuration, sloping, and revegetation preferences. The supplemental EA also addressed the use of Park borrow pits as disposal sites and considered any wilderness or cultural values of possible on-site borrow pit disposal areas. The temporary stockpiles will be kept free of exotics through periodic maintenance (mowing). The four alternatives considered during the supplemental EA process completed in September 1998 were:

Alternative A: On-site disposal: The NPS would dispose of all HID substrate (soil and plant material) scraped from the site within the Park in or near the HID to help re-establish indigenous wetland and upland communities and to help eliminate *Schinus*. The substrate would be stockpiled to create vegetated upland mounds or used to reclaim borrow pits. No substrate would be disposed of outside the Park. The disposal work would be completed in less than 20 years. Alternative A was specifically designed to achieve the following results: 1) maximize the area in the HID reclaimed to near natural conditions without disposing substrate outside the park; 2) minimize substrate hauling impacts and costs; and 3) minimize the impacts of on-site disposal.

Alternative B: Off-site disposal: The project goal remains the same as originally proposed, to restore about 2,530 ha of wetlands within the HID area of ENP by removing exotic vegetation and excavating an average of 15 cm of soil to limestone base. Disposal of the scrape-down material would occur off-site at locations able to accept thousands of cubic meters of material. The advantage of alternative B is that it would maximize the area in the HID reclaimed to near-natural conditions by disposing of all HID material outside the Park. The disposal work would be completed in 20 to 30 years at the highest cost of any of the alternatives.

Alternative C: Combination of on-site and off-site disposal: The basic project goal remains the same as originally proposed, to restore about 2,530 ha of wetlands within the HID area of ENP by removing exotic vegetation and excavating an average of 15 cm of soil to the limestone base. This disposal option is possible combination of part on-site and part off-site disposal. Material would be disposed off-site only if non-NPS entities funded all associated planning, hauling, disposal, and road repair costs. Like alternative A, some substrate would be stockpiled to create upland mounds and reclaimed or used to reclaim borrow pits. The disposal work would be completed in less than 20 years. The advantages of alternative C are: 1) maximize the area in the HID reclaimed to near-natural conditions by disposing as much HID material outside the Park without using Freshwater Wetland Mitigation Trust Funds or NPS funds; 2) minimize substrate hauling impacts and costs; and 3) minimize impacts of on-site disposal.

Alternative D: No Action: The no-action alternative would involve continuing existing conditions and trends. The no-action plan would be the "temporary" on-site disposal of excavated substrate using existing substrate disposal methods, locations and existing mound design and maintenance methods.

Significant Findings to Date

Construction

- 1996 - 1997 80 ha restored
- 1997 - 1998 113 ha restored
- 1998 - 1999 55 ha restored
- 1999 - 2000 98 ha restored
- 346 ha restored
- 2000 - 2001 142 ha to be restored
- 488 ha restored by June 2001 - 19% of the HID

Environmental Monitoring

- Filling deep borrow pits in ENP restores Everglades shallow marsh habitat form.
- An estimate of species richness was higher in natural vegetation (130 species) than on the restored sites. However, the restored sites reach approximately 80% of the species richness observed in natural vegetation within 15 months.
- Between 61% and 73% of the plant species and total vegetation cover on the restored sites were wetland-associated species. By comparison, 66% of the species in adjacent natural vegetation and 27% of the species in unmitigated *Schinus* were wetland-associated species.