

Appendix 5-5: Avian Protection Plan for Black-Necked Stilts and Burrowing Owls in the Everglades Agricultural Area Stormwater Treatment Areas

Pandion Systems, Inc. (Final Draft, April 2007)

FINAL DRAFT

Avian Protection Plan

For Black-necked Stilts and Burrowing Owls Nesting in the Everglades Agricultural Area Stormwater Treatment Areas

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Final Draft
April 6, 2007

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ACRONYMS AND ABBREVIATIONS

BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practice
C&SF Project	Central and Southern Florida Flood Control Project
CERP	Comprehensive Everglades Restoration Plan
Corps	US Army Corps of Engineers
District	South Florida Water Management District
EAA	Everglades Agricultural Area
EAV	Emergent aquatic vegetation
ECP	Everglades Construction Project
EFA	Everglades Forever Act
ESA	Endangered Species Act
FAC	Florida Administrative Code
F.S.	Florida Statutes
FFWCC	Florida Fish and Wildlife Conservation Commission
GIS	Geographic Information Systems
MBTA	Migratory Bird Treaty Act
MFLs	Minimum Flows and Levels
P	phosphorus
PSTA	Periphyton-Based Stormwater Treatment Area
Refuge	Arthur R. Marshall Loxahatchee National Wildlife Refuge
RWMA	Rotenberger Wildlife Management Area
SAV	submersed aquatic vegetation
Service	US Fish and Wildlife Service
SFER	South Florida Environmental Report
SFWMD	South Florida Water Management District
STA	Stormwater Treatment Area
TP	total phosphorus
U.S.	United States
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WCA	Water Conservation Area
WMA	Wildlife Management Area

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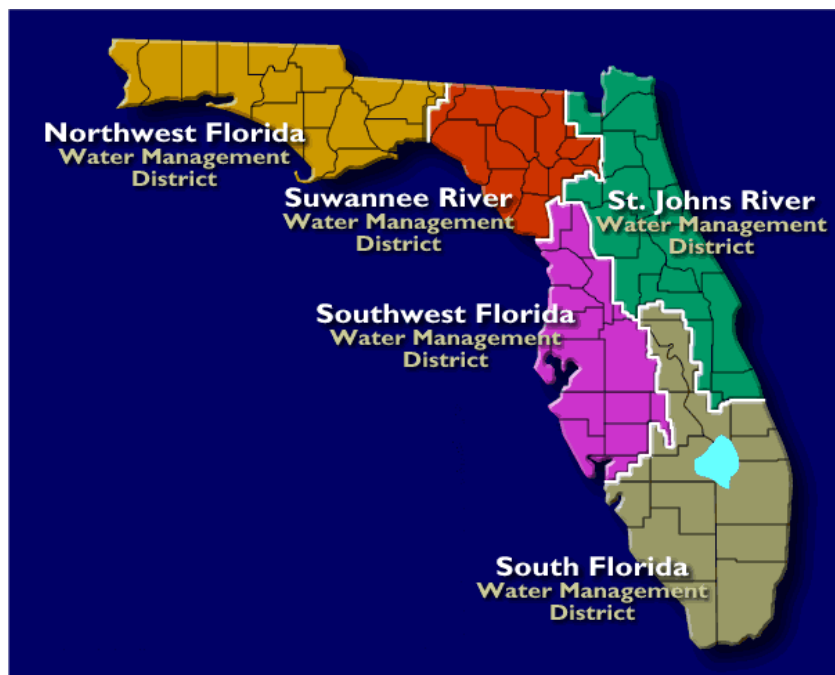
1. INTRODUCTION

1.1. About the South Florida Water Management District

South Florida's subtropical extremes of hurricanes, flood and drought, combined with rapid population growth in the region, led the United States Congress in 1948 to adopt legislation creating the Central and Southern Florida Flood Control Project (C&SF Project). The C&SF Project authorized the U.S. Army Corps of Engineers (USACE) to construct the pump stations, canals, levees, impoundments and numerous water control structures that comprise south Florida's flood control system.

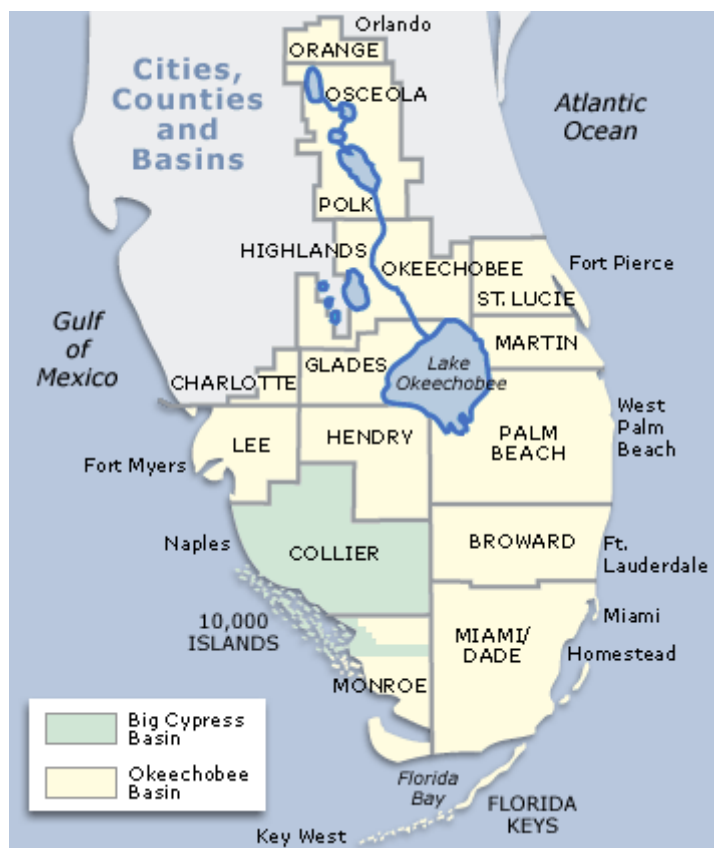
In 1949, the Florida Legislature created the Central and Southern Florida Flood Control District, the predecessor to the South Florida Water Management District (District), to assist the USACE in managing the C&SF Project. In 1972, with the adoption of the Florida Water Resources Act, Chapter 373, Florida Statutes, the state created the existing five Water Management Districts, each with broad responsibilities for regional water resource management. Each district's boundaries track the hydrologic boundaries of the five primary watersheds within the state: the Northwest Florida, the Suwannee River, the St. Johns River, the Southwest Florida and the South Florida Water Management District (Figure 1-1).

Figure 1-1. Water Management Districts.



The District's boundaries include 16 counties that encompass 17,930 square miles and extend from the headwaters of the Kissimmee River near Orlando in central Florida south to Lake Okeechobee and from Fort Myers east to Fort Pierce and south through the Everglades to Florida Bay and the Keys (Figure 1-2).

Figure 1-2. Boundary of the South Florida Water Management District.



The District's mission is to manage and protect water resources of the region by balancing and improving water quality, flood control, natural systems and water supply. In simple terms, if the District does not operate the pumps located south of Lake Okeechobee during the dry season, thereby sending water south along the Miami and North New River Canals, potable water wells in the lower east coast could go dry. If it does not turn on other pumps during the wet season, there will be flooding in western Dade, Broward and Palm Beach Counties. For the most part, the decision of when or when not to pump is often governed by operation, or "regulation", schedules developed by the USACE. Today, the District operates and maintains approximately 1,800 miles of canals and levees, 25 major pump stations and more than 2,000 other water control structures of various sizes.

1.2. About Stormwater Treatment Areas

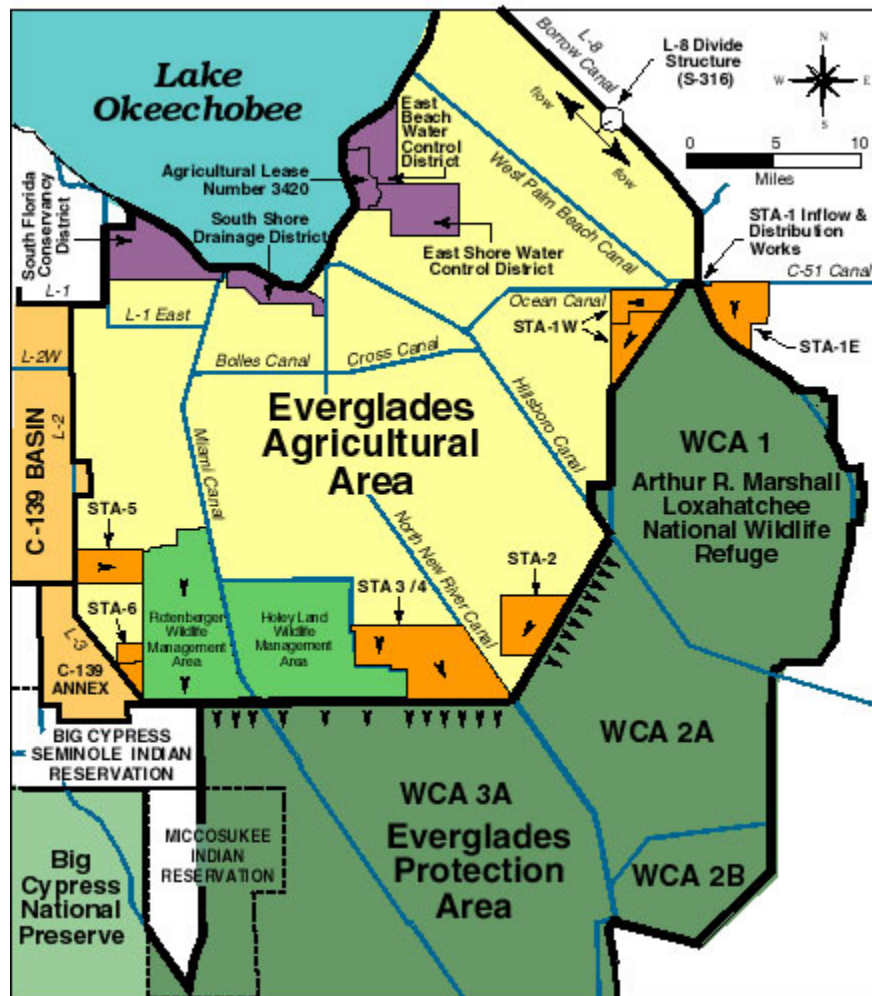
In accordance with the Everglades Forever Act (EFA) (Section 373.4592, Florida Statutes), waters entering the Everglades must meet the State's phosphorus (P) water quality standard. As provided in Rule 62-302.540, Florida Administrative Code, this means that P concentrations in inflows must either meet Florida's P criterion of 10 parts per billion (ppb¹) measured as a long-term geometric mean or, if that is not feasible, must be as low as is achievable by use of the best available P reduction technology. Because the stormwater runoff that the District pumps into the

¹ One ppb is equivalent to a concentration of 1 µg/L.

Everglades in order to provide flood control and water supply contains elevated levels of P, this water must be treated.

The District treats stormwater runoff before it enters the Everglades by passing it through more than 40,000 acres of constructed wetlands, known as Stormwater Treatment Areas (STAs). An additional 18,000 acres of STAs are under construction. STAs are large, shallow earthen impoundments (some as large as 17,000 acres), each of which is divided by interior levees into a number of separate treatment cells (Cells) that contain emergent or submerged aquatic vegetation (EAV or SAV) communities. Phosphorus in inflows is removed by natural wetland processes and subsequent sediment accretion as the water flows through the STAs. The six existing STAs (STA-1E, STA-1W, STA-2, STA-3/4, STA-5 and STA-6) are generally located on the southern and eastern boundaries of the Everglades Agricultural Area (EAA) with the Water Conservation Areas (WCAs) (Figure 1-3). To date, the STAs, in conjunction with agricultural Best Management Practices, have reduced P loads in waters leaving the EAA and entering the Everglades by an average of 80%.

Figure 1-3. Location of the District's Stormwater Treatment Areas in the Everglades Agricultural Area.



1.3. Description and Purpose of Avian Protection Plan

As a program, the concept of Avian Protection Plans (APP) was originally developed jointly by the U.S. Fish and Wildlife Service (Service) and the electric utility industry to meet public needs for a safe and affordable source of electricity while simultaneously minimizing the adverse impacts to bird populations caused by high voltage power transmission lines. According to the APP Guidelines (APLIC and USFWS 2005), an entity that implements an APP will reduce avian risk as well as its own risk of enforcement under the Migratory Bird Treaty Act (MBTA). The APP guidelines state:

While the Service generally does not authorize incidental take under these Acts (referring to MBTA and other wildlife acts), USFWS [Service] realizes that some birds may be killed even if all reasonable measures to avoid the take are implemented. USFWS Office of Law Enforcement carries out its mission to protect migratory birds through investigations and enforcement, as well as by fostering relationships with individuals, companies and industries that seek to minimize their impacts on migratory birds. Unless the take is authorized, it is not possible to absolve individuals, companies or agencies from liability even if they implement avian mortality avoidance or similar conservation measures. However, the Office of Law Enforcement focuses on those individuals, companies, or agencies that take migratory birds with disregard for their actions and the law, especially when conservation measures have been developed but are not properly implemented (APLIC and USFWS 2005).

1.4. Applicable Wildlife Protection Policies and Permits

1.4.1. Federal Laws

Three Federal laws protect birds in the STAs: the Endangered Species Act (ESA), the Bald and Golden Eagle Protection Act (BGEPA) and the MBTA. USFWS Biological Opinions (e.g., J. Slack, USFWS letter, Service Log No. 4-1-05-1128 dated August 16, 2005 to Col. R. Carpenter USACE) on the construction, operation and maintenance of the STAs concluded no adverse effects on Bald Eagles (*Haliaeetus leucocephalus*), Everglades Snail Kites (*Rostrhamus sociabilis plumbeus*), or other endangered species. Because of these Biological Opinions, the ESA and BGEPA are not directly relevant to this APP. Since some migratory bird species may be affected by the STAs, the MBTA protections are relevant to this APP.

1.4.2. Florida Statutes and Regulations

The Florida Endangered and Threatened Species Act, Section 372.0725 Florida Statutes and Florida Administrative Code 68A-4.001 broadly protect all native wildlife. The Florida Burrowing Owl (*Athene cunicularia floridana*) is listed by the Florida Fish and Wildlife Conservation Commission (FFWCC) as a Species of Special Concern.

1.4.3. Avian Related Permits Held by the District

The management of *inactive* migratory bird nests, including Burrowing Owl nests, is permitted through the Migratory Bird Nest Removal Permit process implemented by the FFWCC, as per Chapter 68A of the Florida Administrative Code. The District obtained permits from the FFWCC to remove inactive nests during the construction of STA-1E (Appendix 1).

1.5. Issue of Black-necked Stilts and Burrowing Owls in the STAs

Some STAs have been used as nesting habitat by two species of ground nesting birds: Black-necked Stilts (*Himantopus mexicanus*) and the Burrowing Owl. The presence of nesting birds has impeded both construction activities and STA operations. The District responded to these situations by consulting with the Service and FFWCC on a case-by-case basis. This APP is intended to provide the District with guidelines for dealing with all future STA-Black-necked Stilt and Burrowing Owl nesting interactions.

1.5.1. Black-necked Stilts in the STAs

Black-necked Stilts, with their shiny black back and wings, contrasting white breast and belly and bright, inordinately long, red legs, are one of our most spectacular shorebirds. Black-necked Stilts are in the genus *Himantopus* of the order Charadriiformes (the shorebirds). Members of this genus are found worldwide; in the Western Hemisphere, Black-necked Stilts occur from western and southern North America through Central America and the West Indies to southern South America. The Black-necked Stilt is semi-colonial and territorial (Robinson et al. 1999).

Black-necked Stilts nest in wetlands on emergent vegetation and in flooded lowlands or permanently flooded pastures, mud flats, dikes, or islands. Occasionally nests are constructed on algal mats. Nests may be in the open, but are usually surrounded by a vegetative cover (Robinson et al. 1999). Stilts may also site their nests along the edge of impoundments and will occasionally nest on the emergent remains of dead cattails. The nest site is often slightly elevated (2–10 cm) from the surrounding substrate. Some Black-necked Stilts in the STAs have nested on top of low-lying live vegetation and limestone pads. The nest is a scrape that may be lined with stones, shells or bits of charred wood. Nests are usually built over water but for nests not built over water, distances to water average 12.2 meters (range 0 to 91.4 m) (Robinson et al. 1999).

Nest initiation is seasonally discrete, but opportunistic – nesting often proceeds in response to favorable changes in local conditions (water levels, vegetative cover). Nesting territories may be aggregated in suitable habitat lending to some degree of colonial nesting, although it is uncertain whether this is behavioral (joint participation in predator defense) or because of availability of suitable habitat. Because of nest territoriality, nests of Black-necked Stilts are more regularly distributed and less clumped than nests of other members of this family (Robinson et al. 1999).

The breeding season in Florida can last for more than 3 months. Egg laying dates in Florida have been reported as early as 14 April until 26 June (Stevenson and Anderson 1994). The incubation period is around 21 to 30 days. Young can walk within one day after hatching. Fledgling begins 22 to 31 days from hatching and post-fledging 27 -31 days (Robinson et al. 1999).

Clutch size is usually four eggs. Stilts usually raise only one brood a year, though they will re-nest if the clutch is lost. Both sexes take turns incubating day or night. Male and female usually alternate throughout the day; incubation bouts become shorter as shaded ambient temperature increases. In hot environments, incubation behaviors serve to cool eggs rather than to warm them. Parents soak belly-feathers in water before sitting on the nest to facilitate evaporative cooling and to maintain nest humidity. Because of belly soaking, eggs often become encrusted with mud.

Black-necked Stilt chicks are precocial, leaving the nest soon after hatching (usually within 24 hours). They can fly short distances within 1 to 24 hours of hatching (Robinson et al. 1999) and are capable of full flight in 28 to 32 days. If the nest is on an island, the parents will encourage chicks to swim to shore. Chicks swim with difficulty and are exposed to the possibility of predation from a wide array of potential predators in Florida.

Broods tend to use areas of shallow water with vegetation that is shorter than the adults are, but taller than the chicks, with interspersed openings that permit free access for the chicks. Families remain together as discrete units for a few weeks to several months after the chicks have fledged, but pair members often do not remain together after the breeding season. Individuals may or may not mate with the same bird in subsequent years. Preliminary observations from banding studies suggest that there is little between-year nest site fidelity; in some cases, distances of hundreds of kilometers have been recorded between breeding sites (Robinson et al. 1999).

Construction of the STAs has had the ancillary benefit of providing habitat for wetland dependent species (see Section 2). Ordinarily, water levels in the STAs are maintained at depths that would preclude birds from establishing nests, which would affect operations. However, during droughts or enhancement activities, bottom sediments can be exposed and provide breeding habitat. Flooding these areas during storm events when water must be treated in the STAs can cause some flooding of nests, eggs or young birds.

Black-necked Stilts were first observed nesting on an exposed berm within Cell 5B of STA-1W in 2004. Stilts nested again in portions of Cells 2 and 5B of STA-1W that dried out in 2005. Nesting birds subsequently precluded the District from operating Cell 5. District staff worked with the Service and the following actions were initiated:

- The height of the berm in Cell 5B was lowered to eliminate exposed material that could be used as nesting substrate in following years
- Signs were posted in the areas of concern to increase awareness of bird presence
- Surveys were conducted to locate all nests

Black-necked Stilt nests also were found on the levee roads in STA-5 during 2005, but not within the Cells and did not impact STA operations. A more comprehensive survey of Black-necked Stilt nesting in the STAs was undertaken in 2006; four STAs (STA-1E, STA-1W, STA-3/4 and STA-5) were found to have nests (Table 1-1).

Increased nesting of Black-necked Stilts in 2006 occurred during a drought that resulted in low water levels and exposed bottom sediments in the STAs, which increased available nesting habitat. In all but three cases, the District was able to manage water levels and prevent flooding of nests. However, the necessity to treat stormwater and operate the STAs did affect some nests in STA-1E, STA-1W and STA-3/4. Only a small number of the 362 total nests recorded in 2006 (Table 1-1) were inundated: 2 active nests in STA-1E, 5 active nests in STA-1W and 3 active nests in STA-3/4.

Table 1-1. Summary of Black-necked Stilt Nesting in the STAs during 2006.

STA	Cell	No. of Nests	
		Active	Inactive
1E	4N	51	29
	4S	44	16
	6	32	14
1W	5	5	0
	2A	2	0
	2B	2	0
	4	30	10
3/4	3B	3	2
5	1B	87	35

Source: Pietro et al. (2006)

1.5.2. Burrowing Owls in the STAs

Burrowing Owls are in the order Strigiformes (the true owls) and are unique among the North American owls in that they are active both during the day and night, are colonial and nest in underground burrows. Burrowing owls occur primarily in the Great Plains and western United States; however, a subspecies occurs in Florida (*Athene cunicularia floridana*) that is geographically separated from the core population. The Florida Burrowing Owl occurs locally in suitable habitat throughout the peninsula (Haug et al. 1993).

Burrowing Owls commonly inhabit sandy, well-drained, open, short grass areas. They have also adapted to human habitation and can be found on golf courses, cemeteries, airports and vacant lots. Typically, Burrowing Owl nests in Florida are concentrated in residential and industrial areas at elevated nests sites. Nests are in underground burrows, which adults excavate with their bills and feet. Burrows are typically 1-3 m deep and may be used year round for both breeding and roosting.

Burrowing Owls only lay one clutch of eggs per season although this species will reneest if a nest fails. In Florida, 95% of egg laying occurs from February through late May (peak = mid-Mar), but can occur as early as October. Egg laying dates in Florida are 3 March to 20 May. Incubation lasts 28-30 days. Young are altricial and normally fledge 44 days after hatching. During the nestling stage, males forage for food, while the females brood and feed the young. Florida Burrowing Owls feed on a variety of prey including arthropods, small mammals, birds and herpetofauna. They commonly forage in fields of short grass or mowed pastures; airports and golf courses are also commonly used (Haug et al. 1993).

Florida Burrowing Owls are a species of special concern in the state. The estimated population is between 3,000 and 10,000 adults (Millsap and Bear 1990). Population declines have been noted in Florida since the beginning of the North American Breeding Bird Survey in 1966. Sauer et al. (2005) noted that Burrowing Owls declined at a rate of 6.7% per year from 1966 to 2005. Declines in Burrowing Owl populations have been even more dramatic in recent years

with a decline of 9.5% per year from 1995-2005. They are vulnerable to nest inundation by high rainfall amounts, which results in many nest failures for this species (Millsap and Bear 1988).

Issues with Burrowing Owls first arose in 2004 when 12 active nests were found during the construction of Cell 2 in STA-1E. All burrows were staked-off, marked with a 50-foot perimeter and inspected daily at dawn and dusk for bird activity. Surveys of the Cell were conducted to locate any new nests. No part of Cell 2 was flooded during the breeding season. Construction activities were suspended near the nests until the young had fledged and left the vicinity. The FFWCC issued permits to the District to remove inactive nests after the breeding season had ended (see Appendix 1).

2. BENEFITS OF STORMWATER TREATMENT AREAS

The primary function of the STAs is reducing P loads and concentrations entering the Everglades. STAs are contributing to the restoration of the Everglades by improving water quality. The STAs also have provided a substantial measure of ecological lift; they have benefited wildlife by creating more than 40,000 acres of high-quality habitat, from lands that were previously in active farming, for wetland dependent species (e.g., Black-necked Stilts and Burrowing Owls) even though restoration of wetlands within the EAA was not a design objective for these facilities. However, it must be emphasized that habitat creation and the incidental wildlife benefits derived from the STAs do not take precedence over the other elements of the District's mission, notably the obligation to provide flood control and water quality protection to the region.

The STAs have attracted a high abundance and diversity of birds. Chimney and Gawlik (2007) documented 140 bird species representing 39 families in two STAs (STA-1W and 5). These STAs had 20 of the 21 families identified as common in North America treatment wetlands. Fifteen species of wading birds (Ciconiiformes), 32 species of shorebirds (Charadriiformes), 7 species of gallinules and coots (Gruiformes) and 16 species of ducks (Anseriformes) were numerically abundant, as were on occasion 39 species of perching birds (Passeriformes). Sixteen species attracted to these two STAs are State and/or Federally protected. Seventy-two species are classified as residents and are known to breed in south Florida. The STAs are used by great numbers of migratory birds during the spring and fall (Chimney and Gawlik 2007).

The ecological benefit provided by STAs is an important factor to be considered when designing appropriate avian protection protocols concerning operation of the STAs. The concept of "self-mitigation" is well established in the context of environmental restoration and has been recognized by the Service as an important feature of other restoration projects.² Here, the STAs are by their very nature self-mitigating: enormous tracts of wetlands have been created providing direct benefits to migratory birds and other wildlife derived from this habitat. This ecological benefit militates in favor of regulatory discretion that acknowledge the District's need to operate the STAs for flood control and water supply purposes at times that may result in incidental bird take.

² Generally, self-mitigation occurs when a project's environmental benefits outweigh and compensate for any adverse consequences of the project.

3. STORMWATER TREATMENT AREAS

3.1. Construction, Operation, Maintenance and Enhancement of STAs

3.1.1. Construction of STAs

STA construction activities involve the building of levees, canals and water control structures along with the associated earthwork (e.g., surface contouring, disking, stripping of topsoil, management of borrow material, etc.) and dewatering activities needed to facilitate construction.

3.1.2. Operation of STAs

For the purposes of this APP, there are three operating conditions in the STAs:

- Start-up Operations
- Normal and Extreme Flow Operations
- Drought Condition Operations

Operation of the STAs is governed by the following principles:

- Ensure that inflows (water volume and total phosphorus (TP) load) are within the STA design criteria and are evenly distributed among the flow-ways in each STA
- Avoid dryout of the STAs by maintaining a minimum water depth of 0.5 ft
- Avoid maintaining the STAs too deep for too long by limiting maximum depth to 4 ft for no longer than 3 days
- Maintain a target depth of approximately 1.25 ft in all Cells between storm events
- Monitor conditions in the STAs through frequent field observations by site managers

The following sections are general descriptions of these operating conditions applicable to all the STAs. Each STA has its own specific operational guidelines (see latest version of the appropriate STA Operation Plan).

Start-up Operations

Start-up operations apply to newly constructed STAs and involve regulating water levels within the Cells to encourage the establishment of aquatic vegetation and prevent discharge of water until prescribed water quality conditions are met. To facilitate the growth of cattail and other species of EAV, a shallow water depth (approximately 0.5 ft) is maintained during plant grow-in. To establish SAV, the target water depth is kept deeper (1.5 to 3 ft). During start-up, all Cell outflow structures are kept fully closed and inflow structures are operated to achieve target water depths. Upon reaching a water depth of approximately 1 ft above average ground elevation in EAV Cells and a depth of approximately 3 ft above average ground elevation in SAV Cells, a Start-up Water Quality sampling program is initiated in the STA.

Normal and Extreme Flow Operations

Normal Operations are defined as operation of an STA for flows up to and including the Design Peak Flow Condition. Design Peak Flow Conditions vary with each STA (see specific STA Operation Plans). Under normal operating conditions, the water depth within each Cell is maintained between the Minimum Operational Depth of 0.5 ft above average ground elevation and a Maximum Operational Depth above average ground elevation. Each STA has defined stages corresponding to these depths. When a storm event occurs and the STAs begin to receive runoff,

water depth in the Cells will rise. How much water depth increases is a function of the amount of rainfall in the upstream watershed and STA operations, including the volume of pumping before and during the event. Once the storm has passed, water depths are lowered and the Cells returned to normal depth conditions.

Extreme Flow Operations occur during very large storms (i.e., the Standard Project Storm and the Probable Maximum Storm). The STAs are designed to accommodate large inflows, however during extreme precipitation events, inflow structures are generally closed and all outflow structures are generally fully open.

Drought Condition Operations

During Drought Condition Operations, the District, to the greatest extent practicable, attempts to maintain water depth in the STAs at an average of 0.5 ft above average ground elevation between storm events. In general, when the water depth in any Cell falls below this minimum target level, the outflow water control structures are fully closed to retain the remaining water within the Cell and supplemental water may be sent to the STA if it is available in the watershed. However, during severe Drought Conditions, supplemental water sources may not be available and water depth will drop below the minimum target level in some or all Cells. Operational requirements for these conditions are further specified in each STA Operation Plan.

After a prolonged drought and subsequent dryout of Cells, the potential exists for the release of P during the first flush of water from the STAs after flow-through operations resume. To avoid a large release of P, it is advantageous to retain as much of the first-flush water as possible. The length of time required to allow P levels to moderate will vary depending on the length of dryout, the type of soils, the condition of the plant community and time of year. This scenario may require diversion of flow around the STA dependent on rainfall levels and time required for P stabilization. Internal P concentrations are monitored during these times and a determination made whether unabated flow-through or temporary retention of post-dryout flows will contribute the least amount of P downstream.

3.1.3. Maintenance of STAs

Routine maintenance of the STAs is required to keep the facilities in working order to avert damage to structures, maintain upstream flood protection and ensure continued functionality and efficiency of the water conveyance and treatment systems. During non-routine maintenance, individual Cells may be temporarily taken off-line and/or water levels within Cells adjusted for short periods to minimize impacts to STA operation and facilitate completion of maintenance activities. Specific maintenance activities include:

- Water Control Structure Maintenance
- Levee and Canal Maintenance
- Vegetation Management

Water Control Structure Maintenance – In order to ensure operational readiness, pump stations are required to operate 2 to 4 hours per month to maintain the pumps' mechanical integrity. The District also services pump stations routinely to ensure that pumps are in good working order and not leaking contaminants into downstream waters. The District maintains other STA water con-

trol structures to ensure that culverts and risers are conveying prescribed water volumes and that gated weirs are functioning properly.

Levee and Canal Maintenance – The District maintains all levees to ensure continued structural integrity. Activities include inspections, grading and maintenance of cover vegetation through regular mowing and/or appropriate use of herbicides. Levees are inspected regularly in response to factors such as rapid changes in flow rates, high water stages, normal wear and tear, or any other factor that could cause levee destabilization. STA canals are maintained via periodic dredging as needed to restore water conveyance and water depth to design criteria.

Vegetation Management – The District controls invasive or exotic plant species both inside the STAs and along the project perimeter through periodic use of approved herbicides, biological controls, burning and manual, mechanical or physical controls. Vegetative management also includes physical removal of excess vegetation at inflow, outflow and interior locations to ensure adequate water conveyance. Exotic plant species that are controlled in the STAs include, but are not limited to, hydrilla, water hyacinth (*Eichhornia crassipes*), water lettuce (*Pistia stratiotes*), Brazilian pepper (*Schinus terebinthifolius*) and melaleuca (*Melaleuca quinquenervia*).

Vegetation in the Cells is managed to promote one of two plant community types:

- Emergent aquatic vegetation including cattail (*Typha* spp.), arrowhead (*Sagittaria* spp.), pickerelweed (*Pontederia cordata*) and other emergent marsh species, or
- Submersed aquatic vegetation including southern naiad (*Najas quadalupensis*), coontail (*Ceratophyllum demersum*), pondweed (*Potamogeton* spp.), hydrilla (*Hydrilla verticillata*) and other species.

A third general classification of vegetation important in the treatment process is periphyton, an assemblage of algae, bacteria and other microorganisms. Periphyton grows naturally throughout the STAs, most often in combination with SAV (Goforth 2005).

3.1.4. Enhancement of STAs

Enhancement activities have included replacing EAV with SAV, refurbishment or replacement of water control structures, levee restoration, excavation of flow-way cuts in berms and canals, earthwork on berms, construction of new interior levees and water control structures and expanding the size of STAs by adding new Cells. Enhancement activities for each STA are discussed in section 3.2.

3.2. Characteristics of Individual STAs

The following sections briefly describe each STA and note any unique operational, maintenance and enhancement activities.

3.2.1. STA-1E

Location

STA-1E is located in Palm Beach County immediately east of WCA-1 (Figure 1-3). STA-1E provides a total effective treatment area of 5,132 acres.

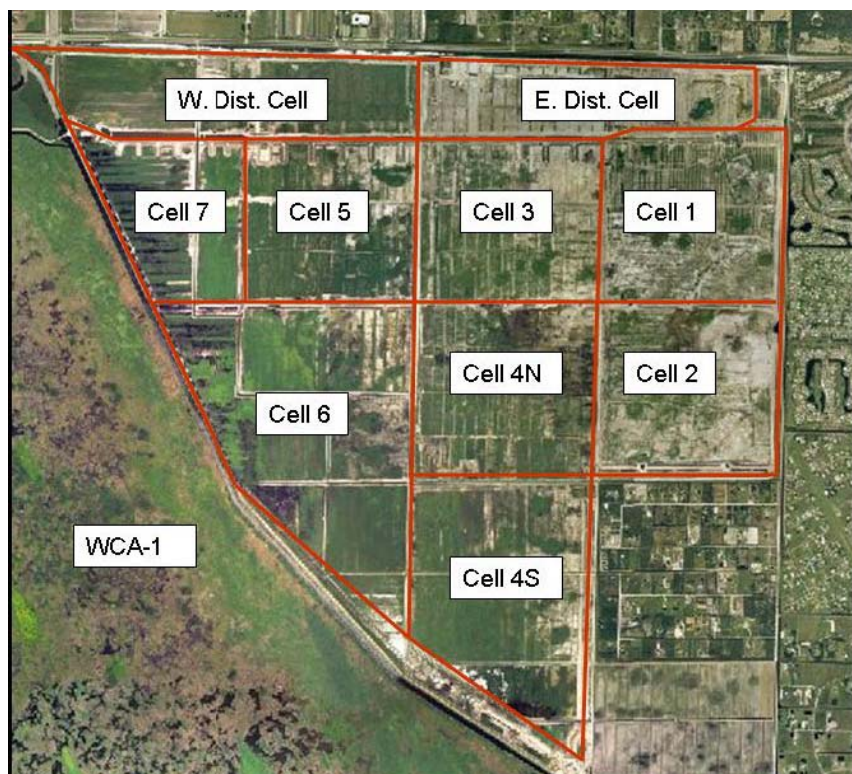
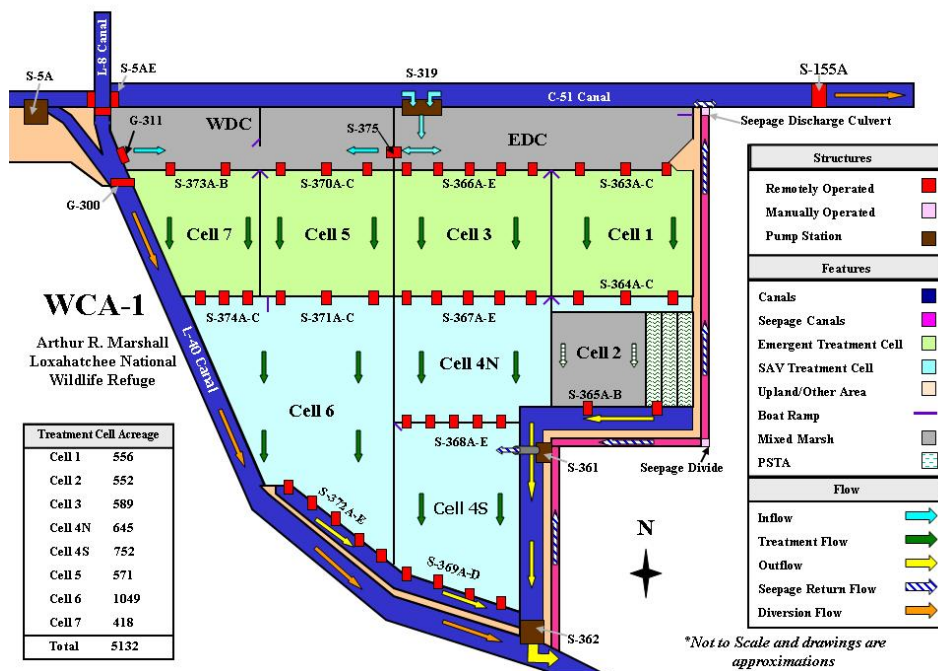
Operations

STA-1E receives inflow from the C-51 West basin through S-319 pump station and from the S-5A basin through the G-311 structure (Figure 3-1). Water deliveries through each structure vary depending upon hydrologic conditions in the basins (see STA-2 Operation Plan).

Enhancement Activities

Cells 2, 4N, 4S and 6 (Figure 3-1) were herbicided in 2005 to facilitate conversion of the cattail-dominated plant communities in these Cells to SAV. A Periphyton-dominated STA (PSTA) demonstration project is currently being constructed by the USACE in Cells 1 and 2.

Figure 3-1. Map and Aerial Photograph of STA-1E. Arrows indicate direction of flow.



3.2.2. STA-1W

Location

STA-1W and the STA-1 Inflow Basin are located in Palm Beach County immediately west of the WCA-1 (Figure 1-3). STA-1W provides a total effective treatment area of 6,670 acres.

Operations

Inflows are directed into STA-1W from the STA-1 inflow basin via the G-302 structure (Figure 3-2). Flow then moves into Cell 5A via the G-302 and G-304A–J structures and into Cells 1 through 4 via the G-303 structure (see STA-1W Operation Plan).

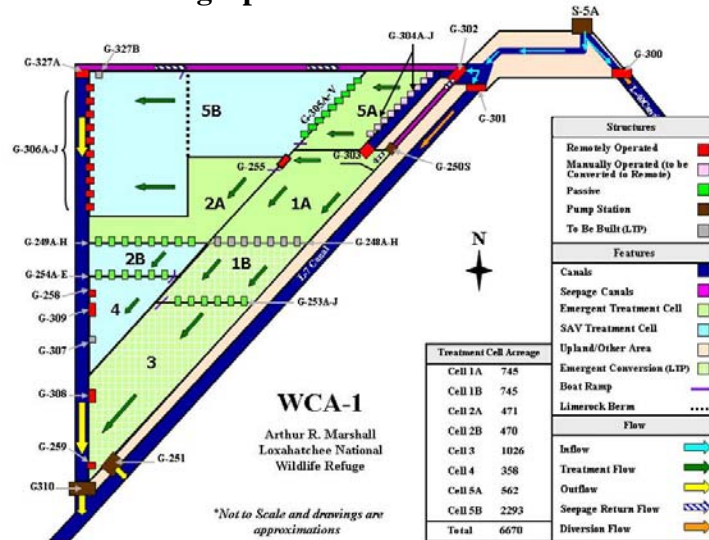
Enhancement Activities

Major enhancements underway in STA-1W include:

- Construction of a new internal levee and water control structures to divide Cell 1 into two Cells during the 2006-2007 dry season.
- Convert the plant community Cells 1B, 2B and 3 from EAV to SAV.
- Reestablish SAV in Cell 4.

Completion of all enhancement activities is expected by approximately June 2007 with vegetation grow-in and return of the Cells to full service by the following year.

Figure 3-2. Map and Aerial Photograph of STA-1W. Arrows indicate direction of flow.



3.2.3. STA-2

Location

STA-2 is located in Palm Beach County generally on and surrounding the former Brown's Farm Wildlife Management Area and is immediately west of WCA-2A (Figure 1-3). STA-2 provides a total effective treatment area of 8,331 acres.

Operations

Stormwater runoff from the Hillsboro Canal and Ocean Canal drainage basins enters STA-2 via the S-6 and G-328 pump stations and distributed by an inflow canal to the north end of Cells 1, 2 and 3 (Figure 3-3). Treated water is collected from the south end of the Cells and discharged to WCA-2A via the G-335 outflow pump station (see STA-2 Operation Plan).

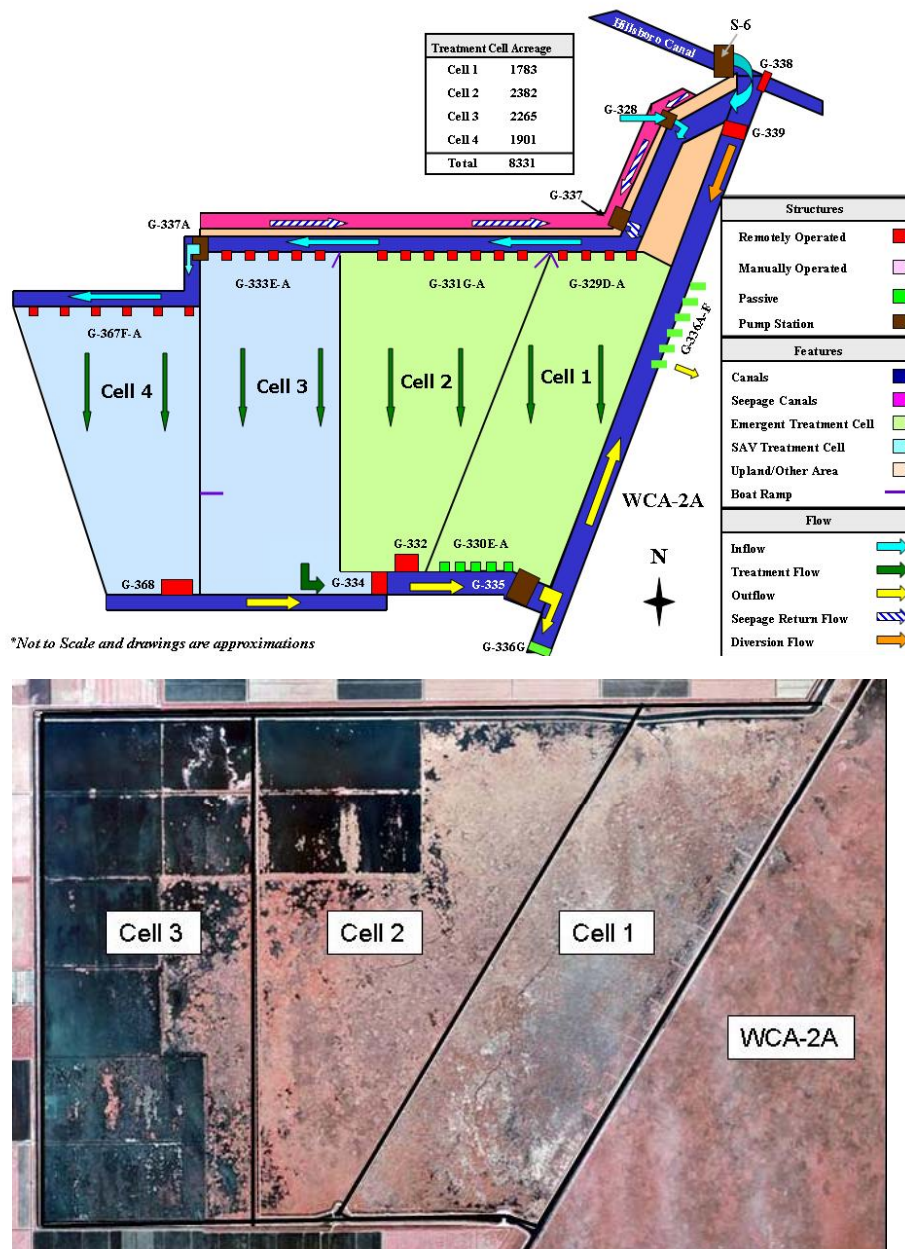
Routine Maintenance

Vegetation in STA-2 is managed through herbicide applications and control of water depth to promote EAV in Cells 1 and 2 and SAV in Cell 3.

Enhancement Activities

Enhancement activities include the addition of a new Cell (Cell 4) to STA-2, construction of interior levees and associated water control structures to subdivide Cells 1 and 2 and conversion of EAV to SAV in the new downstream Cells. The subdivision of Cells 1 and 2 is scheduled to occur in a phased approach following commencement of flow-through operation in Cell 4. Although much of Cell 3 is currently dominated by SAV, 500 acres of cattail marsh still exist. The Long-Term Plan specifies that this area of EAV be converted to SAV.

Figure 3-3. Map and Aerial Photograph of STA-2. Arrows indicate direction of flow.



3.2.4. STA-3/4

Location

STA-3/4 is located in Palm Beach County immediately east of the Holey Land Wildlife Management Area, north of WCA-3A and west of the North New River Canal (Figure 1-3). STA-3/4 provides a total effective treatment area of 16,543 acres.

Operations

STA-3/4 has three flow-ways: the Eastern Flow-way contains Cells 1A and 1B, the Central Flow-way contains Cells 2A and 2B and the Western Flow-way contains Cells 3A and 3B (Figure 3-4). Inflows are through the G-370 and G-372 pump stations and outflows are through the G-376, G-379 and G-381 structures. STA-3/4 uses the existing S-7 and S-8 facilities as outflow pump stations (see STA-3/4 Operation Plan).

Routine Maintenance

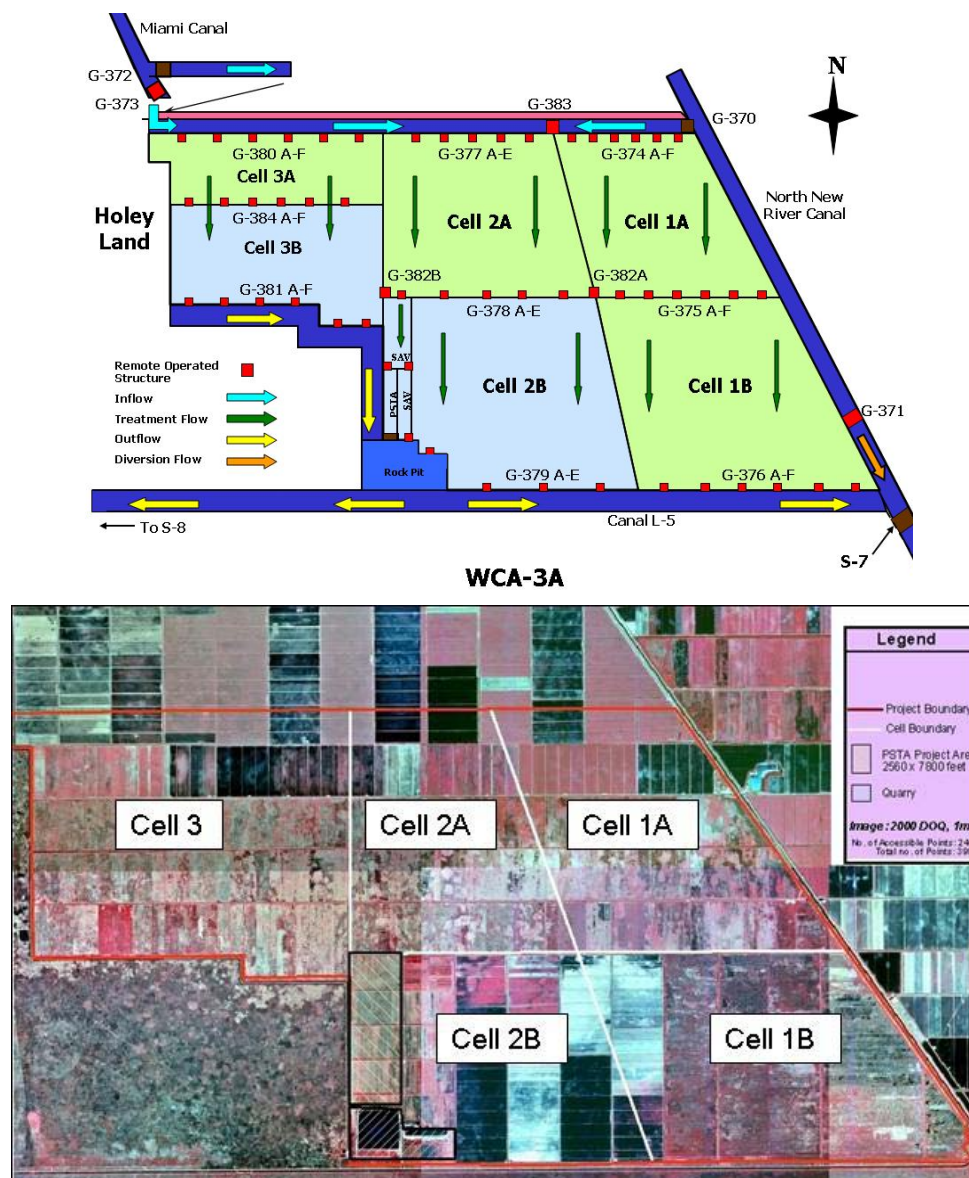
The upper Cells in STA-3/4 (Cells 1A, 2A and 3A) are managed to promote EAV. The lower Cells are currently being managed (Cell 2B) or will be managed within several years (Cells 1B and 3B) for SAV.

Enhancement Activities

Completed enhancements to STA-3/4 include:

- Construction of an internal levee and water control structures that subdivided Cell 3 into Cells 3A and 3B.
- Construction of small interior pump stations to move water from the upper Cells to lower Cells to hydrate SAV during drought conditions. Supplemental flow can be transferred from Cell 2A to Cell 1A through structure G-382A and between Cell 2A and Cell 3B through structure G-382B (Figure 3-4).
- Herbicide treatment of Cells 1B, 2B and 3B to remove EAV and promote SAV.
- Construction of a full-scale PSTA demonstration project in a 400-acre portion of Cell 2B.

Figure 3-4. Map and Aerial Photograph of STA-3/4. Arrows indicate direction of flow.



3.2.5. STA-5

Location

STA-5 is located in Hendry County immediately north of U.S. Sugar Corporation's Southern Division Ranch - Unit 2 and extends from the L-2 borrow canal on the west to the Rotenberger Wildlife Management Area (RWMA) on the east (Figure 1-3). STA-5 provides a total effective treatment area of 4,110 acres.

Operations

Stormwater runoff originating within the C-139 Basin enters STA-5 from the west and flows eastward through the north and south flow-ways (Figure 3-5). Treated water is discharged either to the RWMA or routed to the Miami Canal (Figure 1-3), where it eventually enters the north-west corner of WCA-3A (see STA-5 Operation Plan).

Routine Maintenance

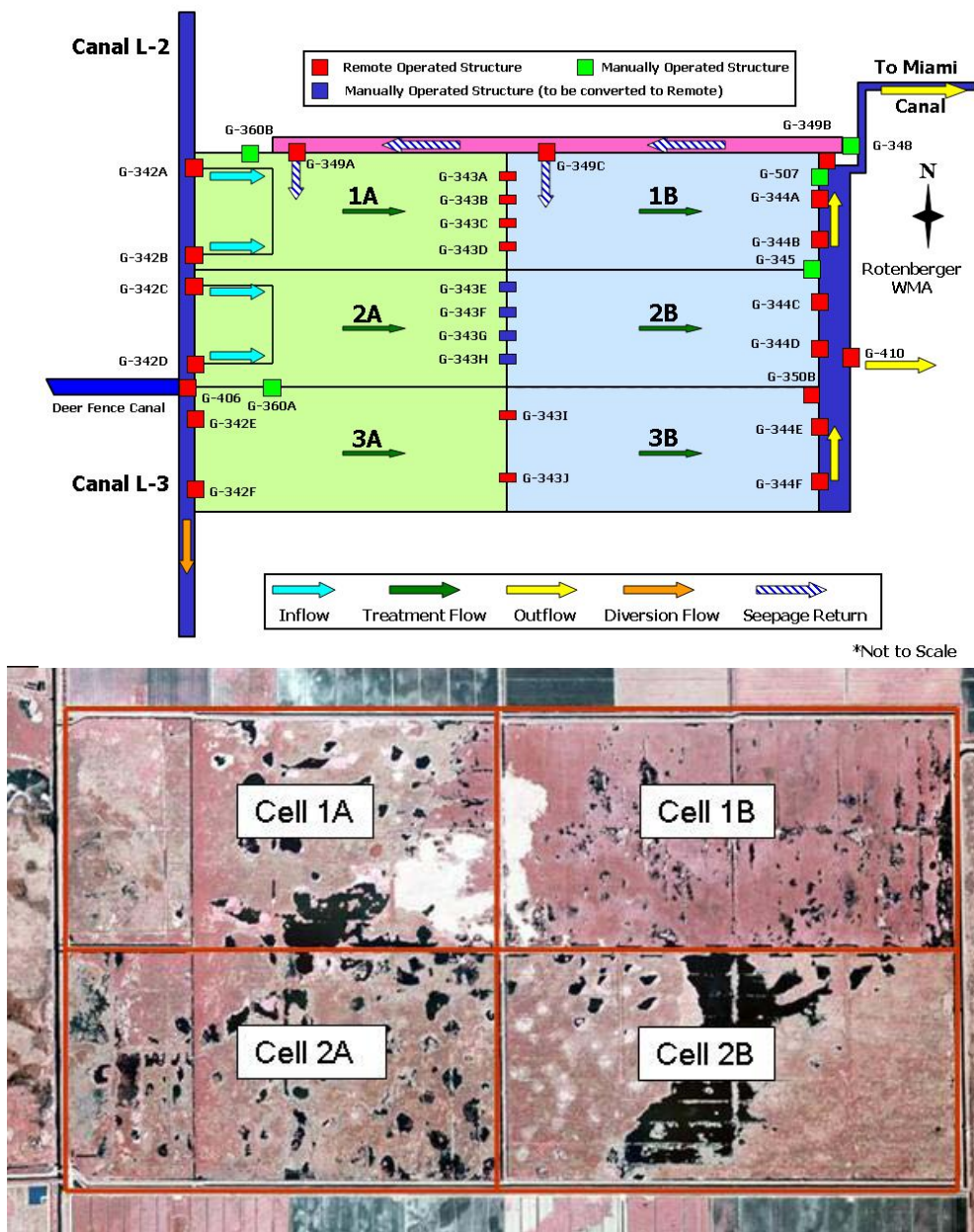
Cells 1A and 2A in STA-5 are managed to promote EAV and Cells 1B and 2B are managed for SAV.

Enhancement Activities

Completed enhancements to STA-5 include:

- Converted Cell 2B from EAV to SAV
- Modified internal water control structures to improve the distribution of water between the north and south flow-ways
- Constructed a new seepage return pump to hydrate Cell 1B during drought conditions
- Constructed new Cells to expand treatment area of the STA

Figure 3-5. Map and Aerial Photograph of STA-5. Arrows indicate direction of flow.



3.2.6. STA-6

Location

STA-6 is located in Hendry and Palm Beach Counties south of STA-5 and west of RWMA (Figure 1-3). STA-6 provides a total effective treatment area of 2,282 acres.

Operations

Historically, stormwater runoff entered STA-6 via the G-600 pump station, was routed to the Cells through three broad-crested weirs (G-601, G-602 and G-603) and was discharged through several combination box weir/culvert structures (G-393 and G-354) (Figure 3-6). With the implementation of the Long-Term Plan Enhancements, the STA-6 inflow facilities will be modified to accept additional sources of water. Treated water will continue to be collected in a discharge canal that flows into the L-4 borrow canal; this water eventually enters the northwest corner of WCA-3A (Figure 1-3) (see STA-6 Operation Plan).

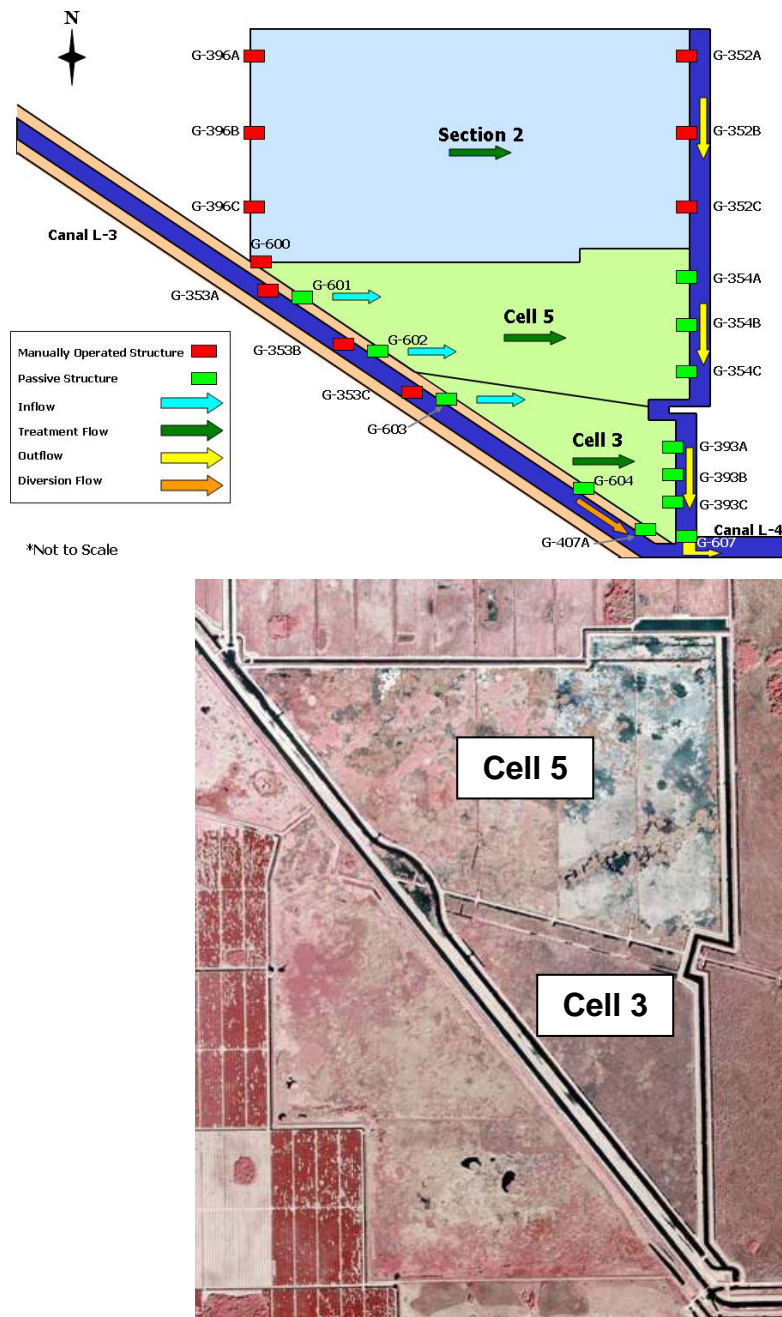
Routine Maintenance

Cells 3 and 5 in STA-6 are maintained as EAV communities, with sawgrass (*Cladium jamaicense*) and willow (*Salix* spp.) dominant in Cell 3, while cattail and grasses (*Brachiaria mutica*, *Panicum hemitomon*, *P. repens* and *P. virgatum*) are dominant in Cell 5.

Enhancement Activities

Completed enhancements to STA-6 include the construction of STA-6 Section 2 (Figure 3-6), which added 1,385 acres of treatment area to the STA-5/STA-6 system. This expansion will allow for the capture and treatment of stormwater runoff from the C-139 annex located immediately west of the L-3 borrow canal (Figure 1-3). STA-6 Section 2 became flow capable on December 31, 2006.

Figure 3-6. Map and Aerial Photograph of STA-6. Arrows indicate direction of flow.



4. STA RISK ASSESSMENT

4.1. Avian Risk Assessment Methodology

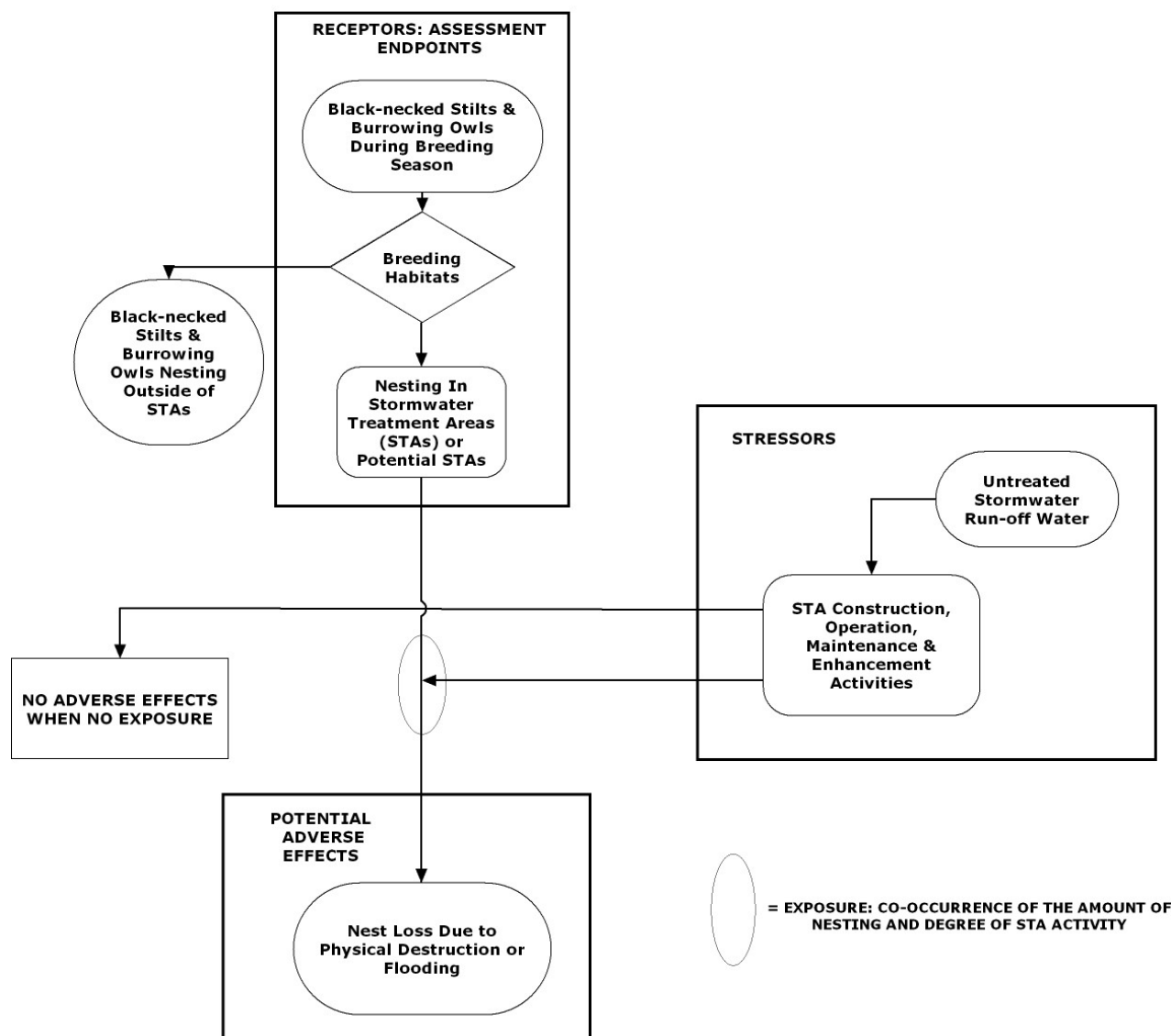
As a part of this APP, the District has developed the following avian risk assessment that identifies and evaluates the risks to Black-necked Stilts and Burrowing Owls from construction, operation, routine maintenance and enhancement of the STAs. For this risk assessment, risk is defined as the *probability of an adverse event or hazard (e.g., flooding) affecting nesting Black-necked Stilts and Burrowing Owls*. This risk assessment follows the four step U.S. Environmental Protection Agency (USEPA) ERA framework (USEPA 1992): 1) problem formulation, 2) characterization of effects, 3) characterization of exposure and 4) risk characterization.

4.2. Problem Formulation

Problem formulation involves the development of a conceptual model used to identify the relationship between stressors, receptors and effects. Figure 4-1 presents a conceptual model of these risk relationships as they occur in the STAs. The stressors are the Construction, Operation, Maintenance and Enhancement activities that are associated with the mandated treatment of stormwater. A receptor is the ecological entity that is exposed to a stressor. In this case, ground birds, more specifically Black-necked Stilts and Burrowing Owls, are receptors. In ecological risk assessment, the receptor is further defined as an assessment endpoint or the environmental value that is to be protected. For this APP, the assessment endpoints are reproduction of Black-necked Stilts and Burrowing Owls.

The effects associated with the stressor-receptor relationship are nest, egg and young loss due to flooding of nests or physical destruction of nests. If the Black-necked Stilts and Burrowing Owls are not nesting or nesting outside of the STAs, there is no exposure to the stressors and no adverse effects can occur. As discussed earlier the District is required to construct, operate and conduct routine maintenance and enhancement activities in the STAs and in doing so can expose ground nesting birds to flooding and/or to physical disturbance if these activities occur while these birds are nesting.

Figure 4-1. Conceptual Model of Avian Risks to Black-necked Stilt and Burrowing Owl Nesting in STAs



4.3. Characterization of Exposure

The characterization of exposure step expresses the interaction of a receptor with a stressor. It combines estimates of the expected timing, frequency and intensity and spatial extent of the exposure event. Exposure can be in the form of contact or co-occurrence. In this case, the exposure event is co-occurrence of various stressors (i.e., STA activities) (see Section 3.0) with avian receptors (i.e., nesting Black-necked Stilts or Burrowing Owls). Different STA activities have different exposure characteristics (Table 4-1). In some cases, all cells in a STA are exposed and in other cases, only certain cells are exposed to the stressors. Table 4-1 illustrates that STA activities can generally start any time depending upon site condition requirements. Enhancement

activities have the most predictable exposure conditions since they are scheduled activities and have more flexibility in choice of timing. Some STA activities may occur only once in the life of an STA (e.g., Construction and Start-up Activities), while other activities are continuous or repeated frequently (e.g., Normal and Extreme Flow Operations and Routine Maintenance Activities). The general duration of STA activities can last for several weeks to months with the exception of Construction, which may take a two or more years to complete.

Black-necked stilts will generally start breeding in mid April and have been reported to lay eggs as late as June (see Section 1.5.1). With a three plus month breeding period, nesting might extend from mid June to August. The ability of young stilts to avoid flooding is greatest in the last month of the breeding season since young birds have the ability to fly short distances. The Burrowing Owl breeding season can be from February to July (see Section 1.5.1).

Table 4-1 also indicates that STA Activities generally span the breeding season of Black-necked Stilts and Burrowing Owls. Normal and Extreme Flow conditions will occur during the entire breeding season. Operation under drought conditions is more likely to occur during the breeding season and more likely at the beginning of the breeding season. The timing of this condition will be determined by the nature and duration of the drought.

Table 4-1. STA Activities and Exposure Relationships.

STA Activities	Exposure Relationships				
	Extent of Affected Area	Seasonal Timing	Duration of Activity	Frequency of Activity	Co-occurrence With Breeding Season ¹
Construction (Earthwork and/or De-watering)	Lands being converted to STAs, variable in size	Can start any time but primarily during the dry season	Two or more years	Once	Any time including during part or all of a breeding season ¹
Start Up Operations	All new cells of a given STA, fixed size	can start any time, once construction is completed	Months	Once	Same as above
Normal & Extreme Flow Operations	All new cells of a given STA, fixed size	Ongoing	Life of STA	Continuously	Same as above
Drought Condition Operations	All new cells of a given STA, fixed size	Varies annually occurring late winter early spring	Varies (weeks, months)	Varies depending upon occurrence of drought conditions	Same as above, but more likely at the beginning of the breeding season ¹
Routine Maintenance (Water Control Structure Maintenance, Levee and Canal Maintenance, Vegetation Management)	Different cells or groups of cells in a STA, fixed size	Ongoing	Varies (days) depends upon activity	Repeatedly	Same as above
Enhancement (Various similar to Maintenance Activities: can result in dewatering and reflooding)	Different cells or groups of cells in a STA, fixed size	Annual planned	Varies (weeks, months)	Varies for each STA	Same as above

Note 1. Black-necked Stilt's breeding season can be from April to August; Burrowing Owl breeding season can be from February to July.

4.4. Characterization of Effects

The characterization of effects step describes the exposure-response relationship of stressors and receptors. Figure 4.1 indicates that for the three types of stressor activities: Construction, Operation, Routine Maintenance and Enhancement of the STAs, there are two primary effects of these activities: drowning of eggs or young because of flooding and physical destruction of nests because of human activity. These effects although infrequent and small in number have been observed in the STAs (see Section 1.5.1 and 1.5.2). In general, adult Black-necked Stilts and Burrowing Owls are not affected since they can fly away if the nest becomes flooded. The secondary effects of nesting disruption are lower annual reproductive output (nests, eggs, young). Overall, recurrent flooding and destruction of nests may result in periodic loss of reproductive output and reduction of foraging areas. Figures 4-2, 4-3 and 4-4 illustrate these effects for each STA activity.

During Construction Activities, adverse effects to Black-necked Stilts and Burrowing Owls can occur if earthwork occurs during the breeding season and in a nesting area. Earthwork can cause destruction of nests, eggs and young (Figure 4.2). If impacts occur early enough in the nesting cycle, displaced birds may attempt to re-nest elsewhere. Dewatering of lands being converted to STAs that already have nesting birds has the potential for increasing predation of nests by allowing easier access by raccoons and other predators and reducing the foraging of adults and young nesting in adjacent areas.

Under Start-up Operations, there is some potential for adverse effects if Start-up flooding occurs after nesting has been initiated (Figure 4.3). During Normal Flow and Extreme Flow Operating Conditions, the STAs are maintained at a water depth no less than 0.5 ft, rendering them unsuitable habitat for nest initiation by Black-necked Stilts and thus no effects are predicted. Similarly, there will be no effects to Burrowing owls since they will be nesting above design levels. During Drought Condition Operations, flooding of nests and drowning of eggs or young can occur when dry conditions exist at the start of nesting and supplemental water is diverted in or required in response to a storm event during drought conditions.

During Routine Maintenance, actions such as levee mowing and road grading can result in nest abandonment or increased predation by making the nests more accessible to predators (Figure 4.4).

During some Enhancement Activities, Cells are taken off-line and dried out. Depending on when this occurs in the breeding season, reflooding to restore operational water levels can lead to drowning of nests and destruction of eggs or young if birds have nested during the dry period (see exposure conditions in Section 4.3).

Figure 4-2. Effects Black-necked Stilt and Burrowing Owl Nesting in STAs from Construction Activities (Conceptual Model)

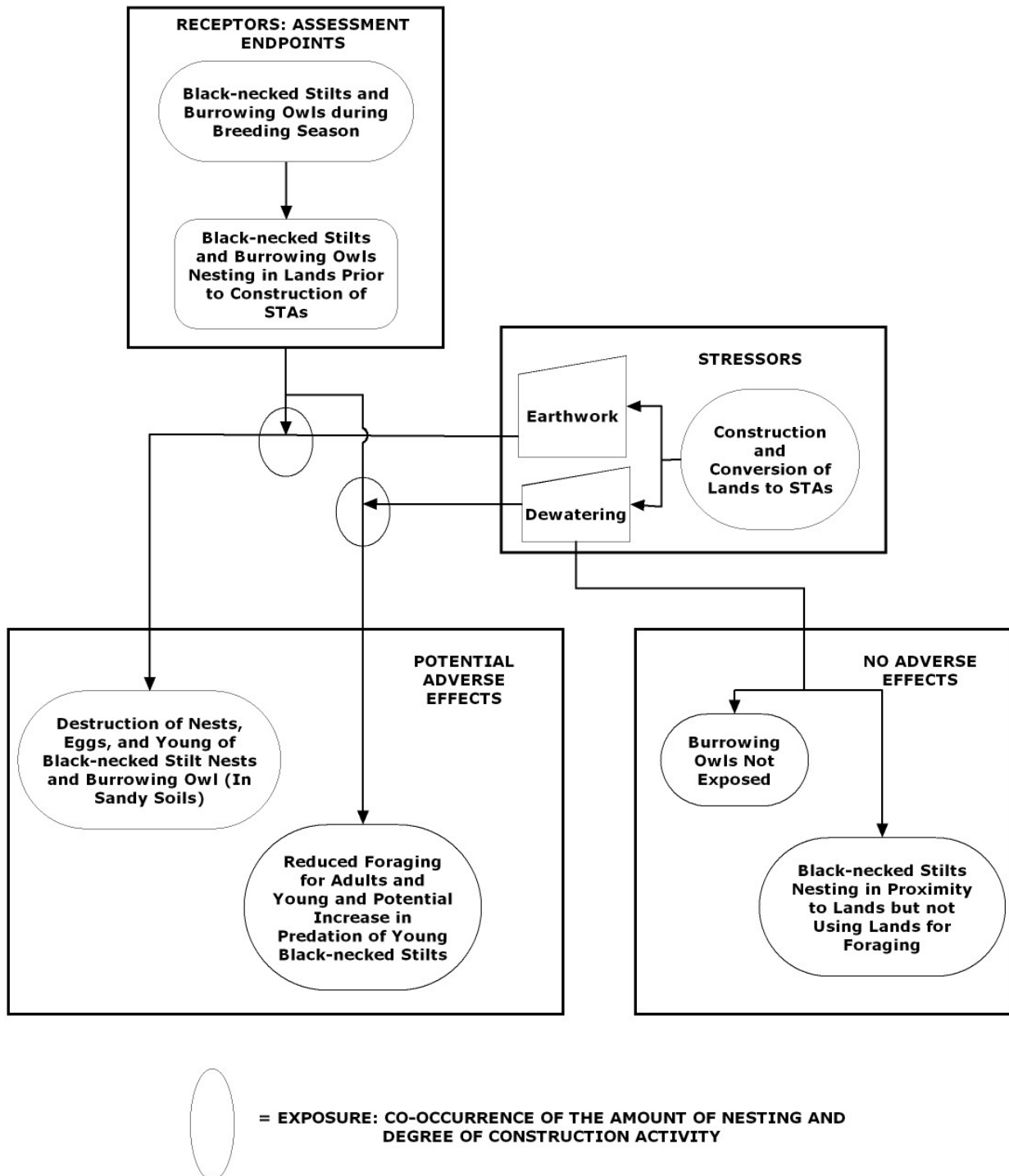


Figure 4-3. Effects Black-necked Stilt and Burrowing Owl Nesting in STAs from Operation Activities (Conceptual Model)

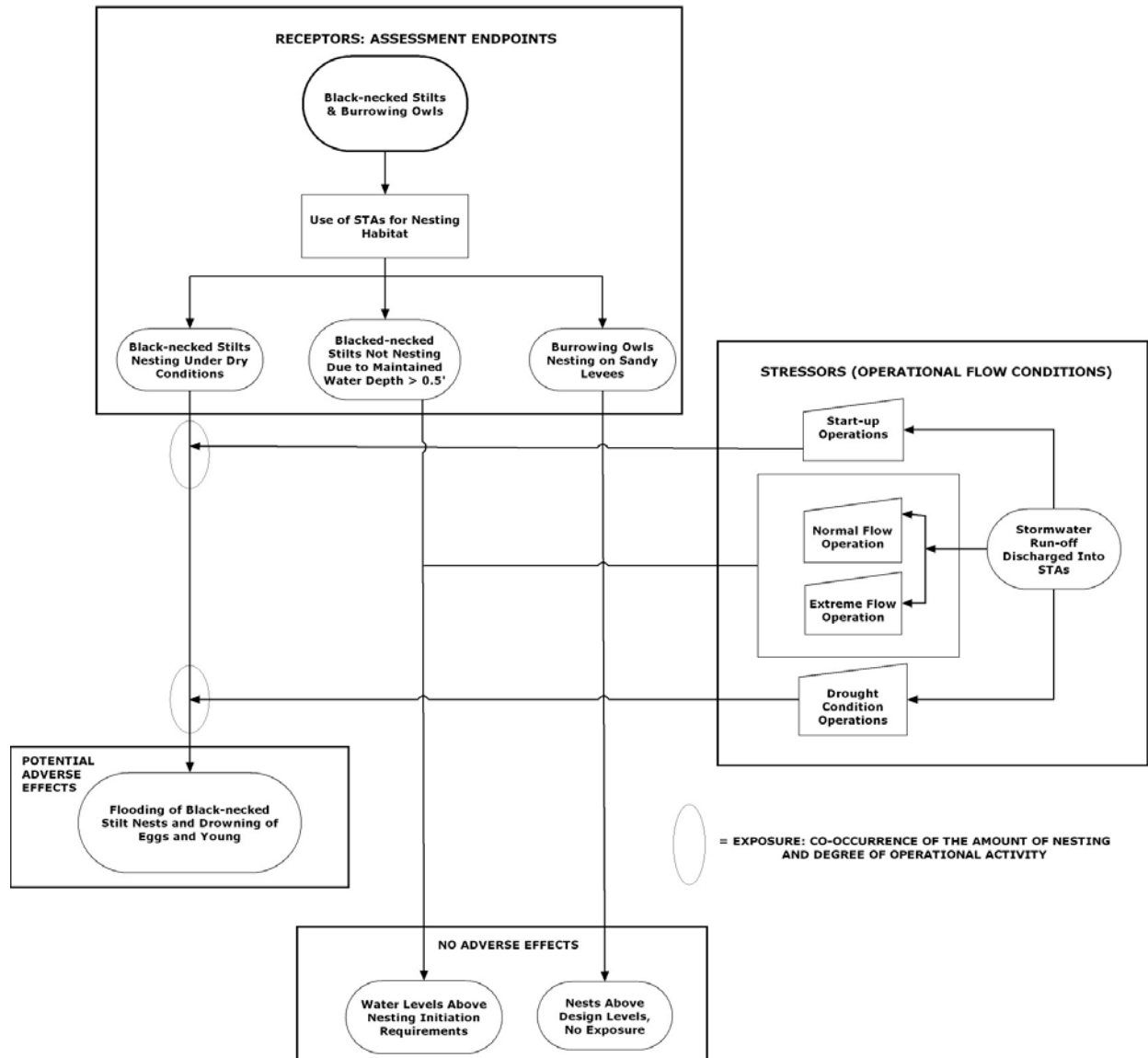
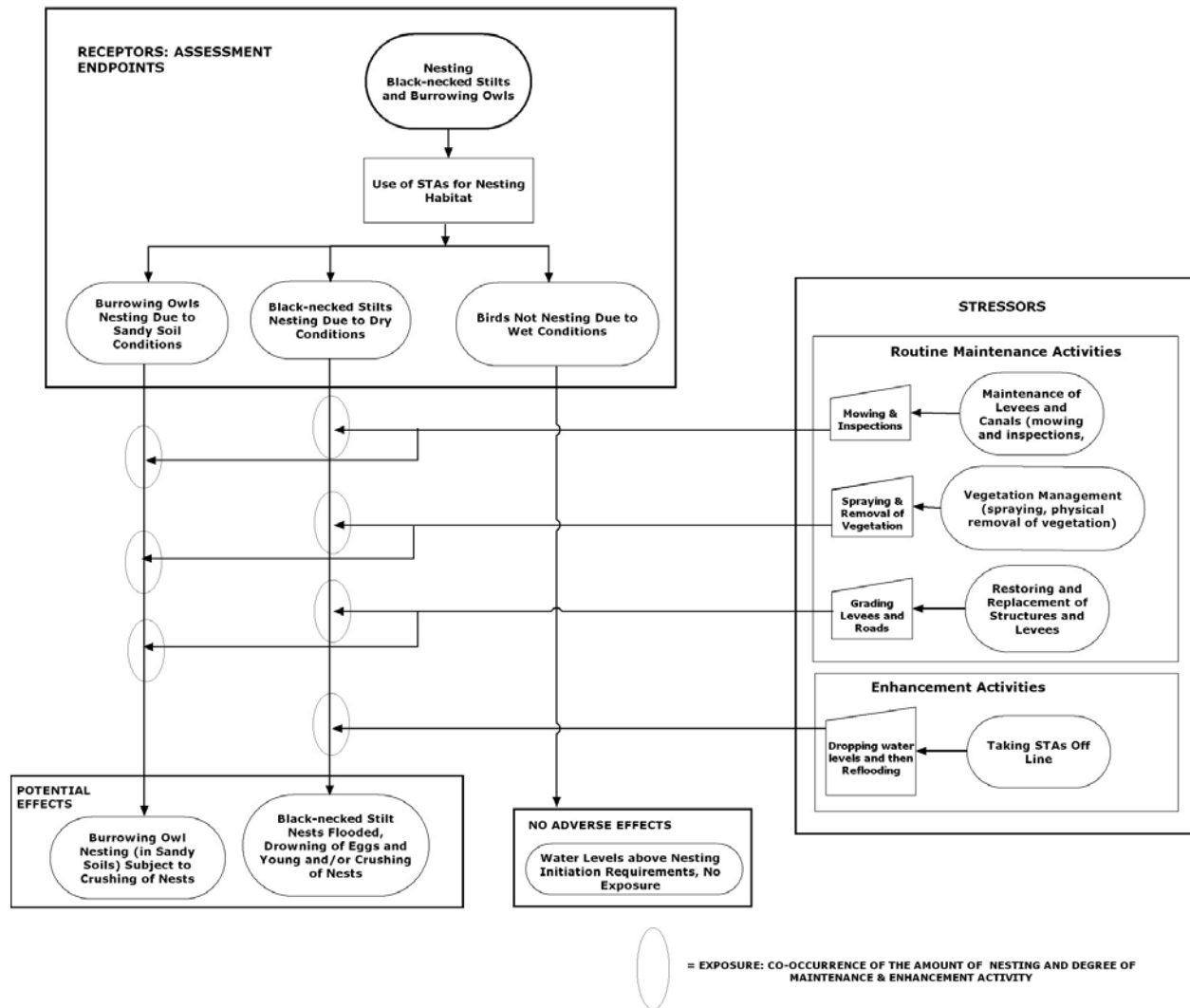


Figure 4-4. Effects Black-necked Stilt and Burrowing Owl Nesting in STAs from Routine Maintenance and Enhancement Activities (Conceptual Model)



4.5. Risk Characterization

The *risk characterization* step is the integration of exposure and effects information expressed in a statement of risk. Included in the risk characterization is an analysis of the uncertainty inherent in the risk estimates. Table 4-2 characterizes the risks for each STA Activity.

Overall, the higher risks are associated with Construction, Operation Start-up, Drought Condition Operations, Routine Maintenance and Enhancement Activities. No risks are associated with Operation under Normal and Extreme Flow Conditions. As indicated in the tables there are different conditions that affect the certainty of the risk to Black-necked Stilts and Burrowing Owls. In interpreting these risks, it is important to point out that not all STAs or Cells in the STAs have risks because Black-necked Stilts have not been found to nest in all STAs (see Table 1-1) and Burrowing Owl nesting appears to be confined to areas with sandy soils. These soils only occur in certain STAs, such as STA-1E.

Table 4-2. Summary of Avian Risks to Black-necked Stilts and Burrowing Owls for STA Activities Along with Uncertainties in Risk Characterization.

STA Activities	Ecological Risks	Uncertainty
Construction (Earthwork and/or Dewatering)	<p>Higher risks if birds are nesting in areas subject to earthwork or dewatering.</p> <p>Risk is a one time event per STA</p> <p>Lower risk if construction occurs late in the breeding season¹ (i.e. fledging season) some of the young Black-necked Stilts may be able to avoid stressors and not be affected.</p>	<p>Depends upon co-occurrence of the breeding season¹ and specific construction activities in areas with nests.</p> <p>Not all areas being considered for development have a history of Black-necked Stilt and Burrowing Owl nesting.</p> <p>Risks to Burrowing Owls are limited to sandy soils suitable for nesting; these areas are limited in size and location.</p>
Start Up Operations	<p>Higher risk to Black-necked Stilts if birds have initiated nesting before target water depths have been achieved (see Section 3.1.2)</p> <p>In general, no risks to Burrowing Owls since they nest above design water levels.</p> <p>Risk is a one time event per STA</p>	<p>Depends upon co-occurrence of the breeding season¹ and specific Start-up time and Cells with nests.</p> <p>If start-up occurs late in the fledging season, some of the young birds may be able to avoid stressors and may not be affected.</p> <p>Not all STAs and Cells have a history of Black-necked Stilt nesting.</p> <p>If during construction sandy soils are encountered along berms, some risks</p>

STA Activities	Ecological Risks	Uncertainty
		could exist if Burrowing Owls return to nest and nests are below design water levels.
Normal & Extreme Flow Operations	<p>No risks to Black-necked Stilts since design water depths will preclude nesting of Stilts.</p> <p>No Risks to Burrowing Owls since they nest above design water levels.</p>	None
Drought Condition Operations	<p>Higher Risk to Black-necked Stilts, which may have nested because of dry conditions and supplemental water sent into the STA.</p> <p>Risks will be infrequent and determined by extent and duration of drought conditions.</p> <p>Lower risks to Burrowing Owls since they generally nest above design water levels.</p>	<p>Depends upon co-occurrence of the breeding season¹ and specific Drought Conditions and STA cells with nests.</p> <p>Not all STAs and Cells have a history of Black-necked Stilt nesting.</p> <p>Risks to Burrowing Owls are limited to sandy soils suitable for nesting; these areas are limited in size and location.</p>
Routine Maintenance (Water Control Structure Maintenance, Levee and Canal Maintenance, Vegetation Management)	<p>Higher risks to Black-necked Stilts and Burrowing Owls if dry conditions exist and birds have initiated nesting.</p> <p>Lower risk if Maintenance occurs late enough in the breeding season¹ (i.e. fledging season) some of the young birds may be able to avoid stressors and may not be affected.</p>	<p>Depends upon co-occurrence of the breeding season¹ and specific Routine Maintenance activities and Cells with nests.</p> <p>Not all STAs and Cells have a history of Black-necked Stilt or Burrowing Owl nesting.</p> <p>Risks to Burrowing Owls are limited to sandy soils suitable for nesting; these areas are limited in size and location.</p>
Enhancement (Various similar to Maintenance Activities: can result in dewatering and refolding)	Higher risks to Black-necked Stilts occur when the STA is taken off-line and dry enough for birds to start nesting and then re-flooding occurs.	Not all STAs and Cells have a history of Black-necked Stilt or Burrowing Owl nesting.

STA Activities	Ecological Risks	Uncertainty
	<p>Higher risks to Burrowing Owls in STAs (e.g., STA-1E) that have suitable soils for nesting.</p> <p>Lower risk if taking Cells off-line occurs late enough in the breeding season¹, nesting may not be initiated by Black-necked Stilts.</p>	<p>Risks to Burrowing Owls are limited to sandy soils suitable for nesting; these areas are limited in size and location.</p>

Note 1. Black-necked Stilt's breeding season can be from April to August; Burrowing Owl's breeding season can be from February to July.

5. MORTALITY REDUCTION MEASURES

Separate Mortality Reduction Measures were developed for the Black-necked Stilt and Burrowing Owl for Construction Activities, Operation Activities, and Maintenance and Enhancement Activities in the STAs.

5.1. Construction Activities

Black-necked Stilt Mortality Reduction Measures

1. District Site Managers or contractors will inspect all STAs for nests during breeding season.
2. If nesting is observed by Site Managers, location information will be collected.
3. Avoid flooding any part of a Cell with nests during the breeding season.
4. Suspend construction activities near nests while nests are active. All construction personnel shall be advised that the Black-necked Stilt is protected under the MBTA and of the legal prohibitions on taking birds or their nests.
5. After breeding season has ended, document the number of active and inactive nests and report them in the District's South Florida Environmental Report.

Burrowing Owl Mortality Reduction Measures

1. District Site Managers or contractors will periodically inspect all STAs for nests during breeding season.
2. If nesting is observed by Site Managers, location information will be collected.
3. Mark and stake off nests with a 50-foot perimeter and post signs in area to increase awareness of the birds' presence.
4. Avoid flooding any part of a Cell with nests during the breeding season.
5. Suspend construction activities near burrows while nests are active. All construction personnel shall be advised that the Burrowing Owl is a listed Species of Special Concern by the State of Florida and of the legal prohibitions on taking birds or their nest burrows.
6. After breeding season has ended, document the number of active and inactive nests and report them in the District's South Florida Environmental Report.

5.2. Operation Activities

Black-necked Stilts Mortality Reduction Measures

1. If possible, keep all STAs inundated to a minimum depth of 0.5 ft during breeding season to prevent nesting.
2. District Site Managers will periodically inspect all STAs for nests, in particular Cells that become dry during the breeding season.
3. If nesting is observed by the Site Managers, periodic surveys of the STA will be conducted by District or contractor personnel throughout the remainder of the breeding season to locate and monitor all nests.
4. If a storm event necessitates operating STAs containing nests, the sequence of operational decisions shall be:
 - a. Divert stormwater runoff to other Cells within the STA to avoid flooding Cells with nests.

- b. Divert stormwater runoff to another STA to avoid flooding Cells with nests and
- c. If options a and b are not practicable, operate dry Cells containing nests to provide water quality treatment and/or flood protection.

Although the District is committed to following the above listed mortality reduction measures, there are situations where bird mortality cannot be avoided as it fulfills its responsibilities as outlined in Sections 1.1 and 1.2 of this Plan. Specifically, in no cases shall inflows to the STAs be diverted or bypassed solely to prevent the taking of birds or nests. Because the District seeks to avoid sending untreated water directly to the WCAs, in some situations treating water in the STAs may result in unintentional impacts to migratory birds.

Burrowing Owl Mortality Reduction Measures

There are no risks to Burrowing Owls during Operation Activities (see Section 4.5) and therefore no mortality reduction measures are necessary

5.3. Maintenance and Enhancement Activities

Black-necked Stilts Mortality Reduction Measures

1. Suspend all levee and road maintenance (e.g., mowing, grading, etc.) during the breeding season.
2. If possible, avoid performing enhancement activities such as refurbishing water control structures or building new levees or Cells during the breeding season.
3. If enhancement activities in the Cells must be conducted during the breeding season, perform the work in the wet, if possible.
4. If enhancement activities in the Cells must be performed during the breeding season and the Cells must be dewatered to perform the work, conduct periodic surveys for nests.
5. If nests are found in a Cell that has been dried out for enhancement activities, avoid re-flooding the Cells until the hatchings have fledged and left the nest unless the STA must be operated during a storm event. In this case, follow the operational decision tree in Section 5.2.

Burrowing Owl Mortality Reduction Measures

1. Suspend all levee and road maintenance (e.g., mowing, grading, etc.) during the breeding season.
2. If possible, avoid performing enhancement activities such as refurbishing water control structures or building new levees or Cells during the breeding season.
3. If enhancement activities in the Cells must be conducted during the breeding season, perform the work in the wet, if possible.
4. If enhancement activities in the Cells must be performed during the breeding season and the Cells must be dewatered to perform the work, conduct periodic surveys for nests.
5. If nests are found in a Cell that has been dried out for enhancement activities, avoid re-flooding the Cells until the hatchings have fledged and left the nest unless the STA must be operated during a storm event. In this case, follow the operational decision tree in Section 5.2.

6. AVIAN ENHANCEMENT MEASURES

One facet of the District's Mission is ecosystem restoration. The District has been recognized for many years as one of the leaders among State and Federal agencies for its commitment to environmental protection. The Agency has invested almost \$1 billion in implementing the EFA, which includes constructing the STAs. The District also is playing a lead role in the State and Federal partnership to restore the Everglades (i.e., \$10 billion Comprehensive Everglades Restoration Plan). The construction of the STAs has provided a measure of ecological lift to the region by creating more than 40,000 acres of wetland habitat on what previously had been farmland. Although not the intended purpose of the STAs, these treatment wetlands support many species of birds, fish and reptiles. However, it must be emphasized that wildlife benefits derived from the STAs do not take precedence over the other elements of the District's mission, notably the obligation to operate these facilities to provide flood control and water quality protection to the region.

7. AVIAN REPORTING SYSTEM

Elements of Avian Reporting System:

1. Field surveys to document the presence of nesting Black-necked Stilts and Burrowing Owls in the STAs and collect field information such as the number and location of nests.
2. Create a database to store information on nesting birds (species and locations) and document corrective action(s) taken by the District.
3. Summarize and report this information on an annual basis in the South Florida Environmental Report.

8. Key Resources to Address Avian Protection Issues

8.1. District Contacts

South Florida Water Management District
3301 Gun Club Road
West Palm Beach, FL 33406
Watershed Management Department
Dean Powell, Department Director
Phone: 561-682-6787

South Florida Water Management District
3301 Gun Club Road
West Palm Beach, FL 33406
Operations Control & Engineering Department
Susan Sylvester, Department Director
Phone: 561-682-6152

8.2. Federal and State Contacts

Federal Protected Species Issues

US Fish and Wildlife Service
South Florida Ecological Services Office
1339 20th Street
Vero Beach, FL 32960
Phone: 772-562-3909
Fax: 772-562-4288

U.S. Fish and Wildlife Service
Office of Law Enforcement
P.O. Box 676
Minneola, FL 34755-0676
Luis Santiago, Resident Agent-In-Charge
Phone: 352-394-4060, Fax: 352-394-1862
Or call Law Enforcement at the field offices above

U.S. Fish and Wildlife Service
Migratory Bird Division
Branch of Policies, Permits & Regulations
Arlington Square, MS MBSP 4107
4401 N. Fairfax Drive
Arlington, VA 22203, USA
FAX# 703/358-2272 or 2217

State Protected Species Issues

Florida Fish and Wildlife Conservation Commission
Farris Bryant Building
620 South Meridian Street
Tallahassee, FL 32399-1600
Phone: 850-488-4676
Fax: 850-488-1961

Florida Fish and Wildlife Conservation Commission
Southwest Region
Greg Holder, Regional Director
3900 Drane Field Road
Lakeland, FL 33811-1299
(863) 648-3203
24-Hour Law Enforcement:
863-648-3200

Florida Fish and Wildlife Conservation Commission
South Region
Chuck Collins, Regional Director
8535 Northlake Boulevard
West Palm Beach, FL 33412
(561) 625-5122
24-Hour Law Enforcement:
561-625-5122

Florida Fish and Wildlife Conservation Commission
Monroe and Collier County
24-Hour Law Enforcement:
305-289-2320
Florida Fish and Wildlife Conservation Commission
Gainesville Wildlife Research Laboratory
4005 South Main Street
Gainesville, FL 32601
Phone: (352) 955-2230
Fax: (352) 376-5359

Wildlife Control Issues

USDA/APHIS/WS/NWRC
Florida Field Station
2820 E. University Ave.
Gainesville, FL 32641
Phone: (352) 375-2229
Fax: (352) 377-5559

9. GLOSSARY

Best Management Practices (BMPs) – Land, agricultural, industrial and waste management techniques that reduce pollutant export from a specified area.

Central and Southern Florida Project (C&SF Project) – The system of canals, storage areas and water control structures spanning the area from Lake Okeechobee to both the east and west coasts and from Orlando south to the Everglades. It was designed and constructed during the 1950s by the U.S. Army Corps of Engineers (USACE) to provide flood control and improve navigation and recreation.

Comprehensive Everglades Restoration Plan (CERP) – The framework and guidance for the restoration, protection and preservation of the south Florida ecosystem. CERP also provides for water-related needs of the region, such as water supply and flood protection.

Drought – A long period of abnormally low rainfall, especially one that adversely affects growing or living conditions.

Ecosystem – Biological communities together with their environment, functioning as a unit.

Emergent aquatic vegetation – Wetland plants that extend above the water surface. Cattail and rushes are two examples.

Eutrophic (Eutrophication) – An aquatic environment enriched with nutrients, usually associated with high plant productivity and low oxygen levels.

Everglades Agricultural Area (EAA) – An area extending south from Lake Okeechobee to the northern levee of WCA-3A, from its eastern boundary at the L-8 canal to the western boundary along the L-1, L-2 and L-3 levees. The EAA encompasses almost 3,000 square kilometers (1,158 square miles) of highly productive agricultural land.

Everglades Construction Project (ECP) – Twelve interrelated construction projects located between Lake Okeechobee and the Everglades. The cornerstone of the ECP is six large constructed wetlands known as Stormwater Treatment Areas (STAs) that use naturally occurring chemical, biological and physical wetland processes to reduce phosphorus that enters the Everglades. The ECP also contains four hydropattern restoration projects that will improve the volume, timing and distribution of water entering the Everglades.

Everglades Forever Act (EFA) – A 1994 Florida law (§373.4592, F.S.), amended in 2003, to ensure Everglades restoration and protection. This will be achieved through comprehensive and innovative solutions to issues of water quality, water quantity, hydroperiod and invasion of exotic species to the Everglades ecosystem. The EFA establishes the plan, an enforceable schedule and the funding mechanism for the various components of the Everglades Program.

Everglades Program – Projects, regulations, monitoring efforts and research associated with restoring and protecting the Everglades. This program was established by the 1994 Everglades Forever Act.

Everglades Protection Area (EPA) – As defined in the Everglades Forever Act, the EPA is comprised of the Water Conservation Areas 1, 2A, 2B, 3A and 3B.

Florida Statutes (F.S.) – The Florida Statutes are a permanent collection of state laws organized by subject area into a code made up of titles, chapters, parts and sections. The Florida Statutes are updated annually by laws that create, amend or repeal statutory material.

Impoundment – A reservoir used for retaining water.

Inflow – The act or process of flowing in or into a water body.

Invasive exotic species – Species of plants or animals that are not naturally found in a region (nonindigenous). They can sometimes aggressively invade habitats and cause multiple ecological changes, including the displacement of native species.

Long-Term Plan – The State's plan for achieving and maintaining compliance with the phosphorus criterion in the Everglades Protection Area. The Long-Term Plan contains activities to achieve that goal and to permit the State of Florida and the South Florida Water Management District to fulfill their obligations under the Everglades Forever Act.

Marsh – An area of soft, wet, low-lying land, characterized by grassy vegetation and often forming a transition zone between water and land.

Nutrients – Organic or inorganic compounds essential for the survival of an organism. In aquatic environments, nitrogen and phosphorus are important nutrients that affect the growth rate of plants.

Outflow – The act or process of flowing out of a water body.

Periphyton – The biological community of microscopic plants and animals attached to surfaces in aquatic environments. Algae are the primary component in these assemblages, which naturally reduce phosphorus levels in water and serve a key function in Stormwater Treatment Areas.

Phosphorus (P) – An element that is essential for life. In freshwater aquatic environments, phosphorus is often in short supply; increased levels can promote the growth of algae and other plants.

Pollutant loading – Influx of a chemical or nutrient that contaminates air, soil or water.

Reservoir – A man-made or natural water body used for water storage.

Stage – The height of a water surface above an established reference point (datum or elevation).

Stormwater Treatment Area (STA) – A large, constructed wetland designed to remove pollutants, particularly nutrients, from stormwater runoff using natural processes.

Structure – Man-made pump stations, reservoirs, channel improvements canals, levees and diversion channels.

Submersed aquatic vegetation (SAV) – Wetland plants that exist completely below the water surface.

Water Conservation Areas (WCAs) – Diked areas of the remnant Everglades that are hydrologically controlled for flood control and water supply purposes. The primary targets of the Everglades restoration and major components of the Everglades Protection Area.

Watershed – A region or area bounded peripherally by a water parting and draining ultimately to a particular watercourse or body of water.

Wetland – An area that is inundated or saturated by surface water or groundwater with vegetation adapted for life under those soil conditions (for example, swamps, bogs and marshes).

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10.2. Other References Reviewed

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11. APPENDICES

11.1. Burrowing Owl Permit and Management Plan for STA-1E

FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION



RODNEY BARRETO
Miami

SANDRA T. KAUPÉ
Palm Beach

H.A. "HERKY" HUFFMAN
Enterprise

DAVID K. MEEHAN
St. Petersburg

KATHY BARCO
Jacksonville

RICHARD A. CORBETT
Tampa

BRIAN S. YABLONSKI
Tallahassee

KENNETH D. HADDAD, Executive Director
VICTOR J. HELLER, Assistant Executive Director

TIMOTHY A. BREAUULT, Director
DIVISION OF HABITAT AND SPECIES CONSERVATION
(850) 488-3831 TDD: (850) 488-9542

MEMORANDUM

TO: Ronald Bearzotti, South Florida Water Management District
FROM: Angela T. Williams, Species Conservation Planning Section,
Protected Species Permit Coordinator
SUBJECT: Use of Burrowing Owl Nest Removal Permit
DATE: September 15, 2005

Enclosed please find a permit which authorizes the destruction of inactive burrowing owl nest burrow(s) in accordance with Rules 68A-9.002 and 68A-27.005 of the Wildlife Code of the State of Florida. You may execute (i.e., collapse the burrow) this permit from date of issuance to February 15, 2006, provided the nests are inactive (has no eggs or flightless young).

Please note that burrows may still be active after the July 10th end of the nesting season date. We ask that you monitor the burrows carefully to ensure that the young owls are flying or have left prior to executing this permit. You must wait until no owls are physically located at the burrows then carefully excavate the burrows, either by hand or with a shovel to ensure that no eggs or flightless young reside in the burrows. You may fill the burrows with substrate upon determining that the burrows are inactive. Should you find eggs or flightless young in the burrows, contact this office immediately for further instructions.

We recommend that you stake and rope-off a 10-ft buffer around the burrow entrances from February 15 - July 10 of each year in observance of the breeding season. Feel free to contact our Protected Species Biologist, Ms. Christine Yannett at (850) 921-5990, ext. 17323, should you have any questions or need additional information.

CY/ATW/cy
LIC 6-20 (buow)
WN05387.ltr

PERMIT

Issued Under Authority of the Wildlife Code of the State of Florida
(Title 68A, Florida Administrative Code) by the

STATE OF FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION

Division of Habitat and Species Conservation, 620 South Meridian Street, Mail Station 2A, Tallahassee, FL 32399-1600, (850) 921-5990, ext. 17310

Permit No. WN05387 Issuance Date 15 September 2005 Expiration Date 15 February 2006

Permit Type Migratory Bird Nest Specific Rule Authority 68A-9.002 & 68A-27.005

Permittee Ronald Bearzotti Affiliation South Florida Water Management District

Phone/FAX No. 561-682-6291/ 561-682-5772 3301 Gun Club Road, MS 4712

West Palm Beach, FL 33406

Signature _____ Date _____

Not valid until signed

Certification: I hereby state and confirm by signature that I have received, read, understand, and agree to abide by all regulations, guidelines, and provisions regarding the issuance of this permit, and I further certify that the information submitted in this application and supporting documents is complete and accurate to the best of my knowledge and belief. I understand that any false statement herein may subject me to criminal penalties. I further state that I will abide by all applicable State, Federal, and local laws. Finally I hereby confirm by signature that representatives of the Florida Fish and Wildlife Conservation Commission (Commission) have my permission as the applicant and that of the landowner(s) to enter on and inspect the property(ies) described in the application for all reasonable purposes pertaining to applicable Commission rules. Please return a signed copy to this office.

The above named Permittee is authorized to destroy **eight (8) inactive** (i.e., containing no eggs or flightless young) Florida burrowing owl (*Athene cunicularia floridana*) nest burrows in Florida, pursuant to Rules 68A-9.002 & 68A-27.005, F.A.C., and subject to the following provisions/conditions.

Provisions/Conditions:

1. The **eight (8) inactive** burrowing owl burrows situated at the South Florida Water Management District - Storm Water Treatment Area 1E (T44S, R40E in cell 2), Palm Beach County, Florida may be destroyed in association with the Everglades Construction Project (ECP) provided that such destruction is effected between date of issuance and 15 February 2006, is completed immediately prior to construction activities, and is done at a time when the burrows are inactive and no owls are physically present at the burrows.
2. Any incidental or accidental mortality resulting from the permitted work must be reported to the Commission within five days via fax at [(850) 921-1847]. Disposition of all such specimens is subject to approval by the Protected Species Permit Coordinator, Species Conservation Planning Section.
3. This permit does not authorize the Permittee access to any public or private properties. In instances where written or verbal permission for access is required, such permission must be secured from the appropriate landowners or public agencies in advance of undertaking any work on those controlled properties.
4. This permit is an addendum to work authorized under permit WN05387, which expired on February 15, 2005. It is nontransferable, and must be readily available for inspection at all times while engaging in the permitted activities. Other qualified personnel may assist in permitted work in the absence of the Permittee's direct supervision, when those assistants are designated via letter from the Permittee to each designee, with this office provided a copy of such letter(s).

PERMIT

Permit No: WN05387

Provisions/Conditions Continued:

BURROWING OWL NEST PROTECTION GUIDELINES AND PROCEDURES IN URBAN AREAS

The Florida burrowing owl (*Athene cunicularia floridana*) is listed by the State of Florida, Fish and Wildlife Conservation Commission (Commission) as a Species of Special Concern (Florida Administrative Code [F.A.C.] 68A-27.005). This classification means that the burrowing owl has a high vulnerability to factors that may lead to its becoming a threatened species in the absence of appropriate protection or management. As a Species of Special Concern, it is illegal to take (pursue, hunt, capture, molest, or kill) burrowing owls and their nest burrows and eggs without a permit issued by the Executive Director of the Commission (68A-9.002 & 68A-27.005 F.A.C.). Burrowing owls and their nests are also afforded protection under the Federal Migratory Bird Treaty Act. Rules promulgated under this act (Title 50, Code of Federal Regulations, Part 21) prohibit the destruction of active (i.e., nests which contain eggs or flightless young) nests without a federal permit, which is issued by the U.S. Fish and Wildlife Service Regional Office in Atlanta, Georgia.

The Commission's policy is to issue permits to destroy burrowing owl nest burrows only as a last resort, after all reasonable alternatives (such as realigning development to avoid the nest) have been shown to be impractical. When such permits are issued, they apply only to inactive nests (i.e., burrows containing no eggs or flightless young). Burrowing owl nests can generally be considered inactive from 10 July to 15 February, although some nesting occurs as early as October each year. Between 15 February and 10 July, burrows attended by one or more burrowing owls are considered active nests unless information is available to suggest otherwise (i.e., proof that young fledged from the nest prior to 10 July).

Burrowing owls often nest on vacant lots in rapidly developing suburban areas. In these areas, home construction is a major cause of burrow destruction. However, Commission studies in Cape Coral, Lee County, have shown that if development is conducted in such a way that the area within 50 ft of the burrow is protected from disturbance, nesting is seldom interrupted. No Commission permit is needed to build a home on a lot when at least a 50-ft radius circle can be provided around the burrow, but cautionary measures must be taken to guard against accidental destruction of the nest. A larger buffer, ideally 150 ft, will decrease chances the nest burrow will be adversely impacted. We recommend that the buffer circle around the burrow entrance be staked and roped-off prior to initiating construction. Sod may be laid within the protected area outside the "active" nesting period, but the burrow entrance must be left open. Plugging the burrow entrance or causing the burrow to collapse would effectively destroy the nest, and as such, require a permit. As a cautionary measure, we recommend that after completion of the home, the homeowners place a T-perch (see enclosed brochure) near the burrow or stake-off the area around the burrow to prevent someone from accidentally stepping into the entrance.

At present, the Commission has no guidelines for management of burrowing owls in other than urban/suburban areas. Protection criteria for these situations, or situations where numerous burrows will be impacted, will be developed on a case-by-case basis.

To request a permit to take a burrowing owl nest, submit an application packet to the Protected Species Permit Coordinator, Species Conservation Planning Section, Florida Fish and Wildlife Conservation Commission, 620 South Meridian St., Mail Station 2A, Tallahassee, FL 32399-1600, (850) 921-5990, ext. 17310, Fax (850) 921-1847. The packet must contain: (1) a complete application stating the location of the burrow(s), (2) a statement as to why the burrow(s) must be destroyed (i.e. nest burrow conflicts with proper installation/functioning of a structure or prohibits construction in a certain manner) in detail, (3) a detailed site plan or scaled diagram of the property that clearly indicates the location of the burrow(s) and it's proximity/distance to the proposed structure/construction activity, and (4) a statement of mitigation measures that will be enacted to offset the loss of nesting habitat for this species. Federal permits are required only if the nest is active (i.e., has flightless young or eggs present). Please contact Special Law Enforcement Agent in charge, U.S. Fish and Wildlife Service.

Nest removal application.doc revised 29 September 2004


PERMIT

Permit No: WN05387

Provisions/Conditions Continued:

5. Formally designated assistants/subpermittees are also to be in possession of your letter of authorization, a copy of this state permit and any required federal authorization/permit when working in your absence.
6. The Permittee by signature above confirms that representatives of the Florida Fish and Wildlife Conservation Commission (Commission) have his/her permission as the Permittee, and that of the landowner(s) to enter on and inspect the property(ies) described in the application (herein incorporated by reference) for all reasonable purposes pertaining to applicable Commission rules.
7. Progress reports during the course of the permitted work are to be provided to the Protected Species Permit Coordinator, Species Conservation Planning Section, upon request. A detailed report of all activities engaged in pursuant to this permit must also be submitted within 90 days of permit expiration or upon application for renewal, whichever is precedent. Copies of any other reports or publications which result from this work must also be provided upon their availability.
8. This permit is subject to revocation prior to the expiration date pursuant to Chapter 120, Florida Statutes. Application for renewal should be made at least 45 days in advance of the date it is needed.

Kenneth D. Haddad
Executive Director

By: 
Thomas H. Eason, Ph.D., Leader
Species Conservation Planning Section

ATW/THE/cy
LIC 6-20
WN05387.per

cc: South Region

ANNUAL REPORT: MIGRATORY BIRD
NEST REMOVAL

PERMITTEE NAME: _____

FEDERAL PERMIT NUMBER: _____

STATE PERMIT NUMBER: _____

COUNTY: _____

DATE NESTS WERE REMOVED: _____

NUMBER OF NESTS REMOVED: _____

COMMENTS: _____

**Management Plan
For
Athene cunicularia floridana (burrowing owl)
at
Stormwater Treatment Area-1East**

The Mission of the South Florida Water Management District (District) is to manage and protect water resources of the region by balancing and improving water quality, flood control, natural systems and water supply. The key elements to the Mission are environmental protection and enhancement, water supply, flood protection and water quality protection. Responsibilities of the District are further set out in state law. The Everglades Forever Act of 1994, §373.4592, F.S. (EFA), mandates the District (and the U.S. Army Corps of Engineers (Corps)) to proceed expeditiously with construction and operation of the Everglades Construction Project (ECP).

One of the major components of the ECP is Stormwater Treatment Area -1 East (STA-1E). Overall construction of STA-1E (by the Corps) has been completed. The STA-1E is located in Palm Beach County Florida, immediately east of the Arthur R. Marshall Loxahatchee National Wildlife Refuge (Refuge) and the STA-1 Inflow and Distribution Works (STA-1 Inflow Basin). The total land coverage STA-1E is approximately 6,505 acres. STA-1 E consists of a created wetland marsh system providing an effective treatment area of approximately 5,132 acres. STA-1 E includes two inflow pumping stations, inflow distribution cells, interior treatment cells, interior gravity control structures, perimeter levees, collection canals, discharge canals, a seepage collection canal system and an outflow pumping station. STA-1E is comprised of four parallel treatment paths (flow ways) with eight interior Treatment Cells moving water in a general north-to-south direction (see attached map).

The District has located 8 burrows created by *Athene cunicularia floridana* (burrowing owl) in STA-1E. These burrows all reside in interior Treatment Cell 2 (numbers 1-8 on attached map). All burrows have been staked-off and marked with a 50-foot parameter and provided with T-perches. Corps and District staffs periodically inspect the burrows to ensure that no impacts are experienced.

Although overall large-scale construction of the STA is complete, the Corps shall be constructing a treatment technology demonstration project, approximately 150 acres in size, within the interior of the STA, in the eastern most portion of Treatment Cell 2. This management plan is being created to address the conflict between these construction activities in Treatment Cell 2 and the safety and well-being of the burrowing owls and active and/or inactive nests. Appropriate protection will be provided as detailed below;

Actions to be taken by the District and the Corps to insure safety and welfare of the burrow owl;

1. No part of cell 2 will be flooded anytime soon. The Corps will not complete construction activities in this cell until June 2006.
2. After breeding season and before any burrow is taken, documentation will be provided to FFWCC to ensure that hatchlings have fledged and the burrows are inactive.
3. Construction activities shall be kept under surveillance, management and control to prevent impacts to burrowing owls and their nests. All construction personnel shall be advised that burrowing owls are listed as a Species of Special Concern by the State of Florida and therefore it is illegal to take (pursue, hunt, capture, molest, or kill) them and their nest burrows.
4. In order to meet these responsibilities (even after the existing 8 nests are permitted for take), during construction, on-going surveillance and monitoring of the construction area will continuously occur. Daily monitoring using the Daily Bird Monitoring Report shall be conducted during the dawn or dusk time frames by a District/Corps approved bird monitor. All caution shall be taken

by the monitor to avoid disturbance to any new found nests. A daily log shall be maintained detailing monitoring and burrowing owl nesting activity. If new nests are found, FFWCC shall be immediately notified and an amendment to this taking permit application shall be submitted.

5. A nearby upland mitigation site in close proximity to the STA is in the process of being selected by District and Corps staff in order to provide the opportunity for future nesting. This mitigation site will be prepared and ready for potential relocation prior to removal of burrows within the STA. The District shall provide starter burrows at this mitigation site each with perches. This mitigation site will be sparsely seeded with Bahiagrass and naturally recruited vegetation. Documentation of completion of this site shall be supplied to FFWCC at a later time.
6. After construction, future conflicts between the owl and the STA will be avoided by constant inundation of the STA. Upon completion of construction activities by the Corps cell 2 will be flooded and operated to maintain a target operating range in water depths from 6 inches to 2 feet. All other treatment cells within STA-1E are currently inundated.