United States Department of the Interior

FISH AND WILDLIFE SERVICE
1875 Century Boulevard
Atlanta, Georgia 30345

FEB 24 1999

IN REPLY REFER TO:

FEB 19 1999

Colonel Joe R. Miller
District Engineer
U.S. Army Corps of Engineers
P. O. Box 4970
Jacksonville, Florida 32232-0019

RE: Log Number 4-1-95-310R

Dear Colonel Miller:

Enclosed is the final biological opinion for the Modified Water Deliveries to Everglades National Park project, Experimental Water Deliveries Program, and the C-111 Project, proposed by the Corps of Engineers in South Florida. A separate letter addressing your specific comments, dated February 5, 1999, on our final draft biological opinion, dated January 4, 1999, will be provided early next week.

The reasonable and prudent alternative provided in the biological opinion is a tiered process to implement over a four year period. This allows the Interim Measures Team to work together to review proposed actions as well as other options without jeopardizing the Cape Sable seaside sparrow. If the Interim Measures Team determines that other actions would be more appropriate for the protection of the sparrow and fulfillment of the project objectives, the biological opinion can be modified through reinitation of formal consultation.

Your cooperation in completion of this biological opinion was greatly appreciated. If you have any questions regarding this issue, please contact Steve Forsythe, my Florida State Supervisor, at (561) 778-7671.

Sincerely yours,

H Dale Hall

for Sam D. Hamilton
Regional Director

United States Department of the Interior

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U. S. FISH & WILDLIFE SERVICE
FINAL BIOLOGICAL OPINION

FOR

THE U. S. ARMY CORPS OF ENGINEERS

MODIFIED WATER DELIVERIES
TO EVERGLADES NATIONAL PARK,
EXPERIMENTAL WATER DELIVERIES PROGRAM,
CANAL 111 PROJECT

FEBRUARY 19, 1999

United States Department of the Interior

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Colonel Joe R. Miller
District Engineer
U.S. Army Corps of Engineers
P. O. Box 4970
Jacksonville, Florida 32232-0019

Dear Colonel Miller:

This document transmits the Fish and Wildlife Service's biological opinion based on our review of the proposal by the U.S. Army Corps of Engineers (Corps) for the Modified Water Deliveries to Everglades National Park project, Experimental Water Deliveries Program, and the C-111 Project, all located in South Florida, and their effects on federally listed threatened and endangered species in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*). By letter dated November 4, 1997 the Corps agreed to reinitiate consultation on the **Modified Water Deliveries** project and the **Experimental Program.**

This biological opinion is based on information provided by the Army Corps of Engineers (Corps), Everglades National Park, Florida Game and Fresh Water Fish Commission, South Florida Water Management District, and project information available in our files. It also includes data on the biology and ecology of threatened and endangered species in the action area, previous biological opinions prepared for similar actions in the action area, the Technical Agency Draft of Volume I of the Multi-Species Recovery Plan for the Threatened and Endangered Species of South Florida and other published and unpublished sources of information. A complete administrative record of this consultation is on file in the Service's South Florida Restoration Projects Office in Vero Beach, Florida.

Executive Summary

This biological opinion covers three interrelated Everglades restoration projects. The **Modified Water Deliveries** project and **C-111 Project** are scheduled to be implemented over the next decade. The **Experimental Program**, which has been ongoing since 1983, is implemented through a series of test iterations. The **Modified Water Deliveries** and **C-111 Project** consist of structural changes to water management facilities in South Florida designed to restore a more natural flow of water through the Everglades. The **Experimental Program** consists primarily of changes in the operation of current water management facilities designed to restore a more natural flow of water through the Everglades.

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The effects these three projects are likely to have on endangered species are analyzed in detail. Results of these analyses are summarized in the table below.

Summary of Effects and/or Adverse Modification of Critical Habitat of The Modified Water Deliveries Project to Everglades National Park, Experimental Program of Water Deliveries to Everglades National Park, And C-111 Project, as proposed, on Federally Listed Species (E - endangered, T - threatened).

SPECIES / PROJECTS	EXPERIMENTAL PROGRAM	MODIFIED WATER DELIVERIES	C-111 PROJECT
Cape Sable Seaside Sparrow (E)	Hydrologic: jeopardy and adverse modification of critical habitat Construction: adverse effects, no adverse modification of critical habitat Reasonable and Prudent Alternatives: a single reasonable and prudent alternative is identified Incidental Take: incidental take is anticipated; reasonable and prudent measures are identified	Hydrologic: NONE Construction: NONE	Hydrologic: NONE Construction: adverse effects, no adverse modification of critical habitat Incidental Take: incidental take is anticipated; no reasonable and prudent measures are necessary due to Construction Monitoring Conditions
American Crocodile (E)	Hydrologic: NONE Construction: NONE	Hydrologic: adverse effects, no adverse modification of critical habitat Construction: NONE Incidental Take: incidental take is anticipated; reasonable and prudent measures are identified	Hydrologic: NONE Construction: NONE

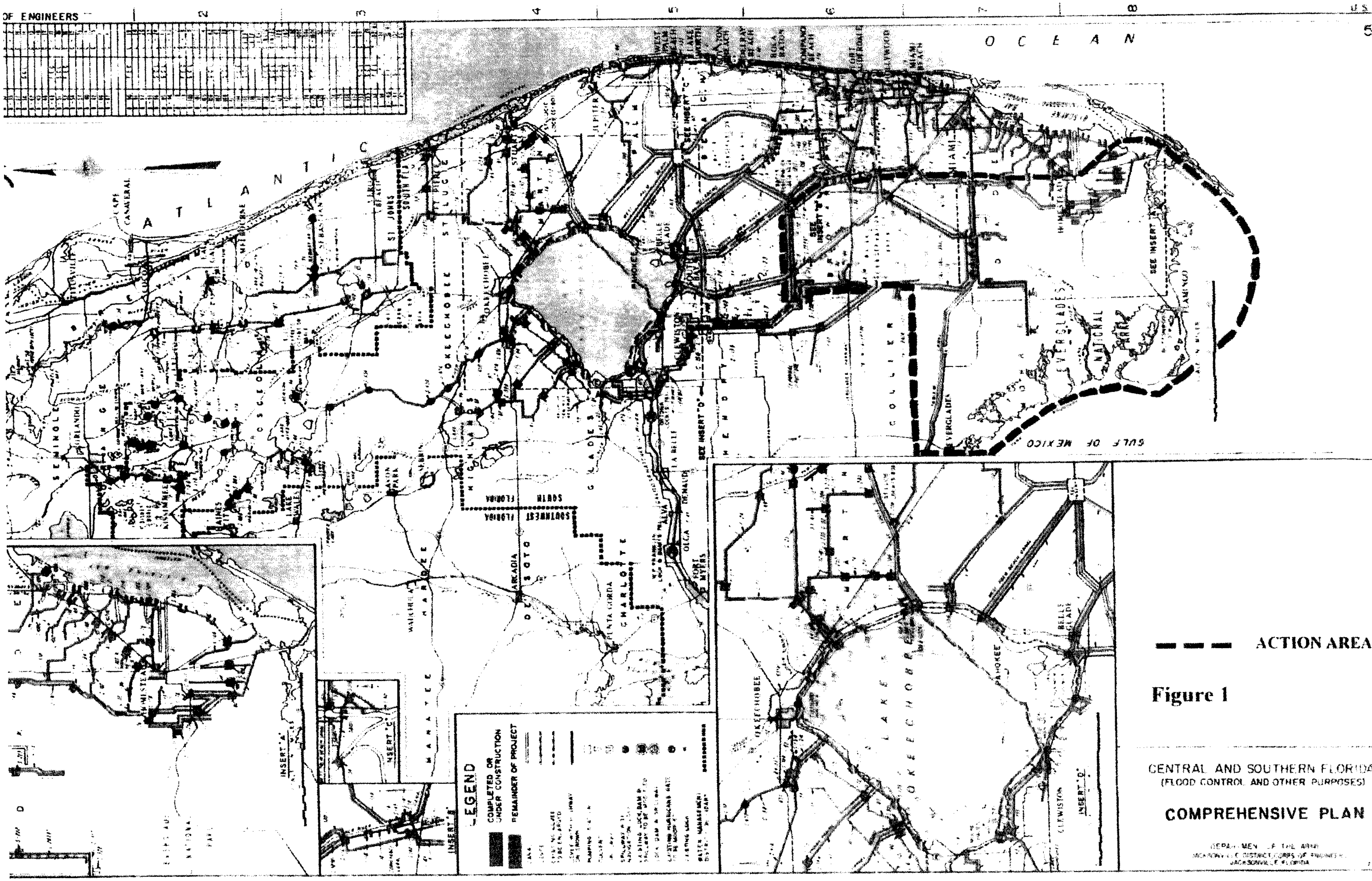
Wood Stork (E) (critical habitat has not been designated)	Hydrologic: adverse effects Construction: NONE Incidental Take: incidental take is anticipated; reasonable and prudent measures are identified	Hydrologic: adverse effects Construction: NONE Incidental Take: incidental take is anticipated; reasonable and prudent measures are identified	Hydrologic: NONE Construction: NONE
Snail Kite (E)	Hydrologic: adverse effects, no adverse modification of critical habitat Construction: NONE Incidental Take: incidental take is anticipated but the reasonable and prudent alternative will eliminate the incidental take	Hydrologic: adverse effects, no adverse modification of critical habitat Construction: NONE Incidental Take: incidental take is anticipated; reasonable and prudent measures are identified	Hydrologic: NONE Construction: NONE

A reasonable and prudent alternative to the **Experimental Program** that will avoid jeopardizing the Cape Sable seaside sparrow is presented. This alternative requires that: (1) By March 1, 1999, a minimum amount of sparrow habitat be protected from unusually high or low water levels; (2) By May 1, 1999, a fire management strategy be initiated; (3) Between March 1, 2000, and 2003, incrementally increase protections from unusually high or low water levels; (4) Annual reports must be submitted to the Service detailing progress implementing the RPA. Reasonable and prudent measures and terms and conditions designed to minimize incidental take of listed species, and conservation recommendations designed to benefit listed species, are also presented.

Consultation History

The Central and South Florida Project for Flood Control and Other Purposes (C&SF Project) utilizes levees, water storage areas, canals, gravity-flow water control structures, and large-capacity pump stations for managing water in central and southern Florida (Figure 1). In November 1983, as a result of adverse environmental effects within Everglades National Park (ENP) related to high rainfall and water management practices in South Florida, Congress enacted legislation that authorized the **Experimental Program**, allowing the U.S. Army Corps of Engineers (Corps), with the concurrence of the National Park Service (NPS) and South Florida Water Management District (SFWMD), to deviate from the existing minimum water delivery schedule established for ENP by Congress in 1970. The **Experimental Program**, which is being implemented through a series of test iterations, is attempting to improve the location, timing, and volume of water deliveries to ENP. The first five test iterations involved the operation of structures that delivered water from Water Conservation Area 3 (WCA 3) to both western and northeastern Shark River Slough (Figure 2). Our files contain a June 5, 1985, record of concurrence with the Corps' no effect determination for Test Iterations 1-5.

On September 20, 1988, the U.S. Fish and Wildlife Service (Service) provided the Corps with the Fish and Wildlife Coordination Act (FWCA) report on the **C-111 Project**. The **C-111 Project** entails flood control and ecosystem restoration in the C-111 basin of the C&SF Project, including Taylor Slough within ENP, and extending north in the area of Levee 31N (L-31N) to water control Structure 331 (S-331) (Figure 2). The proposed **C-111 Project** plan only included structural features, since operational plans were still under development. The Service raised concerns in the FWCA report regarding potential adverse effects to American crocodile (*Crocodylus acutus*) nesting and adverse modification of Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*) habitat. Our files contain no additional consultation records regarding this action.



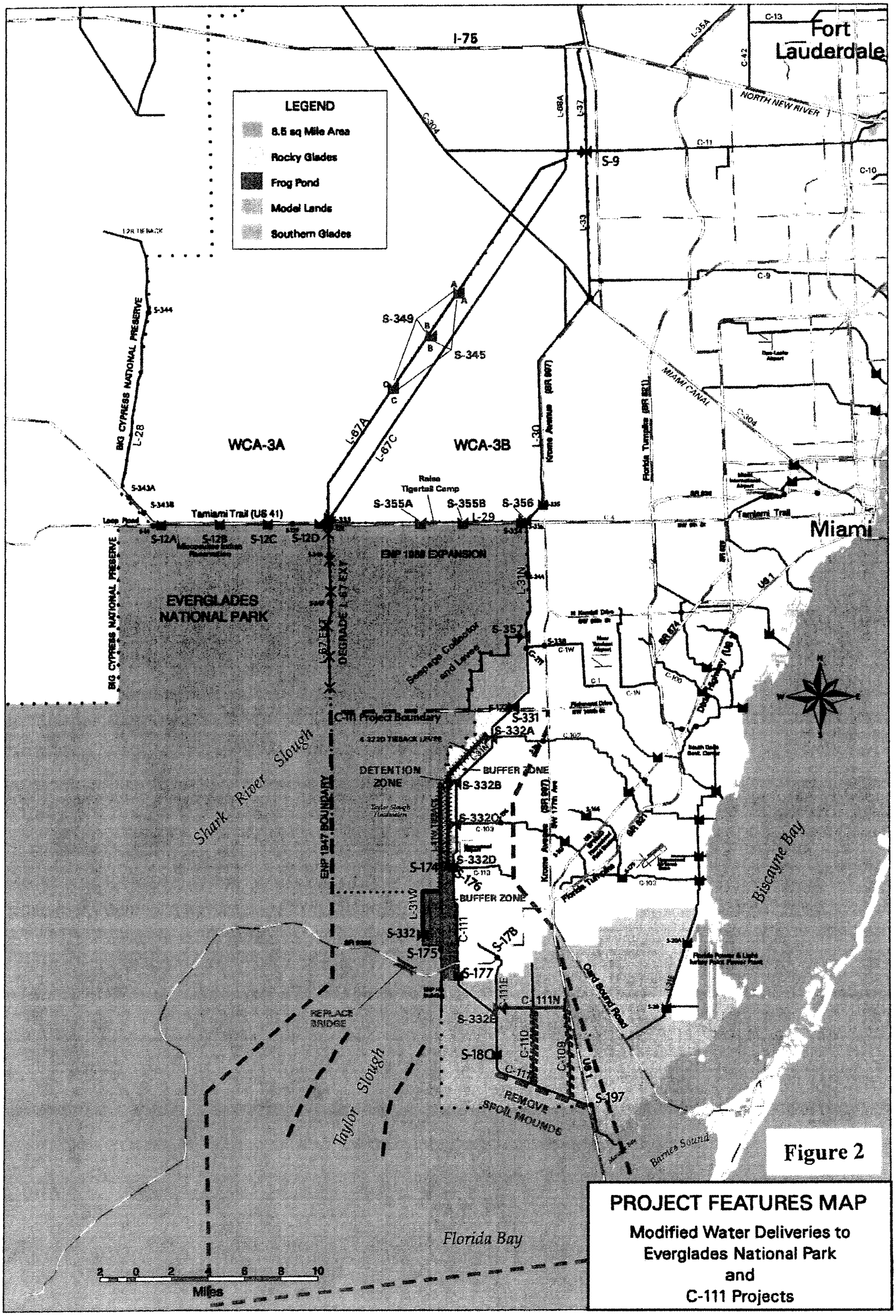
ACTION AREA

Figure 1

CENTRAL AND SOUTHERN FLORIDA
(FLOOD CONTROL AND OTHER PURPOSES)

COMPREHENSIVE PLAN

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA



PROJECT FEATURES MAP

Modified Water Deliveries to Everglades National Park and C-111 Projects

In 1989 Congress passed legislation which authorized the Corps to construct modifications to improve water deliveries into ENP through Shark River Slough. These modifications were to be based upon the findings of the **Experimental Program** and a General Design Memorandum (GDM) under preparation by the Corps entitled, "Modified Water Deliveries to Everglades National Park" (**Modified Water Deliveries**). The **Modified Water Deliveries** project addresses water deliveries to ENP through Shark River Slough, and operationally extends east to include the L-31N Canal area north of S-331 (Figure 2). The GDM addressed both structural and operational plans for four different alternatives. On February 13, 1990, the Service issued a biological opinion on **Modified Water Deliveries** which evaluated three action alternatives: (1) Modified Minimum Water Deliveries, (2) Modified Rainfall-Driven Water Deliveries, (3) Basic Rain-Driven Water Deliveries. The biological opinion concluded that implementation of either the Modified Minimum Water Deliveries or Modified Rainfall-Driven Water Deliveries were not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of designated critical habitat. However, implementation of the Basic Rain-Driven Water Deliveries alternative was found to jeopardize the continued existence of the snail kite (*Rostrhamus sociabilis plumbeus*) and adversely modify its critical habitat. The biological opinion included the following reasonable and prudent alternatives to preclude jeopardy: (a) implement the Modified Minimum Water Deliveries alternative or (b) implement the Modified Rainfall-Driven Water Deliveries alternative with monitoring related to the anticipated incidental take of the snail kite. The Corps decided to implement the Modified Rainfall-Driven alternative.

Test 6 of the **Experimental Program** began in July 1993, and involved the use of two additional 100 cubic feet per second (cfs) portable pumps at pump station Structure 332 (S-332) and the potential to increase discharges into Taylor Slough up to a total of 500 cfs as water was available and needed (Figure 2). Previously, the pump operation had been restricted to the months of June through October (wet season), however, the Test 6 operation proposal sought to pump at any time of the year when water is available in C-111 West at S-332. Water delivery operations for Shark River Slough were carried over into Test 6 unchanged from the previous test iteration. The second component of the proposal was the raising of operational canal levels in the C-111 system. A biological opinion was issued by the Service on June 3, 1994 (mistakenly dated 1993), which concluded that implementation of Test 6 of the **Experimental Program** was not likely to jeopardize the continued existence of the Cape Sable seaside sparrow, but recommended that pumping at S-332 during January through May (sparrow nesting season) be limited to 200 cfs to prevent nest flooding.

On May 31, 1994, the Service provided an interim FWCA report to the Corps on the December 9, 1993, revised **C-111 Project**. The Service concurred with the Corps's determination of "no effect" for the snail kite, wood stork (*Mycteria americana*), bald eagle (*Haliaeetus leucocephalus*), eastern Indigo snake (*Drymarchon corais couperi*), American crocodile and Florida panther (*Felis concolor coryi*). However, the Service was unable to evaluate the effects on the Cape Sable seaside sparrow beyond construction features and, therefore, could not concur with a "no effect" determination until operational plans where developed and reviewed.

In a letter dated March 2, 1995, the Corps requested informal consultation and sought concurrence with their determination of effects to listed species from implementation of proposed Test 7 of the **Experimental Program**. The proposal was to implement water delivery to ENP at Taylor Slough via the L-31W Canal based on a formula derived from a rainfall/canal stage relationship developed by ENP for water deliveries to Taylor Slough (Figure 2). Under this proposal, the Corps indicated they would need the flexibility to deliver whatever volumes of water the formula called for including the potential to exceed the 200 cfs capacity that was consulted on for Test Iteration 6. The Corps's evaluation concluded that implementation of the Test 7 proposal would have "no effect" on federally listed species, including the Cape Sable seaside sparrow, because the 1994 sparrow survey had indicated that the species was no longer present in Taylor Slough.

In a letter dated September 22, 1995, the Service responded to the Corps's Preliminary Environmental Assessment and Finding of No Significant Impact for Test Iteration 7 and accompanying determination that implementation of their preferred alternative "may effect" designated critical habitat for the Cape Sable seaside sparrow. The Service concluded that Test 7 was not likely to adversely affect the Florida panther, American crocodile, snail kite and eastern indigo snake, but that implementation was likely to adversely affect the Cape Sable seaside sparrow, its designated critical habitat, and the wood stork.

On October 27, 1995, the Service issued its biological opinion which concluded that implementation of Test 7 was likely to jeopardize the continued existence of the Cape Sable seaside sparrow, but would not adversely modify its critical habitat. In addition, the biological opinion concluded that implementation of Test 7 was not likely to jeopardize the continued existence of the wood stork. As a reasonable and prudent alternative to avoid jeopardy to the sparrow, the Service instructed the Corps to develop a Remedial Action Plan.

By letter dated October 17, 1997, the Service requested the Corps to reinitiate consultation on the **Modified Water Deliveries** project, **Experimental Program**, and the **C-111 Project**. The request to reinitiate consultation on the **Modified Water Deliveries** project was recommended because new information indicated that the previous "no effect" determination on the **Modified Water Deliveries** project for the Cape Sable seaside sparrow was no longer valid and there were deficiencies in the existing biological opinion relating to the potential unauthorized incidental taking of wood storks. The reinitiation request for the **Experimental Program** resulted from the scope of the 1995 biological opinion for Test 7, which only addressed operational plans for Phase I and from new information which indicated that the 1995 reasonable and prudent alternative would not avoid jeopardizing the continued existence of the Cape Sable seaside sparrow. The operational plans associated with Phase II and their potential effects to the Cape Sable seaside sparrow were never evaluated. Due to the interdependency of the **C-111 Project** with the **Experimental Program**, the Service requested reinitiation of consultation on all three of these activities.

By letter dated November 4, 1997, the Corps agreed to reinitiate consultation on the **Modified Water Deliveries** project and the **Experimental Program**, but recommended consultation be deferred on the **C-111 Project** since operational plans were still under development.

By letter dated March 6, 1998, the Corps requested a list of information needs necessary for the Service to begin preparing the biological opinion. The Corps stressed the urgency in completing formal consultation to avoid further delay with the operation of pump S-332D; a vital component of Test 7, Phase II, for the restoration of Taylor Slough within ENP.

In a letter dated March 12, 1998, the Service provided a list of information needs considered necessary to complete the consultation on the **Modified Water Deliveries** project, the **Experimental Program**, and the **C-111 Project**. The Service informed the Corps that the **C-111 Project** is considered interrelated and interdependent to both the **Modified Water Deliveries** project and **Experimental Program** and, therefore, would need to be included in the reinitiation request and subsequent biological opinion.

By letter dated April 23, 1998, the Service acknowledged the Corps's sense of urgency for completing the biological opinion in a timely manner as expressed in the Corps's March 6, 1998, letter. Although the Service would proceed with the biological opinion based on the best information currently available, additional flexibility with the consultation time frame was requested. The Service indicated that an extension of this time frame may be appropriate if it becomes clear that crucial information would become available too late for incorporation into the first draft of this biological opinion prior to the July 31, 1998, due date. The Corps had previously requested, by letter dated March 6, 1998, the Service proceed with the consultation and use the October, 1995, Environmental Assessment on Test 7 as the biological assessment on the effects of Test 7, Phase II, including the use of S-332D. The Service indicated that upon further review of the environmental assessment for Test 7, insufficient information on the design or proposed operation of S-332D or the effects its use may have on listed species or designated critical habitats was provided. This information along with the information identified in the Service's March 12, 1998, letter were requested as soon as possible to complete the biological opinion.

On July 21, 1998, the first draft of this biological opinion was delivered to the Corps and the Corps distributed copies to interested parties.

On August 28, 1998, the Corps provided initial comments on the draft along with comments received from other interested parties as attachments. The Corps' comments of August 28, 1998, recommended the following: (1) the Service provide a second draft of the biological opinion by October 23, 1998; (2) the Corps would provide final comments by October 30, 1998; and, (3) a final biological opinion would be delivered by November 13, 1998. By letter dated September 24, 1998, the Service agreed to this schedule.

By letter dated October 22, 1998, the Corps requested delay of the schedule for issuing the second draft biological opinion until March, 1999, and the final biological opinion until April, 1999, to provide additional time to review the ecology of the Cape Sable seaside sparrow and hydrology associated with implementation of the reasonable and prudent alternative within the initial July 21, 1998, draft biological opinion.

By letter dated October 26, 1998, the Service did not concur with the Corps request for an extension indicating that: (1) no significant new information is likely to become available during the proposed extension; (2) the proposed extension would serve only to delay conclusion of this consultation well into the Cape Sable seaside sparrow's next breeding season resulting in a fourth year of jeopardy conditions; and, (3) should new significant information become available at some time in the future, consultation can be reinitiated.

Discussions with the Corps during November, 1998, resulted in modification of the time table for completion of the draft biological opinion. These discussions resulted in an agreement that the final draft biological opinion would be provided to the Corps on January 5, 1999.

The final draft biological opinion was delivered to the Corps on January 4, 1999. The Corps provided final comments on this draft by letter dated February 5, 1999.

To summarize the consultation history:

<u>C-111 Project</u>
* May 1994 - Service concurred with the Corps' determination of "no effect" for the snail kite, wood stork, bald eagle, eastern Indigo snake, American crocodile and Florida panther. However, the Service was unable to evaluate the effects on the Cape Sable seaside sparrow beyond construction features and, therefore, could not concur with a "no effect" determination until operational plans were developed.

<u>Modified Water Deliveries</u>
* February 1990 - Service issued jeopardy biological opinion with accompanying reasonable and prudent alternative to preclude jeopardy for snail kite and concluded non-jeopardy for the wood stork.

<u>Experimental Program</u>
* June 1994 - Serviced issued non-jeopardy biological opinion for Test Iteration 6 on the Cape Sable seaside sparrow. In addition, the Service concurred with a "no effect" determination for all other listed species by letter dated April 4, 1994 (mistakenly dated 1993).
* October 1995 - Service issued jeopardy biological opinion for Test Iteration 7 (Phase I) on the Cape Sable seaside sparrow with accompanying reasonable and prudent alternative to preclude jeopardy and concluded non-jeopardy for the wood stork. In addition, the

Service concurred with a "no effect" determination for all other listed species by letter dated September 22, 1995.

On October 17, 1997, the Service requested the Corps reinitiate consultation on the **Modified Water Deliveries** project, **Experimental Program**, and the **C-111 Project**.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

Background

After major hurricanes struck southern Florida in 1947-48, producing widespread flooding, Congress authorized the C&SF Project; which utilizes levees, water storage areas, canals, gravity-flow water control structures, and large-capacity pump stations for managing water in central and southern Florida. For decades, the Corps and the SFWMD, through the operation of the C&SF Project, have manipulated the location, timing and volume of water deliveries to ENP. Over the years, since its initial completion in 1963, it has become evident that the network of canals, levees, and water control structures associated with the C&SF Project have substantially altered the natural hydrologic conditions of ENP and, concurrently, State and Federal water resource agencies have been cooperating with natural resource agencies to try to eliminate associated adverse ecological effects.

The **C-111 Project**, located in southeastern Dade County, Florida, adjacent to the eastern boundary of ENP, was authorized as an addition to the C&SF Project by the Flood Control Act of 1962. In 1970, in response to concerns from the Department of the Interior about failing ecosystems in ENP, Congress mandated a Minimum Water Delivery Schedule whereby ENP was guaranteed a minimum amount of water during each month of the year. In addition, Congress authorized modification of the **C-111 Project** for construction of the ENP-South Dade Conveyance System to provide a water supply to Dade County as well as ENP. This project included enlarging existing canals and construction of new structures and pump stations. However, it soon became apparent that the artificially-amplified flood events were as destructive as the artificial droughts.

In 1983, the NPS issued a Seven Point Plan calling for a number of measures to remedy flooding problems and restore historical flow patterns to the Everglades. Later in 1983, in response to the Seven Point Plan, Congress authorized the **Experimental Program** as part of the Supplemental Appropriations Act of 1984. This Act authorized the Corps, with the concurrence of the NPS and the SFWMD, to deviate from the minimum water delivery schedule for two years to conduct an **Experimental Program** of water deliveries to improve water conditions in ENP.

Since 1983, the **Experimental Program** has made seven tests of water management operations in an attempt to improve the ecological conditions in ENP. The first five test iterations involved operating the structures associated with the C&SF Project in a way that delivered water from WCA 3 to both western and northeastern Shark River Slough. Iteration 6, which ended on October 31, 1995, involved improvements in water delivery to Taylor Slough while continuing the improved water deliveries to Shark River Slough that were initiated in Test Iteration 5. The current Test 7, begun on November 1, 1995, and scheduled to run for 4 years, is intended to make further improvements in Taylor Slough water deliveries.

The Everglades National Park Protection and Expansion Act of 1989 authorized the Corps to construct modifications to the C&SF Project to improve water deliveries into ENP, and to the extent practicable, take steps to restore the natural hydrological conditions within ENP. These modifications were to be based upon the findings of the **Experimental Program** authorized by the 1984 Supplemental Appropriations Act and "generally set forth" in a GDM to be prepared by the Corps entitled, "Modified Water Deliveries to Everglades National Park" **(Modified Water Deliveries)**. In June 1992, the Corps issued the GDM, which proposed a modified rainfall driven schedule and certain structural modifications to the C&SF Project.

The **Experimental Program**, the **Modified Water Deliveries** project, and the **C-111 Project**, are all interrelated and are linked to the umbrella C&SF Project. Generally, the **Modified Water Deliveries** and **C-111 Project** plans identify the structural components to be built and the **Experimental Program** addresses the operational plan for water delivery via these structures and others already in place. The **Experimental Program** may also include the construction of previously authorized structural components.

The Canal 111 Project

The Corps's May, 1994, Final Integrated General Reevaluation Report on Canal 111 is incorporated here by reference. The **C-111 Project** boundary is that portion of the C&SF Project located south of and including S-331. The **C-111 Project** plans consist of the following significant structural additions to the existing C&SF Project works (Figure 2):

* Construct S-332E and Canal 111N - a spreader canal and a pump station used to improve the hydropatterns in the Southern Glades Wildlife and Environmental Area.
* Construct the L-31W and S-332D Tieback Levees - to hold water between the two levees to minimize seepage loses from ENP.
* Construct 4 pump stations (S-332A,B,C,D) - to pump water from the L-31N Canal into a detention area for later release to ENP. *(The Corps has completed the Pump Station 332D construction.)*
* Replace the bridge (SR 9336) over Taylor Slough- due to increased flows, the bridge needs modification.
* Remove spoil mounds along southernly leg of C-111 - to allow a more natural water flow to Florida Bay. (*The Corps has completed removal of the spoil mounds.*)

* Fill Canal 110 (C-110) and Canal 109 (C-109) - to stop overdrainage and establish a more natural hydropattern in the Southern Glades conservation area. (*The Corps has completed the filling of C-109.*)

The Modified Water Deliveries Project

The Corps' June, 1992, General Design Memorandum on, "Modified Water Deliveries to Everglades National Park", is incorporated here by reference. The **Modified Water Deliveries** project boundary is Shark River Slough and that portion of the C&SF Project north of S-331 to include WCA 3. The **Modified Water Deliveries** project plans consist of the following structural additions to the existing C&SF Project works (Figure 2):

* Construct Structures 345A,B,C (S-345) and Structures 349A,B,C (S-349)- to provide waterflow from WCA 3A to WCA 3B.
* Provide three breaks in the Levee 67C (L-67) and construct three canals between L-67A and C to provide conveyance for water discharged from 345A,B,C between WCA 3A and WCA 3B.
* Degrade the L-67 extension - to allow water released from WCA 3A to spread into Northeast Shark River Slough.
* Construct Structure 355 (S-355) A and B - to provide water flow from WCA 3B into Northeast Shark River Slough. (*The Corps will complete the construction of S-355A and B in early 1999.*)
* Raise Tigertail Camp - to provide flood protection for a small camp of Miccosukee Indians.
* Construct Pump Station 357 (S-357)- to pump water out of the 8.5 square mile area north through the L-31N Canal and then into Northeast Shark River Slough via new pump station 356 (S-356).
* Construct a levee and seepage collector canal around the 8.5 square mile area - to provide flood mitigation for the private residential area.

The **Modified Water Deliveries** project consists of major structural modification of, and additions to, the existing system of water control features in the central and southern Everglades that are meant to restore more natural timing, volume and placement of water flows through the action area. In general, the **Modified Water Deliveries** project attempts to reroute large volumes of water that currently pass through WCA 3A into western Shark River Slough, instead passing the water from WCA 3A to WCA 3B and then from WCA 3B to Northeast Shark River Slough.

As part of their efforts to provide technical assistance to the Corps and the Service, the NPS examined the hydrologic aspects of the **Experimental Program**, **Modified Water Deliveries**, and the **C-111 Project** relevant to endangered species. The report (Van Lent et al. 1999) indicates the **Modified Water Deliveries** project would be successful at passing water from WCA 3A to WCA 3B. However, some other structural components, as currently designed, are not physically large enough to move the large volumes of water necessary to restore natural flows (Van Lent et al. 1999). Van Lent et al. (1999) also indicates the **Modified Water Deliveries** components that are designed to pass flows into Northeast Shark River Slough would have to be five times larger in order to pass peak flow volumes necessary to restore natural conditions and that the elevation of Tamiami Trail severely limits the amount of water that can be passed from WCA 3B into Northeast Shark River Slough. This results in the retention of large volumes of water in WCA 3B causing high water levels in this area, increased loss of water due to evapotranspiration, and increased loss of water due to seepage through the levee forming the eastern boundary of WCA 3B (Van Lent et al. 1999). This further results in significant reductions in the volume of water passing across Tamiami Trail into western and Northeastern Shark River Slough and Taylor Slough, producing substantially drier conditions in downstream areas of ENP as compared to current conditions (Van Lent et al. 1999).

The Experimental Program

There have been 6 previous test iterations of water delivery to ENP. The current Test 7 is described in detail in the Environmental Assessment and Finding of No Significant Impact for Test Iteration 7 of the **Experimental Program** of Water Deliveries to Everglades National Park (Corps 1995). The descriptions of the water delivery schedules and the proposed structural modifications that are found in that document are incorporated here by reference. However, we include the following summary of the major structural components and operational features of Test 7 to make it easier to follow the discussion in this biological opinion.

The purpose of Test 7 is to evaluate methods of restoring more natural hydroperiods to ecosystems within ENP, including Northeast Shark River Slough and Taylor Slough; enhance freshwater flows to Florida Bay through Taylor Slough; and reduce large, freshwater discharges through Structure 197 (S-197) into Manatee Bay and Barnes Sound (Figure 2). One objective of Test 7 carried over from previous tests is to deliver water to Northeast Shark River Slough consistent with rainfall levels. Another objective is to allow water levels in L-31W, which is upstream of Taylor Slough, to fluctuate more naturally in response to rainfall.

Test 7 would help the Corps, SFWMD, and ENP to determine the effects of a more natural water flow, resulting from rainfall, on the salinity regime of northeastern Florida Bay. Test 7 would also help determine if water loss out of the Taylor Slough area, resulting from drainage into C-111, can be reduced by holding higher water stages at Structure 18C (S-18C) .

The major constraint on Test 7, like the tests before it, is the concern for flooding of private lands adjacent to ENP (Figure 2). During storm events, flood control criteria override normal operations established for the test. Other constraints include ecological concerns and structural limitations for water levels in the WCAs.

The objectives of Test 7 would be achieved through a program of water deliveries to ENP through Shark River Slough and Taylor Slough. The goal of Test 7 is to deliver 45 percent of the total water deliveries to Shark River Slough through Structures 12 (S-12) A, B, C, and D and 55 percent of the total through Structure 333 (S-333) (deliveries through the S-12 structures are to western Shark River Slough; deliveries through S-333 are to Northeast Shark River Slough). If S-333 is closed or discharging less than 28 percent of computed flows, the guidelines for the **Experimental Program** allow and, in some instances require, the S-12 structures to discharge between 73 and 100 percent of the computed flows from WCA 3A. The constraint on the use of S-333 involves flowing water over private lands and the Tamiami Trail roadbed.

Test 7 includes the following structural modifications and operational features to be implemented in two phases:

Structural Modifications

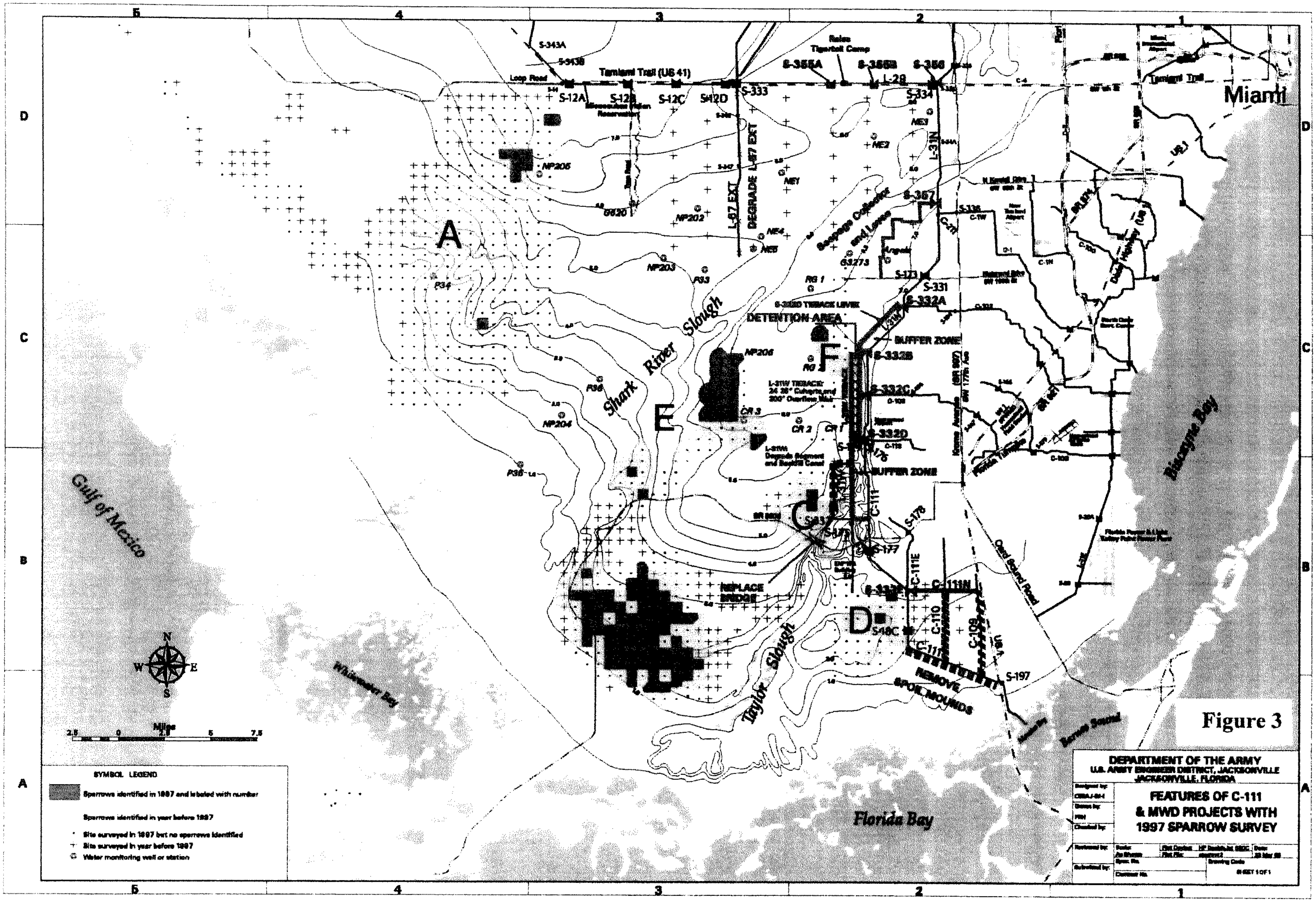
1) Degrade the berm on the west side of the L-31W canal.
2) Plug the L-31W canal south of Structure 175 (S-175).
3) Plug the east/west-aligned, south of S-175, Aerojet Canal.
4) Install two auxiliary pumps (50 and 75 cfs capacities) at Structures 173/331 (S-173/331).
5) Construct S-332D as authorized by the **C-111 Project** *(The Corps has completed construction of S-332D, but has not begun operation).*

Operational Features

1) Water deliveries to Northeast Shark River Slough through the S-12 and S-333 structures will continue, without change, as they have since Test 5.
2) Water deliveries to Taylor Slough would be changed by increasing stages in the L-31W canal (between Structure 174 {S-174} and S-175). This would allow the L-31W canal to serve as a spreader canal that would recharge the adjacent marsh in Taylor Slough through overbank flow and reduce seepage losses, depending on canal stages. The area between the L-31W Canal and C-111 (the area known as the Frog Pond) has been placed in public ownership.
3) Implement the Rainfall-Stage operating criteria for the L-31W canal (Taylor Slough) to reflect more natural water level fluctuations.
4) Abandon the S-332 and S-175 structures as water delivery points to ENP and minimize their future operation for flood control.
5) Change the operational levels at S-176 to open at 5.2 feet and close at 5.0 feet.
6) Change the operational levels at S-174/S-332D to open at 5.0 feet and close at 4.8 feet.

There are two phases to Test 7. Phase I is ongoing and includes capping the water levels in the L-31W Canal at 4.7 feet, ensuring that levels do not fall below 3 feet, and modifying S-332 to pump up to 495 cfs of water into Taylor Slough. In addition, a new pump station, S-332D, was constructed in vicinity of S-174. During Phase II, the cap on stages in the L-31W Canal would be eliminated, the canal would be plugged in several places south of S-175, the western berm of that levee north of S-332 would be degraded, and pumping at S-332 would be minimized, which would allow stages in the canal to approximate surface water levels. Also during Phase II, pump S-332D would be used to move excess flood water through the L-31W Canal.

The berm on the west side of the L-31W canal is immediately adjacent to the eastern edge of Cape Sable seaside sparrow subpopulation C habitat, and sparrow breeding activity has been observed in this vicinity as recently as 1997 (Figure 3). The L-31W canal south of S-175 (where a plug is to be installed) is more than 1 mile away from the closest Cape Sable seaside sparrow habitat (subpopulation C). The Aerojet Canal (where a plug is to be installed) is immediately adjacent to the northern edge of Cape Sable seaside sparrow subpopulation D, and sparrow breeding activity has been observed in this vicinity as recently as 1997 (Figure 3).



Tamiami Trail (US 41)
Loop Road
S-12A
S-12B
S-12C
S-12D
S-333
S-355A
S-355B
S-356
L-29
S-334
Miami
Tamiami Trail
NP205
NP202
NP203
NE1
NE2
NE3
NE4
NE5
P33
P34
P35
P36
P38
NP204
NP206
L-67 EXT
DEGRADE L-67 EXT
L-31N
S-357
Seepage Collector and Levee
S-331
S-332A
S-332B
S-332C
S-332D
S-332
DETENTION AREA
BUFFER ZONE
Shark River Slough
Taylor Slough
CR 1
CR 2
CR 3
RG 1
RG 2
C-111
C-111E
C-111N
C-110
C-109
S-175
S-176
S-177
S-178
S-18C
S-197
REPLACE BRIDGE
REMOVE SPOIL MOUNDS
A
B
C
D
E
F
Gulf of Mexico
Whitewater Bay
Florida Bay
Biscayne Bay
Barnes Sound
Card Sound Road
N
S
E
W
Miles
2.5
0
2.5
5
7.5
SYMBOL LEGEND
Sparrows identified in 1997 and labeled with number
Sparrows identified in year before 1997
Site surveyed in 1997 but no sparrows identified
Site surveyed in year before 1997
Water monitoring well or station
DEPARTMENT OF THE ARMY
FEATURES OF C-111
& MWD PROJECTS WITH
1997 SPARROW SURVEY
SHEET 1 OF 1

Figure 3

Conservation Measures

<u>Construction Monitoring Plan</u>

Through recent discussions with the Service, the Corps has agreed to incorporate the following provisions for endangered species monitoring in association with construction activities (Construction Monitoring Plan) into all three proposed actions.

1. Monitoring for Wood Storks, Snail Kites and Cape Sable Seaside Sparrows

   For construction activities involving heavy, earth-moving equipment, sustained noise levels that make conversation difficult, blasting, or other activities having similar general disturbance potential occurring near wood stork, snail kite or Cape Sable seaside sparrow nesting habitat:

   a. construction will be conducted outside the species' breeding season; or,
   b. trained observers will survey the site beginning one month before construction is to begin, and then every two weeks thereafter, within 0.5 mile (for wood storks and snail kites) or 0.25 mile (for Cape Sable seaside sparrows) of the site of construction activity. If any breeding activity is detected, all work will cease, and an intensive survey of the site will be conducted to assess the specific location, density and stage of breeding activity. Upon completion of this survey, a meeting will be convened between the appropriate staff of the Service, Corps, ENP, SFWMD and the Florida Game and Freshwater Fish Commission (GFC). Survey results will be reviewed, and, based on available information, a decision will be made on whether to continue construction at the site, with potential restrictions, or cease construction activities within the area, until nesting is completed.
   c. surveys should begin before construction crews are mobilized so as to minimize cost of delays.

2. Monitoring for Eastern Indigo Snakes

   a. the Corps shall coordinate with the Service's South Florida Field Office during the establishment and implementation of an eastern indigo snake protection/education plan.
   b. a trained observer shall be present on site to watch for eastern indigo snakes during all initial construction and clearing phases of the project. If the observer determines that no further disturbance of eastern indigo snakes is likely for the remainder of an individual construction project, then the observer's presence will no longer be required for the remainder of that construction project. However, in the event that disturbance to an eastern indigo snake does occur after the observer has departed, observation will again be required. The name(s) and qualifications of the proposed observer shall be submitted to the Service for review and approval. The information submitted for approval should indicate what

experience the individual has that would qualify them to act as an eastern indigo snake observer.

c. an eastern indigo snake protection/education plan shall be developed for all construction crews to follow. The educational materials for the plan could consist of a combination of posters or videos, pamphlets, and lectures and should include the following information:

    1. a description of the eastern indigo snake, its habits, and protection under Federal Law;
    2. instructions not to injure, harm, harass or kill this species;
    3. directions to notify the qualified observer(s) if an eastern indigo snake is sighted;
    4. directions to cease construction activity, notify the qualified observer, and allow the eastern indigo snake sufficient time to move away from the site on its own, or have the observer move the snake out of harm's way, before resuming construction (only a qualified individual, who has either been authorized by a section 10(a)(1)(A) permit issued by the Service or has been designated as an agent of the State of Florida by the GFC for such activities, is permitted to come in contact with an eastern indigo snake); and
    5. telephone numbers of pertinent agencies to be contacted if a dead eastern indigo snake is encountered.

d. the qualified observer should examine any possible eastern indigo snake burrows in the construction area. If a burrow is found to contain an eastern indigo snake, the burrow should be carefully excavated until the snake leaves the area or until it can be moved out of harm's way by the qualified observer.

e. a monitoring report summarizing all activities pertaining to the eastern indigo snake must be submitted to the South Florida Field Office within 60 days of the conclusion of clearing and construction phases and following maintenance activities that may occur. The report should contain the following information:

    1. any sightings of eastern indigo snakes; and,
    2. summaries of any relocated snakes (e.g., locations of where and when they were found and relocated).

These monitoring provisions are designed to reduce or eliminate any disturbance to breeding activities of listed species that occur due to construction activities near breeding sites. They will also minimize costly construction delays. The Service commends the Corps for this proactive approach to reducing possible adverse effects to listed species.

Action Area

For the purposes of this consultation, the action area includes the boundaries of Big Cypress National Preserve south of S-344, ENP, WCA 3 (units A and B), the area known as the Frog Pond, the area known as the 8.5-square mile area, Florida Bay, and Barnes Sound (Figure 1). This area encompasses those lands and waters that would be directly and indirectly affected by water delivery, regulation, and flood control; and also includes those lands and waters supporting populations of threatened and endangered species, and their designated critical habitat, likely to be directly or indirectly affected by the proposed action.

STATUS OF THE SPECIES/CRITICAL HABITAT

This section presents the biological and ecological information relevant to formulating the biological opinion. Appropriate information on the species' life history, habitat and distribution, and other factors necessary for survival are included. This analysis documents the effects of all past human and natural activities or events that have led to the current status of the species. When the Service's review focuses on the effects of the action on a discrete recovery unit or designated critical habitat unit, this section describes the status of that unit and its significance to the species as listed or to the designated critical habitat.

During preparation of this biological opinion, the Corps and others raised several questions regarding the biological information on the Cape Sable seaside sparrow and hydrological information presented in Van Lent *et al.* (1999) used in this analysis. The Service has reviewed all available data regarding the biology of the Cape Sable seaside sparrow and the hydrology of the action area. Further, the Service has reviewed some peer review of the Service's conclusions drawn from the currently available data, including the peer review cited by the Corps. To the extent that such peer review is available, it has been considered and discussed as appropriate. Taking all of this into careful consideration, the Service has determined that the biological information regarding the Cape Sable seaside sparrow cited in this biological opinion is the best such information currently available.

The Service has also carefully considered the substantive questions that have been raised by the Corps and others concerning the Van Lent *et al.* (1999) modeling, and if future modeling is developed that is agreeable to both the Corps and the Service, the Service would likely consider that to be new information that may warrant a reexamination of this biological opinion. However, until such new modeling is developed, the Service has determined that the Van Lent *et al.* (1999) modeling is part of the best scientific information currently available because it is the only published, peer reviewed, modeling information of a sufficiently detailed nature to make the required determinations and because the questions raised by the Corps and others are based on professional differences of opinion rather than findings of factual error. Also, we would like to point out that the finding of jeopardy for the Cape Sable seaside sparrow and the reasonable and prudent alternative are based on actual observed field information cited by Van Lent *et al.*

(1999), Nott *et al.* (1998), Curnutt *et al.* (1998), Pimm (1997) and others, and are not predicated in any way on the Van Lent *et al.* (1999) hydrologic modeling.

The Service has determined the following species may occur within the action area:

1. Cape Sable seaside sparrow - (E)(CH)	(*Ammodramus maritimus mirabilis*)
2. Snail kite - (E)(CH)	(*Rostrhamus sociabilis plumbeus*)
3. Wood stork - (E)	(*Mycteria americana*)
4. American crocodile - (E)(CH)	(*Crocodylus acutus*)
5. West Indian manatee - (E)(CH)	(*Trichechus manatus*)
6. Florida panther - (E)	(*Felis concolor coryi*)
7. Red-cockaded woodpecker - (E)	(*Picoides borealis*)
8. Bald eagle - (T)	(*Haliaeetus leucocephalus*)
9. Eastern indigo snake - (T)	(*Drymarchon corais couperi*)
10. Garber's spurge - (T)	(*Euphorbia garberi*)

(E) = federally listed as endangered
(T) = federally listed as threatened
(CH) = federally designated critical habitat

A summary of the status of the species listed above across their entire range, as well as the biological and ecological information relevant to our analysis of effects is provided below. The analysis of the species and critical habitat likely to be affected is also provided. This analysis will be presented in more detail later in the *Effects of the Action* section of this biological opinion. Detailed information regarding the status of the above-mentioned species along with the biological and ecological information utilized by the Service in evaluating potential adverse effects can be found in the Technical Agency Draft of Volume I of the Multi-Species Recovery Plan for the Threatened and Endangered Species of South Florida (U.S. Fish and Wildlife Service 1998). That document is incorporated here by reference.

Cape Sable Seaside Sparrow

The Cape Sable seaside sparrow was listed as an endangered species on March 11, 1967, pursuant to the Endangered Species Preservation Act of 1966 (32 FR 4001). That protection was continued under the Endangered Species Conservation Act of 1969 and the Endangered Species Act of 1973, as amended. The Cape Sable seaside sparrow was listed because of its limited distribution and threats to its habitat posed by large-scale conversion of land in southern Florida to agricultural uses. Critical habitat for the Cape Sable seaside sparrow was designated on August 11, 1977 (42 FR 40685).

A. Distribution

The eight surviving subspecies of seaside sparrow are distributed along the east coast of the United States, from Massachusetts to southern Florida, and along the Gulf coast, from southeast Texas to the west coast of Florida. The distribution of the Cape Sable seaside sparrow is now limited to the Everglades region of Dade and Monroe Counties in South Florida (Figure 3). They are non-migratory and are isolated from other breeding populations of seaside sparrows.

When first discovered on Cape Sable in Monroe County, the sparrows were utilizing freshwater and brackish water marshes across the area east of the mangrove zone in Carnestown to Shark Valley and Taylor Sloughs. The original range most likely included all suitable habitat in south and southwestern Florida (Werner 1978), and extended from Cape Sable (south) to Ochopee (northwest), and east to Taylor Slough and the east Everglades.

The historical distribution of the Cape Sable seaside sparrow included areas that periodically experienced extensive flooding, fires and hurricanes; the sparrow probably adapted to these natural disturbances by varying their distribution within their range as habitat suitability changed. Since its discovery in the early 1900's, the Cape Sable seaside sparrow has been episodically extirpated from portions of its total range. For example, Howell (1919) found the Cape Sable seaside sparrow to be "moderately numerous" on Cape Sable when he first discovered them in 1918. The Great Labor Day Hurricane of 1935 initiated vegetative changes in the Cape Sable area that were later responsible for extirpating the sparrow population. In 1970, Werner discovered Cape Sable seaside sparrows in three cordgrass marshes on Cape Sable. In 1979, fires on Cape Sable appear to have extirpated the sparrow population again; as no sparrows were noted in surveys conducted on Cape Sable in 1979, 1980, or 1981 (U.S. Fish and Wildlife Service 1983). By 1983, the stands of *Spartina*-dominated vegetation that once covered extensive areas of Cape Sable were gone (Werner and Woolfenden 1983) along with the Cape Sable seaside sparrow.

Cape Sable seaside sparrows were first documented in the Big Cypress basin in 1928 by Nicholson. They appeared to flourish there in the 1950s (Stimson 1956), but had been extirpated as a result of widespread frequent fires by the time surveys were conducted in the early 1960s (Stimson 1968). In the early 1970s, they were rediscovered in the Big Cypress area (Kushlan and Bass 1983, Werner and Woolfenden 1983), but were considered rare.

Similar changes in distribution and abundance were noted in other subpopulations. Cape Sable seaside sparrows were initially located in Ochopee by Anderson (1942), but few birds were found in the Ochopee area between the mid-1970's and the 1990's. Pimm *et al.* (1994) located a small number of seaside sparrows there in 1993, but they were not found in 1994 (although the area may not have been adequately surveyed due to logistical problems). The decline of the Cape Sable seaside sparrow subpopulation in this area has been attributed to fires and salinity changes associated with altered hydrology (U.S. Fish and Wildlife Service 1983).

Cape Sable seaside sparrow surveys in 1974, 1975, and 1978-81 indicate the Taylor Slough area supported one of the largest and most viable populations of the sparrow that were known at the time (Bass and Kushlan 1982, Werner 1978). Both studies reported that the extent of suitable habitat in the Taylor Slough area was decreasing because of invasion by exotic trees and shrubby vegetation. These habitat changes may explain why later studies reported the Taylor Slough population as a peripheral population (Curnutt and Pimm 1993, Pimm *et al.* 1994).

Curnutt and Pimm (1993) identified six subpopulations (subpopulations A-F) of the Cape Sable seaside sparrow across their range (Figure 3), with their distribution fluctuating through time, noting that four of the six subpopulations show signs of wide population variation and probably underwent periodic, local extirpations.

B. Habitat

The preferred nesting habitat of Cape Sable seaside sparrows appears to be short-hydroperiod mixed marl prairie communities that often include muhly grass (*Muhlenbergia filipes*) (Stevenson and Anderson 1994). These short-hydroperiod prairies contain moderately-dense, clumped grasses, with open space permitting ground movements by the sparrows. Sparrows tend to avoid tall, dense, sawgrass-dominated communities, coastal spike-rush (*Eleocharis*) marshes, extensive cattail (*Typha*) monocultures, long-hydroperiod wetlands with tall, dense vegetative cover, and sites supporting woody vegetation (Werner 1975, Bass and Kushlan 1982). Cape Sable seaside sparrows also avoid sites with permanent water cover (Curnutt and Pimm 1993).

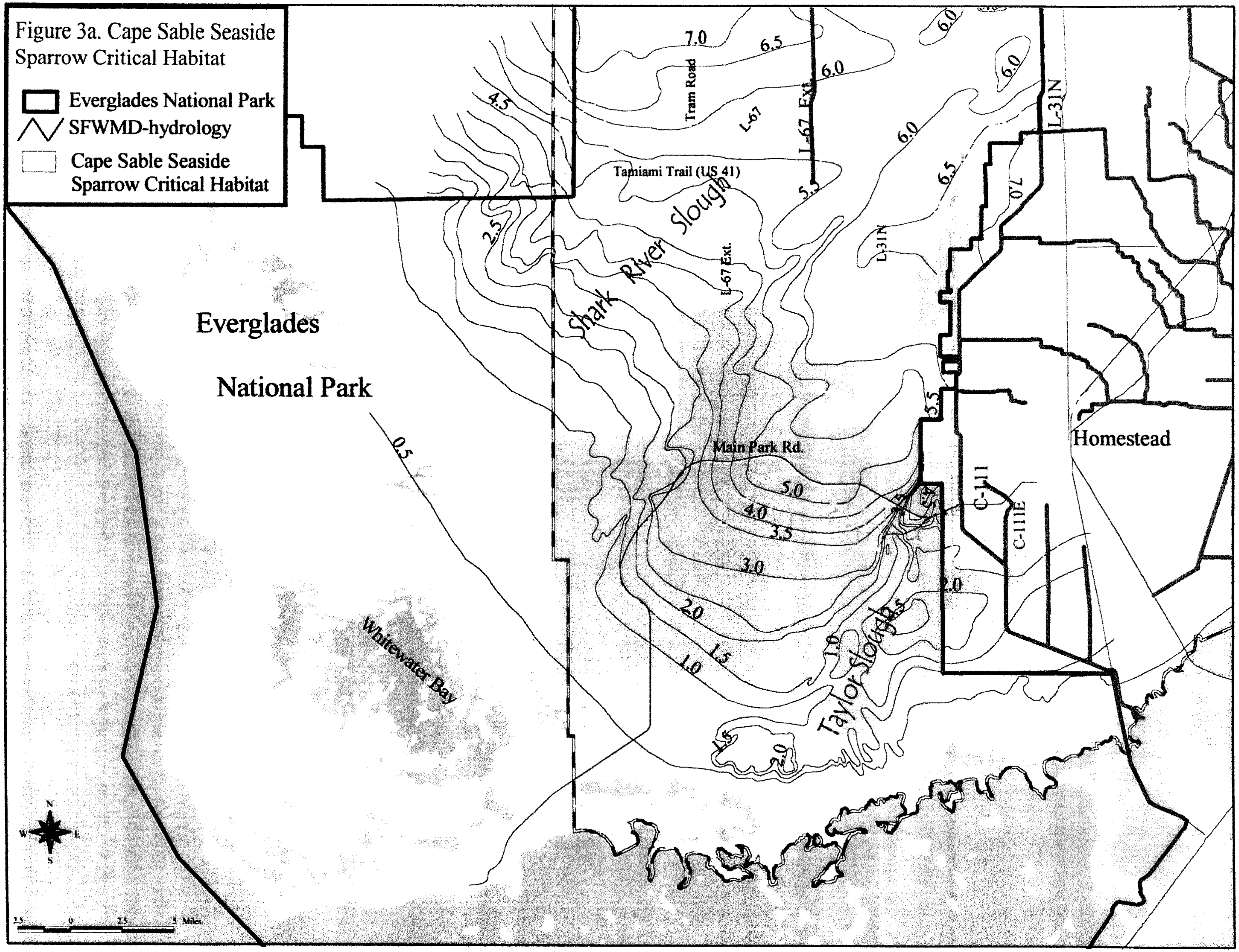
Studies completed since the 1970s document that *Muhlenbergia* prairies support the highest densities of sparrows (Kushlan and Bass 1983, Werner and Woolfenden 1983, Pimm *et al.* 1994). The suitability of this vegetative community for the sparrow is driven by a combination of hydroperiod and periodic fires (Kushlan and Bass 1983). Fires prevent hardwood species from invading these communities and prevent the accretion of dead plant material, both of which decrease the suitability of these habitats for Cape Sable seaside sparrows. Werner (as cited by Pimm *et al.* 1994) found that sparrow numbers increased annually in areas that had been burned up to 3 years previously. Four years after a fire, he expected the suitability of these habitats to decline sharply. Curnutt (personal communication 1998) suggested that could be a localized response, but typically sparrow numbers increase up to 10 years post-fire.

Little is known about the wintering habitat of Cape Sable seaside sparrows. Birds have been observed near tree islands in December but may additionally be wintering within the salt marshes of the southern Everglades (Pimm *et al.* 1996).

C. Critical Habitat

Critical habitat for the Cape Sable seaside sparrow was designated on August 11, 1977 (50 CFR 17.95). The critical habitat, as designated, does not adequately account for the distribution of the present-day core subpopulations, or the areas necessary for the birds to maintain a stable population (Figure 3a). An important area west of Shark River Slough, which until 1993 supported one of two critical subpopulations (nearly half of the entire population), is not included within the designation, and has been undergoing detrimental changes in habitat structure as a result of water management practices (Curnutt *et al.* 1998, Nott *et al.* 1998).

Figure 3a. Cape Sable Seaside Sparrow Critical Habitat



Additionally, other parts of the designated critical habitat have been converted to agriculture and are no longer occupied by sparrows.

Although the critical habitat that was designated for the Cape Sable seaside sparrow did not include constituent elements, hydroperiods that sustain the short-hydroperiod prairies are considered essential for the sparrows to successfully breed and are considered necessary to ensure the species' survival.

D. Reproduction

In most years, nesting typically occurs from mid-March until the onset of the rainy season (mid-June)(Nott et al. 1998). In dry years, nesting can begin as early as mid-February and continue through early August. The majority of nesting occurs in the spring when marl prairies are dry. Cape Sable seaside sparrows usually raise two broods in a season, although they may raise a third brood if weather conditions allow (Kushlan *et al.* 1982, U.S. Fish and Wildlife Service 1983). Sparrows need at least 40 days to complete one nesting cycle, a 60 day period is required for the initiation of second clutches, and an 80 day period allows for the fledglings of the second clutch to leave the nest (Nott et al. 1998). Nest cups are placed approximately 14 cm above the ground and are constructed with grasses (Werner 1975, Lockwood *et al.* 1997). Pimm (personal communication, 1997) suggests that nesting will not be initiated if water levels are at a depth greater than 10 cm during the breeding season. The end of the breeding season appears to be triggered by the onset of the summer rains. When water levels rise above the mean height of the nests off the ground, sparrows cease breeding.

Werner (1975) documented a 62 percent nest success rate in the Taylor Slough area, demonstrating a high reproductive potential for this subspecies. However, Pimm *et al.* (1996) report a significantly lower success rate (42 percent) during the 1995 and 1996 breeding seasons. Lockwood *et al.* (1997) report an 88 percent hatching rate, but only 40 percent of the eggs laid contribute to the total population each year. Kushlan *et al.* (1982) contend that the population has the ability to maintain or expand due to the high survival rate of adult males and the potential to produce two clutches of four eggs each breeding season.

Cape Sable seaside sparrows lay three to four eggs in each clutch (Werner 1978). Incubation has been estimated to take 12 to 13 days (Sprunt 1968, Trost 1968). The young spend 9 to 11 days at the nest. Both parents rear and feed the young birds and may do so for an additional 10 to 20 days after the young fledge (Woolfenden 1956, 1968, Trost 1968). Fledglings are incapable of flight until they are approximately 17 days of age.

E. Foraging

Cape Sable seaside sparrows typically forage by gleaning items from low vegetation or from the substrate (Ehrlich *et al.* 1992). They commonly feed on soft-bodied insects such as grasshoppers, spiders, moths, caterpillars, beetles, dragonflies, wasps, marine worms, shrimp, grass and sedge seeds (Stevenson and Anderson 1994). Significant differences were detected in nestling diet between years and sites (Lockwood *et al.* 1997), which reflects the patchy distribution of insects and opportunistic nature of the sparrow. The sparrow appears to shift the importance of prey items in its diet in response to their availability (Pimm *et al.* 1996).

F. Movements

The Cape Sable seaside sparrow is non-migratory. The fidelity of breeding male sparrows to their territories is high; many male seaside sparrows will defend the same area for two to three years (Werner 1975). During the non-breeding season they appear to congregate, and fly short distances within their range (Pimm, personal communication 1996). Cape Sable seaside sparrows have never been observed outside of nesting habitat areas during the wet-season. Results of a wintering ecology study (Dean and Morrison 1998) report that birds equipped with radio transmitters during the 1997-1998 wet season were generally sedentary or moved short distances (less than 1 km), and sometimes moved longer distances (5-7 km) within marl prairie habitat areas.

G. Status and Trends

The results of several studies suggest that Cape Sable seaside sparrows exist as several subpopulations whose distribution, size, and importance to the persistence of the species change with time. Bass and Kushlan (1982) described two core subpopulations of the sparrow, one northwest of Shark River Slough in the southeast portion of the Big Cypress National Preserve, and a second one in the Taylor Slough area southeast of Shark River Slough. Curnutt and Pimm (1993) recognized six subpopulations (subpopulations A-F) of the Cape Sable seaside sparrow that roughly correspond to the groupings recognized by Bass and Kushlan in 1982 (Figure 3). Pimm (1998) suggested that three breeding subpopulations are critical to the long-term survival of the Cape Sable seaside sparrow.

In 1981, Bass and Kushlan (1982) estimated a total of 6,656 birds in the six subpopulations; two core subpopulations that held most of the sparrows, and four peripheral subpopulations. Core subpopulation A inhabited the marl prairies west of Shark River Slough extending into Big Cypress National Preserve and held an estimated 2,688 individuals. Core subpopulation B held 2,352 birds inhabiting the marl prairies southeast of Shark River Slough near the center of ENP. Peripheral subpopulation E, north of subpopulation B, held about 672 sparrows, while subpopulation C, located along the eastern boundary of ENP, and subpopulation D, just to the southeast of subpopulation C, held about 400 birds each. Peripheral subpopulation F, the northern most peripheral subpopulation located on the western edge of the Atlantic Coastal Ridge, was the smallest subpopulation with an estimated 112 birds. Bass repeated the survey in 1992, with population estimates similar to those in 1981.

In 1981 and 1992, the area west of Shark River Slough (subpopulation A) supported nearly half of the total Cape Sable seaside sparrow population. Starting in 1993, the number of individuals declined precipitously in this area. By 1994 and 1995, the birds were absent from this area except for a few locations (Pimm *et al.* 1994, Pimm *et al.* 1995), and the number of individuals had dropped to less than ten percent of 1992 numbers. Population estimates improved slightly during the 1996 breeding season as the numbers of sparrows found west of Shark River Slough increased from approximately 240 in 1995 to 272 birds in 1996 and 1997 (Pimm *et al.* 1996). However, in 1998, the total number of birds west of Shark River Slough declined again to 192 birds (Sonny Bass, ENP, personal communication 1998).

Core subpopulation B increased by more than 800 birds from 1981 to 1992, declined slightly from 1992-1995, remained stable from 1995-1997, and decreased by approximately 1,000 individuals in 1998 (Sonny Bass, ENP, personal communication 1998). Since 1992, subpopulation B has held the majority of sparrows (Curnutt *et al.* 1998).

Curnutt *et al.* (1998) noted the following regarding the peripheral subpopulations: subpopulation C declined to 11 percent of its 1981 value by 1992. After three years of no birds, 48 birds were estimated in this area in 1996 and 1997 and 80 birds were estimated in 1998. Subpopulation D declined from 1981 to 1993 , was not counted in 1994, no birds were found in 1995, but 80 birds were estimated in this area in 1996, and 48 in 1997 and 1998. Subpopulation E decreased little between 1981 and 1992, 320 birds were estimated in 1993, 112 in 1994, 352 in 1995, 208 in 1996, 835 in 1997 and 912 in 1998. No sparrows were observed in subpopulation F in 1993, and only 16 birds were estimated in 1996 - 1998.

The most recent data indicate that Cape Sable seaside sparrows have declined by as much as 60 percent rangewide since 1981 (Curnutt *et al.* 1998, Nott *et al.* 1998). Biologists studying the sparrow have documented that high water levels in western Shark River Slough have caused the decline of the western subpopulation and continue to contribute to the absence of a population rebound (Nott *et al.* 1998). These declines cannot be attributed to the effects of Hurricane Andrew, which traversed this area in 1992 (Curnutt *et al.* 1998, Nott *et al.* 1998). Declines in sparrow population numbers were detected following Hurricane Andrew, however; a leveling off of declines, or rebound in population numbers, would be expected if populations were recovering from a single adverse event such as Hurricane Andrew. Instead, declines continued steadily as would be expected under continuing adverse hydrological conditions. Between 1992 and 1998, the size of the western breeding subpopulation of the Cape Sable seaside sparrow, which had represented 50 percent of the total population in 1992, had declined to about 10 percent of its previous size.

The smaller subpopulations composing the eastern breeding subpopulations C and F appeared to have been extirpated by 1993; however, the 1996, 1997 and 1998 surveys located a small number of birds at each of these sites. Frequent fires and shrubs invading these areas are thought to preclude the use of this habitat by the birds.

H. Recovery Plan Objective

According to the Technical Agency Draft of Volume I of the Multi-Species Recovery Plan for the Threatened and Endangered Species of South Florida (U.S. Fish and Wildlife Service 1998), criteria are provided below for reclassifying the Cape Sable seaside sparrow from endangered to threatened:

1. The loss of functional Cape Sable seaside sparrow habitat, as a result of current and past water management practices, and the invasion of woody and exotic species, is eliminated;
2. If the habitat west of Shark River Slough and in Taylor Slough is restored so that it supports breeding subpopulations larger than those measured in those areas for 1981 for 10 years;
3. When demographic information on the Cape Sable seaside sparrow supports, for a minimum of five years, a probability of persistence that is equal to or greater than 80 percent, for a minimum of 100 years;
4. When the rate of increase for the total population is equal to or greater than 0.0 as a 3-year running average for at least 10 years;
5. When a minimum of two stable, self-sustaining core breeding areas are secured;
6. If three auxiliary sites, in addition to the two core areas, are maintained and are used for breeding by a minimum of 10 percent of the total population for a minimum of two out of every five years during a 10 year period;
7. When a stable age structure is achieved in the core subpopulations and two other subpopulations;
8. When a minimum population of 6,600 birds is sustained for an average of 5 years, with all fluctuations occurring above this level; and,
9. When the ecosystem of the Cape Sable seaside sparrow is protected from the effects of water management practices throughout the species' historic range.

West Indian Manatee

The West Indian manatee was listed as an endangered on March 11, 1967 due to impacts to the population from harvesting for flesh, oil, and skins as well as for "sport"; coastal feeding grounds modification by siltation; and the volume of injuries and deaths resulting from collisions with the keels and propellers of powerboats (32 FR 4001). Manatees are also protected under the provisions of the Marine Mammal Protection Act of 1972, as amended (16 U.S.C. 1361 et seq.) and have been protected by Florida law since 1893. Critical habitat was designated for the manatee in 1976 and is described at 50 CFR § 17.95.

A. Distribution

The present distribution of the West Indian manatee includes the coasts and rivers of Florida, the Greater Antilles, eastern Mexico and Central America and northern and eastern South America

(Husar 1977, Lefebvre *et al.* 1989). *T. manatus latirostris* is found in and around Florida and *T. manatus manatus* occurs in the remaining areas of its range. The cooler winters along the U.S. coast of Gulf of Mexico, in combination with the deep water and strong currents of the Straits of Florida, create a barrier between the Antillean and Florida manatee; the resulting isolation contributes to their status as a subspecies.

The Florida manatee occurs primarily in the southeastern United States. The only year-round populations of manatees occur throughout the coastal and inland waterways of peninsular Florida and Georgia (Hartman 1974). During the summer months, manatees may range as far north along the East Coast of the U.S. as Rhode Island, west to Texas, and, rarely, east to the Bahamas (U.S. Fish and Wildlife Service 1996a, Lefebvre *et al.* 1989).

In Florida, manatees are found from the Georgia/Florida border south to Biscayne Bay on the east coast and from Wakulla River south to Cape Sable on the west coast (Hartman 1974, Powell and Rathbun 1984). Manatees are also found throughout the waterways in the Everglades and occasionally in the Florida Keys. Although temperatures are suitable for manatees in the Florida Keys, the low number of manatees has been attributed to the lack of fresh water (Hartman 1974). Manatees also occur in Lake Okeechobee.

Manatees frequently migrate throughout the waterways in South Florida. In South Florida, manatees are most prominent year round in the Indian River, Biscayne Bay, Everglades and Ten Thousand Island area, Estero Bay and Caloosahatchee River area, and Charlotte Harbor area.

B. Habitat

Manatees occur in both fresh and salt water habitats within tropical and subtropical regions and show preferences to waters with salinity levels of < 25 parts per thousand (ppt) (Hartman 1979). Manatees depend on areas with access to natural springs or man-made warm water refugia and access to areas with vascular plants and freshwater sources. Several factors contribute to the distribution of manatees in Florida. These factors are habitat-related and include proximity to warm water during cold weather, aquatic vegetation availability, proximity to channels of at least 6.5 feet in depth, and location of fresh water sources (Hartman 1979).

Manatees often seek out quiet areas in canals, creeks, lagoons or rivers. Deeper channels are often used as migratory routes. The combination of suitable seagrass beds, nearby deeper water access, and minimal boat traffic may be indicative of important mating, calving, and nursery grounds for manatees (MMC 1988, Smith 1993). Due to light limitations, most seagrass beds, are limited to shallow, nearshore waters.

C. Critical Habitat

Critical habitat was designated for the manatee in the early 1970s, although no specific primary or secondary constituent elements were included in the designation. Critical habitat for the manatee identifies specific areas occupied by the manatee, which have those physical and biological features essential to the conservation of the manatee and/or may require special management considerations.

D. Reproduction

The manatee population sex ratio is considered to be 1:1 for both adults and calves (Rathbun *et al.* 1992). Females reach sexual maturity at 3-5 years of age (Marmontel 1993) and males may reach sexual maturity at 3-4 years of age. Manatee longevity has been estimated at 50 years or more and they appear to be able to reproduce their entire adult life (Marmontel *et al.* 1992). The minimum interval between manatee birth is 2 years, but not all female manatees are this fecund. Gestation of the single calf takes 12-14 months (Reid *et al.* 1992). Age to weaning varies from 1-2 years. Per capita reproductive rates in Florida manatees have been estimated from a low of 0.15 in the Blue Spring population to a high of 0.19 in the Atlantic coast population. The maximum potential rate of population increase has been estimated at 2.0-7.0 percent, this rate is most sensitive to changes in adult survival and, secondarily, subadult survival (Packard 1985, Marmontel 1993).

E. Foraging

Normally, manatees feed on a variety of submergent, emergent, and floating vegetation. In northeast Florida, where submerged vegetation is scarce, especially in the St. Johns River, manatees feed on floating vegetation. In South Florida, submerged vegetation is more plentiful. Seagrasses comprise the largest component of the manatee's diet, especially in South Florida (Hartman 1979). Some manatees have been observed to return to the same seagrass beds to feed year after year and may show preferences for certain areas (Sirenia 1993). Preference was also shown for areas with healthy seagrass beds adjacent to relatively deeper waters with little boat traffic (Sirenia 1993).

F. Movements

Typically manatees migrate northward in the springtime and southward in the fall and winter. Manatees do not range far offshore, but may travel along the coast (Beeler and O'Shea 1988).

The increase in the number of man-made warm water sources over the years has influenced manatee behavior, specifically migratory patterns and social behavior. Although man-made, warm-water sites provide a type of refugia for manatees in winter, the effects of the associated behavioral changes (e.g., mating, cavorting, calving) as a result of the availability of artificial refugia has not been closely examined to determine if there are any negative effects to the manatee. During the 1996 die-off, a large number of manatees aggregating in warm waters near the Ft. Myers powerplant died from exposure to a red tide brevetoxin outbreak. Their vulnerability was increased because they were congregated near this artificial refuge when the red tide occurred (Lefebvre *et al.* 1989).

G. Status and Trends

Exact estimates of the historic manatee population is uncertain, but overhunting between the 1700s and 1900s is believed to be responsible for reducing manatee population to only a few relict groups (Hartman 1979). A slow increase in manatee numbers in the late 1800s is attributed to their protection by the 1893 State law prohibiting their killing.

Synoptic aerial surveys were conducted twice in 1997, resulting in total counts of 2,229 and 1,709 animals, respectively. During the January 19-20, 1997, survey, 900 manatees were counted on the east coast and 1,329 on the west coast. During the February 13, 1997, survey, 791 manatees were counted on the east coast and 918 on the west coast. This estimate represents the minimum number of manatees in Florida waters. Although this has been the highest estimate of manatees since the synoptic surveys were started, the results of these surveys may vary because of such factors as sampling methodology, manatee behavior, and weather conditions. Because of this variation and the high degree of uncertainty in surveying, it is difficult to correlate these manatee population estimates with overall manatee population trends (Ackerman *et al.* 1995).

H. Recovery Plan Objective

The West Indian manatee can be considered for reclassification to threatened when data and population models are available to assess population size and trends; when analyses indicate that the population is growing or stable; when mortality factors are controlled at acceptable levels or are decreasing; and when critical habitats are secure and threats to them are controlled or decreasing.

The long-range recovery goal is to contribute toward restoring Florida manatees to optimum sustainable population levels which is a range between the largest number supportable by the ecosystem and the population size that results in maximum net productivity.

Florida Panther

The Florida panther was listed as endangered on March 11, 1967 due to heavy hunting and trapping pressures, the inability of the species to adapt to changes in the environment, and developmental pressures (32 FR 4001). No critical habitat has been designated for this species.

A. Distribution

The only known, remaining panther population is centered in and around the Big Cypress Swamp/Everglades physiographic region of South Florida. Data on radio-instrumented members of this population indicate that it is centered in Collier and Hendry counties of southwest Florida. Instrumented panthers have also been documented in Broward, Dade, Glades, Hardee, Highlands, Lee, Monroe, and Palm Beach counties. There are still large areas of private land in

Charlotte, Collier, Hendry, Lee, and Glades counties where uncollared individuals may reside (Maehr 1990).

B. Habitat

The greatest concentration of unprotected, occupied panther habitat is found on private land in eastern Collier County and southern Hendry County. In general, these private lands are located north of important panther habitat on key publicly owned lands (Maehr 1988). For the most part, privately owned lands are higher in elevation, better drained, have a higher percentage of hardwood hammocks and pine flatwoods, and are higher in natural fertility/productivity than public lands south of Interstate 75. A difference in soils and drainage patterns is reflected in more upland vegetation and more abundant prey in lands north of Interstate 75. These factors, in combination with some management practices (e.g. prescribed fire) tend to make the area more attractive to, and increase carrying capacities for, white-tailed deer (*Odocoileus virginianus*) and feral hogs (*Sus scrofa*).

Native, upland forests are preferred by panthers in southwest Florida (Maehr 1990). Understory thickets of tall, almost impenetrable, saw palmetto have been identified as the most important resting and denning cover for panthers (Maehr 1990). Early radio-telemetry investigations indicated that panther use of mixed swamp forests and hammock forests was greater than expected in relation to their availability within the panthers' home range area (Belden *et al.* 1988). Hardwood hammocks were consistently preferred by panthers, followed by pine flatwoods. This may be related to the fact that, among major vegetation types in south Florida, hammocks have the greatest potential for producing white-tailed deer, an important panther prey species (Harlow 1959, Belden *et al.* 1988, Maehr 1990).

Dispersing males may wander widely through unforested and disturbed areas. Agricultural and other disturbed habitats, freshwater marsh, thicket swamp, and mixed swamp are not preferred, and are either used in proportion to their availability or are avoided (Maehr 1990). Habitats avoided by panthers include agricultural, barren land, shrub and brush, and dry prairie. Panthers have not been found in pastures during daytime radio-telemetry flights but may travel through them at night (Maehr *et al.* 1991).

C. Reproduction

Male Florida panthers are polygynous. Breeding activity peaks in fall and winter. Parturition is distributed throughout the year with 81 percent of births occurring between March and July. Litter sizes range from one to four kittens, with a mean of 2.2 kittens per successful litter. Intervals between litters range from 16 to 37 months (Land 1994). Age at first reproduction has been documented at 18 months for females (Maehr *et al.* 1990). The dispersal of young typically occurs around 1.5 to 2 years of age.

D. Foraging

Food habit studies of panthers in southwest Florida indicated that the feral hog was the most commonly taken prey followed by white-tailed deer, raccoon (*Procyon lotor*), and 9-banded armadillo (*Dasypus novemcinctus*). Deer and hogs accounted for 85.7 percent of consumed biomass north of Interstate 75, and 66.1 percent south of Interstate 75 (Maehr 1990). No seasonal variation in diet was detected; however, panthers inhabiting an area of better soils north of Interstate 75 consumed more large prey. In addition, deer abundance was 8-fold greater north of Interstate 75. Fewer large prey may, in part, explain the poorer physical condition, larger home ranges, and lower reproductive output of panthers in the south. Hogs dominated the diet of panthers in the north in terms of both estimated biomass and numbers. In the south, deer accounted for the greatest estimated biomass consumed, whereas raccoons were the highest estimated number of consumed prey.

E. Movements

Adult panthers space themselves throughout available habitat where home range overlap is extensive among resident females and limited among resident males (Maehr *et al.* 1991). Dispersal distances average 36.5 miles for subadult males and 10 miles for a subadult female. Dispersing males wander widely. Although some travel occurs during the day, panthers are mostly crepuscular (Maehr *et al.* 1990).

F. Status and Trends

The population of the Florida panther may have numbered as many as 500 at the turn of the century (Seal and Lacy 1989). Hunting, habitat loss through residential and agricultural development, loss of the panther's prey base, and other forms of persecution have led to the decline of this species since that time (Belden *et al.* 1988). In 1950, the Florida panther was declared a game species in the State of Florida. This action resulted in the first regulation of panther harvest. By 1958 it was listed under state law as an endangered species. The population was estimated at 100 to 300 statewide in 1966 (Schemnitz 1972). The federal government followed suit and listed the species as endangered in 1967.

The Florida panther's existence is severely threatened by both rapid and gradual extinction processes. Population viability analysis projections indicate that under existing demographic and genetic conditions the Florida panther will likely be extinct in only a few decades (24-63 years) (Seal *et al.* 1989). Environmental factors affecting the Florida panther include: habitat loss and fragmentation, environmental contaminants, prey availability, human-related disturbance and mortality, disease, and genetic erosion (U.S. Fish and Wildlife Service 1998).

G. Recovery Plan Objective

The present recovery objective for the Florida panther is to achieve three viable, self-sustaining populations within the historic range of the animal. First priority will be to secure the population in south Florida. A viable population level will be determined when enough data are available to develop a panther population model. An essential criteria for recovery of the panther needs to ensure 95 percent probability of persistence of the south Florida population over 100 years. Re-established populations may require separate population goals. Population objectives will generally be based on the size of the respective areas, and other ecological factors important to panthers.

Snail Kite

The species was federally listed as endangered in 1967 and critical habitat was determined in 1977 (see FR 42(155): 40685-40688). That protection was continued under the Endangered Species Conservation Act of 1969 and the Endangered Species Act of 1973, as amended. The snail kite was listed because of its limited distribution and threats to its habitat posed by large-scale conversion of land in southern Florida to agricultural uses.

A. Distribution

The current distribution of the snail kite in Florida is limited to central and southern portions of the State (Figure 4). Six large freshwater systems generally encompasses the current range of the species, although radio tracking of snail kites has revealed that the network of habitats used by the species also includes many other smaller widely dispersed wetlands within this overall range (Bennetts and Kitchens 1997).

B. Habitat

Snail kite habitat consists of fresh-water marshes and the shallow vegetated edges of lakes (natural and man-made) where apple snails can be found. Suitable foraging habitat for the snail kite is typically a combination of low profile (≤10 feet) marsh with an interdigitated matrix of shallow (0.65 - 4.25 feet deep) open water, which is relatively clear and calm. Low trees and shrubs are also often interspersed with the marsh and open water. Snail kites require foraging areas to be relatively clear and open in order to visually search for apple snails, therefore, dense growth of herbaceous or woody vegetation is not conducive to efficient foraging. Nearly continuous flooding of wetlands for ≥1 year is needed to support apple snail populations that in turn provide forage for the snail kite (Beissinger 1988).

Nesting and roosting sites almost always occurs over water, which deters predation. Nesting substrates include small trees (usually < 32.8 feet in height), but can also occur in herbaceous vegetation, such as sawgrass, cattail, bulrush, and reed (U.S. Fish and Wildlife Service 1998). It is important to note that suitable nesting substrate must be close to suitable foraging habitat, so extensive areas of contiguous woody vegetation are generally unsuitable for nesting.

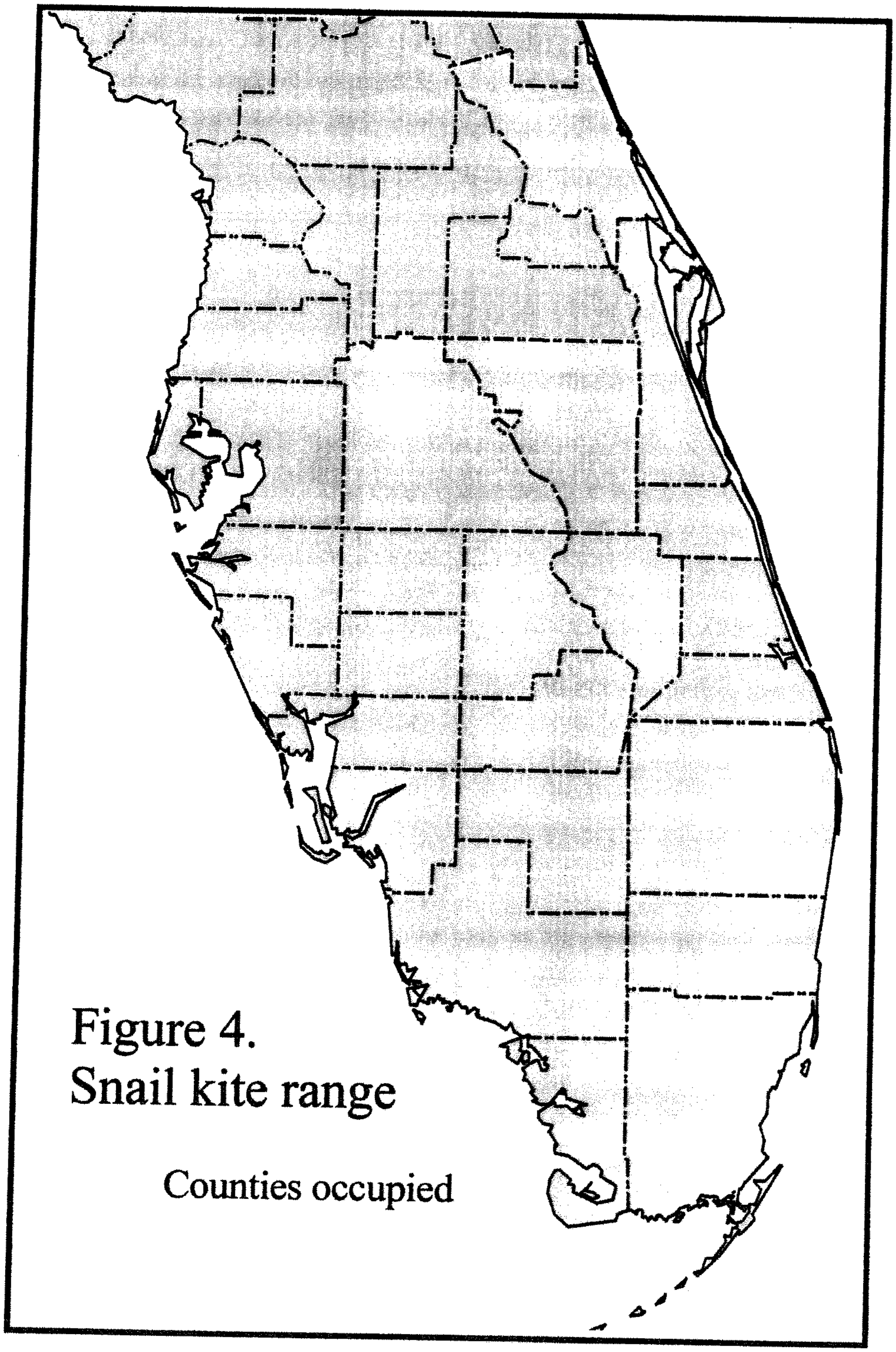


Figure 4.
Snail kite range
Counties occupied

C. Critical Habitat

Critical habitat was designated for the snail kite in 1977 and, since then, has not been revised (Figure 5). Critical habitat includes the WCAs, portions of ENP, western portions of Lake Okeechobee, the Strazzulla and Cloud Lake reservoirs in St. Lucie County, and portions of the St. Johns marsh in Indian River County. A complete description of the critical habitat is available in 50 CFR §17.95.

Although the critical habitat that was designated for the snail kite did not include constituent elements, water level management is required to maintain favorable habitat conditions that are considered necessary to ensure the species survival.

D. Reproduction

Copulation can occur from early stages of nest construction, through egg-laying, and during early incubation if the clutch is not complete. Egg laying begins soon after completion of the nest or is delayed a week or more. In Florida, the incubation period lasts 24-30 days (Sykes 1987).

Hatching success is variable from year to year and between areas. In nests where more than one egg hatched, hatching success averaged 2.3 chicks/nest. The most successful months for hatching are February (19 percent), March (31 percent), and April (23 percent) (Sykes 1987).

The breeding season varies widely from year to year in relation to rainfall and water levels. Ninety-eight percent of the nesting attempts are initiated from December through July, while 89 percent are initiated from January through June (Sykes 1987, Beissinger 1988).

E. Foraging

The snail kite feeds almost exclusively on apple snails (*Pomacea paludosa*) in Florida. Snail kites spend between 25 to 50 percent of the time foraging while nesting and 31 to 68 percent of the time foraging during pre- and post-nest desertion periods. Feeding perches include living and dead woody-stemmed plants, blades of sawgrass and cattails, and fence posts.

F. Movements

Snail kites in Florida are not migratory in the strict sense; they are restricted to South and Central Florida. Snail kites are nomadic in response to water depths, hydroperiod, food availability, nutrient loads, and other habitat changes (Bennetts *et al.* 1994). Radio-tracking and sighting of marked individuals have revealed that nonbreeding individuals disperse widely on a frequent basis (Bennetts *et al.* 1994). Shifts in distribution can be short-term, seasonal, or long-term, and can take place between areas among years (Rodgers *et al.* 1988), between areas within a given nesting season (Beissinger 1986), within areas in a given nesting season, and within or between areas for several days to a few weeks (Bennetts *et al.* 1986). Sykes (1983) noted that during colder winters, snail kites will shift their distribution more to the southern part of their range.

G. Status and Trends

Several authors (Nicholson 1926, Howell, 1932, Bent 1937) indicated that the snail kite was numerous in central and South Florida marshes during the early 1900s, with groups of up to 100 birds. Sprunt (1945) estimated the population to be 50 to 100 individuals. The snail kite apparently plummeted to its lowest population between 1950 and 1965. By 1954, the population was estimated at no more than 50 to 75 birds (Sprunt 1954). Stieglitz and Thompson (1967) reported eight birds in 1963 at the Loxahatchee National Wildlife Refuge, 17 on the refuge and two at Lake Okeechobee in 1964, eight in WCA 2A and two at Lake Okeechobee in 1965, and 21 in WCA 2A in 1966.

While acknowledging the problems associated with making year-to-year comparisons in the count data, some general conclusions are apparent. Lake Okeechobee apparently retains some suitable snail kite habitat throughout both wet and dry years. In contrast, kite use of WCA 3A fluctuates greatly, with low use during drought years, such as 1991, and high use in wet years, such as 1994. Although sharp declines have occurred in the counts since 1969 (for example, 1981, 1985, 1987), it is unknown to what extent this reflects actual changes in the population. Rodgers *et al.* (1988) point out that it is unknown whether decreases in snail kite numbers in the annual count are due to mortality, dispersal (into areas not counted), decreased productivity, or a combination of these factors. Despite these problems in interpreting the annual counts, the data since 1969 have indicated a generally increasing trend (Rodgers *et al.* 1988, Bennetts *et al.* 1994).

The snail kite has apparently experienced population fluctuations associated with hydrologic influences, both man-induced and natural (Sykes 1983, Beissinger 1986), but the amount of fluctuation is debated. The abundance of its prey, apple snails, is closely linked to water regime (Sykes 1979, 1983). Drainage of Florida's interior wetlands has reduced the extent and quality of habitat for both the apple snail and the kite (Sykes 1983). The kite nests over water, and nests become accessible to predators in the event of unseasonal drying (Beissinger 1986, Sykes 1987). In dry years, the kite depends on water bodies which normally are suboptimal for feeding, such as canals, impoundments, or small marsh areas, remote from regularly used sites (Bennetts *et al.* 1988). These secondary or refuge habitats are vital to the continued survival of this species in Florida.

H. Recovery Plan Objective

Pursuant to the Florida snail kite Recovery Plan (U.S. Fish and Wildlife Service 1986), to achieve downlisting the following criteria must be met:

> The population goal is the number of kites that have a 95 percent probability of surviving 3-4 successive drought years of no reproduction and high mortality, while remaining reproductively viable. In the absence of adequate data, upon which to establish a specific population goal, the interim goal is an annual average of 650 birds for a ten-year period with annual population declines of less than 10 percent of the average.

Wood Stork

The United States population of the wood stork was listed as endangered in 1984 because it had declined by more than 75 percent since the 1930s (49 FR 7335). At the time, the Service believed that the United States breeding population would be extirpated by the turn of the century if it continued to decline at the same rate. The original listing recognized the relationship between the declining wood stork population, the loss of suitable foraging habitat and colony nesting failures, particularly in the breeding colonies in South Florida where human actions have reduced wetland areas by about 35 percent (Ogden and Nesbitt 1979), influenced the hydrologic regime, and altered the prey base. No critical habitat has been designated for this species.

A. Distribution

In the United States, the wood stork has been reported both as a casual and regular visitor, ranging from southern California and southern Arizona, the Gulf of Mexico north to Canada; from Maine, southern New Brunswick, Canada, and New York, south to its breeding range in Florida, Georgia, and South Carolina. It is suspected that most wood storks sighted in Arkansas, Louisiana, Texas, and points farther west are birds that have dispersed from colonies in Mexico. Wood storks have nested in every county in South Florida. During the non-breeding season (July to October), wood storks are much less common in South Florida. The range of the wood stork in Florida is identified in Figure 6.

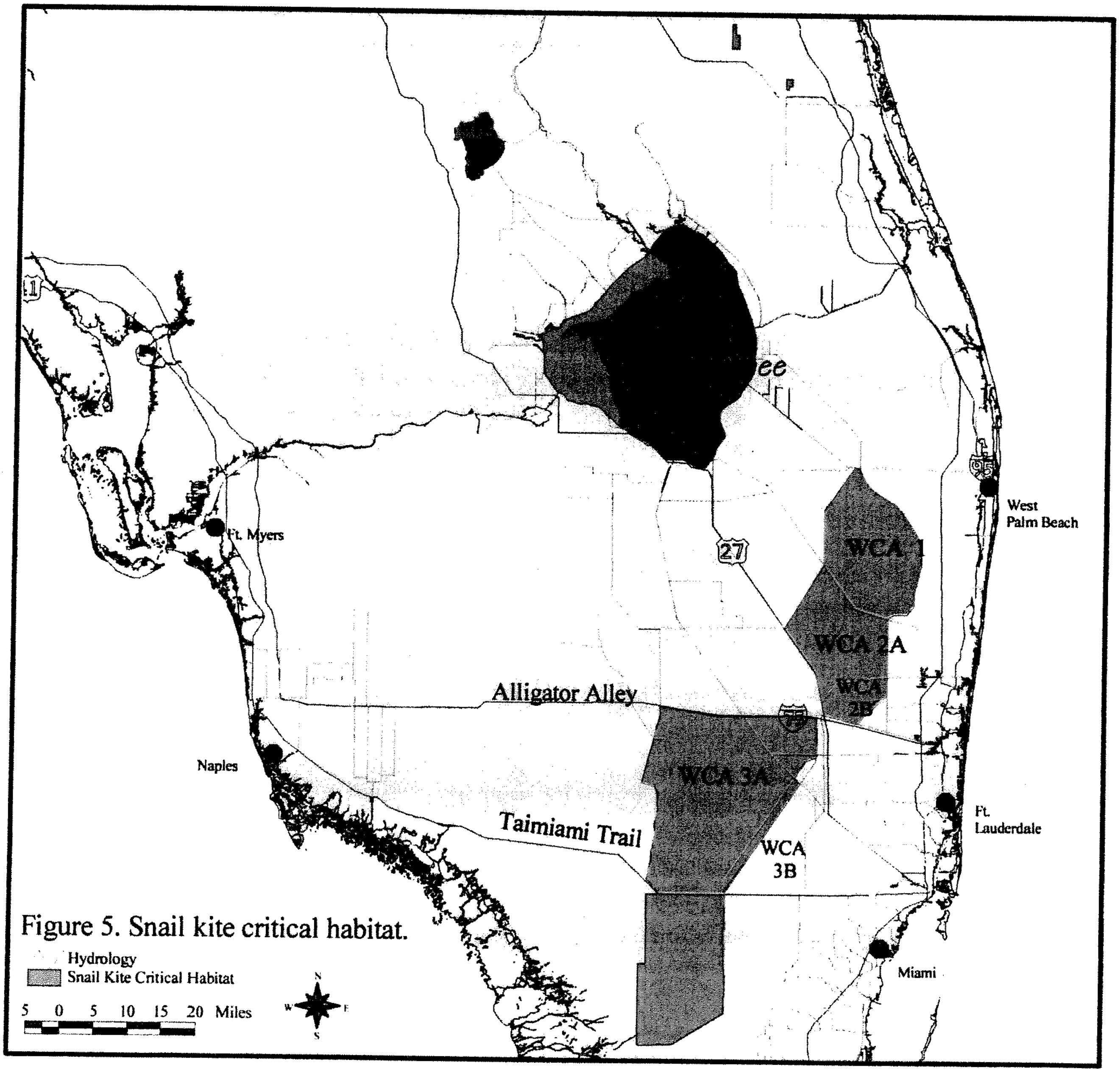


Figure 5. Snail kite critical habitat.

B. Habitat

The wood stork is primarily associated with freshwater habitats for nesting, roosting, foraging, and rearing. Wood storks typically construct their nests in medium to tall trees that occur in stands located either in swamps or on islands surrounded by relatively broad expanses of open water (Ogden 1991). During the non-breeding season or while foraging, wood storks occur in a wide variety of wetland and other aquatic habitats. Typical foraging sites for the wood stork include freshwater marshes and stock ponds, shallow, seasonally flooded roadside or agricultural ditches, narrow tidal creeks or shallow tidal pools, managed impoundments, and depressions in cypress heads and swamp sloughs. Because of their specialized feeding behavior, wood storks forage most effectively in shallow-water areas with highly concentrated prey (Ogden *et al.* 1978, Browder 1984, Coulter 1987). In South Florida, low, dry-season water levels are often necessary to concentrate fish to densities suitable for effective foraging by wood storks (Kushlan *et al.* 1975). As a result, wood storks will forage in many different shallow wetland depressions where fish become concentrated, either due to local reproduction by fishes, or as a consequence of seasonal drying.

C. Reproduction

Wood storks tend to use the same colony sites over many years, as long as the sites remain undisturbed and sufficient feeding habitat remains in the surrounding wetlands. Traditional wetland sites may be abandoned by storks once local or regional drainage schemes remove surface water from beneath the colony trees. As a result of such drainage, many storks have shifted colony sites from natural to managed or impounded wetlands. Ogden (1991) has suggested that recent increases in the number of colonies in north and central Florida have occurred as a result of an increase in the availability of altered or artificial wetlands.

The date on which wood storks begin nesting varies geographically. In Florida, wood storks lay eggs as early as October and as late as June (Rodgers 1990). In general, earlier nesting occurs in the southern portion of the state (below 27°N). Storks nesting in the Everglades and Big Cypress basins, under pre-drainage conditions, formed colonies between November and January (December in most years) regardless of annual rainfall and water level conditions (Ogden 1994). In response to deteriorating habitat conditions in South Florida, wood storks in these two regions have delayed the initiation of nesting to February or March in most years since the 1970s. This shift in the timing of nesting is believed to be responsible for the increased frequencies of nest failures and colony abandonment in these regions over the last 20 years; colonies that start after January in South Florida risk having young in the nests when May-June rains flood marshes and disperse fish.

Female wood storks lay a single clutch of eggs per breeding season. However, they will lay a second clutch if their nests fail early in the breeding season. Wood storks lay two to five (usually three) eggs depending on environmental conditions; the average clutch size may increase during years with favorable water levels and food resources. Once an egg has been laid in a nest, the breeding pair never leave the nest unguarded. Both parents are responsible for incubation and foraging (Palmer 1962). Incubation takes approximately 30 days, and begins after the first one or two eggs are laid.

The productivity of wood stork colonies varies considerably between years and locations, apparently in response to differences in food availability; colonies that are limited by food resources may fledge an average of 0.5-1.0 young per active nest; colonies that are not limited by food resources may fledge between 2.0 and 3.0 young per active nest (Ogden 1996).

D. Foraging

The natural hydrologic regime in South Florida involves seasonal flooding of extensive areas of the flat, low-lying peninsula, followed by drying events which confine water to ponds and sloughs. Fish populations reach high numbers during the wet season, but become concentrated into smaller areas as drying occurs. Consumers, such as the wood stork, are able to exploit high concentrations of fish in drying pools and sloughs. In the pre-drainage Everglades, the dry season of South Florida provided wood storks with ideal foraging conditions over a wide area.

Storks forage in a wide variety of shallow wetlands, wherever prey reach high enough densities, and in water that is shallow and open enough for the birds to be successful in their hunting efforts (Ogden *et al.* 1978, Browder 1984, Coulter 1987). Good feeding conditions usually occur in relatively calm water, where depths are between 4 - 10 inches, and where the water column is uncluttered by dense patches of aquatic vegetation (Coulter and Bryan 1993). In South Florida, dropping water levels are often necessary to concentrate fish to suitable densities (Kushlan *et al.* 1975). Typical foraging sites throughout the wood stork's range include freshwater marshes and stock ponds;, shallow, seasonally flooded roadside or agricultural ditches; narrow tidal creeks or shallow tidal pools; managed impoundments; and depressions in cypress heads and swamp sloughs. Almost any shallow wetland depression that concentrates fish, either through local reproduction or the consequences of area drying, may be used as feeding habitat.

E. Movements

During the non-breeding season (summer-fall), juvenile wood storks from South Florida colonies have been located throughout the Florida Peninsula, southern Georgia, coastal South Carolina, central Alabama, and east-central Mississippi (Ogden 1996). Additionally, marked individuals from a colony in east-central Georgia were found in the central Everglades during the winter. This information suggests the notion of a single population of wood storks in the southeast responding to changing environmental conditions through temporal relocation. Although the majority of nesting by the southeastern wood stork population no longer occurs in South Florida, the wetlands of the Everglades remain as important feeding areas for large numbers of storks during the dry season (winter-spring) (Bancroft *et al.* 1992).

F. Status and Trends

Although we cannot accurately estimate the size of the United States breeding population prior to the late-1950s, we have reliable estimates of the size of some breeding colonies. Historically, larger breeding colonies at areas like Corkscrew Swamp, Okaloacoochee Slough, and the southern Everglades contained 5,000 to 15,000 pairs of wood storks (Palmer 1962, Ogden 1996). Most authors also agree that, since the late 1930s, the number of wood storks in the United States declined by more than 90 percent; additionally, the rate of decline in South Florida accelerated in the 1960s and 1970s (Palmer 1962, Ogden 1994).

Between 1957 and 1960, the Florida and National Audubon Societies conducted a series of statewide aerial wood stork surveys of all known or suspected stork nesting colonies. In 1974, statewide aerial surveys were initiated and repeated, annually, until 1986. In 1959, 14 breeding colonies supported an estimated 7,657 pairs of wood storks in Florida; in 1960, 15 breeding colonies supported an estimated 10,060 breeding pairs. By 1975, 15 breeding colonies supported an estimated 5,382 breeding pairs; in 1976, 17 breeding colonies supported an estimated 5,110 breeding pairs. Since 1983, the United States breeding population of wood storks has fluctuated between 5,500 and 6,500 pairs.

While the number of wood storks breeding in South Florida has substantially decreased in the 1970's; in north Florida, Georgia, and South Carolina the number of breeding wood storks has significantly increased (Ogden *et al.* 1987). From 1958-1960, 80-88 percent of wood stork nesting pairs were located at six sites in South Florida. Surveys from 1976 showed a decline to 68 percent, with a further decline to 13 percent in 1986. Since the late 1970s, a majority of wood storks have nested in central and north Florida, and an increasing number have nested in coastal colonies in Georgia and South Carolina. Between 1965 and 1995, the number of wood storks nesting in Georgia increased from four pairs to 1,501 pairs; between 1981 and 1995, the number of wood storks nesting in South Carolina increased from 11 pairs to 829 pairs. Since the 1970s, associated with this shift to the north, the southeast wood stork population appears to be gradually increasing, from a low of 3,000-4,000 pairs in the late 1970s, to over 6,000 pairs in the mid-1990s.

H. Recovery Plan Objective

Pursuant to the wood stork Recovery Plan (U.S. Fish and Wildlife Service 1996b), to achieve recovery the following criteria must be met:

To downlist:
An average of 6,000 nesting pairs and annual regional productivity greater than 1.5 chicks per nest year, calculated over 3 years.

To delist:
An average of 10, 000 nesting pairs calculated over 5 years beginning at time of reclassification, annual regional productivity greater than 1.5 chicks per nest per year (also calculated over a 5-year average). As a subset of the 10,000 pairs, a minimum of 2,500 successful nesting pairs must occur in the Everglades and Big Cypress systems.

American Crocodile

The American crocodile was listed as endangered throughout its range in 1975 and critical habitat was established for this species in 1979 (40 FR 44151 and 44 FR 75076, respectively). The listing of the species and protection of habitat was required because of documented population declines most likely associated with habitat alterations and direct human disturbances to crocodiles and their nests (U.S. Fish and Wildlife Service 1984). Critical habitat was designated for the crocodile in 1979 and is described at 50 CFR § 17.95.

A. Distribution

Historically, American crocodiles occurred at least as far north on the Florida east coast as Lake Worth, Palm Beach County (DeSola 1935, U.S. Fish and Wildlife Service 1984), to Tampa Bay on the west coast (Kushlan and Mazzotti 1989), and as far south as Key West (Neill 1971). The distribution of crocodiles during the non-nesting season may vary considerably among years since adult crocodiles can disperse great distances (Kushlan and Mazzotti 1989). Today, the majority of crocodiles are present in the vicinity of their core nesting areas (Figure 7), located in Biscayne and Florida Bays (Kushlan and Mazzotti 1989).

The current distribution of the American crocodile is limited to extreme South Florida including coastal areas of Dade, Monroe, Collier, and Lee counties (U.S. Fish and Wildlife Service 1984). Occasional sightings are still reported farther north on the east coast, and a few isolated crocodiles may still survive in remnant mangrove habitats in Broward County.

B. Habitat

The American crocodile is found primarily in mangrove swamps and along low energy mangrove-lined bays, creeks, and inland swamps (Kushlan and Mazzotti 1989). In Florida, patterns of crocodile habitat use shifts seasonally. During the breeding and nesting seasons, adults use the more open waters of Florida Bay, whereas during the fall and winter, they are found primarily in the fresh and brackish-water inland swamps, creeks, and bays (Kushlan and Mazzotti 1989). Along northeastern Florida Bay, crocodiles were found in inland ponds and creeks (50 percent of observations), protected coves (25 percent of observations), exposed shorelines (6 percent of observations) and a small number were observed on mud flats (Kushlan and Mazzotti 1989). The high use of inland waters suggests crocodiles prefer less saline waters; using sheltered areas such as undercut banks and mangrove snags and roots that are protected from wind and wave action. Access to deep water (>3 feet) is also an important component of preferred habitats (Mazzoti 1983).

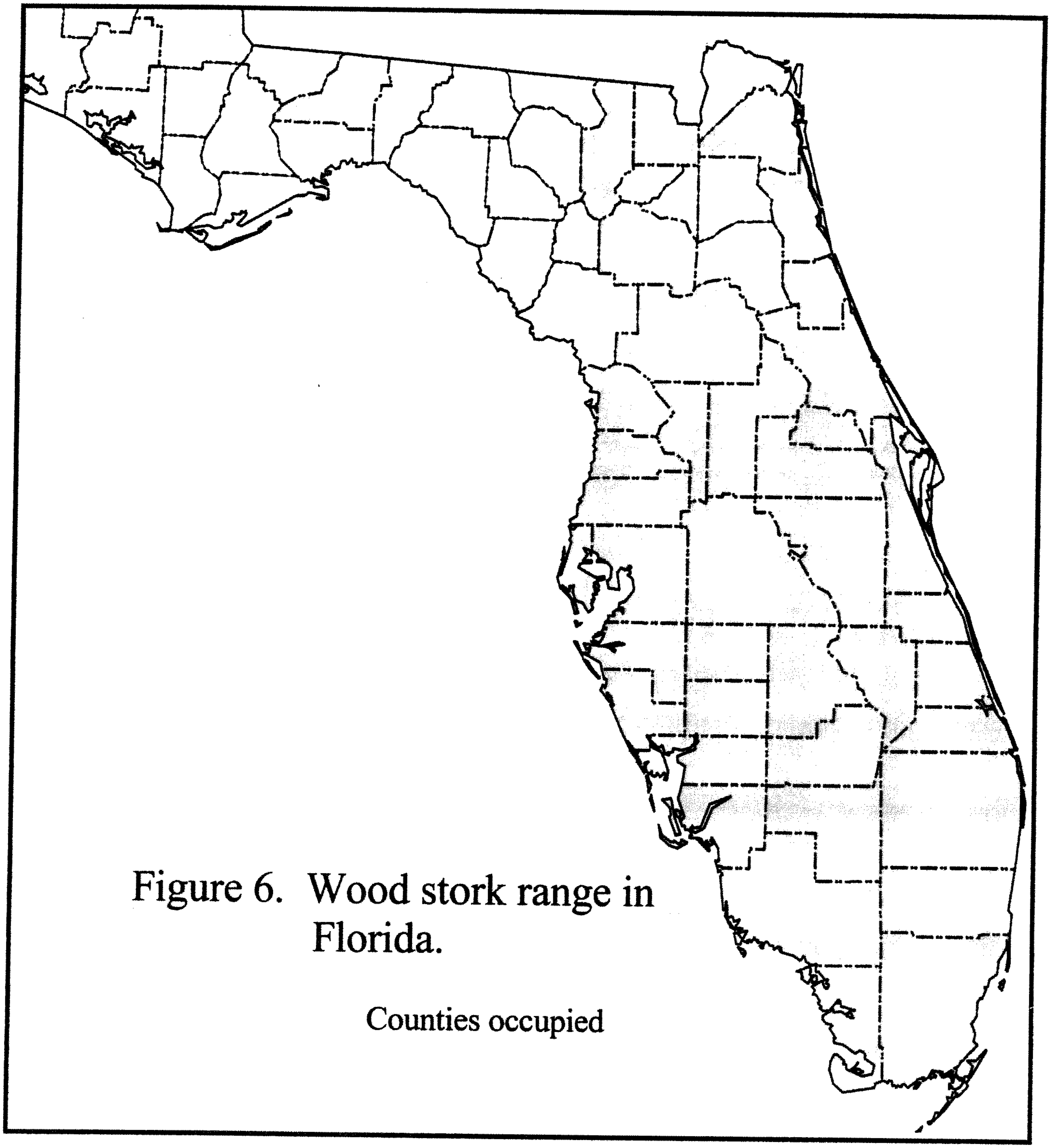


Figure 6. Wood stork range in Florida.

Counties occupied

Natural nesting habitat includes sites with raised marl creek banks or sandy shorelines adjacent to deep water. Crocodiles also nest on elevated man-made structures such as canal berms and other places where fill has been introduced. In natural nesting situations, creek bank nests are generally considered optimal since these sites provide a good incubation medium and are generally protected from wind and wave action. These nest sites also provide deep water refuge for adult females. Nests adjacent to open water provide little protection of the nest or adults. Shore nests are typically not located near good nursery habitat, and mortality of hatchlings is generally higher than in inland nests (Kushlan and Mazzotti 1989).

C. Critical Habitat

Critical habitat was designated for the American crocodile in 1979 (44 FR 75076) and, since then, has not been revised (Figure 8). Although the critical habitat that was designated for the American crocodile did not include constituent elements, water level management is required to maintain favorable habitat conditions that are considered necessary to ensure the species survival.

D. Reproduction

As with most crocodilians, courtship and mating are stimulated by increasing ambient water and air temperatures. In South Florida, temperatures sufficient to allow initiation of courtship behavior are reached by late February through March. Like all other crocodilians, the mating system of the American crocodile is polygynous; each breeding male mates with a number of females (Magnusson *et al.* 1989).

Nest sites are typically selected where a sandy substrate exists above the normal high water level. Nesting sites include areas of well drained sands, marl, peat, and rocky spoil and may include areas such as sand/shell beaches, stream banks and canal spoil banks that are adjacent to relatively deep water (Ogden 1978, Kushlan and Mazzotti 1989).

The success of American crocodile nesting in South Florida is dependent primarily on the maintenance of suitable egg cavity moisture throughout incubation and on nest predation. On Key Largo, and other island nests, failure of crocodile nests is typically attributed to dessication due to low rainfall (Moler 1991). On Key Largo, about 52 percent of nests were successful in hatching at least one young (Moler 1991). Nest failures on the mainland may be associated with flooding, desiccation, or predation (Mazzotti *et al.* 1988, Mazzotti 1989). On the mainland, about 13 percent of nests monitored were affected by flooding or desiccation, while 13 percent of nests were partially or entirely depredated (Mazzotti *et al.* 1988, Mazzotti 1989). More recently, Mazzotti (1994) found that predation rates on the mainland increased to 27 percent, while only nine percent of nests failed because of infertility or embryonic mortality. Most examined eggs have been fertile (90 percent, range 84-100 percent)(Kushlan and Mazzotti 1989, Mazzotti 1989). Incubation of the clutch takes about 86 days (Lang 1975), during which time the female periodically visits the nest (Neill 1971, Ogden 1978).

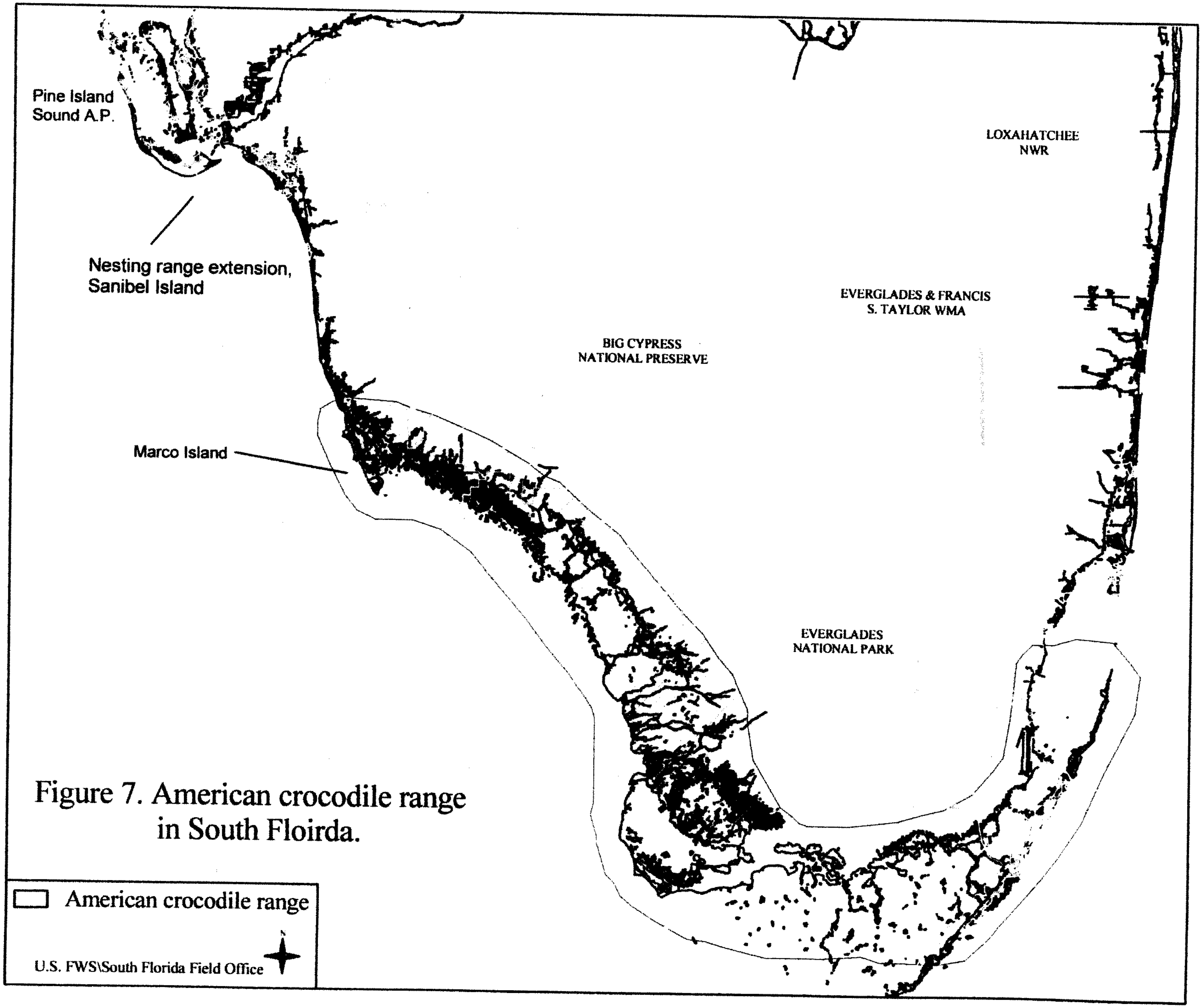


Figure 7. American crocodile range in South Floirda.

Hatchling survival appears to be low in ENP (Mazzotti 1983, Kushlan and Mazzotti 1989), but fairly high in the more sheltered habitats of North Key Largo (20.4 percent)(Moler 1991). Higher survival on Key Largo has been attributed to the close proximity of nest sites to suitable nursery habitat. On the mainland, nest sites on exposed beaches are often far from nursery habitat, requiring recently hatched young to disperse long distances in unsheltered water.

E. Foraging

Compared to the historical estimates of Ogden (1978), populations have declined, and shifts in the nesting distribution have likely occurred. The lowest estimated population levels apparently occurred sometime during the 1960s or 70s when Ogden (1978) estimated the Florida population of the American crocodile to be between 100 and 400 non-hatchlings. Kushlan and Mazzotti (1989) estimated that 220 ± 78 adult and subadult crocodiles remained in South Florida, while Moler believes between 500 and 1,000 individuals (including hatchlings) persist there currently (Moler, pers. comm. 1996).

The American crocodile population is South Florida has increased substantially over the last 20 years, while still remaining well below historic numbers. The recent increase is best represented by changes in nesting effort. Survey data gathered with consistent effort indicates that nesting has increased from about 20 nests in the late 1970's to about 48 nests in 1995. Since it is likely that female crocodiles only produce one clutch per year, it follows that the population of reproductively active females has more than doubled in the last 20 years. In addition, since at least a portion of the population's sex ratio approaches 1:1 (Moler 1991), it is likely that the male portion of the population has also increased substantially.

H. Recovery Plan Objective

Pursuant to the American crocodile Recovery Plan (U.S. Fish and Wildlife Service 1984), to achieve downlisting the following criteria must be met:

- An increase in the number of breeding females to 60. Sixty breeding females translates into an estimated total population size of 1,500 individuals, assuming breeding females comprise 4-5 percent of the total.

Red-cockaded Woodpecker

The red-cockaded woodpecker was federally listed as endangered on October 13, 1970 due to documented declines in local populations, presumed reductions in available nesting habitat, and because of its perceived rarity (35 FR 16047). No critical habitat has been designated for this species.

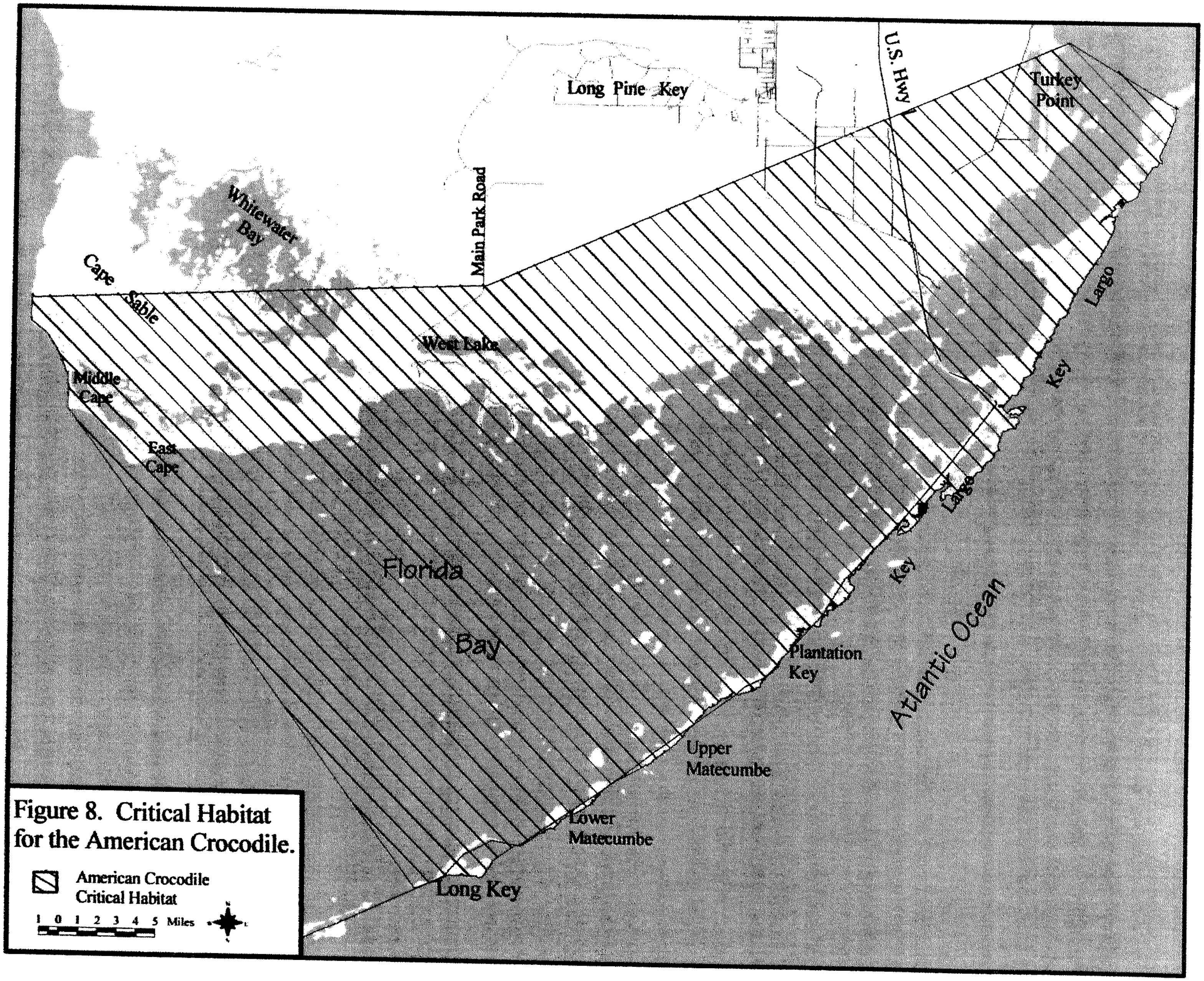


Figure 8. Critical Habitat for the American Crocodile.

A. Distribution

The red-cockaded woodpecker is found in all southern and southeastern coastal States from eastern Texas into southern Virginia, and small populations in the interior are found in southeastern Oklahoma, southern Arkansas, and southeastern Kentucky. The largest populations are in Coastal Plain forests of the Carolinas, Florida, Georgia, Alabama, Mississippi, Louisiana, and eastern Texas, and in the Sandhill forests of the Carolinas (U.S. Fish and Wildlife Service 1985).

The red-cockaded woodpecker probably once occurred in all 67 Florida counties, with exception of the Florida Keys in Monroe County (Hovis and Labisky 1996). The southernmost historic record is from the Florida City area in Dade County (Howell 1921). This species is still widely distributed in the state, but substantial populations now occur only in the panhandle; elsewhere, populations are relatively small and disjunct. The estimated breeding population of the red-cockaded woodpecker in Florida is 1,500 pairs, with about 75 percent of that total occurring in the panhandle (Cox *et al.* 1995).

In South Florida, the status and distribution of the red-cockaded woodpecker is uncertain, particularly in Highlands, Glades, St. Lucie, Martin, and Sarasota counties because of the inability to access and survey private lands that may support suitable habitat.

B. Habitat

Pine stands, or pine-dominated pine/hardwood stands, with a low or sparse understory and ample old-growth pines, constitute primary red-cockaded woodpecker nesting/roosting habitat. The low/sparse understory affords unimpeded access to cavities. Red-cockaded woodpeckers will abandon otherwise suitable nesting/roosting areas when the understory approaches cavity height (Wood 1996).

In south central Florida, at Avon Park Air Force Range, cavities are excavated only in longleaf pine, even though active red-cockaded woodpecker clusters occur in mixed longleaf/slash pine stands (Bowman and Fitzpatrick 1993). South of the longleaf pine range, red-cockaded woodpeckers can only excavate cavities in slash pine. In this region, cavity trees selected by red-cockaded woodpeckers are typically shorter and smaller in diameter-breast-height, on average, than cavity trees elsewhere in the southeast (Shapiro 1983).

Red-cockaded woodpecker clusters are typically found in the older or oldest, sparsely stocked pine stands, where cavity trees are more widely spaced than trees found further north. Shapiro (1983) attributed the differences in cavity trees and vegetation to be due to the poor site quality and growth conditions of South Florida flatwoods, and historic timber management practices.

In southwest Florida (Charlotte, Collier, and Lee counties), the hydric slash pine (*P. elliotii* var. *densa*) flatwoods provide the preferred nesting and foraging habitat for red-cockaded woodpeckers (Beever and Dryden 1992). This community has been maintained by fire and hydroperiod, and therefore does not have the dense midstory more typical of xeric and mesic flatwoods in southwest Florida. Also, hydric pine flatwoods were not as accessible to historic forestry, agriculture, and land clearing practices as the xeric and mesic communities.

Older growth pine or pine-dominated stands are also needed for foraging, but not to the extent needed for nesting/roosting. Red-cockaded woodpeckers will forage to some degree on hardwood trees and even in bayheads and cypress domes, but in general, mature pines constitute the primary foraging substrate. This habitat, in association with or proximal to nesting/roosting habitat, is necessary for population survival. In South Florida, red-cockaded woodpeckers need more habitat for foraging than in areas farther north because of the poor habitat quality (less than 30 square feet/acre pine basal area) (Hovis and Labisky 1996).

C. Reproduction

Red-cockaded woodpeckers attain breeding age at 1 year, however, reproductive success improves with increased age (Walters 1990). The nesting season in Florida is late April through early June. The nest cavity is also unusually the roost cavity of the breeding male (Ligon1970). The red-cockaded woodpecker is monogomous and is essentially single brooded (Jackson 1994). Clutch size is normally 2-4 eggs and incubation is 10-11 days (Ligon 1970). Although not all groups produce young, in south Florida, 81 percent of groups were found to be successful.

D. Foraging

Red-cockaded woodpeckers forage primarily on arthropods, taken by chipping away the outer layer of tree bark and gleaning what they find underneath. They will occasionally feed on vegetative matter such as pine mast and fruits (Jackson 1994). They have also been observed taking flying insects on the wing. Red-cockaded woodpeckers typically forage in larger pines in pine-dominated habitat (90 percent), rather than in hardwoods.

E. Movements

The spatial extent needed to sustain red-cockaded woodpeckers depends primarily on habitat quality. Home ranges in optimal quality habitat in the Carolinas average 170-220 acres In most of Florida, however, habitat quality is considerably lower than the more optimal conditions in the Carolinas, as well as other areas within the species' range. Habitat quality in southern and central Florida is particularly marginal in that respect; home ranges average 346-395 acres , but can exceed 494 acres (Wood 1996). Territory sizes for red-cockaded woodpeckers in South Florida have been reported as large as 741-988 acres in Big Cypress National Preserve, because the pinelands are not contiguous. At Avon Park Air Force Range, the largest home range size reported was 890 acres , with an average of 395 acres . In constrained territories, home range is limited to 173 acres (U.S. Fish and Wildlife Service 1998).

F. Status and Trends

Jackson (1978) estimated the total population of red-cockaded woodpeckers to be between 1,500-3,000 clusters and 4,500-10,500 birds, based upon extensive literature reviews and questionnaire surveys. This was revised from his earlier estimate of 2,939 birds - a conservative estimate based upon limited data.

The most extensive, rangewide population surveys for red-cockaded woodpeckers have been conducted on federal lands. In 1979, the Service's Southeast Region and the USFS initiated a rangewide survey of clusters on federal lands in the southeast. The results of this effort estimated 2,677 (+/- 456) active red-cockaded woodpecker clusters on the lands censused (Lennartz *et al.* 1983). With the addition of a few federal properties not included in the census, the population was subsequently estimated to exceed 3,000 active clusters (Lennartz and Henry 1985). Among the federal lands censused (national forests, military bases, national wildlife refuges), the largest number of active clusters (2,121) was found on national forests. More recent surveys estimate the rangewide population at 4,694 active clusters (Costa and Walker 1995).

Recovery Plan Objective

The establishment of one or more viable populations of red-cockaded woodpeckers in South Florida toward the overall recovery goal for the species throughout its range. This effort should focus on the hydric pine flatwoods community of southwest Florida. This objective will be achieved when a reserve design for South Florida is developed that identifies patches of suitable-sized nesting and foraging habitat (stands of old-age, mature pines of adequate size) essential for preventing further declines in the population; when any further loss and fragmentation of habitat within these reserves has been prevented; when suitable, occupied habitat within the reserves is protected through appropriate management on public and private lands, land acquisition, and cooperative agreements with private landowners, when additional nesting and foraging habitats are created or restored adjacent to existing clusters; when augmentation or artificial starts are successfully implemented where needed to establish new groups; and when groups of red-cockaded woodpeckers within the reserves sustain a rate of population increase equal to or greater than 0.0 as a 3-year running average for at least 10 years.

Bald eagle

The bald eagle was listed as endangered on March 11, 1967 due to significant population declines (32 FR 4001). On July 12, 1995, the bald eagle's status was downgraded from endangered to threatened due to substantial population increases following conservation efforts, including the banning of DDT and other organochlorides (60 FR 36010). No critical habitat has been designated for this species.

A. Distribution

The bald eagle was historically found throughout the North American continent from the Aleutian Islands and western Alaska to the Maritime Provinces of Canada and south to the Florida Keys, the Gulf Coast, and Baja California (Curnutt 1996). Apart from Alaska, most nesting bald eagles were found in Florida, the Chesapeake Bay area, the Great Lakes region, Maine, and the Pacific northwest. In Florida, eagles were historically found throughout the state, although they were probably most abundant along large rivers and lakes. Eagles were probably never numerous in the panhandle or extreme southeastern Florida. Today, bald eagle nesting is prevalent along the southwest coast, the Gulf Coast from Pinellas County north to the Suwannee River, the St. Johns/Oklawaha River basins, and the Kissimmee River valley including Polk and Osceola counties (Curnutt 1996).

B. Habitat

Bald Eagles are considered a water-dependant species typically found near estuaries, large lakes, reservoirs, major rivers and some seacoast habitats (U.S. Fish and Wildlife Service 1998). Their distribution is influenced by the availability of suitable nest and perch sites near large, open water-bodies, typically with high amounts of water-to-land edge.

Nesting habitat includes the nest tree, perch and roost sites, and adjacent high use areas but usually does not include foraging areas. The nest, perch, roost sites, and use areas around the nest, comprise the nesting territory. The size and shape of a defended nesting territory varies greatly depending on the terrain, vegetation, food availability, and eagle density in the area. Generally, bald eagle nesting habitat is adjacent to, or near large bodies of water that are used for foraging (U.S. Fish and Wildlife Service 1998). Nest sites must also provide good visibility, and a clear flight path to the nest (Montana Bald Eagle Working Group 1991).

In Florida, nests are often in the ecotone between forest and marsh or water, and are constructed in dominant or co-dominant living pines (*Pinus* spp.) or bald cypress (*Taxodium distichum*) (McEwan and Hirth 1979). About 10 percent of eagle nests are located in dead pine trees while two to three percent occur in other species such as Australian pine (*Casuarina equisetifolia*) and live oak (*Quercus virginiana*). The stature of nest trees decreases from north to south and in extreme southwest Florida (Wood *et al.* 1989), eagles nest in black (*Avicennia germinans*) and red mangroves (*Rhizophora mangle*), half of which are snags (Curnutt and Robertson 1994). Nest trees in South Florida are smaller and shorter than reported elsewhere, however, eagles nesting here select the largest trees available (Wood *et al.* 1989, Hardesty 1991). The small size of nest trees in South Florida relative to other nest sites throughout its range is due to the naturally smaller stature of *Pinus elliottii*, *P. taeda*, *P. palustris* and *P. clausa* in South Florida.

C. Reproduction

Most breeding eagles construct nests within several hundred yards of open water (U.S. Fish and Wildlife Service 1998). In Florida, most nests were located within two miles of open water, substantially further than other reported distances (McEwan and Hirth 1979, Wood *et al.* 1989).

In the Southeast, nesting activity generally begin in early September, with egg laying occurring as early as late October, and peaking in the latter part of December. Depending on latitude, incubation may be initiated from as early as October to as late as March. Clutches usually consist of one or two eggs, but occasionally three or four are laid. Parental care may extend four to six weeks after fledging even though young eagles are fully developed and may not remain at the nest after fledging.

D. Foraging

The bald eagle is an opportunistic feeder. Accordingly, its diet varies tremendously, depending on the time of year and habitat. Most studies indicate that fish are an important component of the eagle's diet, while birds and mammals account for the bulk of the remaining foods (Johnsgard 1990). During the winter, reduced availability of prey resulting from frozen waters require interior eagle populations to switch from a predominately fish diet to one of birds and mammals. Carrion is taken by many eagles and is also a substantial portion of the diet, especially for coastal eagles dependent on post-spawning salmonids. Some interior populations may also rely heavily on carrion particularly during late winter and early spring.

In the Southeastern United States the bulk of the diet is fish. Broley (1947) found catfish (*Ictalurus* spp.), mullet, and turtles, to be the most common food items found at nests in Florida. He also found that the variety of prey items differ among individual pairs. McEwan (1977) reported 79 percent fish and 17 percent bird prey, by occurrence, based on 788 animal remains recovered from nests. Of these, the dominant items were catfish and the American coot (*Fulica americana*).

E. Movements

Adult birds in coastal Alaska, Canada, the Pacific Northwest, Florida, and the Chesapeake Bay areas do not migrate, although dispersal of young may occur seasonally from some of these areas. Juvenile birds fledged in Florida are highly migratory, with more than one-third of the recoveries made 1,000 miles or more north of Florida, all during the non-nesting season (Broley 1947). Most radio-collared juveniles return each year but a small proportion remain away for two to three years.

Little information is available on the dispersal of bald eagles as they approach and enter early adulthood . If paired, it is assumed these birds remain in Florida as do most other paired adults. If not paired, it is not clear whether these birds continue to migrate north during summer or remain in Florida with the breeding adults. Similarly, it is not known whether all birds fledged in Florida ultimately breed in Florida.

In southern peninsular Florida, bald eagles breed and nest during the temperate winter. Contrary to changes in habitat use exhibited by northern bald eagle populations, eagles in the south do not substantially alter habitat use throughout the year. Some adults may remain in and defend their nesting territory outside of the breeding season (Palmer 1988), use or defend portions of their territory, or disperse and congregate at predictable food sources such as landfills. Of those adults that do not maintain territories throughout the year, most are not thought to leave the state. Conversely, following fledging, many juvenile eagles disperse north and summer from along the Atlantic Coast west to the Appalachian Mountains and north as far as Canada (Broley 1947, Wood and Collopy 1995).

F. Status and Trends

Bald eagle nesting in Florida has been widely studied and published accounts are available from a variety of sources. Broley (1947) was the first to document a decline in eagle nesting in the late 1940s. A further decline from 73 to 43 active nesting areas was reported for west central Florida between 1936 and 1956. Howell (1973) reported a decline in nesting around Merritt Island from 24 nests in 1935 to four nests in 1971. An excellent summary was provided by Peterson and Robertson (1978), in which they characterized the bald eagle population of the 1970s as less than 50 percent of historic numbers and still slowly decreasing.

State natural resource agencies, and conservation organizations initiated surveys for nesting bald eagles in the early 1950s which reveal that bald eagle numbers declined from historic numbers in many locations. A nationwide survey by the Service, State wildlife agencies, and conservation groups in 1974 indicated that eagle numbers and their reproductive success in certain areas were low enough to warrant protective actions.

In Florida, bald eagle nesting and productivity has increased dramatically since the early 1970s. Florida currently supports the highest number of breeding bald eagles of any southeastern state, supporting approximately 70 percent of the occupied territories in this region (Nesbitt 1995). Although numbers and productivity of bald eagles are increasing in Florida, concerns remain about the cumulative impacts associated with continued agricultural, residential, and commercial development (Wood 1987, Nesbitt 1995).

G. Recovery Plan Objective

Efforts have only recently been initiated to develop delisting criteria for bald eagles in the southeast. The objective for South Florida's contribution to the recovery of the bald eagle will be achieved when; at least 45.4 percent of the total of occupied territories throughout the State of Florida are protected in South Florida; these territories are managed or enhanced to increase productivity; average productivity for occupied territories is greater than or equal to 1.13 chicks over a consecutive 10-year period. The percentage of active territories located in South Florida may change if the balance of the state's bald eagle population increases or decreases at a different rate than South Florida. In this case, the objective may be modified to maintain the number of territories found in South Florida in the 1996-97 nesting season.

Eastern indigo snake

The eastern indigo snake was listed as a threatened species on January 31, 1978 due to a serious population decline caused by habitat loss, over-collecting for the pet trade, and mortality from gassing gopher tortoise burrows to collect rattlesnakes (43 FR 4028). No critical habitat has been designated for this species.

A. Distribution

Georgia and Florida currently support the remaining, endemic populations of the eastern indigo snake (Lawler 1977). In 1982, only a few populations remained in the Florida panhandle. In these areas, the species is considered rare. Nevertheless, based on museum specimens and field sightings, the eastern indigo snake still occurs throughout Florida, though not commonly seen (Moler 1985).

B. Habitat

Over most of its range in Florida, the eastern indigo snake frequents diverse habitats such as pine flatwoods, scrubby flatwoods, flood plain edges, sand ridges, dry glades, tropical hammocks, edges of freshwater marshes, muckland fields, coastal dunes, and xeric sandhill communities. On the central Atlantic coast, eastern indigo snakes can be found in orange groves and near ditches and canals. In south Florida, these snakes are found in pine flatwoods and tropical hammocks or in most undeveloped areas (Kuntz 1977); although they may use open areas more than hammocks. Eastern indigo snakes also use agricultural lands and various types of wetlands, with higher population concentrations occurring in the sandhill and pineland regions of northern and central Florida.

Smith (1987) radio-tagged hatchling, yearling, and gravid eastern indigo snakes and released them in different habitat types on St. Marks National Wildlife Refuge in Wakulla County, Florida, in 1985 and 1986. He concluded that diverse habitats, including high pineland, pine-palmetto flatwoods, and permanent open ponds, were important for the eastern indigo snake's seasonal activity. Habitat use differed by age, class, and season. Stumps, ground litter, and saw palmetto debris were frequently used as refugia. Adult indigo snakes often used gopher tortoise burrows (*Gopherus polyphemus*) during April and May, while juveniles chose smaller root and rodent holes.

Eastern indigo snakes need a mosaic of habitats to complete their annual cycle. Interspersion of tortoise-inhabited sandhills and wetlands improves habitat quality for the indigo snakes (Landers and Speake 1980). Wherever the eastern indigo snake occurs in xeric habitats, it is closely associated with the gopher tortoise, the burrows of which shelter the indigo snakes from winter cold and desiccating sandhill environment (Bogert and Cowles, 1947; Speake, *et al.* 1978). This dependence seems especially pronounced in Georgia, Alabama, and the panhandle area of Florida, where eastern indigo snakes are largely restricted to the vicinity of sandhill habitats occupied by gopher tortoises (Diemer and Speake, 1981; Moler 1985; Mount 1975). In wetter habitats that lack gopher tortoises, eastern indigo snakes may take shelter in hollowed root channels, hollow logs, or the burrows of rodents, armadillo, or crabs (Lawler 1977, Moler 1985). In south Florida, indigo snakes occur along canal banks, where they use crab holes in lieu of gopher tortoise burrows (Lawler 1977).

C. Reproduction

Eastern indigo snakes breed between November and April, with females depositing 4-12 eggs during May or June (Moler 1992). Young hatch in approximately 3 months from late May through August with peak hatching activity occurring between August and September, while yearling activity peaks in April and May (Smith 1987). There is no evidence of parental care although the snakes take 3 to 4 years to reach sexual maturity (Moulis 1976).

D. Foraging

The eastern indigo snake is a generalized predator and will eat any vertebrate small enough to be overpowered. The snake's food items include fish, frogs, toads, snakes (venomous as well as nonvenomous), lizards, turtles, turtle eggs, small alligators, birds, and small mammals.

E. Movements

Outside of peninsular Florida, eastern indigo snakes are generally restricted to the vicinity of xeric habitats that support populations of gopher tortoises, although they move seasonally into more mesic habitats. Throughout peninsular Florida, the eastern indigo snake may be found in all terrestrial habitats which have not suffered high density urban development. They are especially common in the hydric hammocks of north Florida and in similar habitats throughout peninsular Florida (Moler 1985).

F. Status and Trends

The wide distribution and large territory size of the eastern indigo snake complicate evaluation of its population status and trends. Although we have no quantitative data with which to evaluate the trend of eastern indigo snakes in South Florida, we surmise the population as a whole is declining because of current rates of habitat destruction and degradation. Fragmented habitat patches probably cannot support a sufficient number of indigo snakes to ensure viable populations.

G. Recovery Plan Objective

The objective is to stabilize and increase numbers of indigo snakes in South Florida. An increasing population will need to sustain a rate of increase greater than 0.0 as a 3-year running average over at least 10 years. Once it is determined that sufficient, suitable habitat exists in South Florida for the eastern indigo snake population to stabilize or increase, delisting criteria can be considered. The development of delisting criteria will require the analysis of demographic data to demonstrate that there are adequate, contiguous tracts of upland habitat in South Florida to ensure at least a 95 percent probability of persistence for the eastern indigo snake for 100 years.

Garber's spurge

The Garber's spurge was listed as a threatened species on July 18, 1985 (50 FR 29349) due to the destruction and degradation of its habitat: pine rocklands, coastal flats, coastal grasslands, beach berms, and beach ridges. No critical habitat has been designated for this species.

A. Distribution

The Garber's spurge is an endemic of Florida that occurs on less than five locations from Perrine in Dade County, west to Cape Sable, and south to most of the Keys in Monroe County (Small 1903, 1933). While most populations of the Garber's spurge occur in coastal habitats, one population in Dade County is approximately 16 miles inland from Florida Bay.

B. Habitat

Garber's spurge grows at low elevations (<10 feet) in well- to poorly-drained, calcareous sands or directly on exposed limestone in a variety of open to moderately-shaded vegetative communities. In pine rocklands, Garber's spurge grows in crevices in oolitic limestone. On Cape Sable in Everglades National Park, Garber's spurge has been reported from hammock edges, open grassy prairie, and backdune swales. In the Keys, Garber's spurge grows on semi-exposed limestone shores, open calcareous salt flats, pine rocklands, calcareous sands of beach ridges, and along disturbed roadsides.

The Garber's spurge occurs in vegetative communities that historically are naturally prone to periodic disturbance. Pine rocklands and coastal grasslands experience frequent wildfires, while coastal habitats are prone to periodic submergence at high tide or during storm surges.

C. Reproduction

The Garber's spurge is a perennial that reproduces sexually by seed. Reproductive ecology in *Chamaesyce* has been poorly studied but it is known to be highly variable (Ehrenfeld 1976, 1979; Webster 1967). Some spurges are completely reliant on insects for pollination and seed production while others are self-pollinating. Pollinators may include bees, flies, ants, and wasps (Ehrenfeld 1979). Seed capsules of many Euphorbiaceae are explosively dehiscent, ejecting seeds a short distance from the parent plant. The seeds of some species are dispersed by ants (Pemberton 1988).

D. Status and Trends

The total population of the spurge has been estimated as less than 1,000 individual plants. A status survey by Austin *et al.* (1981) found five sites; three on Cape Sable (ENP), one on Long Pine Key (ENP), and one on Big Pine Key. Only the Long Pine Key site has been resurveyed, and it was found to contain approximately 150 plants. The status of the three Garber's spurge populations on the Cape is not known. A new population was found in 1988 at the Charles Deering Estate, Dade County, after a burn. It had 250 plants in 1991 but the population size appears to be getting smaller. Two other sites, located at Bahia Honda State Park and Long Key State Recreation Area, have populations and trends which are unknown. The remaining habitat is relatively fragmented and most populations are disjunct and small, causing concerns that these populations are more susceptible to extirpation from a single natural or manmade disturbance.

E. Recovery Plan Objective

The recovery objective is to stabilize existing populations within the historic range of the species and protect these sites from further habitat loss, degradation, exotic plant invasion, and fire suppression. Once the existing populations are stabilized, delisting may be considered when enough demographic data are available to determine the appropriate numbers of self-sustaining populations required to assure 95 percent probability of persistence for 100 years; when these populations within the historic range are adequately protected from further habitat loss, degradation, exotic plant invasion, and fire suppression; when these sites are managed to maintain the pine rocklands to support the species; and when monitoring programs demonstrate that populations on these sites support sufficient population sizes, are distributed throughout the historic range, and are sexually or vegetatively reproducing at sufficient rates to maintain the population. The recovery objective will be reassessed annually based on new research.

Analysis of the species/critical habitat likely to be affected

1. Cape Sable seaside sparrow - the **Experimental Program** would adversely affect the sparrow due to the timing, volume, and direction of regulated water releases resulting in adverse nesting habitat alteration and sparrow population declines. In addition, hatchlings or eggs would be vulnerable to direct crushing by heavy equipment during construction activities.

The **Modified Water Deliveries** project will provide for water deliveries that mimic more natural water flow conditions across the sparrow's nesting habitat. The Service anticipates these conditions will provide for the frequency of nesting opportunities and maintenance of nesting habitat necessary for the sparrow's long-term viability. Further, no adverse effects are anticipated due to construction because these activities will not occur in or near sparrow habitat.

Consequently, the Service anticipates the **Modified Water Deliveries** project is not likely to adversely effect the Cape Sable seaside sparrow.

The **C-111 Project** would increase wet season water flows to the Rocky Glades and Taylor Slough areas, improving hydroperiods in marl prairie habitats in this area, which should maintain suitable nesting substrate and enhance nesting opportunities. Thus, the hydrological effects of the **C-111 Project** are not likely to adversely effect the Cape Sable seaside sparrow. Construction related activities associated with the **C-111 Project** could disturb birds during the breeding season, therefore, these activities are anticipated to result in adverse effects to the sparrow.

2. West Indian Manatee - The **C-111 Project** would improve the timing and volume of freshwater flows to Florida Bay estuaries (NPS 1993). The **Experimental Program** provides greater volumes of freshwater flow into Florida Bay in all months (Van Lent et al. 1999). Since manatees prefer habitats that include sources of freshwater, these projects may increase the area of habitat suitable for manatees in Florida Bay. Decreased salinities and decreased temperatures associated with increased freshwater inflows may cause a shift in seagrass species composition. However, manatees eat all species of seagrasses and are not thought to be food limited in this area (U.S. Fish and Wildlife Service 1998). Further, no adverse effects are anticipated due to construction because these activities will not occur in or near manatee habitat. Consequently, implementation of the **Experimental Program** and the **C-111 Project** are not likely to adversely affect the West Indian manatee.

The **Modified Water Deliveries** project would result in substantially decreased freshwater inflows to Florida Bay resulting in a higher percentage of months with high salinities and increased temperatures in this area (Van Lent et al. 1999). Prior decreases in freshwater flows associated with the original C&SF project probably increased salinities in this area above manatee tolerance levels, rendering much of the area unsuitable. In addition, much of Florida Bay is too shallow to provide suitable manatee habitat causing manatees to avoid this area. Therefore, an additional decrease in freshwater flows is not likely to adversely affect the West Indian manatee or its critical habitat. Further, no adverse effects are anticipated due to construction because these activities will not occur in or near manatee habitat.

3. Florida Panther -The Florida panther is not likely to be adversely affected by implementation of these proposed actions because the preferred upland habitats of this species will not be impacted by either construction activities or manipulation of hydrologic conditions.

4. Snail Kite - No known snail kite nesting habitat occurs in areas affected by the **C-111 Project** (Bennetts *et al.* 1994, Bennetts and Kitchens 1997). Therefore, the **C-111 Project** will not adversely affect the snail kite or its critical habitat.

The **Experimental Program** and the **Modified Water Deliveries** project will maintain deep impounded pools in WCA-3A that degrade nesting habitat due to the loss of woody vegetation and foraging habitat due to the loss of wet prairie communities. Therefore, the **Experimental Program** and the **Modified Water Deliveries** project are likely to adversely affect the snail kite. Due to the Corps' adoption of a Construction Monitoring Plan, construction related activities associated with these two projects are not likely to adversely effect the snail kite.

5. Wood Stork - The **C-111 Project** would increase wet season water flows to the Rocky Glades and Taylor Slough areas, improving hydroperiods in marl prairie habitats in this area, and improving the timing and volume of freshwater flows to Florida Bay estuaries (Van Lent et al. 1999). This should improve availability and timing of food resources important to nesting wood storks (Ogden 1994, U.S. Fish and Wildlife Service 1998). Further, no adverse effects are anticipated due to construction because these activities will not occur in or near wood stork habitat. Consequently, implementation of the **C-111 Project** is not likely to adversely effect the wood stork.

The **Experimental Program** would continue the current reduced duration and timing of hydroperiods and flow volumes in two areas of Shark River Slough and the volume and timing of water passing through southern portions of Shark River Slough and Taylor Slough as compared to historic conditions, and the **Modified Water Deliveries** project would result in a further decrease in the duration and timing of hydroperiods in two areas of Shark River Slough and the volume and timing of water passing through southern portions of Shark River Slough and Taylor Slough as compared to the **Experimental Program**. Both proposed actions would effect the amount and timing of freshwater reaching the mangrove zone nesting habitat. These reductions are of sufficient magnitude to delay colony formation and ultimately increase the probability of an unsuccessful nesting season. Therefore, the Service anticipates that the **Experimental Program** and the **Modified Water Deliveries** project are likely to adversely effect the wood stork. Due to the Corps' adoption of a Construction Monitoring Plan, construction related activities associated with these two projects are not likely to adversely effect the wood stork.

6. American Crocodile - The **C-111 Project** would improve the timing and volume of freshwater flows to Florida Bay estuaries (NPS 1993) and the **Experimental Program** would continue current freshwater flows. Changes in the hydrologic flow that mimic natural flow conditions are likely to benefit crocodiles, in addition, continued current conditions will not affect crocodiles. No adverse effects are anticipated due to construction because these activities will not occur in or near American crocodile habitat. Consequently, implementation of the **Experimental Program** and **C-111 Projects** are not likely to adversely effect the American crocodile.

The **Modified Water Deliveries** project is anticipated to result in reduced volume flows into Florida Bay estuaries than would occur under current conditions. This would result in increased salinity levels that would result in lower survival rates of hatchling crocodiles and reduced reproductive potential for adults. Consequently, the Service anticipates the **Modified Water Deliveries** project is likely to adversely effect the crocodile. Further, no adverse effects are anticipated due to construction because these activities will not occur in or near American crocodile habitat.

7. Red-cockaded Woodpecker -The red-cockaded woodpecker is not likely to be adversely affected by implementation of these proposed actions because the preferred upland habitats of this species will not be impacted by either structural construction activities or manipulation of hydrologic conditions.

8. Bald Eagle - The bald eagle is not likely to be adversely affected because the proposed actions will not impact any bald eagle nesting sites, will not substantially reduce the spatial extent of the natural habitat types utilized by bald eagles for foraging and resting, and the Service anticipates that individual bald eagles will adjust to expected gradual shifts in the location or composition of natural habitats, resulting in insignificant effects.

9. Eastern Indigo Snake -The Eastern indigo snake is not likely to be adversely affected by hydrological changes resulting from the proposed actions because the proposed actions will not substantially reduce the spatial extent of the natural habitat types utilized by the Eastern indigo snake and the Service anticipates that individual snakes will adjust to expected gradual shifts in the location or composition of natural habitats, resulting in insignificant effects. Since the Corps has agreed to incorporate a Construction Monitoring Plan for the Eastern indigo snake that will ensure that no snakes are injured or killed during construction activities, the Service has determined that construction activities associated with these proposed actions will not adversely affect the Eastern indigo snake.

10. Garber's Spurge -The Garber's spurge is not likely to be adversely affected by implementation of these proposed actions because the preferred upland and coastal habitats of this species will not be impacted by either construction activities or manipulation of hydrologic conditions.

ENVIRONMENTAL BASELINE

This section is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, their habitats (including designated critical habitat), and ecosystems within the action area. The environmental baseline is a "snapshot" of a species' health at a specified point in time. It does not include the effects of the actions under review in the consultation. Rather, the effects analyzed in this biological opinion will be additive to establish a new environmental baseline.

Since, between them, the **Modified Water Deliveries** project and the **Experimental Program** have had three previous biological opinions issued within the action area (February 1990, June 1993, October 1995), the environmental baseline for the current proposed actions will be the one established by the issuance of the October, 1995, biological opinion on Test 7 (Phase I) of the **Experimental Program**.

The October 1995 biological opinion determined that Test Iteration 7 would jeopardize the sparrow unless: (1) Water flows through the S-12 structures should be distributed in a manner that restores and maintains the short hydroperiods of the marl prairies and sloughs west of Shark River Slough, to the maximum extent possible within the operating constraints of Test 7; (2) during the nesting period of the Cape Sable seaside sparrow (January through June) pumping at S-332 should be limited to 165 cfs, to the maximum extent possible; (3) the Corps, with the cooperation of the Service, NPS, SFWMD, and GFC, should undertake a comprehensive monitoring and research program on the Cape Sable seaside sparrow within the action area; (4) the Corps, with the cooperation of the Service, NPS, SFWMD, and the GFC, should develop a plan that identified remedial actions and management interventions that could be taken if the status of the Cape Sable seaside sparrow population declines during Test 7; and, (5) the Corps, in cooperation with the SFWMD, the NPS, and the Service, should examine future options to restore the everglades ecosystem to identify ways to redistribute regulatory releases from WCA 3A more naturally over as large a geographic area as possible.

The effects of the current proposed actions under consultation, along with cumulative effects, will be added to the environmental baseline to determine if implementation will jeopardize the continued existence of the Cape Sable seaside sparrow, snail kite, wood stork or American crocodile.

Status of the species within the action area

Cape Sable Seaside Sparrow

Presently, the known distribution of the Cape Sable seaside sparrow is restricted to localized areas on the east and west sides of Shark River Slough which is entirely contained within the action area. Therefore, pertinent habitat and life history information utilized in the analysis of past and ongoing factors leading to the current status of the species and its habitat within the action area is provided in the *Status of the species/critical habitat* section of this document. The status of the Cape Sable seaside sparrow after the breeding season in 1995 is provided below.

By 1995, subpopulation A, located in the western marl prairies and representing approximately 50 percent of the total population in 1992, had disappeared from all but a few locations. It was noted in the Service's October, 1995, biological opinion on Test 7 of the **Experimental Program**, that the Cape Sable seaside sparrow was now represented by a single viable subpopulation (subpopulation B) and two subpopulations (subpopulations A and C-F) too small to persist over the long term. Subpopulation A increased slightly to 272 birds in 1996 and 1997, and declined again in 1998 to 192 birds.

The smaller subpopulations located in the eastern marl prairies are struggling to persist. For example, subpopulations C, D, and F appear to have been extirpated in 1995, but the 1996 and 1997 surveys located a small number of birds at each of these sites. The 1998 survey results in subpopulations C, D, and F estimated 80, 48, and 16 birds, respectively, or approximately 5 percent of the total 1998 rangewide estimate. The 1995 estimate for subpopulation B, considered the most stable of all the sparrow subpopulations, was 2,128 birds. This subpopulation declined to 1,888 birds in 1996, increased to 2,832 in 1997, and declined again in 1998 to 1,808 birds. Subpopulation E, the remaining eastern prairie subpopulation, had a 1995 estimate of 352 birds, declined in 1996 to 208, increased in 1997 to 832, and again increased in 1998 to 912.

Snail Kite

Snail kite use of the action area fluctuates greatly, with low use during drought years, such as 1991, and high use in wet years, such as 1994. Although sharp declines have occurred in the counts since 1969 (for example, 1981, 1985, 1987), it is unknown whether decreases in snail kite numbers in the annual count are due to mortality, dispersal (into areas not counted), decreased productivity, or a combination of these factors. Despite these problems in interpreting the annual counts, the data since 1969 have indicated a generally increasing trend (Bennetts *et al.* 1994). The annual counts since 1995 confirm a continued increasing trend, however, the degree of this apparent increase in the snail kite's population needs to be confirmed with alternative methods of estimating population size.

Wood Stork

Historically, South Florida supported greater than 70 percent of the total nesting effort in the southeast U.S. In 1996, nesting effort in South Florida improved from the previous three years, most likely in response to improved foraging conditions as a result of a rapid dry-down following three high water years. In Everglades NP, Big Cypress National Preserve, Corkscew National Sanctuary, and Florida Panther NWR, there were a total of approximately 1,600 nesting pairs. Numbers of nesting storks in the action area have declined since 1996, averaging about 142 nesting pairs (Ogden 1998, personal communication).

American Crocodile

Kushlan and Mazzotti (1989) estimated that 220 ± 78 adult and subadult crocodiles remained in South Florida, while Moler believes between 500 and 1,000 individuals (including hatchlings) persist there currently (Moler, personal communication 1998). The recent increase is best represented by changes in nesting effort. Survey data gathered with consistent effort indicates that nesting has increased from about 20 nests in the late 1970's to about 48 nests in 1995. Since it is likely that female crocodiles only produce one clutch per year it follows that the population of reproductively active females has more than doubled in the last 20 years.

Factors affecting species environment within the action area

This section addresses all unrelated Federal, State, local, Tribal and private actions, within the action area, that will occur contemporaneously with the proposed actions and will affect the species' environment. The Service is aware of only one additional action that will affect the species environment:

> ENP will continue fire management and exotic species control programs within park boundaries that are expected to improve and maintain habitat for the snail kite, wood stork, American crocodile and Cape Sable seaside sparrow.

EFFECTS OF THE ACTION

Effects of each of the proposed actions addressed in this biological opinion will be discussed separately here. Within each discussion, possible effects have been divided into two categories - hydrological effects and construction effects. Hydrological effects are those caused by changes in the timing, volume and direction of water flows resulting from operational changes in the water management system. Construction effects are those caused by construction activities necessary to install new structures or modify existing structures.

Experimental Program

The proposed action, continued operation of Test 7, Phase I, and proposed operation of Test 7, Phase II, of the **Experimental Program**, continues water delivery schedules to Shark River Slough as in Test 7, Phase I, and continues and expands water deliveries to Taylor Slough. Differences between Test 7, Phase I, and Test 7, Phase II, have to do with higher canal stages and increased pumping in the area of the headwaters of Taylor Slough in an effort to increase water levels in the marl prairie areas forming the headwaters of Taylor Slough, increase water deliveries to Taylor Slough, and provide flood control. The **Experimental Program** is likely to adversely effect the Cape Sable seaside sparrow, snail kite, and wood stork.

A. <u>Hydrological Effects</u>

Cape Sable Seaside Sparrow

To assist in determining the effects of the **Experimental Program** on the Cape Sable seaside sparrow, the Service requested the following information from the Corps: (1) hydrologic modeling output for operation of the newly constructed S-332D pump station. The modeling output was requested to provide expected hydropatterns, including flow distributions, depths, and duration of inundation within the breeding habitats of the sparrow; (2) the results of any hydrologic and ecological monitoring completed for Test Iterations 1 through 6; and, (3) weekly records of discharges to Shark River Slough from 1983 to present, distinguishing between quantities delivered to western and northeast Shark River Slough, including quantities derived from the rainfall formula, from supplemental discharges associated with WCA 3A's stage, and quantities associated with the target discharges. Additionally, the Service requested technical assistance from the staff at ENP to also provide similar hydrologic modeling runs for the current Test 7, Phase I, and the proposed Test 7, Phase II. To date, the Corps has provided most of the requested information (except modeling results for S-332D operations) and ENP provided a report focused on the hydrologic aspects of **Modified Water Deliveries**, the **C-111 Project**, and the **Experimental Program** with accompanying computer simulations and discussion of the effects to listed species (Van Lent et al. 1999).

As proposed, the Test 7, Phase II, operational schedule for water release into Shark River Slough is consistent with previous test iterations dating back to 1985, starting with Tests 1- 5, continuing in 1994 with Test 6, and followed by Test 7, Phase I, in 1995. Like the previous test iterations, the concern with Test 7 is the impact of managed water releases through the S-12 spillways into the western marl prairies and it's potential effect on the breeding habitat and behavior of the Cape Sable seaside sparrow within core subpopulation A. Precipitation in combination with managed water releases through the S-12 spillways determine the extent water levels affect the birds directly, by flooding their nests, and indirectly by altering the nesting habitat on which they depend. The amount of water released through the S-12s that will preclude nesting is correlated to: (a) the existing water table level prior to the nesting season and (b) the amount of breeding season rainfall that occurs. There is no consideration in the operational water delivery schedule to sparrow nesting habitat conditions below the S-12s prior to regulated water release. Therefore, the proposed water delivery schedule is anticipated to result in continued adverse effects to the Cape Sable seaside sparrow in subpopulation A during those years when managed water releases will: (1) flood the marl prairies of western Shark River Slough during the sparrow nesting season, whereby unsuitable nesting habitat conditions would be created that effectively preclude successful reproduction (Nott *et al.* 1998); and/or (2) by flooding occupied nesting habitat that results in mortality of eggs or chicks, due to nest flooding, or increased predation (Nott *et al.* 1998). The rationale for these determinations is provided below.

As noted earlier, the sparrow nesting season typically begins as early as mid-March and ends with the onset of the wet season, which can be as late as August. For modeling purposes, the beginning of the sparrow nesting season has been defined as March 15, and the beginning of the wet season has been defined as July 1. The sparrow will not commence nesting activity if water levels over the nesting habitat have not receded below 10 cm, and needs a minimum of 40 consecutive days to complete one breeding cycle; they will successfully fledge two clutches if provided at least an 80 day nesting period (Nott *et al.* 1998). Therefore, one important hydrologic measure for potential sparrow nesting success is to determine the number of consecutive days between March 1 and July 15 that water levels are below 10 cm within nesting habitat. In applying this principle to modeling output that shows the water level at a fixed point such as NP205, it is important to note that, due to the topographic variation within the sparrow's habitat, habitat at a higher elevation than the reference point will remain dry for longer than habitat at or below the reference point elevation. Therefore, for example, a water management scenario that would provide water levels at or below a particular reference point for 60 consecutive days would actually provide the 80 dry days required for completion of two successive broods over much of the habitat at a higher elevation.

The inference from the model simulations provided by Van Lent et al. (1999) is that approximately 60 percent of the time one can expect water levels to be below 10 cm for at least 40 consecutive days during the nesting season. Viewed another way, in 6 out of every 10 years we can expect the water level to be adequate for the sparrow to complete one breeding cycle. Furthermore, the modeling results indicate the sparrow could complete two broods in only 5 out of every 10 years. In determining what effect this has to the sparrow, it is necessary to consider if such a breeding frequency is outside of natural variability.

Reviewing hydrologic conditions during the 20 year period from 1977 through 1996, Nott *et al.* (1998) collected data at a hydrological monitoring index station (NP205) that was considered by the authors as representative of the sparrow's western marl prairie nesting habitat. They also collected data from a rainfall monitoring station close to the S-12A spillway along with daily water release data for the S-12 structures. These data reflect that over the 20 year period, there were 9 years with an insufficient number of dry days during the breeding season for the sparrow to complete one brood. During these 9 years, water was released though the S-12A spillway and the flow ranged from 213 to 2,063 cm/acre/day. There were only two exceptions: (1) In 1980 when there was no regulatory water release through S-12A, however over 15 cm of rainfall fell during the breeding season and only 42 percent of the habitat was available to complete one brood; and, (2) In 1996 when there was no regulatory water release through S-12A, however 13 cm of rainfall fell during the breeding season and only 33 percent of the habitat was available to complete one brood. There were only 4 years over this 20 year period with higher rainfall during the breeding season than occurred in 1996. Conversely, during the 11 years that at least 40 dry days were available during the breeding season for the sparrow to complete one brood, regulatory water releases through the S-12A spillway only occurred in 4 of those years, and the range of water release was relatively low (0.59 to 55.16 cm/acre/day). During these 4 years, mean breeding season water level ranged from 7.15 to 61.77 cm below mean sea level and in 3 of the 4 years the habitat available to complete one brood was above 93 percent; the exception was in 1988, where, due to high breeding season rainfall (over 6 inches), only 63 percent of the habitat was available to complete one brood. It is clear that both local rainfall and discharges from the S-12s impact the water levels at NP205.

The Van Lent et al. (1999) model predicts that if conditions remained the same, 12 out of every 20 years the water level should be adequate to complete one brood. The data set of actual, observed conditions analyzed from Nott *et al.* (1998) reflects that, indeed, in 11 of the past 20 years the nesting habitat conditions were adequate for the sparrow to complete one brood. However, regulatory water releases only occurred during 4 of those years and the actual releases had a relatively low volume flowing through the S-12A spillway (mean of 22 cm/acre/day). During the 9 years when the nesting habitat conditions were inadequate for the sparrow to successfully complete one brood, water releases through the S-12A spillway were considerably larger (mean of 1,040 cm/acre/day). Our conclusion is consistent with the observation of Van Lent and Pimm (1998), that the opening of the S-12 spillways is the single most important factor in predicting nesting success. Continued high flows across the S-12s in combination with a high water table across the nesting habitat and high breeding season rainfall expected under natural rainfall patterns would likely lead to the loss of the western population as a core area.

The loss of one core population breeding season is detrimental, but the loss of consecutive nesting seasons for the Cape Sable seaside sparrow could be critical for its long-term survival. Initiated in 1995, Test 7 is to run for four years. As concluded by Nott *et al.* (1998), the relatively high water levels in 1994-96 kept subpopulation A suppressed; one of only two remaining core populations for the sparrow. Nott *et al.* (1998) noted that since the annual survival of territory-holding males is about 50 percent, four years without breeding would have left few individuals that lived long enough to see the relatively dry year of 1997. Subpopulation A has now remained suppressed for the past 4 consecutive years due to the flooding of their nesting habitat during the breeding season. Furthermore, both Nott *et al.* (1998) and Curnutt *et al.* (1998) document the long-term potential adverse effects of sustained long hydroperiods on the vegetative composition of Cape Sable seaside sparrow nesting habitat.

The sparrow occupies marl prairies dominated by muhly grass or mixed prairies with plant characteristics of short hydroperiods, avoiding longer hydroperiod vegetative communities where plants such as sawgrass (*Cladium jamaicense*) are the dominant species. In both the eastern and western marl prairies, increased water levels similarly changed the vegetation from muhly to sawgrass dominated and so caused the sparrow population to decline (Nott *et al.* 1998). Moreover, with fewer places available to construct nests, vegetational changes have consequences much greater to the sparrow than ephemeral flooding. Sustained hydroperiods across the western marl prairies would alter vegetational composition such that it would eliminate suitable nesting substrate. Without available nesting habitat across the western marl prairies, the loss of subpopulation A would be eminent.

Since the environmental baseline conditions of 1995, when subpopulation A totaled 224 birds, the numbers increased to 416 birds in 1996, this increase was likely the result of the minimal regulatory water releases through the S-12s, but then declined to 272 birds in 1997 and 192 birds in 1998. By 1997 the number of individuals in this core area had dropped to less than 10 percent of its highest recorded numbers since surveys were initiated in 1992. In a risk assessment analysis conducted by Pimm (1997), his simulation modeling determined that if current conditions persist the western population of the sparrow will be lost within 10 years. Van Lent and Pimm (1998) note that another unsuccessful nesting season, the fifth in six years, could result in the loss of subpopulation A, which in turn would lead to a high risk of extinction for the Cape Sable seaside sparrow.

Test 7, Phase I, is anticipated to result in continued decline in the eastern Cape Sable seaside sparrow subpopulations and further deteriorate suitable nesting habitat conditions. This decline is related to over-drainage and the resultant shift in the vegetative community, which increases the frequency of fire such that it becomes detrimental for sparrow breeding (Pimm 1997). Nott *et al.* (1998) and Curnutt *et al.* (1998) attribute declines to over-drainage and resultant fire frequencies in the areas of subpopulations E and F and almost all of subpopulation C located upstream of S-

332, along with flooding that eliminates suitable nesting substrate in the southern part of subpopulation C, located immediately downstream of S-332. These vegetative changes, in turn, are directly related to the hydroperiod, or number of days per year a marsh is flooded (Van Lent et al. 1999). Therefore, another important hydrologic measure to determine the effects of the **Experimental Program** on the Cape Sable seaside sparrow is the hydrologic regime required to maintain the eastern wet prairie habitat.

The proposed Test 7, Phase II, operational schedule for water deliveries to Taylor Slough is predicted to result in slight increases in water levels in the eastern marl prairies compared to the 1995 environmental baseline condition (Van Lent et al. 1999, Corps 1995). Water management operations proposed in Test 7, Phase II, include higher L-31N canal stages and provisions for increased wet season water deliveries to Taylor Slough as compared to those in Test 7, Phase I. Specifically, model runs predict slightly higher water levels in the areas occupied by subpopulations C, E and F and slightly lower water levels in the area of subpopulation D (Van Lent et al. 1999). The Service expects this may result in slight reductions in expected fire frequencies in the areas of subpopulations C, E, and F, which may slightly reduce the extent and duration of unsuitable habitat conditions for sparrows due to frequent fires.

Test 7, Phase I, continues diverting water to the west creating more xeric habitat conditions in the area of subpopulation E, which likely contributed to its decline from 352 birds in 1995 to 192 in 1996. However, subpopulation E has shown an increase to 752 in 1997 and 912 in 1998. This positive trend is anticipated to continue with implementation of Test 7, Phase II, as the projected higher water levels across this area approach conditions that resemble more natural water flow conditions that existed prior to the **Experimental Program** (Van Lent et al. 1999). These slightly higher water levels should restore a more mesic prairie habitat condition that is conducive for sparrow nesting. Such conditions should benefit the sparrow by increasing the potential to produce more young. With an increased probability of establishing nesting territories, sparrow numbers are anticipated to increase slightly in this area

Declines in subpopulations C and F are thought to be the result of over-drainage, which created drier conditions resulting in woody shrub invasion into prairie nesting habitats followed by frequent burns (Curnutt *et al.* 1998). In their analysis of historic fire patterns in ENP from 1982 to 1996, Curnutt *et al.* (1998) determined that longer intervals between fires increase sparrow numbers, for at least 10 years, and that infrequent fires may be necessary to maintain suitable sparrow habitat by removing dense prairie debris and the undesirable woody shrub component. Furthermore, observations of vegetative changes near the existing S-332 pump station (Armentano *et al.* 1995) suggest that pumping at S-332D, and/or continued pumping at S-332, would result in further vegetation shifts from *Muhlenbergia* dominated communities preferred by sparrows to undesirable sawgrass dominated communities in the immediate vicinity of these pumps (part of subpopulation C). Unsuitable habitat conditions further eliminate nesting opportunities and would limit the reproductive potential of subpopulations C and F. After the apparent local extinction by 1995, subpopulation C increased to an estimated 48 birds in 1996 and 1997 and to 80 birds by 1998, while the estimate for subpopulation F has remained at 16 birds since 1996. As of this writing, the Corps has not made a decision on detailed operational criteria for S-332D and S-332, and highly detailed modeling results describing the hydrological effects of the operational options now under consideration are not available. Available results from the Van Lent et al. (1999) modeling give only a general indication of expected water level changes in this area. A precise description of the nature and extent of vegetation shifts resulting from S-332D and/or S-332 operations and, therefore, the precise effects such shifts may have on the Cape Sable seaside sparrow remain speculative.

Unlike the western marl prairies, the concern with subpopulations C and F is not the flooding of nesting habitat, but the diversion of natural water flow to the west, causing drier habitat conditions, invasion of woody shrubs, and frequent fires that preclude the birds from successfully reproducing. Although water levels in the northeastern portion of the sparrow's range, occupied by subpopulations C and F, will increase slightly from the 1995 environmental baseline condition (Van Lent et al. 1999), this slight increase is not anticipated to appreciably reduce fire frequencies or cause a vegetational shift to a more muhly grass or mixed prairie vegetative community preferred by the sparrow for nesting. Such a vegetation shift is necessary to re-establish the eastern core population and reduce the potential for extirpation from a single catastrophic event.

In recent years, subpopulation D experienced an increase in hydroperiod during the nesting season, with resultant decrease in available nesting days, as a consequence of increased water conveyed south through C-111 during Test 7, Phase I (Van Lent et al. 1999). These effects occurred coincident with, and were almost certainly caused by the original dredging of the L-31N canal and subsequent flood control operations of Test 7 Phase I that held stages in L-31N and L-31W low enough to cause drainage of water from the areas of subpopulations E and F and part of subpopulation C (Kushlan *et al.* 1982, Nott *et al.* 1998). The subsequent increased pumping at S-332 resulted in higher water levels and a longer hydroperiod in a part of subpopulation C and subpopulation D located downstream. Consequently, subpopulation D was considered extirpated by 1995, rebounded to an estimated 80 birds in 1996, but declined to only 48 birds in 1997 and 1998. Implementation of Test 7, Phase II, will result in slightly lower water levels across the downstream area of subpopulation D, possibly increasing available nesting days, resulting in beneficial effects by increasing the potential to produce more young. With an increased probability of multiple broods, sparrow numbers are anticipated to increase slightly in this area.

In the area of subpopulation B, in the central portion of the sparrow's range, the proposed operational schedule for the **Experimental Program** is not predicted to result in any significant change to the hydroperiod compared to the 1995 environmental baseline condition (Van Lent et al. 1999). This area is far enough away from the water control features that it remains unaffected by the operational water delivery schedule (Van Lent et al. 1999). Subpopulation B had an estimated 2,048 birds in 1995 and 1996, and increased to 2,784 birds in 1997, but decreased to 1,792 birds in 1998.

Although Test 7, Phase II will slightly increase water levels in subpopulations C and F, these increases will not be sufficient to substantially improve hydroperiods (Van Lent et al. 1999). Therefore, implementation of Test 7, Phase II, like Phase I, will continue to adversely modify designated critical habitat occurring in the areas of subpopulations C and F by facilitating shortened hydroperiods that result in the invasion of undesirable woody shrubs and increased fire frequencies and a change in the vegetative community from muhly grass to sawgrass dominance. Part of the critical habitat downstream of S-332 and S-332D will also be adversely modified through increased hydroperiods due to pumping at those structures that will cause a shift from Muhly dominated to sawgrass dominated habitat. Over time, this habitat alteration will effectively eliminate the available nesting substrate in these areas causing an appreciable reduction in reproductive capability, numbers of birds, and distribution across the eastern portion of the sparrow's range. The condition of critical habitat in the area of subpopulations D and E are anticipated to improve slightly. Due to its location, critical habitat located in the area of subpopulation B would not be affected and no critical habitat is designated in the area of subpopulation A.

In summary, regulatory water releases through the S-12 spillways provide too much water to the western side of Shark River Slough, flooding available nesting habitat during the nesting season, causing declines in the western sparrow subpopulation. Current (Test 7, Phase I) and proposed (Test 7, Phase II) managed water releases also provide insufficient flows to the eastern side of Shark River Slough that create drier habitat conditions, unsuitable nesting substrate, and recurrent fires which preclude successful reproduction. Additionally, flood control operations near the headwaters of Taylor Slough overdrain the northeastern areas facilitating an adverse alteration in vegetative composition and increased fire frequency, while concurrently providing too much dry season water to part of the southern downstream areas. The results are reduced nesting opportunities and a decline in reproductive effort causing declines in eastern sparrow subpopulations. Simulation modeling conducted by Pimm (1997) predicts that without changes in current water management practices, the Cape Sable seaside sparrow will become extinct within two decades.

Snail Kite

The latest snail kite research (Bennetts and Kitchens 1997) suggests that maintaining deep, impounded pools, like those seen in southern WCA 3A under current conditions, will result in degradation of snail kite nesting habitat due to the loss of woody vegetation and degradation of foraging habitat due to the loss of wet prairie communities. The **Experimental Program**, Test 7, Phase I and Phase II, will continue to degrade habitats used by snail kites (Van Lent et al. 1999). This loss of nesting substrate and foraging habitat will adversely effect snail kites by reducing the reproductive potential of snail kite individuals using this area. Although this habitat degradation will occur within designated critical habitat, impacts will not reach the level of adverse modification of critical habitat because only a small percentage of available habitat will be impacted, and snail kite populations will not be appreciably reduced.

Wood Stork

Ogden (1998) defines a set of measures that can be used to evaluate the effects of alternative water management scenarios on the timing of wood stork colony formation. These measures are the duration and timing of hydroperiods in two areas of Shark River Slough known as indicator regions 10 and 11 and the volume and timing of water passing through the southern portions of Shark River Slough and Taylor Slough. Each of these measures provides information on the amount and timing of freshwater reaching the mangrove zone nesting habitat, which, in turn, provides information on when conditions conducive to wood stork colony formation would be expected under various water management scenarios.

The proposed action and the environmental baseline were modeled using the South Florida Water Management Model (SFWMM), and the results were used to generate estimates for each of the measures suggested by Ogden (1998). These results are presented in Van Lent et al. (1999). The inference is that Test 7 produced an overall decline of approximately 13 percent in hydroperiod and flow volume factors related to timing of wood stork colony formation as compared to the environmental baseline. This is a significant decrease in hydroperiod and flow volume which likely would cause wood storks to delay the timing of colony formation (Ogden 1998, personal communication). The adverse effect of delaying colony formation on wood storks is a reduction in reproductive potential due to a reduced period of suitable nesting conditions and an increased probability of nesting failure.

B. Construction Effects

Test 7, Phase II, includes construction activities that would involve the use of heavy earth-moving and other equipment. Information on the exact nature, timing and duration of construction activities is not yet available. Therefore, impacts from these activities will be assumed to be similar to those of other construction activities.

Cape Sable seaside sparrow

Based on the proximity of proposed construction activity at the L-31W berm site and the Aerojet Canal plug site to known Cape Sable seaside sparrow breeding habitat, the Service believes that Cape Sable seaside sparrow individuals could be adversely affected by physical disturbance and/or noise disturbance resulting from these construction activities if they occur during the breeding season and sparrows are actively engaged in breeding activities nearby. This disturbance could include direct crushing of nests by heavy equipment operating in sparrow habitat adjacent to levees, and could cause nesting sparrows to flush from their nests, increasing the likelihood that eggs or nestlings would be lost to predation. Adult sparrows flushed in this manner would experience reduced nesting success due to this disruption of their essential breeding behavior. However, the Corps has agreed to implement a Construction Monitoring Plan for Cape Sable seaside sparrows during proposed construction activities that would minimize disruption to sparrow breeding activities. Because all of the proposed construction activities would occur within the footprints of existing structures, there would be no effect on designated Cape Sable seaside sparrow critical habitat.

Snail Kite, Wood Stork and American Crocodile

The proposed construction sites do not occur within the breeding habitat of the snail kite, wood stork or American crocodile, therefore, breeding activity would not be affected. Any disturbance to foraging activities of snail kites or wood storks, which may sometimes forage near the proposed construction sites, are anticipated to result in insignificant effects. Because all of the proposed construction activities would occur within the footprints of existing structures, there would be no effect to snail kite or American crocodile designated critical habitat.

Modified Water Deliveries

The **Modified Water Deliveries** project consists of major structural modification of, and additions to, the existing system of water control features in the central and southern Everglades that are meant to restore more natural timing, volume and placement of water flows through the action area. In general, the **Modified Water Deliveries** project provides water conveyance and control that allows routing of water that currently passes through WCA 3A into western Shark River Slough, instead passing the water from WCA 3A to WCA 3B and then to Northeast Shark River Slough. The **Modified Water Deliveries** project is likely to adversely effect the snail kite, wood stork, and American crocodile.

A. Hydrological Effects

Snail Kite

The latest snail kite research (Bennetts and Kitchens 1997) suggests that maintaining deep, impounded pools, like those seen in southern WCA 3A under current conditions, will result in degradation of snail kite nesting habitat due to the loss of woody vegetation and degradation of foraging habitat due to the loss of wet prairie communities. The **Modified Water Deliveries** project will continue to degrade habitats used by snail kites (Van Lent et al. 1999). So, habitat degradation similar to that expected under current conditions will likely occur as a result of the **Modified Water Deliveries** project. This loss of nesting substrate and foraging habitat will adversely affect snail kites by reducing the reproductive potential of snail kite individuals using this area.

Impacts to designated critical habitat will not rise to the level of adverse modification because the affected area (southern WCA-3A) represents only a small fraction of available habitat.

Wood Stork

IRs 129 & 130

Ogden (1998) defines a set of measures that can be used to evaluate the effects of alternative water management scenarios on the timing of wood stork colony formation. These measures are the duration and timing of hydroperiods in two areas of Shark River Slough known as indicator regions 10 and 11, and the volume and timing of water passing through the southern portions of Shark River Slough and Taylor slough. Each of these measures provides information on the amount and timing of freshwater reaching the mangrove zone nesting habitat, which, in turn, provides information on when conditions conducive to wood stork colony formation would be expected under various water management scenarios.

Van Lent et al. (1999) conclude that implementation of the **Modified Water Deliveries** project would provide a 15 percent decrease in Ogden's (1998) performance measures for Shark River Slough and a 36 percent decrease for Taylor Slough as compared to current conditions. These decreases are of sufficient magnitude to delay the timing of wood stork colony formation (Ogden 1998, personal communication). The adverse effect of delaying colony formation on wood storks is a reduction in reproductive potential due to a reduced period of suitable nesting conditions and an increased probability of nesting failure.

American Crocodile

Adult American crocodiles avoid high salinity habitats and hatchling crocodiles experience decreased growth rates and increased predation when low salinity nursery habitats are not available (Mazzotti and Brandt 1995, U.S. Fish and Wildlife Service 1998). Therefore, an evaluation of any changes in salinities in American crocodile habitats is important in assessing the effects the **Modified Water Deliveries** project will have on American crocodiles.

Van Lent et al. (1999) conclude that expected flow volumes entering Shark River Slough estuaries under **Modified Water Deliveries** conditions are very similar to those occurring under current conditions (represented by Test 7, Phase I). This suggests that American crocodile habitat conditions in this area will not change as a result of the **Modified Water Deliveries** project. However, during certain periods of the year expected flow volumes entering Florida Bay estuaries under **Modified Water Deliveries** conditions would be much lower, particularly from July through November (Van Lent et al. 1999). This would result in substantially higher salinities in Florida Bay estuarine areas during these months. The adverse effects of higher July through November salinities on American crocodiles would be: 1) an increase in predation rates for American crocodile hatchlings due to a reduction in habitable areas that provide adequate cover from predators; and 2) a reduction in survival rates for American crocodile hatchlings due to reduced growth rates that lead to a longer period in which the hatchlings remain in a size class subject to high predation rates. In addition, the Service anticipates that increased salinity levels will not adversely modify designated critical habitat because the affected area represents only a small portion of the species' habitat.

Cape Sable seaside sparrow

The **Modified Water Deliveries** project will provide for water deliveries that mimic more natural water flow conditions across the sparrow's nesting habitat. The Service anticipates these conditions will provide for the frequency of nesting opportunities and maintenance of nesting habitat necessary for the sparrow's long-term viability. Consequently, the Service anticipates the **Modified Water Deliveries** project is not likely to adversely affect the Cape Sable seaside sparrow, nor is it likely to adversely modify designated critical habitat.

B. Construction Effects

The **Modified Water Deliveries** project includes construction activities would involve the use of heavy earth-moving and other equipment. The construction of Pump Stations 355 A and B and raising of Tigertail Camp are ongoing. Information on the exact nature, timing and duration of other construction activities is not yet available. Therefore, impacts from these activities will be assumed to be similar to those of other construction activities.

Snail Kite

Snail kite nests have been reported in the vicinities of the S-349 A, B and C, L-67A and C break, S-355 A and B, and Tigertail Camp sites (Bennetts *et al.* 1994, Bennetts and Kitchens 1997). Based on the close proximity of proposed construction activity at these sites to known snail kite nesting habitat, and observed responses to similar construction activities, the Service believes that snail kite individuals could be adversely affected by physical disturbance resulting from these construction activities if they occur during the breeding season and snail kites are actively engaged in breeding activities nearby. Such harassment could cause nesting snail kites to flush from or abandon their nests, increasing the likelihood that eggs or nestlings would be lost to predators or the elements. This disturbance would also reduce the reproductive potential of adult kites flushed from nests through significant disruption of essential breeding behavior. However, the Corps has agreed to implement a Construction Monitoring Plan for snail kites during proposed construction activities that would minimize disruption to snail kite breeding activities to the point that only insignificant effects are anticipated. Because all of the proposed construction activities would occur within or nearly within the footprints of existing structures, there would be no effect on designated snail kite critical habitat.

Wood Stork

Wood stork nests have been reported in the vicinities of the S-349 A, B and C, L-67A and C break, S-355 A and B, and Tigertail Camp sites (Ogden 1994). Based on the close proximity of proposed construction activity at these sites to known wood stork nesting habitat, the Service believes that wood stork individuals could be adversely affected by physical disturbance and/or noise disturbance resulting from these construction activities if they occur during the breeding season and wood storks are actively engaged in breeding activities nearby. Such harassment could cause nesting storks to be flushed from or abandon their nests, increasing the likelihood that eggs or nestlings would be lost to predation and/or exposure. This disturbance would also reduce the reproductive potential of adult wood storks flushed from nests through the significant disruption of essential breeding behavior. However, the Corps has agreed to implement a Construction Monitoring Plan for wood storks during proposed construction activities that would minimize disruption to wood stork breeding activities to the point that only insignificant effects are anticipated.

American Crocodile and Cape Sable seaside sparrow

The proposed construction sites do not occur within Cape Sable seaside sparrow or American crocodile habitat, therefore, these species would not be affected.

C-111 Project

The **C-111 Project**, located in southeastern Dade County, Florida, adjacent to the eastern boundary of ENP, was authorized as an addition to the C&SF Project by the Flood Control Act of 1962. The original C&SF Project included construction of the ENP-South Dade Conveyance System to provide a water supply to Dade County as well as ENP. This project included enlarging existing canals and construction of new structures and pump stations. However, it soon became apparent that the artificially-amplified flood events were as destructive as the artificial droughts. Congress authorized the **C-111 Project** to correct these problems and provide for more beneficial flow of water to ENP. The **C-111 Project** is likely to benefit listed species in the area overall. However, construction is likely to produce some adverse effects to the Cape Sable seaside sparrow.

A. Hydrological Effects

Specific operational criteria for individual structural features included in the **C-111 Project** have been developed for only one component - the S-332D pump. Hydrological effects resulting from these operations are discussed above as part of the **Experimental Program**. Specific hydrological effects resulting from specific operational criteria of other project features will be analyzed through reinitiation of this section 7 consultation when sufficient information on possible operational criteria and their hydrological effects is available. Information on the other components of C-111 have not yet been developed. A general analysis of hydrological effects is provided below.

Cape Sable seaside sparrow

The **C-111 Project** would increase wet season water flows to the Rocky Glades and Taylor Slough areas, improving hydroperiods in marl prairie habitats in this area, which should maintain suitable nesting substrate and enhance nesting opportunities. Thus, the hydrological effects of the **C-111 Project** are not likely to adversely affect the Cape Sable seaside sparrow, nor is it likely to adversely modify designated critical habitat.

Snail Kite

No known snail kite nesting habitat occurs in areas affected by the **C-111 Project** (Bennetts *et al.* 1994, Bennetts and Kitchens 1997). Therefore, the **C-111 Project** will not adversely affect the snail kite or its designated critical habitat.

Wood Stork

The **C-111 Project** would increase wet season water flows to the Rocky Glades and Taylor Slough areas, improving hydroperiods in marl prairie habitats in this area, and improving the timing and volume of freshwater flows to Florida Bay estuaries (NPS 1993). This should improve availability and timing of food resources important to nesting wood storks (Ogden 1994, U.S. Fish and Wildlife Service 1998). Consequently, implementation of the **C-111 Project** is not likely to adversely affect the wood stork.

American Crocodile

The **C-111 Project** would improve the timing and volume of freshwater flows to Florida Bay estuaries (NPS 1993). Changes in the hydrologic flow that mimic natural flow conditions are likely to benefit crocodiles. Consequently, implementation of the **C-111 Project** is not likely to adversely affect the American crocodile or adversely modify its critical habitat.

B. Construction Effects

The **C-111 Project** includes construction activities involving the use of heavy earth-moving and other equipment. The construction of Pump Station S-332D and Taylor Slough bridge replacement are ongoing. Information on the exact nature, timing and duration of other construction activities is not yet available. Therefore, impacts from these activities will be assumed to be similar to those of other construction activities.

Cape Sable Seaside Sparrow

The L-31 tieback, S-332B, S-332E, Taylor Slough bridge sites and part of the **C-111 Project** spoil mound site are directly adjacent to known Cape Sable seaside sparrow breeding habitat (Figure 3). Due to the proximity of proposed construction activity to these habitats, the Service believes that Cape Sable seaside sparrow individuals could be adversely affected by physical disturbance and/or noise disturbance resulting from these construction activities if they occur during the breeding season and sparrows are actively engaged in breeding activities nearby. Such harassment could cause nesting sparrows to be flushed from their nests, increasing the likelihood that unattended eggs or nestlings could be lost to predation. This disturbance would also reduce the reproduction potential of adult sparrows flushed from nests through a significant disruption of essential breeding behavior. The Corps has agreed to implement a Construction Monitoring Plan for Cape Sable seaside sparrows during construction activities that would minimize disruption to sparrow breeding activities. However, these measures are not sufficient to eliminate all of the adverse impacts to the Sparrow. Therefore, the Service concludes that the **C-111 Project** is likely to cause adverse effects to the Cape Sable seaside sparrow.

Snail Kite, Wood Stork and American Crocodile

The proposed construction sites do not occur within the breeding habitat of the snail kite, wood stork or American crocodile, therefore, no effect on breeding activities is expected. Snail kites and wood storks sometimes forage near the proposed construction sites. However, any disturbance to snail kite or wood stork foraging is anticipated to result in insignificant effects. In addition, since proposed construction sites are not located in any areas designated as critical habitat for the snail kite or American crocodile, no adverse effects to critical habitat are anticipated.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

All future actions that are reasonably certain to occur in the action area and could affect listed species are expected to be carried out, funded and/or permitted by the Corps, National Park Service or U.S. Fish and Wildlife Service. Therefore, all future actions would require separate section 7 consultation and are not subject to evaluation in this biological opinion.

CONCLUSION

After reviewing the current status of the snail kite and its designated critical habitat, wood stork, Cape Sable seaside sparrow and its designated critical habitat, American crocodile and its designated critical habitat, the environmental baseline for the action area, the effects of the proposed **Experimental Program, Modified Water Deliveries** project and **C-111 Project** and the cumulative effects, it is the Service's biological opinion that:

1. the **Experimental Program** is likely to jeopardize the continued existence of the Cape Sable seaside sparrow and adversely modify its critical habitat;

2. the **Experimental Program** is likely to adversely affect, but is not likely to jeopardize the continued existence of the wood stork and the snail kite and is not likely to adversely modify snail kite critical habitat;

3. the **Modified Water Deliveries** project is likely to adversely affect, but is not likely to jeopardize the continued existence of the snail kite, wood stork and American crocodile and is not likely to adversely modify snail kite or American crocodile critical habitat; and,

4. the **C-111 Project** is likely to adversely affect, but is not likely to jeopardize the continued existence of the Cape Sable seaside sparrow and is not likely to adversely modify its critical habitat.

REASONABLE AND PRUDENT ALTERNATIVES

Regulations (50 CFR §402.02) implementing section 7 define reasonable and prudent alternatives (RPAs) as alternative actions, identified during formal consultation, that (1) can be implemented in a manner consistent with the intended purpose of the action, (2) can be implemented consistent with the scope of the action agency's legal authority and jurisdiction, (3) are economically and technologically feasible, and (4) would, the Service believes, avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat. The Service believes that the following RPA can be implemented consistent with the requirements of 50 CFR §402.02.

The RPA outlined below precludes jeopardy to the Cape Sable seaside sparrow by requiring that: (1) By March 1, 1999, a minimum amount of sparrow habitat be protected from unusually high or low water levels; (2) By May 1, 1999, initiate a fire management strategy; (3) By March 1, 2000, increase water levels to reestablish muhly grass as the dominant vegetation within the marl prairies; (4) continue water level increases in 2001 and 2002; (5) By 2003, implement the **Modified Water Deliveries** project; and (6) provide annual reports until the **Modified Water Deliveries** project is implemented.

Reasonable and Prudent Alternative

A single RPA is presented below for the **Experimental Program**. Each of the following points is an integral component of the RPA. Implementation of less than all of these points will not constitute compliance with this RPA.

1) By March 1, 1999, the Corps must ensure the following:

<u>Western Marl Prairies (Subpopulation A)</u>

The Corps must prevent water levels at National Park 205 (NP 205) from exceeding 6.0 feet National Geodetic Vertical Datum (NGVD) for a minimum of 45 consecutive days between March 1 and July 15. This would provide water levels sufficient to allow completion of one nesting cycle in approximately 40 percent of the sparrow habitat in subpopulation A. Although sparrows need at least 40 days to complete one nesting cycle and build new nests for each successive brood, more than 40 days may sometimes be necessary to complete the cycle when individuals do not find a mate and/or establish a pair bond in the first day. A management scheme that would provide for a nesting period of 45 days would take this possible variation into account, thereby increasing the chances that all breeding pairs would successfully complete one nesting cycle.

An exception to this requirement may be granted if all of the following factors are met and concurred to in writing by the Service: 1) that all other requirements of this RPA have been met; 2) that failure to meet the requirement is due entirely to extraordinary rainfall occurring in the western subpopulation habitat <u>OR</u> that failure to meet the requirement is due entirely to limited structural capacity of the C&SF Project works; and, 3) that the Corps has taken every possible step to anticipate, plan and manage for forecasted rainfall throughout the C&SF Project boundaries, including steps to bring NP 205 water levels down below the target in order to provide a buffer that would allow normal rainfall to occur without bringing NP 205 levels back above the target, and including steps that would lower water levels in the WCAs in order to provide a buffer that would allow forecasted above-average rainfall to be released within structural capacity limitations.

2) By May 1, 1999, or within 60 days of receipt of pertinent information from ENP and GFC, the Corps must ensure the following:

<u>Eastern Marl Prairies (Subpopulations C, E & F)</u>

The Corps must provide additional funding and/or contracted labor to ENP sufficient to provide for: 1) increased fire prevention signing in the East Everglades, Tamiami, Southern Glades , Big Cypress Preserve and main park road areas; 2) eradication of *Casuarina* and other exotic woody vegetation in publicly-owned sparrow habitat areas east of Shark River Slough; and, 3) a symposium on the Cape Sable seaside sparrow and fire management to include all agencies (ENP, Big Cypress Preserve, SFWMD, GFC, USFWS and Florida Department of Forestry) involved in fire management in sparrow habitat areas. This action must be continued until implementation of the **Modified Water Deliveries** project.

ENP will develop detailed proposals and cost estimates for these requirements.

<u>Eastern Marl Prairies (Subpopulation D)</u>

The Corps must provide additional funding and/or contracted labor to GFC, or to ENP with the GFC's permission, sufficient to increase prescribed burning on SFWMD-owned property managed by GFC in the area of sparrow subpopulation D. This action must be continued until implementation of the **Modified Water Deliveries** project.

The Corps must coordinate with GFC to develop detailed proposals and cost estimates for these requirements and must obtain GFC approval of detailed proposals.

3) By March 1, 2000, the Corps must ensure the following:

Western Marl Prairies (Subpopulation A)

The Corps must prevent water levels at NP 205 from exceeding 6.0 feet NGVD for a minimum of 60 consecutive days between March 1 and July 15. This would provide water levels sufficient to allow completion of two nesting cycles in approximately 40 percent of the sparrow habitat in subpopulation A. In understanding this requirement, it is important to note that, due to the topographic variation within the sparrow's habitat, habitat at a higher elevation than the NP 205 reference point will remain dry for longer than habitat at the reference point elevation. Therefore, this requirement will provide the 80 dry days required for completion of two successive broods over a large area of habitat above 6.0 feet NGVD. This action must be continued until implementation of the **Modified Water Deliveries** project.

An exception to this requirement may be granted if all of the following factors are met and concurred to in writing by the Service: 1) that all other requirements of this RPA have been met; 2) that failure to meet the requirement is due entirely to extraordinary rainfall occurring in the western subpopulation habitat OR that failure to meet the requirement is due entirely to limited structural capacity of the C&SF Project works; and, 3) that the Corps has taken every possible step to anticipate, plan and manage for forecasted rainfall throughout the C&SF Project boundaries, including steps to bring NP 205 water levels down below the target in order to provide a buffer that would allow normal rainfall to occur without bringing NP 205 levels back above the target, and including steps that would lower water levels in the WCAs in order to provide a buffer that would allow forecasted above-average rainfall to be released within structural capacity limitations.

Eastern Marl Prairies (Subpopulations C, E & F)

The Corps must implement actions that would produce hydroperiods and water levels in the vicinity of Cape Sable seaside sparrow subpopulations C, E and F, equal to or greater than those that would be produced by implementing the exact provisions of Test 7, Phase II as described in the Final EA for Test 7 (Corps 1995). This action must be continued until implementation of the **Modified Water Deliveries** project.

The Corps must ensure that at least 30 percent of all regulatory water releases (described as the "supplemental regulatory component" in appendix C of the Final EA for Test 7) crossing Tamiami Trail enter ENP east of the L-67 Extension. This target must be measured and met weekly.

An exception to the 30 percent requirement may be granted if all of the following factors are met and concurred to in writing by the Service: 1) that all other requirements of this RPA have been met; 2) that failure to meet the requirement is due entirely to limited structural capacity of the C&SF Project works; and, 3) that the Corps has taken every possible step to anticipate, plan and manage for forecasted rainfall, including steps that would lower water levels in the WCAs in order to provide a buffer that would allow forecasted above-average rainfall to be released within structural capacity limitations.

4) By March 1, 2001, the Corps must ensure the following:

Eastern Marl Prairies (Subpopulations C, E & F)

The Corps must ensure that at least 45 percent of all regulatory water releases (described as the "supplemental regulatory component" in appendix C of the Final EA for Test 7) crossing Tamiami Trail enter ENP east of the L-67 Extension. This target must be measured and met weekly.
An exception to the 45 percent requirement may be granted if all of the following factors are met and concurred to in writing by the Service: 1) that all other requirements of this RPA have been met; 2) that failure to meet the requirement is due entirely to limited structural capacity of the C&SF Project works; and, 3) that the Corps has taken every possible step to anticipate, plan and manage for forecasted rainfall, including steps that would lower water levels in the WCAs in order to provide a buffer that would allow forecasted above-average rainfall to be released within structural capacity limitations.

5) By March 1, 2002, the Corps must ensure the following:

Eastern Marl Prairies (Subpopulations C, E & F)

The Corps must ensure that at least 60 percent of all regulatory water releases (described as the "supplemental regulatory component" in appendix C of the Final EA for Test 7) crossing Tamiami Trail enter ENP east of the L-67 Extension. This target must be measured and met weekly. This action must be continued until implementation of the **Modified Water Deliveries** project.

An exception to the 60 percent requirement may be granted if all of the following factors are met and concurred to in writing by the Service: 1) that all other requirements of this RPA have been met; 2) that failure to meet the requirement is due entirely to limited structural capacity of the C&SF Project works; and, 3) that the Corps has taken every possible step to anticipate, plan and manage for forecasted rainfall, including steps that would lower water levels in the WCAs in order to provide a buffer that would allow forecasted above-average rainfall to be released within structural capacity limitations.

6) The Corps must take all actions necessary to complete full operational implementation of the Modified Water Deliveries project by December, 2003. Implementation of **Modified Water Deliveries** will avoid unusually long periods of flooding in the western marl prairies while providing for additional flooding in the eastern marl prairies.

7) If the Corps determines that land acquisition and/or flowage easement acquisition is necessary in order to meet the above targets, the Corps must ensure that such acquisition is accomplished. Any contributions made by the Department of the Interior could contribute to this goal but the Corps is still obligated to ensure that any necessary acquisition is completed.

8) Implementation of the 9 items in this RPA must be in a way that is consistent with the **Experimental Program's** intended purpose of improving water deliveries through the WCAs south of Alligator Alley and ENP, thereby avoiding adverse impacts to tree islands and other threatened and endangered species and critical habitats. The Service believes the best way to achieve this is to make regulatory releases to Northeast Shark River Slough. When the Corps has the choice between two options for implementing this RPA, one which adversely impacts listed species and/or critical habitat, and one which does not, the Corps should choose the option which does not impact listed species or critical habitat. Excessive water storage in WCA 3, above the current operating schedule, adversely impacts the endangered wood stork, the endangered snail kite, and designated snail kite critical habitat.

9) Until the **Modified Water Deliveries** project is implemented, the Corps must provide an annual report to the Service by September 30th of each year that identifies the following:

a) The number, acreage, and time-of-year of wildfires that occurred within the marl prairies and the results of implementation of additional fire prevention and suppression measures;*

b) Results of woody vegetation control supported by the Corps;*

c) The water release schedule the Corps has implemented to meet water level and flow targets in the eastern marl prairies;

d) The number of consecutive days between March 1 and July 15 that water levels at NP 205 were below 6.0 feet NGVD;

e) The number and location of acres acquired and/or the number of acres with flowage easements within the 8.5 square mile area and the Everglades Expansion Area;*

f) The status and timetable for completion of the **Modified Water Deliveries** project components;

g) A description of any additional structures, or changes to existing structure, the Corps plans to make in order to meet RPA targets; and,

h) Any other pertinent information.

* Information required to report on these items will be supplied to the Corps in a timely manner by ENP and GFC for lands under their management.

Because this biological opinion has concluded that the **Experimental Program** is likely to jeopardize the continued existence of the Cape Sable seaside sparrow and adversely modify its critical habitat, the Corps is required to notify the Service in writing of its final decision on the implementation of this reasonable and prudent alternative.

INCIDENTAL TAKE STATEMENT

INTRODUCTION

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, purse, hunt, shoot, wound, kill, trap, capture of collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns, including breeding, feeding or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be implemented by the Corps so that they become binding conditions of any grant or permit, as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require other parties to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to permit, grant or other documents, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement. [50 CFR §402.14(I)(3)]

AMOUNT OR EXTENT OF TAKE ANTICIPATED

Experimental Program

1. Cape Sable Seaside Sparrow

The Service has developed the following incidental take statement based on the premise that the reasonable and prudent alternative will be implemented. The Service anticipates incidental take of Cape Sable seaside sparrows will be difficult to detect because discovering a dead or impaired specimen is unlikely due to the species' secretive nature. However, the following level of take in the form of harassment, direct or indirect death or harm to individual sparrows is anticipated to result from construction activity, vegetation shifts and fire frequencies that render habitat unsuitable:

Eastern Marl Prairies

The Service anticipates that a maximum of one square mile (640 acres) of habitat annually may be subject to physical disturbance during the nesting season in the vicinity of **Experimental Program** construction activities and the S-332/S-332-D pump discharges. In addition to habitat disturbance, sparrows may also be subject to behavioral disturbance across this area. Water depths rising to greater than 4 inches in the vicinity of nests located near the S-332/S-332-D pump discharges could result in harassment of sparrows occupying nests or harm to the species by significantly disrupting breeding behavior or precluding breeding altogether. Likewise, death or injury to juvenile sparrows or eggs could result from pump discharges that raise the water level above existing nests.

The Corps' Construction Monitoring Plan should provide for avoidance of impacts to the majority of adults, hatchlings or eggs occupying the one square mile. However, due to the species' secretive breeding habits, the Service anticipates that a small percentage of nests would remain undetected. Therefore, hatchlings or eggs would be vulnerable to direct crushing by heavy equipment during construction activities and adult birds would be injured by reduced fecundity associated with nest abandonment. A small percentage of nests located in the area of the S-332/S-332D pump discharges could also be flooded resulting in direct mortality of hatchlings or eggs or injury to adults when rising waters cause nest abandonment that lowers reproductive success. Consequently, the Service anticipates flooding that would result in both physical and behavioral disturbance on 10 percent of the one square mile (64 acres) of suitable habitat that would result in incidental take of individual sparrows annually until implementation of the **Modified Waters Deliveries** project, currently scheduled for 2003.

In determining the number of individual sparrows that may occur across the 64 acres of suitable habitat, the Service noted that peak densities of 20 pairs per 100 acres were measured by Werner (1976) in Taylor Slough and appear near the middle of the range of densities reported for other seaside sparrow subspecies with similar territorial spacing (Norris 1968 and Post 1974). Werner (1975) noted more than a 10-fold variation in breeding density, which may be related to fire extent, fire frequency, and fire mosaic within vegetative communities (Taylor 1983). Since peak densities are estimated at approximately 1 pair per 5 acres, a 10-fold decrease would equate to 1 pair per 50 acres. Recent declines and the current low number estimates for eastern subpopulations C, D, and F likely put these subpopulations at the lower end of known seaside sparrow density estimates. Therefore, the Service anticipates a single pair of Cape Sable seaside sparrows could be taken annually within the 64 acres of suitable habitat expected to be disturbed as a result of the **Experimental Program**. The incidental take is anticipated to be in the form of harm, harassment, and/or death.

Construction impacts are anticipated to occur over a maximum of one nesting season. Once construction is completed, the S-332/332D pump operation could begin. The S-332/S-332D pump discharge impacts are anticipated to begin in the year 2000 and continue to occur over the life of the **Experimental Program** until implementation of the **Modified Water Deliveries** project, currently scheduled for 2003. If more than one square mile of habitat is disturbed annually due to construction and/or S-332/S-332D pump discharges, the Corps has exceeded the incidental take level.

Western Marl Prairies

The Service anticipates that a maximum of 66 square miles of habitat may be subject to flooding during the nesting season in the vicinity of the western subpopulation due to water releases. This area corresponds to 60 percent of suitable Cape Sable seaside sparrow habitat within the western subpopulation area. The adult birds holding territories within the 66 square miles would be injured by water levels too high to allow breeding or lower fecundity associated with nest abandonment. Likewise, death or injury to juvenile sparrows or eggs could result from pump discharges that raise the water level above existing nests. Since 1980 there has been sufficient habitat available during the nesting season for the birds to complete two nesting cycles in six different years. Consequently, the Service anticipates additional incidental take of adult birds in the form of harm or harassment across 44 square miles of habitat that would not remain protected long enough during the nesting season to allow sparrows to complete a second nesting cycle during 1999. These adult birds would be injured by reduced fecundity caused by elevated water levels too high to allow the successful completion of a second nesting cycle or when water depths rise enough to flush brooding adults. Likewise, death or injury to juvenile sparrows or eggs could result from pump discharges that raise the water level above existing nests.

Due to the species' secretive nature and small size, obtaining numerical counts of sparrows that are taken as a result of the **Experimental Program** will be difficult to ascertain. Therefore, the Service anticipates flooding that would result in both physical and behavioral disturbance resulting in incidental take of individual sparrows across 110 square miles of suitable habitat in 1999 and 66 square miles of suitable habitat annually from 2000-2003, until implementation of the **Modified Waters Deliveries** project.

In determining the number of individual sparrows that may be taken, the 1998 sparrow surveys estimated 192 birds in subpopulation A. The incidental take is expected to be in the form of harassment of adult sparrows occupying nests or harm to the species by significantly disrupting breeding behavior or precluding breeding altogether and/or death of hatchlings or eggs. The adult birds holding territories within the 66 square miles would be injured by water levels too high to allow breeding or lower fecundity associated with nest abandonment. Likewise, death or injury to juvenile sparrows or eggs could result from pump discharges that raise the water level above existing nests. Since water management in 1999 would only guarantee adequate water conditions for one nesting cycle, the **Experimental Program** would impact the sparrow by prohibiting a second nesting cycle. Therefore, the incidental take would be the reproduction of the 192 sparrows during a second nesting cycle. In the year 2000 and subsequent years, until implementation of the **Modified Water Deliveries** project, the Service does not anticipate the **Experimental Program** will incidentally take Cape Sable seaside sparrows.

The determination of no incidental take after 1999 is due to the fact that there is currently an estimated 110 square miles (70,400 acres) of suitable Cape Sable seaside sparrow habitat in the western marl prairies. Although not all 70,400 acres of land may actually be suitable for nesting, the habitat which is suitable for the sparrow is contained within this acreage. The highest recorded population estimate occurred in 1981 when an estimated 2,688 birds occupied the western marl prairies. In 1992 this estimate tallied 2,608, but has been estimated at between 432 and 192 birds ever since. Assuming the availability of suitable habitat in the western marl prairies in 1992 is similar to what is available today, and assuming that all birds are active breeders, which we know is an ideal case, then the habitat currently available in the western marl prairies could support 1,304 pairs or 1 pair per 54 acres. Since a maximum of 66 square miles (42,240 acres) of sparrow habitat would be unavailable each year under this Reasonable and Prudent Alternative until the **Modified Water Deliveries** project is implemented, there remains 44 square miles (28,160 acres) available for sparrow nesting.

The 1998 estimate of sparrows in subpopulation A is 192 birds or, assuming they are all breeding adults, 96 pairs. Since subpopulation A historically contained a density of 1 pair per 54 acres and Werner (1975, 1976) recognized density variability between 1 pair per 5 acres to 1 pair per 50 acres, 96 breeding pairs would need approximately 5,000 acres of suitable habitat for nesting at a density of 1 pair per 50 acres. The Reasonable and Prudent Alternative would result in a minimum of 28,160 acres of suitable nesting habitat. Consequently, the Service does not anticipate the **Experimental Program** will incidentally take the Cape Sable seaside sparrow after the 1999 breeding season because there will be more than 5 times the necessary nesting habitat to support the current number of birds. Furthermore, there is enough sparrow habitat within the 40 percent (28,160 acres) that will be available until the **Modified Water Deliveries** project is implemented to support 522 pairs or a population of 1,044 birds at a density of 1 pair per 54 acres.

Impacts to the 66 square miles could potentially occur every year until the **Modified Water Deliveries** project is implemented in 2003. If annually more than 66 square miles (42,007 acres) of habitat are unavailable for nesting due to water releases, and if during 1999, less than 44 square miles (28,170 acres) of habitat are available for completion of one nesting cycle, then the Corps has exceeded the incidental take level.

2. Snail kite

The Service has developed the following discussion based on the premise that the reasonable and prudent alternative will be implemented. Although the Service concluded that the snail kite would be adversely effected by the **Experimental Program,** no incidental take of snail kites is anticipated because implementation of the reasonable and prudent alternative will eliminate detrimental deep water levels and long hydroperiods in southern WCA-3A, as water is shifted from WCA-3A to WCA-3B, in order to meet the reasonable and prudent alternatives targets for water releases east of the L-67 extension.

3. Wood Stork

The Service has developed the following incidental take statement based on the premise that the reasonable and prudent alternative will be implemented. The Service anticipates incidental take of wood storks will be difficult to detect because the incidental taking of individual wood storks is likely to be masked by losses due to variable rainfall, heat and wind conditions that alter evapotranspiration, vegetation changes, human-induced water management actions and antecedent conditions, which all contribute to changing water levels. However, the following incidental take in the form of harm to wood storks is anticipated to result from reduced hydroperiods and water levels that impair essential foraging and nesting patterns. This incidental take is anticipated to occur annually until implementation of the **Modified Water Deliveries** project, currently scheduled for 2003.

Wood storks attempting to nest in the action area have experienced reduced hydroperiods and water levels in their breeding habitat since the C&SF project was implemented and will continue to experience these same conditions as a result of the **Experimental Program**. During the wet season wood storks require a lengthening hydroperiod to produce enough fish biomass such that during the dry or breeding season, as the water recedes, it concentrates fish at densities to sustain storks as they nest and rear their young. Too short a hydroperiod fails to produce the necessary fish biomass or, if water recedes too slowly, provide available concentrations of fish to sustain adult storks resulting in nest abandonment. The majority of recent and historical stork nesting colonies in the action area are located in the Shark Slough estuaries, with a few located in the Taylor Slough estuaries. Due to it's specialized feeding method, the reproductive success of the wood stork corresponds to the availability of specific foraging conditions, as feeding areas proximal to wood stork breeding colonies likely play an important role in chick survival. Lower than optimal water levels in foraging habitat will preclude fish concentrations at densities suited to the wood stork's specialized feeding behavior, thereby creating unfavorable nesting conditions. In addition, reduced water levels below optimal conditions during the nesting season will cause injury to the wood stork by reducing forage efficiency that impairs nesting and the ability of the adults to successfully rear young.

Due to the number of variables affecting water levels that determine the availability of suitable nesting conditions, accurately obtaining the precise number of wood storks that are harmed by the **Experimental Program** is not possible. Therefore, the Service anticipates the **Experimental Program** will result in habitat modification or degradation which can be measured by actual annual average water flow into wood stork nesting habitat and by the hydroperiod duration in Shark Slough. Ogden (1998) identified two hydrological indicators which best measure the recovery of optimum foraging conditions for storks: (a) the measures of volume of flows into the mainland estuaries downstream from the southern Everglades, which includes two flow lines: one across the southern Shark Slough and the other across the southern Taylor Slough; and (b) the measure of the mean duration of uninterrupted surface hydroperiod in central and southern Shark Slough. If the actual uninterrupted surface hydroperiod in Shark Slough for a given year, as measured at P-33 (or other measurement method agreeable to the Service and the Corps) is shorter than modeled for a similar year in the hydrologic period of record, the Corps will have exceeded the incidental take level. Table 1 provides the Van Lent et al. (1999) modeled average hydroperiod for indicator regions 9 and 10 for comparison. In recognition of the substantive questions that have been raised by the Corps concerning the Van Lent et al. (1999) modeling, if future modeling is developed that is agreeable to both the Corps and the Service, the Service would consider that to be new information that may warrant a reexamination of this incidental take statement. However, until such new modeling is developed, the Service has determined that the Van Lent et al. (1999) modeling is the best scientific information currently available because it is the only published, peer reviewed, modeling information of a sufficiently detailed nature to make the required determinations.

Table 1. Summary of modeling results from Van Lent *et al.* (1999) used to measure incidental take.

IR 131 130 124 124

Proposed Action	Average weeks of innundation for IR 9	Average weeks of innundation for IR 10	Frequency of January-April IR 14 dryouts	Frequency of dryouts ≥ 30 days
Experimental Program (7, II)	52	66	N/A	N/A
Modified Water Deliveries	49.5	54.6	0.10	0.13

Modified Water Deliveries:

1. Snail Kite

The Service anticipates incidental take of snail kites will be difficult to detect because the taking of individual snail kites is likely to be masked by losses due to variable rainfall, heat and wind conditions that alter evapotranspiration, vegetation changes, human-induced water management actions and antecedent conditions, which all contribute to changing water levels. However, incidental take in the form of harm to snail kites is anticipated to result from longer hydroperiods with deep water which impair essential foraging and nesting patterns. This incidental take is anticipated to occur annually until implementation of the Restudy Project, currently scheduled for 2050.

Habitat conditions suitable for snail kites require a balanced approach to water management. Prolonged drying of wetlands, especially in an impounded area with little variation in water depth, can cause local depletion of apple snails. Low water during the nesting season also forces snail kites to nest on poor quality sites, where marginal nesting substrate results in greater nest structure collapse, increases vulnerability to human disturbance, predation and lowers nesting success. Conversely, prolonged periods of high water levels drown out woody vegetation required for successful nesting and by creating deep pool conditions in marsh vegetation that result in unsuitable habitat conditions for effective snail kite foraging. Bennetts and Kitchens (1997) noted that continuous flooding without periodic drying results in a loss of tree islands and other woody vegetation used by snail kites for nesting as well as a loss of foraging habitat. Snail kites initiate nesting when habitat conditions are favorable, however, the **Modified Water Deliveries** project will maintain longer hydroperiods with deep impounded pools. These conditions will injure snail kites by significantly impairing essential nesting and foraging patterns which results in lower fecundity.

Due to the number of variables affecting water levels that determine the availability of suitable nesting conditions, accurately obtaining the precise number of snail kites that are harmed by the **Modified Water Deliveries** project is not possible. Therefore, the Service anticipates the **Modified Water Deliveries** project will result in habitat modification or degradation which can be measured by the frequency and duration of dry-outs occurring between January and April. If the frequency of dry-outs occurring between January and April within Indicator Region 14 (Southern WCA-3A) and the frequency of dry-outs lasting longer than 30 days, used in the ENP analysis for snail kites (Van Lent et al. 1999) are higher than modeled (Table 1), the Corps will have exceeded the incidental take level. The occurrence of dryouts will be measured at G-65 (or other measurement point agreeable to both the Service and the Corps), and will be compared to the modeled frequency as a 5-year running average. In recognition of the substantive questions that have been raised by the Corps concerning the Van Lent et al. (1999) modeling, if future modeling is developed that is agreeable to both the Corps and the Service, the Service would consider that to be new information that may warrant a reexamination of this incidental take statement. However, until such new modeling is developed, the Service has determined that the

Van Lent et al. (1999) modeling is the best scientific information currently available because it is the only published, peer reviewed, modeling information of a sufficiently detailed nature to make the required determinations.

2. Wood Stork

The Service anticipates incidental take of wood storks will be difficult to detect because the incidental taking of individual wood storks is likely to be masked by losses due to variable rainfall, heat and wind conditions that alter evapotranspiration, vegetation changes, human-induced water management actions and antecedent conditions, which all contribute to changing water levels. However, the following incidental take in the form of harm to wood storks is anticipated to result from reduced hydroperiods and water levels that impair essential foraging and nesting patterns. This incidental take is anticipated to occur annually until implementation of the Restudy Project, currently scheduled for 2050.

Wood storks attempting to nest in the action area have experienced reduced hydroperiods and water levels in their breeding habitat since the C&SF project was implemented and will continue to experience these same conditions as a result of the **Modified Water Deliveries** project.

During the wet season wood storks require a lengthening hydroperiod to produce enough fish biomass such that during the dry or breeding season, as the water recedes, it concentrates fish at densities to sustain storks as they nest and rear their young. Too short a hydroperiod fails to produce the necessary fish biomass or, if water recedes too slowly, provide available concentrations of fish to sustain adult storks resulting in nest abandonment. The majority of recent and historical stork nesting colonies in the action area are located in the Shark Slough estuaries, with a few located in the Taylor Slough estuaries. Due to it's specialized feeding method, the reproductive success of the wood stork corresponds to the availability of specific foraging conditions, as feeding areas proximal to wood stork breeding colonies likely play an important role in chick survival. Lower than optimal water levels in foraging habitat will preclude fish concentrations at densities suited to the wood stork's specialized feeding behavior, thereby creating unfavorable nesting conditions. In addition, water levels below optimal conditions during the nesting season will cause injury to the wood stork by reducing forage efficiency that impairs nesting and the ability of the adults to successfully rear young.

Due to the number of variables affecting water levels that determine the availability of suitable nesting conditions, accurately obtaining the precise number of wood storks that are harmed by the **Modified Water Deliveries** project is not possible. Therefore, the Service anticipates the **Modified Water Deliveries** project will result in habitat modification or degradation which can be measured by actual annual average water flow into wood stork nesting habitat and by the hydroperiod duration in Shark Slough - see below. Ogden (1998) identified two hydrological indicators which best measure the recovery of optimum foraging conditions for storks: (a) the measures of volume of flows into the mainland estuaries downstream from the southern Everglades, which includes two flow lines: one across the southern Shark Slough and the other across the southern Taylor Slough; and (b) the measure of the mean duration of uninterrupted surface hydroperiod in central and southern Shark Slough. If the actual uninterrupted surface hydroperiod in Shark Slough for a given year, as measured at P-33 (or other measurement method agreeable to the Service and the Corps) is shorter than modeled for a similar year in the hydrologic period of record, the Corps will have exceeded the incidental take level. Table 1 provides the Van Lent et al. (1999) modeled average hydroperiod for indicator regions 9 and 10 for comparison. In recognition of the substantive questions that have been raised by the Corps concerning the Van Lent et al. (1999) modeling, if future modeling is developed that is agreeable to both the Corps and the Service, the Service would consider that to be new information that may warrant a reexamination of this incidental take statement. However, until such new modeling is developed, the Service has determined that the Van Lent et al. (1999) modeling is the best scientific information currently available because it is the only published, peer reviewed, modeling information of a sufficiently detailed nature to make the required determinations.

3. American Crocodile

The Service anticipates incidental take of American crocodiles will be difficult to detect because of the remoteness of the crocodile's habitat and difficulty observing cryptic hatchling crocodiles. However, the following incidental take in the form of harm to American crocodiles is anticipated to result from increased salinity levels that impair essential breeding patterns. This incidental take is anticipated to occur annually until implementation of the Restudy Project, currently scheduled for 2050.

Water salinity affects habitat use by crocodiles and may be locally important, especially during periods of low rainfall. Adult crocodiles are injured by high salinity habitats that cause crocodile hatchlings to experience decreased growth and survival rates which would result in lower adult reproductive efficiency or genetic fitness for those individuals that survive. The evolutionary success of genetic traits, through the process of natural selection, is directly related to the species' survival or viability. High salinity habitats increase osmoreulatory stress to crocodile hatchlings which are forced to leave protective cover and become exposed to high predation rates. This decrease in survival rate not only lowers the frequency of the parent genotype in the population but its ability to persist and be expressed in future generations.

Due to the number of variables affecting freshwater conditions in South Florida, including tropical storms, hurricanes, frequency of rainfall and anthropogenic factors, accurately obtaining the precise number of crocodiles that are harmed by the **Modified Water Deliveries** project is not possible. Mazzotti (1996) indicates there were approximately 20 crocodile nests in Florida Bay in 1994 and 1995. The nesting success ranged from approximately 45 to 70 percent. Using these numbers and a 90 percent viability for the eggs and an average of 38 eggs per nest, there would be approximately 300 to 475 hatchlings in Florida Bay. Without additional data on the distribution of the salinity wedge with respect to nest locations, we assume that all hatchlings will be taken by the higher salinities as a result of **Modified Waters Deliveries**. The locating or actual counting of death to specific individuals is not possible because of the secretive nature of the hatchlings. Since the Service believes this incidental take is the result of high salinities, the level of incidental take will be monitored by the spatial extent and duration of salinity levels exceeding 40 parts per thousand in Florida Bay mangrove fringe nursery habitats during the August-November hatchling period. The Service will conclude that this anticipated level of incidental take has been exceeded if salinity monitoring shows that the spatial extent and duration of salinity levels exceeding 40 parts per thousand in Florida Bay nursery habitats during the August-November hatchling period increases beyond increases expected to occur as a result of reductions in actual uninterrupted surface hydroperiod in Shark Slough for a given year. Uninterrupted surface hydroperiod is directly related to the volume of water flow and, therefore, serves as an indirect measure of expected salinity. Uninterrupted surface hydroperiod will be measured at P-33 (or other measurement method agreeable to the Service and the Corps) and if the actual measure for a given year is shorter than modeled for a similar year in the hydrologic period of record, the Corps will have exceeded the incidental take level. Table 1 provides the Van Lent et al. (1999) modeled average hydroperiod for indicator regions 9 and 10 for comparison. (Table 1). In recognition of the substantive questions that have been raised by the Corps concerning the Van Lent et al. (1999) modeling, if future modeling is developed that is agreeable to both the Corps and the Service, the Service would consider that to be new information that may warrant a reexamination of this incidental take statement. However, until such new modeling is developed, the Service has determined that the Van Lent et al. (1999) modeling is the best scientific information currently available because it is the only published, peer reviewed, modeling information of a sufficiently detailed nature to make the required determinations.

C-111 Project:

1. Cape Sable seaside sparrow

The Service anticipates incidental take of Cape Sable seaside sparrows will be difficult to detect because discovering a dead or impaired specimen is unlikely due to the species' secretive nature and observability difficulty. However, the following level of take in the form of harassment, direct death or indirect death or harm to individual sparrows is anticipated to result from construction activity.

The Service expects that a maximum of one square mile (640 acres) of habitat may be subject to physical disturbance during the nesting season in the vicinity of **C-111 Project** construction activities. This incidental take may occur over several years, but the Service does not anticipate that the total disturbance will exceed 640 acres, regardless of the duration of construction activities. In addition to habitat disturbance, sparrows may also be subject to behavioral disturbance across this area.

The Corps' Construction Monitoring Plan should provide for avoidance of impacts to the majority of adults, hatchlings or eggs occupying the one square mile. However, due to the species' secretive breeding habits, the Service expects that a small percentage of nests would remain undetected and, therefore, hatchlings or eggs would be vulnerable to direct crushing by heavy equipment during construction activities or nest abandonment by the adult birds. As a result of nest abandonment, the adult birds would be injured by the significant impairment of their reproductive patterns. Consequently, the Service anticipates physical and behavioral disturbance on 10 percent of the one square mile (64 acres) of suitable habitat that would result in incidental take of individual sparrows annually until construction is complete.

Peak densities of 20 pairs per 100 acres were measured by Werner (1976) in Taylor Slough and appear near the middle of the range of densities reported for other seaside sparrow subspecies with similar territorial spacing (Norris 1968 and Post 1974). Werner (1975) noted more than a 10-fold variation in breeding density, which may be related to fire extent, fire frequency, and fire mosaic within vegetative communities (Taylor 1983). Since peak densities are estimated at approximately 1 pair per 5 acres, a 10-fold decrease would equate to 1 pair per 50 acres. Recent declines and the current low number estimates for eastern subpopulations C, D, and F likely put these subpopulations at the lower end of known seaside sparrow density estimates. Therefore, the Service anticipates a single pair of Cape Sable seaside sparrows could be taken annually within the 10 percent suitable habitat (64 acres) expected to be disturbed as a result of the **C-111 Project**. The incidental take is expected to be in the form of harm, harassment, and/or death. If annually more than one square mile of habitat is disturbed due to construction associated with the **C-111 Project**, the Corps has exceeded the incidental take level.

A summary of anticipated incidental take and measures for determining when this level of take has been exceeded is provided in Table 2.

Table 2. Summary of Incidental Take Identified for Modified Water Deliveries, Experimental Water Deliveries, and Canal 111 Projects with Implementation of the Reasonable and Prudent Alternative.

	EXPERIMENTAL PROGRAM	MODIFIED WATER DELIVERIES	CANAL - 111 PROJECT
CAPE SABLE SEASIDE SPARROW (Eastern)	Incidental take from the disturbance of 64 Acres of habitat per year through 2003.	No incidental take	Incidental take from the disturbance of 64 Acres of habitat per year not to exceed 640 acres for the project.
CAPE SABLE SEASIDE SPARROW (Western)	Incidental take as a result of reduced reproduction from high water on 66 square miles of habitat through 2003. This level is exceeded if more the 66 square miles of habitat are subjected to high water.	No incidental take	No incidental take
WOOD STORK	Incidental take because of reduced reproduction from reduced hydroperiods in Shark River and Taylor sloughs through 2003. This level would be exceeded if actual average hydroperiod is less than modeled for a similar year in the period of record.	Incidental take because of reduced reproduction from reduced hydroperiods in Shark River and Taylor sloughs through 2050. This level would be exceeded if actual average hydroperiod is less than modeled for a similar year in the period of record.	
SNAIL KITE	No incidental take	Incidental take because of reduced reproduction as a result of high water conditions. The incidental take will be exceeded if the frequency of dry-outs lasting 30 or more days is less than 0.13 through 2050.	
AMERICAN CROCODILE	No incidental take	Incidental take of hatchlings and eggs due to increased salinity in Florida Bay. The incidental take will be exceeded if the salinity exceeds 40 parts per thousand more frequently than projected in the modeling.	

EFFECT OF THE TAKE

Experimental Program:

1. Cape Sable Seaside Sparrow

The effect to adult sparrows in the western marl prairies is expected to be reduced fecundity of birds in high precipitation years due to managed water releases which would reduce the availability of 60 percent of suitable breeding habitat. In addition, direct take of hatchlings or eggs is anticipated due to nest sites located in the areas of S-12 pump discharges. In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat when the reasonable and prudent alternative is implemented. As part of this alternative, the Corps must ensure water levels in 40 percent of the western marl prairies are sufficient to allow completion of one nesting cycle in 1999 and two nesting cycles thereafter until implementation of the **Modified Water Deliveries** project, currently scheduled for implementation in 2003.

The effect to adult sparrows in the eastern marl prairies is expected to be reduced fecundity of birds located across 64 acres near the S-332/S-332D pump discharges due to rising water levels which reduce availability of suitable breeding habitat. In addition, direct take of hatchlings or eggs is anticipated due to nest sites located within the 64 acres near construction activity and/or pump discharges. In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat when the reasonable and prudent alternative is implemented. Current density estimates indicate only a single pair of sparrows is likely be taken in the area of anticipated disturbance.

2. Wood Stork

The effect to wood storks is expected to be reduced fecundity of some individuals through habitat modification or degradation measured by annual average flow and hydroperiod duration in Shark Slough. In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species when the reasonable and prudent alternative is implemented. The majority of nesting by the southeastern wood stork population no longer occurs in South Florida as wood storks in the southeast have responded to changing environmental conditions through temporal relocation.

Modified Water Deliveries:

1. Snail Kite

The effect to snail kites is expected to be reduced fecundity of some individuals through habitat modification or degradation measured by the frequency and duration of dry-outs occurring between January and April. In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat. Snail kites are nomadic in response to water depth, hydroperiod, food availability, nutrient loads, and other habitat changes (Bennetts *et al.* 1994). Snail kites likely minimize the effect of poor localized habitat conditions by their ability to move long distances across a mosaic of suitable wetland habitats within the landscape.

2. Wood Stork

The effect to wood storks is expected to be reduced fecundity of some individuals through habitat modification or degradation measured by annual average flow and hydroperiod duration in Shark Slough. In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species when the reasonable and prudent alternative is implemented. The majority of nesting by the southeastern wood stork population no longer occurs in South Florida as wood storks in the southeast have responded to changing environmental conditions through temporal relocation.

3. American Crocodile

The effect to American crocodile is expected to be lower adult reproductive efficiency or genetic fitness through habitat modification or degradation measured by the spatial extent and duration of salinity levels exceeding 40 parts per thousand in Florida Bay mangrove fringe nursery habitats during the August-November hatchling period. In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat when the reasonable and prudent alternative is implemented. The affected area represents only a small portion of the species' available nesting habitat in addition to the fact that the American crocodile in South Florida has increased substantially over the last 20 years with the number of reproductively active females more than doubling.

C-111 Project:

Cape Sable Seaside Sparrow

The effect to adult sparrows in the eastern marl prairies is expected to be reduced fecundity of birds in the vicinity of the **C-111 Project** construction activities due to nest abandonment. In addition, mortality of hatchlings or eggs is anticipated due to direct crushing of nests in the vicinity construction activities. In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat when the reasonable and prudent alternative is implemented. Current density estimates indicate only a single pair of sparrows is likely be taken in the area of anticipated disturbance.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take:

Experimental Program:

1. Timing and volume of pumping at S-332 and S-332D must be balanced to minimize vegetation community change and flooding impacts to Cape Sable seaside sparrow habitat while providing as much benefit to Taylor Slough hydrology as possible. Flows should be distributed as evenly as possible across Cape Sable seaside sparrow habitat in this area to avoid over-drying or over-wetting particular areas. This will minimize incidental take by minimizing the amount of breeding habitat rendered unsuitable by over-dry or over-wet conditions.

2. Prior to March 1, 1999, a burn management strategy must be implemented to reduce the risk of fire that could harm Cape Sable seaside sparrows in the area occupied by subpopulation B.

3. Prior to February 15, 2000, water management operations affecting WCA 3 must be adjusted to reduce adverse impacts to wood storks as much as possible without increasing adverse effects to the Cape Sable seaside sparrow. This should include measures to increase flow volumes delivered to wood stork nesting habitats at the Florida Bay/mangrove interface. This will minimize incidental take by minimizing loss of fish populations that provide wood stork foraging resources.

Modified Water Deliveries:

Water management operations must be adjusted to decrease adverse impacts to snail kites, wood storks and American crocodiles. This should include measures to increase flow between WCA 3B and Northeast Shark River Slough and measures to increase conveyance of water through Shark River Slough and into Florida Bay. This will minimize incidental take of snail kites and wood storks by reducing high water levels in WCA 3B that render foraging habitats unsuitable. Incidental take of wood storks will also be minimized through reductions in the number of years in which foraging habitats are not available near Florida Bay nesting areas. Incidental take of American crocodiles will be minimized through reductions in the number of years in which hatchlings habitats affording cover from predators are unavailable due to high salinities.

C-111 Project:

Because the Corps has already agreed to implement a Construction Monitoring Program in conjunction with construction activities that the Service believes will minimize anticipated adverse effects to Cape Sable seaside sparrows, no further reasonable and prudent measures or terms and conditions are required. The Construction Monitoring Program will minimize incidental take of Cape Sable seaside sparrows through reductions in the number of days that intrusive construction activities will take place in occupied breeding habitats.

The Service believes that these reasonable and prudent measures are reasonable, that they cause only minor changes to the project, and that they are within the legal authority and jurisdiction of the Corps to carry out.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

Experimental Program:

1. Because available information does not allow for a precise determination of effects of pumping at S-332 and S-332D, the Corps must ensure that pumping at S-332D and S-332 is initially limited to no more than a total of 165 cfs for both structures to the maximum extent possible during the Cape Sable seaside sparrow breeding season (March 1 - July 15).

2. The Corps, in consultation with the Service, ENP, GFC and SFWMD, must decide on precise operational rules for S-332 and S-332D and develop precise modeling information sufficient to determine the actual effects of the proposed operations on Cape Sable seaside sparrow habitat and individuals. Based on this information, the Corps may consult with the Service to determine whether a change in the initial 165 cfs limit is warranted.

3. The Corps must provide additional funding and/or contracted labor to ENP sufficient to provide for: 1) increased fire prevention signing in the East Everglades, Tamiami, Southern Glades, Big Cypress Preserve and main park road areas; and 2) sponsor a symposium on the Cape Sable seaside sparrow and fire management to include all agencies (ENP, Big Cypress Preserve, SFWMD, GFC, USFWS, and Florida Department of Forestry) involved in fire management in sparrow habitat areas.

4. The Corps must ensure that monitoring and research programs sufficient to track the nature, amount and extent of any take of Cape Sable seaside sparrow or wood stork individuals resulting from implementation of the RPA are in place by January 1, 2000, and are continued for the life of the **Experimental Program**. This would include, but is

not limited to: 1) tracking the yearly status of Cape Sable seaside sparrow and wood stork populations and any vegetative shifts that may occur within Cape Sable seaside sparrow habitats; and, 2) determining the number of wood storks initiating nesting in the action area and the success rate of those nesting efforts each year.

5. Upon locating a dead, injured, or sick individual of an endangered or threatened species, initial notification must be made to the Fish and Wildlife Service Law Enforcement Office at 10426 N.W. 31 Terrace, Miami, FL 33172, (305)526-2610. Additional notification must be made to the Fish and Wildlife Service South Florida Restoration Projects Office at 1360 U.S. Hwy 1, Suite 5, Vero Beach, FL 32960, (561)778-0896. Care should be taken in handling sick or injured individuals and in the preservation of specimens in the best possible state for later analysis of cause of death or injury.

Modified Water Deliveries:

1. The Corps must, in cooperation with the Service, GFC, ENP, SFWMD and other appropriate groups, explore ways to increase freshwater flows through Taylor Slough and into northeast Florida Bay.

2. The Corps must, in cooperation with the Service, GFC, ENP, SFWMD and other appropriate groups, explore ways to increase flows from WCA 3B to Northeast Shark River Slough.

3. The Corps must ensure that monitoring and research programs are sufficient to: 1) track the yearly status of the wood stork, snail kite and American crocodile populations and any vegetative shifts that may occur within snail kite habitats; 2) determine the number of wood storks snail kites and American crocodiles initiating nesting in the action area and the success rate of those nesting efforts each year; 3) monitoring the spatial extent and status of snail kite nesting substrates in southern WCA-3B; and, 4) determine actual and expected flow volumes entering Florida Bay and the Shark Slough estuarine areas. These research efforts must be in place two years prior to final **Modified Water Deliveries** project implementation and must continue for the life of the project. A research plan must be submitted to the Service for approval prior to implementation.

4. Upon locating a dead, injured, or sick individual of an endangered or threatened species, initial notification must be made to the Fish and Wildlife Service Law Enforcement Office at 10426 N.W. 31 Terrace, Miami, FL 33172, (305)526-2610. Additional notification must be made to the Fish and Wildlife Service South Florida Restoration Projects Office at 1360 U.S. Hwy 1, Suite 5, Vero Beach, FL 32960, (561)778-0896. Care should be taken in handling sick or injured individuals and in the preservation of specimens in the best possible state for later analysis of cause of death or injury.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed actions. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. The Service offers the following conservation recommendations for the proposed actions.

Experimental Program:

1. The Corps, in cooperation with ENP, U.S. Geological Survey, Biological Resources Division (USGS-BRD) and other appropriate groups, should gather and provide the Service with elevation data for the areas of Cape Sable seaside sparrow subpopulations B-F sufficient to allow individual-based modeling of these subpopulations as described by the Institute for Environmental Modeling and USGS-BRD (1998).

2. For Cape Sable seaside sparrow habitats within the Rocky Glades, East Everglades and Taylor Slough, the Corps, in cooperation with the Service, ENP and GFC, should eliminate exotic and woody vegetation within historically occupied sparrow habitat.

Modified Water Deliveries Project:

Using additional information and insights on Everglades restoration techniques developed during the C&SF Restudy planning process, the Corps, in cooperation with other appropriate groups, should redesign the **Modified Water Deliveries** project to increase the restoration of natural flow patterns and volumes which benefit listed species while accomplishing Everglades restoration objectives.

C-111 Project:

In designing future detailed construction and operation schedules for **C-111 Project** features, the Corps should coordinate with the Service, ENP, GFC and other appropriate groups to ensure these designs optimize restoration of natural flow patterns and volumes which benefit listed species.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the Corps's November 4, 1997, request for reinitiation of consultation. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary CORPS involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the CORPS' action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the CORPS' action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Sincerely,

H Dale Hall

FOR Sam D. Hamilton
Regional Director

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