United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Florida Ecological Services Office
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Vero Beach, Florida 32960

May 18, 2007

Colonel Paul L. Grosskruger
District Commander
U.S. Army Corps of Engineers
701 San Marco Boulevard, Room 372
Jacksonville, Florida 32207-8175

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Service Consultation Code:	41420-2006-F-0681
Date Received:	May 4, 2007
Formal Consultation Initiation Date:	May 4, 2007
Applicant:	U.S. Army Corps of Engineers
Project:	Lake Istokpoga Regulation Schedule Temporary Deviation Request
County:	Highlands

Dear Colonel Grosskruger:

This document transmits the Fish and Wildlife Service's (Service) biological opinion based on our review of the U.S. Army Corps of Engineers' (Corps) proposed temporary deviation for the Lake Istokpoga regulation schedule, and its effects on the Everglade snail kite (*Rostrhamus sociabilis plumbeus*) in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act) (87 Stat. 884; 16 U.S.C. 1531 *et seq*.). A complete administrative record of this consultation is on file in the South Florida Ecological Services Office, Vero Beach, Florida.

To process the requested deviation from the current regulation schedule, the Corps assessed the effects of the 2007 drought on water levels in Lake Istokpoga taking into consideration impacts to fish and wildlife, listed species, navigation, and water supply. The proposed deviation is operational only and no new construction is planned. The revised schedule would replace the current schedule from May 15, to October 15, 2007. Due to the nature of droughts, specifically the level of uncertainty associated with predicting rainfall patterns, if no deviation is granted, then this consultation will become invalid.

The South Florida Water Management District (District) developed three alternatives for the minimum elevation for Zone B. These alternatives lower the minimum stage in Zone B from 37.5 ft NGVD for the current schedule to 36.5 ft (Alternative 1), 35.5 ft (Alternative 2), or 34.5 ft (Alternative 3). Lowering the minimum stage in Zone B allows releases from Lake Istokpoga to meet current downstream water supply demands in the Indian Prairie Basin. The tentatively selected alternative (Alternative 2) was identified by the District to be the alternative that best met the water supply goal of while minimizing ecological damage to the lake's resources.

This request was made in response to an on-going drought and no human life is at risk; therefore, this request does not meet the criteria for an emergency consultation. An emergency is a situation involving an act of God, disaster, casualties, or national defense or security emergencies, etc., and include the response activities that must be taken to prevent imminent loss of human life or property. Predictable events usually do not qualify as emergencies under the section 7 regulations unless there is a significant unexpected human health risk.

This biological opinion is based on information provided by the District and Corps during weekly teleconferences, in the Corps' biological assessment (received May 4, 2007), analysis of modeling output, and additional information. The Corps provided a determination of "is likely to adversely affect" the Everglade snail kite. The Corps also determined that "no adverse effect is anticipated" for the Audubon's crested caracara (*Polyborus plancus audubonii*), bald eagle (*Leucocephalus haliaeetus*), or wood stork (*Mycteria americana*) as a result of the action. The Service concurs with the Corps' determinations. Acronyms and abbreviations used throughout this letter are outlined in Table 1.

The Use of Best Scientific and Commercial Information by the Service

The Service uses the most current and up-to-date scientific and commercial information available. The nature of the scientific process dictates that information is constantly changing and improving as new studies are completed. The scientific method is an iterative process that builds on previous information. As the Service becomes aware of new information, we will ensure it is fully considered in our decisions, evaluations, reviews, and analyses as it relates to the base of scientific knowledge and any publications cited in our documents.

Specifically, there is one such document cited in this biological opinion that the Service acknowledges has been affected in its cited form by new scientific information. This document is the South Florida Multi-Species Recovery Plan (MSRP) (Service 1999). The MSRP was designed to be a living document and to be flexible to accommodate the changes identified through ongoing and planned research and would be compatible with adaptive management strategies. These principals are set forth in both the transmittal letter from the Secretary of the Interior and in the document itself. As predicted, changes have occurred in the intervening years since the MSRP was published. The Service uses the MSRP in the context that it still presents useful information when taken in conjunction with all the new scientific information developed subsequent to its publication. The Service has taken these new sources of information into account when using this document to help guide our analysis and decisions.

Consultation History

On June 20, 2001, the Service informally consulted on a deviation extension (through July 1, 2001) for the Lake Istokpoga regulation schedule. We evaluated the Corps determination and concluded that the action was not likely to adversely affect the Everglade snail kite, wood stork, bald eagle or Audubon's crested caracara. Nor would the action modify snail kite critical habitat. At that time, snail kites were not known to be nesting on Lake Istokpoga.

On April 1, 2004, the Service informally consulted on a temporary deviation from the water regulation schedule for Lake Istokpoga. The deviation request was to delay the drop in lake stage from March 1 to May 15, 2004. The request would allow more effective treatment of hydrilla (*Hydrilla verticillata*) by the Florida Department of Environmental Protection (FDEP). We concurred with the Corps' determination of no effect on Everglade snail kite, wood stork, Audubon's crested caracara, and bald eagle. Similar to the previous consultation, snail kites were not known to be nesting on Lake Istokpoga in 2004.

On March 30, 2007, the District sent a letter to the Corps requesting a temporary deviation to the Lake Istokpoga Regulation Schedule. The request was for a "gradual decline over the next 45 days to a deviated floor elevation of 36.5 ft National Geodetic Vertical Datum (NGVD) by 15 May 2007." The deviated floor elevation would remain at 36.5 ft until August 31, 2007. Beginning on September 1, 2007, the deviation line would then gradually increase and intercept the existing regulation schedule of 39.0 ft by mid October 2007.

On April 3, 2007, the Service was notified of the District's deviation request via email from the Corps. Urgent coordination with all resource agencies was requested in the email.

On April 4, 2007, the Service received the District's second temporary deviation request via an email from the Corps. In that email, the deviation request outlined three alternatives each with a successively lower minimum elevation of Zone B to 36.5, 35.5, or 34.5 ft, respectively.

On or about April 5, 2007, the Service was notified by the snail kite survey crew (from the Florida Cooperative Fish and Wildlife Research Unit at the University of Florida, under the supervision of Dr. Wiley Kitchens) that one active snail kite nest was found on Lake Istokpoga. The nest substrate was cattails and the water depth was around the nest was 75 cm.

On April 11, 2007, the Service notified the District that an active snail kite nest was found on Lake Istokpoga.

On April 18, 2007, the Service provided the agency partners and other stakeholders the current status of snail kite nesting in Florida for the 2007 breeding season. The information indicated that the overall number of nests found so far this year was low compared to normal years. On Lake Istokpoga, 13 snail kites were observed along with the 1 active nest. Later that day, the Service received an email request from the District for more specific about the Lake Istokpoga nest. We responded via email indicating that the nest had three eggs. We estimated the time of egg laying to be about April 1st.

On or about April 18, 2007, the Corps and District invited the Service to participate in weekly conference calls to discuss the status of the Istokpoga deviation request and the effects of the drought on the Water Conservation Areas and the potential effects on snail kites. The Service participated on these conference calls on April 18, 20, 23, 25, 27, and 30, and May 2, 4, and 7, 2007.

On April 24, 2007, the Service was notified by the snail kite survey crew that two additional active snail kite nests were found on Lake Istokpoga on April 22. A nest in bulrush contained one chick and one egg, and appeared to be partially collapsed but was still upright. It was only 40 cm above the water. The second nest was in a cypress tree and contained one egg. The original cattail nest was still intact with its three eggs.

By email on April 24, 2007, the Service received a scoping letter from the Corps indicating their intent to evaluate the environmental effects of the temporary deviation for Lake Istokpoga under the National Environmental Policy Act (NEPA).

On May 4, 2007, the Service received a biological assessment from the Corps. They provided an effect determination of "is likely to adversely affect" the Everglade snail kite. The Corps also determined that "no adverse effect is anticipated" for the Audubon's crested caracara, bald eagle, or wood stork as a result of the action. The Service concurs with the Corps' determinations.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

Proposed action

The Corps proposes to grant the District a temporary deviation of the existing regulation schedule for Lake Istokpoga for the purpose of water supply for the northern and southern portions of the Indian Prairie Water Use Basin. One of the water users in this basin is the Seminole Tribe of Indians of Florida at the Brighton Reservation. The District and Tribe have a Water Rights Compact for surface water. Figure 1 shows the existing regulation schedule for Lake Istokpoga. The District developed three alternatives for the minimum elevation of Zone B of the regulation schedule. These alternatives lower the minimum stage in Zone B from 37.5 ft NGVD for the current schedule to 36.5 ft (Alternative 1), 35.5 ft (Alternative 2), or 34.5 ft (Alternative 3). Lowering the minimum stage in Zone B would allow water releases from Lake Istokpoga to meet downstream water supply demands in the Indian Prairie Basin if the drought continues. In the event that enough precipitation occurs so as to alleviate the duration of the deviation, the District will begin to raise the lake level in accordance with the existing schedule (we have assumed that water restrictions may also be lessened). In the event that the deviation is not granted due to rainfall or any other reason, then the current regulation schedule will remain in effect and this consultation will become invalid. Alternative 2 was identified by the District to be the preferred alternative and therefore the action upon which we are consulting. We assume that Alternative 2 was selected based on the anticipated water supply needs of the Indian Prairie Basins, the water levels in Lake Istokpoga and Lake Okeechobee, predicted rainfall patterns, potential navigation impacts, and potential ecological responses.

It is important to note that when the water levels in Lake Okeechobee drop below 10 ft NGVD (which they did around April 20, 2007) Okeechobee can no longer supply water to the southern Indian Prairie Basin. Lake Istokpoga then becomes the primary water source for the entire Indian Prairie Basin. When this occurs, there is an automatic change of the minimum elevation of Zone B in Lake Istokpoga from 37.5 ft to 37.0 ft (Figure 1). This may have important ramifications for both the potential need for the granting of a deviation (and resulting need for a biological opinion) and the timing for which a deviation could be issued and still allow the District to meet the non-deviated regulation schedule. The two underlying assumptions are that significant rainfall over the next 4 to 6 weeks, though unlikely, could lessen the need for a deviation, and that the lake functions better if the current regulation schedule is met as opposed to not being met.

Currently, both the northern and southern Indian Prairie Basins are in Phase 2 water restrictions resulting in a 30 percent cutback in agricultural water deliveries from Lake Istokpoga. Additionally, the District issued an order on May 11, 2007, setting lake stages in Lake Istokpoga that would trigger, if needed, a transition to additional water supply cutbacks to Phase 3 and beyond Phase 3. Water releases from Lake Istokpoga are occurring every day except Sunday out of the S-68 Structure only. No water releases are occurring though the Istokpoga Canal (G-85 Structure). The District analyzed the need for Phase 3 water restrictions (resulting in a 45 percent cutback) for Alternatives 1 and 2. The results of their analyses are shown in Table 2. Based on the increased water restrictions of Phase 3, the District estimated that six more days of agricultural water supply might be made available under the tighter restrictions.

The development, assessment, and selection of alternatives under consideration by the District were based on the current water restrictions, water usage permits, existing lake levels, evapotranspiration rates, groundwater flows into the lake from the Lake Wales Ridge, and the time until significant rain is likely. The District provided the information in Figure 2 as their assessment of anticipated water levels in Lake Istokpoga over time for various alternatives (Kosier 2007). The assumptions for this plot are as follows. The simulation uses the changes in lake volume by subtracting losses based on estimated water supply allocations (under the 30 percent reduction) and daily evapotranspiration. The District's May 11, 2007, order would transition into water supply cutbacks, if needed greater than the 30 percent reductions simulated in Figure 2. These would likely flatten the slope of the lake stage recession rate at stages below 37.5 feet. The simulation assumes that there is no rainfall, tributary inflows, or groundwater seepage into the lake. Thus, the resulting recession is conservative in the sense that any inputs would result in a slower recession rate. Tributary inflows have been decreasing and are low. As of April 27, 2007, the discharge in Arbuckle Creek is 22 cfs and Josephine Creek is 68 cfs. The District's daily rainfall report for April 26 shows Kissimmee Lower Basin has rainfall of 0.02 inches for the last week and 1.94 inches for April. The observed stage in Lake Istokpoga for the April 16-April 27 period has been falling a little slower than the simulated stage. This reflects, in part, the inflows that have not been accounted for by the model (Kosier 2007).

Under the "no action" alternative, current water supply deliveries and evapotranspiration (currently estimated by the District at 0.5 inch per day, but increasing throughout the remainder of the dry season) would cause the lake level to drop to 37.0, at which time the S-68 gates would be closed. At that point, water supply deliveries would end but evapotranspiration would cause lake levels to continue decreasing until regular, substantial precipitation occurred. Of course, any substantial precipitation that would occur while water deliveries were on-going would increase the amount time until the S-68 gates were closed. Under the "no action" alternative, all water supply deliveries from Lake Istokpoga would cease around May 23, 2007 (37.0 ft).

Under all proposed "with-action" alternatives, water managers would be allowed to release water from the lake when stages are at or below the current schedule floors, and we anticipate that the actual lake levels will be lower (*i.e.,* ecologically worse) than the "without-action" alternative. All "with-action" alternatives would likely provide more agricultural water supply to Indian Prairie than the "no action" alternative.

Under the selected plan, the Alternative 2 deviated schedule, water would continue to be released from the Lake via the S-68 structure (at Phase 2, or higher, restrictions) until the lake reaches 35.5 ft. If the lake reaches 35.5 ft, no further water releases would be allowed. The lake could drop further through evapotranspiration, but water releases for agricultural supply would not occur until the lake returned above 35.5 ft. With no further precipitation, and implementation of the deviation, the District predicts that the water level could reach 35.5 ft in mid to late July despite being 38.0 on April 25, 2007. This 2.5 ft water level drop represents a substantial threat to nesting snail kites and probably apple snails. At 35.5 ft, the entire littoral zone would be dry. These are the conditions that the analysis in this document is based upon. We present this scenario in order to be most conservative for the species, even though it is possible that some rainfall could occur and lessen the rate of the water level drop in the lake.

According the Corps' April 24, 2007, scoping notice, the deviation would allow a minimum lake stage of 35.5 ft, potentially through July 15, 2007, if necessary. The notice also states that the deviation may be in effect until October 15, 2007. The Service believes that the District may declare the deviation to be ended prior to October 15, but the description of the proposed action did not address this. We expect their decision will be based on specific water level targets. The Service believes that the District should also ensure that at least minimal water restrictions remain in effect until that date. Please see the "Terms and Conditions" section of this biological opinion for more details.

Action area

The action area is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. It encompasses the geographic extent of environmental changes (*i.e.,* the physical, chemical and biotic effects) that will result directly and indirectly from the action. The action area for this biological opinion is Lake Istokpoga. This biological opinion describes a nomadic species that can move among various wetland habitats in central and south Florida. However, the proposed action is not deemed to have direct or indirect effects on habitat conditions in other portions of the species' range such as Lake Okeechobee, the Kissimmee Chain of Lakes, the St. Johns Marsh, Grassy Waters Preserve, or the Water Conservation Areas.

Lake Istokpoga is 11,200-hectares (27,692 acres). It is the fifth largest natural lake in Florida. The lake is generally shallow, averaging only 4 to 6 feet in depth. The major tributaries to Lake Istokpoga are Josephine Creek and Arbuckle Creek, which are located in the northwest and north areas of the lake, respectively. Water can be discharged from the Lake through two major outlets: the Istokpoga canal that flows towards the Kissimmee River and the S-68 Structure that controls water flow to a series of canals that lead to both Lake Okeechobee and the Kissimmee River. Lake water levels are lowered prior to the summer rainy season to provide water storage for flood control. Levels are held higher during the winter-spring dry season for water supply. Lake Istokpoga is the largest single source of permitted surface water in the Kissimmee Valley. The reduction of high lake levels (since 1962) has provided the catalyst for development around the shores of the lake, including agriculture (citrus and caladium farms), pasture land, residential and commercial establishments. Many areas adjacent to the Lake that once flooded seasonally or infrequently are now drained.

The lake is divided into three zones: littoral, nearshore, and pelagic. The littoral zone is defined as that area in the lake that extends from the shoreline into the lake to a bottom elevation of 36 ft NGVD. It is approximately 5,986 acres in size. This area is occupied by desirable emergent and submerged aquatic vegetation and some undesirable exotic aquatic plants. This area is also negatively impacted by an abundance of floating mats of vegetation referred to as "tussocks." The nearshore zone is defined as the area of the lake that occupies the bottom elevations from 36 ft to 34 ft. It is approximately 7,045 acres in size. This area is sparsely vegetated. The pelagic zone is the remainder of the lake (*i.e.*, the interior-most portion) at bottom elevations less than 34 ft. It is approximately 14,661 acres in size. This area is adversely affected by exotic plant growth (primarily hydrilla), and receives routine herbicide spraying.

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/Critical Habitat Description

The Everglade snail kite is one of three subspecies of snail kite, a wide-ranging New World raptor found primarily in lowland freshwater marshes in tropical and subtropical America from Florida, Cuba, and Mexico south to Argentina and Peru. The Everglade subspecies occurs in Florida and Cuba, though only the Florida population is listed. The Florida population was first listed under the Endangered Species Preservation Act in 1967, and protection was continued under the Endangered Species Conservation Act of 1969. The Everglade snail kite, and all other species listed under the Endangered Species Conservation Act were the first species protected under the Act of 1973, as amended, and all of these species were given the 'endangered' status.

Species Description

The snail kite is a medium-sized raptor, with a total body length for adult birds of 14 to 15.5 inches and a wingspan of 43 to 46 inches (Sykes et al. 1995). In both sexes, the tail is square-tipped with a distinctive white base that appears as a white patch on the rump when in flight. The wings are broad, long, and paddle-shaped and are held bowed downward or cupped when in flight (Sykes et al. 1995). Adults of both sexes have red eyes and juveniles have brown eyes (Brown and Amadon 1976; Clark and Wheeler 1987). The plumage is markedly different among adult male, adult female, and juvenile birds. Adult males have a uniformly slate gray plumage, and adult female plumage is brown dorsally and pale white to cream ventrally, with dark streaking on the breast and belly (Sykes et al. 1995). Immature kites are similar in appearance to adult females but are more cinnamon-colored, with tawny or buff-colored streaking rather than brown streaking. Females are slightly larger than males. The slender, decurved bill is an adaptation for extracting the kite's primary prey, the apple snail; the bill is a distinguishing character for field identification in both adults and juveniles.

Critical Habitat

Critical habitat for the Everglade snail kite was designated in 1977 (Service 1977). The designation identified nine units of critical habitat (Table 3) that included two small reservoirs, the littoral zone of Lake Okeechobee, and areas of Everglades' marshes within the Water Conservation Areas (WCA) and Everglades National Park (ENP). In total, about 841,635 acres were included in the designation. Because this designation was one of the earliest under the Act, primary constituent elements were not defined. Since designation of critical habitat in 1977, the Service has consulted on the loss of 18.66 acres of critical habitat in a construction project. Construction of C&SF infrastructure resulted in impacts to less than 20 acres of critical habitat. A Service biological opinion addressed the effects of construction of the Miccosukee Tribe's Government Complex Center on critical habitat, which resulted in loss of 16.88 acres of critical habitat. In addition, the Service has consulted on impacts to 88,000 acres of critical habitat resulting from prolonged flooding and temporary degradation of critical habitat because of prescribed fire. In addition to these projects, degradation of snail kite critical habitat has occurred because of the effects of long-term hydrologic management and eutrophication. While it is not possible to accurately estimate the changes that have occurred within each unit, about 40 percent of the original designation is estimated to be in a degraded condition for snail kite nesting and foraging relative to when it was designated in 1977.

Life History

Everglade snail kites are dietary specialists, a relatively rare foraging strategy among raptors. The Florida apple snail is the kite's principal prey in Florida, and makes up the great majority of the kites' diet (Sykes 1987a; Kitchens et al. 2002). Throughout the range of all subspecies of snail kites, *Pomacea* snails consistently compose the primary prey of snail kites (Sykes 1987a; Beissinger 1990) and kites possess several unique adaptations that allow them to efficiently capture, extract, and consume *Pomacea* snails (*e.g.,* the slender, deeply hooked sharp-tipped bill that allows kites to efficiently extract snails from their shells, long slender toes that allow kites to grasp large snails) (Sykes et al. 1995; Beissinger 1990). Under normal conditions, Everglade snail kites are nearly completely dependent on apple snails as prey. However, other prey items have been documented. Beissinger (1990) reported that kites captured and consumed small turtles such as the musk turtle (*Sternotherus odoratus*) and mud turtles (*Kinosternon* spp), and they captured and consumed another type of small freshwater snail (*Viviparus georgianus*). Other prey that have been occasionally documented include crayfish (*Procambarus* spp.), speckled perch (*Pomoxis nigromaculatus*), and small snakes (Sykes et al. 1995).

Several species of non-native apple snails have become established recently within limited areas of Florida and have been used to varying degrees by snail kites. Takekawa and Beissinger

(1983) reported kite use of the non-native *Pomacea bridgesii*, and snail kites now regularly forage on a relatively newly-arrived non-native apple snail species that currently occurs at high densities within Lake Tohopekaliga, Osceola County, Florida (Kitchens 2006). This snail species was initially suspected to be *Pomacea canaliculata*, but recent research suggests that it is now suspected to be *Pomacea haustrom* (Collins and Rawlings 2006). Despite the use of these other species for foraging, all available evidence suggests that snail kites are still primarily dependent on Florida apple snails. Beissinger (1990) reported that use of turtles and other snail species occurred primarily during periods of limited prey availability such as drought conditions or cold spells. The specializations that allow the snail kite to so efficiently capture and extract apple snails make it difficult for them to capture and eat other alternative prey items (Beissinger 1990). The snail kite may be relatively well-adapted to capture and consume non-native *Pomacea* species, but preliminary information suggests that snail kites may only be able to successfully extract the flesh from a small portion of the presumed *P. haustrom* due to their large size. Juvenile kites that are reliant on these non-native snails may not be able to sustain themselves, despite the fact that snails are abundant (Kitchens 2006). The close tie between the Everglade snail kite and the Florida apple snail requires consideration of both species when developing management strategies and addressing potential impacts.

Everglade snail kites and their primary prey are both wetland-dependent species that rely on wetland habitats for all aspects of their life history. The primary wetland habitat types upon which kites rely consist of freshwater marshes and the shallow vegetated littoral zones along the edges of lakes (natural and man-made) where apple snails occur in relatively high abundance and can be found and captured by kites.

Snail kites use two visual foraging methods: course-hunting, while flying 5 to 33 ft above the water surface or still-hunting from a perch (Sykes 1987a; Sykes et al. 1995). While course-hunting, the flight is characterized by slow wing beats, alternating with gliding; the flight path is usually into the wind, with the head oriented downward to search for prey. Snails are captured with the feet at or below the surface, to a maximum reach of about 6 inches below the surface. Snail kites do not plunge into the water to capture snails and never use the bill to capture prey. Individuals may concentrate hunting in a particular foraging site, returning to the same area as long as foraging conditions are favorable (Cary 1985). Capture rates are higher in summer than in winter (Cary 1985), with no captures observed at a temperature less than 10°C (50°F). Snail kites frequently transfer snails from the feet to the bill while in flight to a perch. Feeding perches include living and dead woody-stemmed plants, blades of sawgrass and cattails, and fence posts.

While kites are capable of foraging successfully under a variety of habitat conditions, the preferred foraging habitat is typically a combination of relatively short-stature, sparse graminoid marsh vegetation less than 6.5 ft (2 meters) in height. The apple snail requires emergent aquatic plants to provide substrate that allows them to reach the water surface to breathe. However, for kites to feed, the emergents must be sparse enough that they are capable of locating and capturing snails (Kitchens et al. 2002). Marshes and lake littoral zones composed of interdigitated areas of open water 0.6 to 4.3 ft deep which is relatively clear and calm and patches of herbaceous emergent wetland plants or sparse continuous growth of herbaceous wetland plants generally provide the appropriate balance of emergent vegetation and open water

(Sykes et al. 1995; Kitchens et al. 2002). Marsh species that commonly occur within favorable kite foraging habitat include spike rush (*Eleocharis cellulosa*), maidencane (*Panicum hemitomon*), sawgrass (*Cladium jamaicense*), bulrush (*Scirpus* spp.), and/or cattails (*Typha* spp.). Shallow open-water areas may also contain sparse cover of species such as white water lily (*Nymphaea odorata*), arrowhead (*Sagittaria lancifolia*), pickerel weed (*Pontederia lanceolata*), and floating heart (*Nymphoides aquatica*). Periphyton growth on the submerged substrate provides food source for apple snails, and submergent aquatic plants such as bladderworts (*Utricularia* spp.) and eelgrass (*Vallisneria* spp) may contribute to favorable conditions for apple snails while not preventing kites from detecting snails (Sykes et al. 1995).

Foraging habitat conditions that differ substantially from those described above will result in either reduced apple snail density or reduced ability of snail kites to locate and capture snails. Vegetation cover that is either too dense or too sparse can result in reduction in the quality of the area as foraging habitat.

The Everglade snail kite breeding season in Florida varies from year to year and is probably affected by rainfall and water levels (Sykes et al. 1995). Ninety-eight percent of the nesting attempts are initiated from December through July, while 89 percent are initiated from January through June (Sykes 1987c; Beissinger 1988; Snyder et al. 1989), with the peak in nest initiation occurring from February to April (Sykes 1987c). Snail kites often renest following failed attempts early in the season, as well as after successful attempts (Beissinger 1986; Snyder et al. 1989), but the actual number of clutches per breeding season is not well documented (Sykes et al. 1995).

Pair bonds are established prior to egg-laying and are relatively short, typically lasting from nest initiation through most of the nestling stage (Beissinger 1986, Sykes et al. 1995). Male kites select nest sites and conduct most nest-building, which is probably part of courtship (Sykes 1987c; Sykes et al. 1995). Unlike most raptors, snail kites do not defend large territories and frequently nest in loose colonies or in association with wading bird nesting colonies (Sykes 1987b; Sykes et al. 1995). Kites actively defend small territories extending about 4 miles around the nest (Sykes 1987b). 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, but may be delayed a week or more (Sykes 1987c). An average 2-day interval between laying each egg results in the laying of a three egg clutch in about 6 days (Sykes et al. 1995). The clutch size ranges from 1 to 5 eggs, with a mode of three (Sykes 1987c; Beissinger 1988; Snyder et al. 1989). Incubation may begin after the first egg is laid, but generally after the second egg (Sykes 1987c). In Florida, the incubation period lasts 24 to 30 days (Sykes 1987c). Incubation is shared by both sexes, but the contribution of incubation time between the male and female is variable (Beissinger 1987). Hatching success is variable from year to year and between areas. In nests where at least one egg hatched, hatching success averaged 2.3 chicks per nest (Sykes 1987c).

After hatching, both parents initially participate in feeding young, but there is variability in the contribution of each member of the pair (Beissinger 1987). The nestling period lasts about 23 to 34 days and fledging dates may vary by 5 days among chicks (Sykes et al. 1995). Following fledging, young are fed by one or both adults until they are 9 to 11 weeks old (Beissinger 1987). In total, snail kites have a nesting cycle that lasts about 4 months from initiation of nest-building through independence of young (Beissinger 1986; Sykes et al. 1995).

Snail kites also have a relatively unique mating system in Florida that is described as ambisexual mate desertion, in which either the male or female may abandon nests part way through the nestling stage (Beissinger 1986, 1987). This behavior appears to occur primarily under conditions when prey is abundant, and it may be an adaptation to maximize productivity during favorable conditions. Following abandonment, the remaining parent continues to feed and attend chicks through independence (Beissinger 1986). Abandoning parents presumably form new pair bonds and initiate a new nesting attempt. Snail kites mature early compared to other raptors and can breed successfully the first spring after they hatch, when they are about 8 to 10 months old. However, not all kites breed at this age. Bennetts et al. (1998) reported that only three out of nine first-year snail kites attempted to breed, while all of 23 adults that were tracked attempted to breed. Of the 23 adult kites, 15 attempted to breed once, 7 attempted to breed twice, and one individual attempted to breed three times. Only one adult kite successfully fledged two clutches. Adult kites generally attempt to breed every year with the exception of drought years when some kites may not attempt to nest (Sykes et al. 1995).

Nesting almost always occurs over water, which deters predation (Sykes 1987b). An important feature for snail kite nesting habitat is the proximity of suitable nesting sites to favorable foraging areas. Thus, extensive stands of contiguous woody vegetation are generally unsuitable for nesting and suitable nest sites consist of single trees or shrubs or small clumps of trees and shrubs within or adjacent to an extensive area of suitable foraging habitat. Trees usually less than 32 ft tall are used for nesting, and include willow (*Salix* spp.), bald cypress (*Taxodium distichum*), pond cypress (*Taxodium ascendens*), *Melaleuca quinquenervia*, sweetbay (*Magnolia virginiana*), swamp bay (*Persea borbonia*), pond apple (*Annona glabra*), and dahoon holly (*Ilex cassine*). Shrubs used for nesting include wax myrtle (*Myrica cerifera*), cocoplum (*Chrysobalanus icaco*), buttonbush (*Cephalanthus occidentalis*), *Sesbania* sp., elderberry (*Sambucus simpsonii*), and Brazilian pepper (*Schinus terebinthifolius*). Nesting also can occur in herbaceous vegetation, such as sawgrass (*Cladium jamaicense*), cattail (*Typha* sp.), bulrush (*Scirpus* sp.), and reed (*Phragmites australis*) (Sykes et al. 1995). Nests are more often observed in herbaceous vegetation around Lake Kissimmee and Lake Okeechobee during periods of low water when dry conditions beneath the willow stands (which tend to grow to the landward side of the cattails, bulrushes, and reeds) prevent snail kites from nesting in woody vegetation. Nests constructed in herbaceous vegetation on the waterward side of the lakes' littoral zone are more vulnerable to collapse due to the weight of the nests, wind, waves, and boat wakes and are more exposed to disturbance by humans (Chandler and Anderson 1974; Sykes and Chandler 1974; Sykes 1987b; Beissinger 1986, 1988; Snyder et al. 1989).

Adult snail kites have relatively high annual survival rates, with estimated average rates ranging from 85 to 98 percent (Nichols et al. 1980; Bennetts, Dreitz et al. 1999; Martin et al. 2006). Adult survival is probably reduced in drought years (Takekawa and Beissinger 1989; Martin et al. 2006). Adult longevity records in the wild are more than 15 years, and kites may frequently live longer than 13 years in the wild (Sykes et al. 1995).

Everglade snail kites may roost communally outside of breeding season, and occasionally roost in groups of up to 400 or more individuals (Bennetts et al. 1994). Roosting sites are also usually located over water. On average, in Florida, 91.6 percent are located in willows, 5.6 percent in *Melaleuca*, and 2.8 percent in pond cypress. Roost sites are in taller vegetation among low-profile marshes. Snail kites tend to roost around small openings in willow stands at a height of 5.9 to 20.0 ft, in stand sizes of 0.05 to 12.35 acres. Roosting also has been observed in *Melaleuca* or pond cypress stands with tree heights of 13 to 40 ft (Sykes 1985).

Snail kites are considered nomadic, and this behavior pattern is probably a response to changing hydrologic conditions (Sykes 1979). During breeding season, kites remain close to their nest sites until they fledge young or fail. Following fledging, adults may remain around the nest for several weeks, but once young are fully independent adults may depart the area. Outside of the breeding season, snail kites regularly travel long distances within and among wetland systems in southern Florida (Bennetts and Kitchens 1997). While most movements may be in response to droughts or other unfavorable conditions, kites may also move away from wetlands when conditions appear favorable. Movements within large wetlands and movements among adjacent wetland units occurred frequently, while movements among spatially isolated wetlands occurred less frequently (Martin et al. 2006). Fledgling kites also move frequently, but are more likely to move to immediately adjacent wetland units than adults, and this may indicate a degree of familiarity with the availability of wetlands across the landscape that adult kites acquire through experience.

Snail kites are highly gregarious. In addition to nesting in loose colonies and roosting communally in large numbers, kites may also forage in common areas in proximity to other foraging kites.

Population Dynamics

From a demographic perspective, Everglade snail kites appear to exhibit high levels of variability in some demographic parameters, while others remain relatively constant. For example, distribution of nesting appears to fluctuate dramatically among years. Similarly, productivity appears to be highly variable and heavily influenced by environmental conditions (Sykes 1979; Beissinger 1989, 1995; Sykes et al. 1995). Duration of breeding season and amount of double- or triple-brooding are also variable (Beissinger 1986). Juvenile survival also appears to be highly variable among years (Beissinger 1995; Bennetts and Kitchens 1999; Martin et al. 2006). In contrast, adult survival appears to be relatively constant over time at a relatively high level (Bennetts, Dreitz et al. 1999; Martin et al. 2006), though drought years may result in reduced adult survival (Beissinger 1995; Martin et al. 2006). The combination of these demographic characteristics may allow kites to survive unfavorable conditions, by either moving to other areas or simply waiting out the unfavorable conditions. Under favorable environmental conditions, kites have the ability to achieve high reproductive rates (Beissinger 1986), and similarly, juvenile survival rates appear to be higher under more favorable conditions.

Relatively large fluctuations in the Everglade snail kite population size have been widely reported and generally attributed to environmental conditions (Beissinger 1986; Beissinger 1995). However, some of these reported fluctuations and the magnitude of reported declines in particular, may be influenced by the population survey methods (see below) and the fact that kites tend to depart traditional areas when those areas experience unfavorable conditions (Bennetts, Link et al. 1999).

Historic records of snail kite nesting include areas as far north as Crescent Lake and Lake Panasoffke in north-central Florida and as far west as the Wakulla River (Howell 1932; Sykes 1984). Several authors (Nicholson 1926; Howell 1932; Bent 1937) indicated that the snail kite was numerous in central and southern Florida marshes during the early 1900s, with groups of up to 100 birds. Reports of snail kite population declines in the 1940s and 1950s suggested that as few as 6 to 100 individuals remained (Sykes 1979). Reports of declines resulted from disappearance of kites from areas where they had previously occurred in large numbers, including Lake Okeechobee and the headwaters of the St. John's marsh (Sykes 1979). Limited resources were available at that time for researchers to reach potential snail kite habitats, the resulting low level of survey effort may have biased these low snail kite population estimates, and absence of kites from particular areas may have resulted from the kite's nomadic behavior and responses to unfavorable hydrologic conditions (Sykes 1979). However, there is little doubt that the snail kite was endangered at that time and that its range had been dramatically reduced.

When the snail kite was listed as endangered in 1967 (Service 1967), the species was considered to be at an extremely low population level. In 1965, only 10 birds were found, 8 in WCA-2A and 2 at Lake Okeechobee. A survey in 1967 found 21 birds in WCA-2A (Stieglitz and Thompson 1967).

Prior to 1969, the snail kite population was monitored only through sporadic and inconsistent surveys (Sykes 1979, 1984). From 1969 to 1994, an annual quasi-systematic mid-winter snail kite count was conducted by a succession of principal investigators. Counts since 1969 have ranged from 65 in 1972 to 996 in 1994. Bennetts et al. (1993, 1994) cautioned that the 1993 and 1994 counts were performed with the advantage of having numerous birds radio-tagged. This influenced the total count, because radio-tagged birds could be easily located and often led researchers to roosts that had not been previously surveyed. Bennetts and Kitchens (1997) identified issues with the count surveys and recommended that they should not be the basis of population estimates or used to infer demographic parameters such as survival or recruitment. Bennetts, Link et al. (1999) analyzed these counts and the sources of variation in these counts and determined that count totals were influenced by observer differences, differences in hydrologic conditions and effort, and site effects. While significant sources of error were identified, these data could provide a crude indication of trends, if all influences of detection rates had been adequately taken into account. The sources of variation in the counts should be recognized prior to using these data in subsequent interpretations, especially in attempting to determine population viability and the risk of extinction.

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 population. Rodgers et al. (1988)

have stated 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 (Sykes 1979; Rodgers et al. 1988; Bennetts et al. 1994). While acknowledging the problems associated with making year-to-year comparisons in the count data, some general conclusions are apparent. Changes in occurrence and occupancy of individual wetland units are variable among years and the degree of variability among wetlands is also variable. For example, Lake Okeechobee seems to retain some suitable snail kite habitat throughout both wet and dry years and remained relatively continuously occupied from 1969 through the mid-1980s. In contrast, snail kite use of WCAs fluctuates greatly, with low use during drought years, such as 1991, and high use in wet years, such as 1994.

Refined population estimates were generated for the Everglade snail kite using a mark-recapture method beginning in 1997 (Dreitz et al. 2002). These new population estimates which explicitly address detection probability and incorporate corrections to exclude the effects of variable detection probability that affected previous population estimates are higher than those resulting from the previous counts. The population size estimate generated from mark-recapture estimates for 1997-2000 was about 2 to 3 times higher than count-based estimates (estimates of about 800 to 1,000 individuals in 1993 and 1995 based on count-based surveys compared to about 2,700 to 3,500 estimated from mark-recapture analyses from 1997 to 2000) (Bennetts and Kitchens 1997; Dreitz et al. 2002). Confidence intervals can also be generated for population estimates generated using the new method, which increases the validity of comparing population estimates among years.

Since 1997, population estimates and estimates of demographic parameters have been generated exclusively employing mark-recapture methods that incorporate detection probabilities. From 1997 through 1999, the snail kite population was estimated to be about 3,000 birds (Dreitz et al. 2002). From 1999 through 2002, the population estimates declined each year until they reached a low level of about 1,400 birds in 2002 and 2003, then increased slightly to about 1,700 birds in 2004 and 2005 (Martin et al. 2006). A preliminary estimate of the 2006 snail kite population size is about 1,600 birds.

The state-wide snail kite population declined from 1999 to 2003 (Figure 3), and may have been exacerbated by a regional drought that affected southern Florida during 2000 to 2001. During this period, nest success was generally low (Martin et al. 2006), and demographic parameters estimated from mark-recapture methods also indicated that juvenile survival rates were low, and even adult survival declined during 2001 (Figure 4) (Martin et al. 2006). However, following the end of the drought conditions in 2002 and a return to normal or wetter-than-normal hydrologic conditions from 2002 to 2006 that generally provide favorable snail kite nesting conditions, population estimates remained low, and nest success and juvenile survival rates also remained low (Martin et al. 2006).

For example, in 2005, only 39 fledglings were produced from 177 nests statewide during the typical breeding season (March 1 – June 30); an additional 11 kites fledged between August 22 and October 17, 2005 (Martin et al. 2006). In Lake Istokpoga, there were only four nests in 2005 but all were successful resulting in nine fledglings. That is a significantly higher success rate than for Lake Okeechobee in 2005 which had 23 nests but only produced 3 fledglings. The data for 2006 have not been completely evaluated; however, only one kite nest was reported for Lake Istokpoga and it was not successful. The reason for nest failure is not known.

As of this writing in April 2007, south Florida is passing through an intense and widespread drought covering the entire range of the Everglade snail kite. Although the nesting season is incomplete, we can offer some preliminary observations. Nesting is nearly absent through much of the species' range, including the WCAs, Lake Okeechobee, and St. Johns Marsh. Three kite nests have been identified with either chicks or eggs on Lake Istokpoga. There is evidence of shifting of the breeding population to more intensively use the Kissimmee Chain of Lakes for nesting this year. This shows a level of adaptability and resilience in the population in response to the severe stress of the drought. Despite the increase in nesting activity in the northern lakes, we anticipate that 2007 will be an overall low year for reproduction of the snail kite. We are uncertain what effect this may have on the overall population and distribution of the species in future years. The population estimates using the mark-recapture program will provide information on the potential effect on the species as a whole. We will also be interested in observing how quickly apple snails can return after the drought to an abundance that will support successful snail kite nesting in Lake Okeechobee and the other major wetland complexes essential to the species.

Status and Distribution

The subspecies *R. s. plumbeus* occurs in Florida, Cuba (including Isla de la Juventud) and northwestern Honduras. There is no evidence of movement of birds between Cuba and Florida, but this possibility has not been ruled out (Sykes 1979; Beissinger et al. 1983). In Florida, the historic range of the snail kite was larger than at present.

The current distribution of the snail kite in Florida is limited to central and southern portions of the State. Six large freshwater systems are located within the current range of the snail kite: Upper St. Johns marshes, Kissimmee Chain of Lakes, Lake Okeechobee, Loxahatchee Slough, the Everglades, and the Big Cypress basin (Beissinger and Takekawa 1983; Sykes 1984; Rodgers et al. 1988; Bennetts and Kitchens 1997; Rumbold and Mihalik 1994; Sykes et al. 1995). Habitats that support snail kites in the Upper St. Johns drainage include the East Orlando Wilderness Park, the Blue Cypress Water Management Area, the St. Johns Reservoir, and the Cloud Lake, Strazzulla, and Indrio impoundments with most current nesting occurring within the Blue Cypress Water Management Area (Martin et al. 2006). In the Kissimmee Chain of Lakes, snail kites may occur within most of the lakes and adjacent wetlands, with the majority of kite nesting occurring within Lake Kissimmee, Lake Tohopekaliga, and East Lake Tohopekaliga. Lake Okeechobee and surrounding wetlands historically supported significant snail kite nesting and foraging habitats. Most of the recent nesting in Lake Okeechobee has occurred within the expansive marsh in the southwestern portion of the lake and the area southwest of the inflow of the Kissimmee River (Martin et al. 2006). In the Loxahatchee Slough region of Palm Beach County, snail kites may occur throughout the remaining marshes in the vicinity and most frequently nest within Grassy Waters, which is also known as the West Palm Beach Water

Catchment Area. Kites may occur within nearly all remaining wetlands of the Everglades region, with recent nesting occurring within WCA-2B, WCA-3A, WCA-3B, and ENP (Martin et al. 2006). Within the Big Cypress basin, snail kites may occur within most of the non-forested and sparsely forested wetlands. Nesting has not been regularly documented in this area in recent years, though some nesting likely occurs.

In addition to the primary wetlands where most kite nesting has been documented, there are numerous records of kite occurrence and/or nesting within isolated wetlands throughout the region. The Savannas State Preserve, in St. Lucie County, the Hancock impoundment in Hendry County, and Lehigh Acres in Lee County are among the smaller more isolated wetlands used by snail kites (Sykes et al. 1995). Takekawa and Beissinger (1989) identified numerous wetlands that they considered drought refugia which may provide kite foraging habitat when conditions in the larger more traditionally occupied wetlands are unsuitable. Although the above list generally describes the current range of the species, radio tracking of snail kites has revealed that the network of habitats used by the species includes many smaller, widely dispersed wetlands within this overall range (Bennetts and Kitchens 1997). Snail kites may use nearly any wetland within southern Florida under some conditions and during some portions of their life history. However, the majority of nesting continues to be concentrated within the large marsh and lake systems of the Greater Everglades and the Upper St. John's marshes.

While it is not possible to compare the current population size to those recorded from the 1970s through 1997 due to differences in sampling methods, several lines of evidence suggest that the current kite population has declined and may be continuing to decline. Martin et al. (2006) reported that the population has declined by about 50 percent and their estimates result from consistent methods. In addition, the distribution of nesting activity in recent years has suggested that several of the traditional nesting areas were in unfavorable conditions for nesting. Low productivity, both in terms of low rates of nest initiation and low success rates resulting from those initiated nests suggest that conditions were poor for kite nesting in those years. Relatively low juvenile survival rates in recent years also support the conclusion that conditions for kites have been relatively unfavorable due to a variety of factors. There has, however, been the expected annual variation in juvenile survival estimates, with 2002-2004 showing comparatively high rates since 2000.

Studies of apple snail abundance and occurrence within traditional snail kite nesting areas also support conclusions that foraging conditions may be poor. Darby et al. (2005) reported that apple snail abundance has recently declined substantially within WCA-3A. Darby (2005a, 2005b) reported that apple snail abundance remains relatively low in areas of traditional snail kite use within Lakes Kissimmee, Tohopekaliga, and Okeechobee in recent years.

As previously noted, however, adult survival has been relatively constant over time at a relatively high level (Bennetts, Dreitz et al. 1999; Martin et al. 2006), except in 2001 and 2002. This factor helps kites survive unfavorable conditions, and the adults can either move to other areas with favorable conditions or simply wait out the unfavorable conditions. Under favorable environmental conditions, kites have the ability to achieve high reproductive rates (Beissinger 1986), and similarly, juvenile survival rates appear to be higher under more favorable conditions.

Barring extreme climatological fluctuations in the coming years, we do not expect a significant change in the health of the population during the duration of this project.

Threats to the Species

There are a variety of threats that have been identified which affect kite nesting, foraging, and survival. These threats include loss of wetland habitats, degradation of wetland habitat, changes in hydrologic conditions, and impacts to prey base.

Collapse of nests constructed in herbaceous vegetation is cited as a cause of increased nest failure during low-water years. This is because the water table is usually below the ground surface at willow heads and other stands of woody vegetation during drought, causing snail kites to nest in herbaceous vegetation, where the nests are more vulnerable to collapse. This effect is more prevalent in lake environments than in the Everglades. Weather also can result in the variability of nesting success. Wind storms can cause toppling of nests, particularly on Lake Okeechobee and Lake Kissimmee due to the long wind fetch across these large lakes. Cold weather can also produce nest failure, either through decreased availability of apple snails or mortality of young due to exposure. Abandonment of nests before egg-laying is common, particularly during drought or following passage of a cold front.

The snail kite has apparently experienced population fluctuations associated with hydrologic influences, both man-induced and natural (Sykes 1983a; Beissinger and Takekawa 1983; Beissinger 1986), but the amount of fluctuation is debated. However, the abundance of its prey, apple snails, has been definitively linked to water regime (Kushlan 1975; Sykes 1979, 1983a). Drainage of Florida's interior wetlands has reduced the extent and quality of habitat for both the snail and the kite (Sykes 1983b). The snail kite nests over water and nests become accessible to predators in the event of unseasonable drying (Beissinger 1986; Sykes 1987b). In dry years, snail kites depend on water bodies that normally are suboptimal for feeding, such as canals, impoundments, or small marsh areas, remote from regularly used sites (Beissinger and Takekawa 1983; Bennetts et al. 1988; Takekawa and Beissinger 1989). These secondary or refuge habitats could play an important role in the future.

The principal threat to the snail kite is the loss or degradation of wetlands in central and southern Florida. Nearly half of the Everglades has been drained for agriculture and urban development (Davis and Ogden 1994). The Everglades Agricultural Area alone eliminated 3,100 square-miles of the original Everglades and the urban areas in Miami-Dade, Broward, and Palm Beach Counties have contributed to the reduction of habitat. North of ENP, which has preserved only about one-fifth of the original extent of the Everglades, the remaining marsh has been fragmented into shallow impoundments. The Corps' C&SF Project encompasses 18,000 square-miles from Orlando to Florida Bay and includes about 994 miles each of canals and levees, 150 water control structures, and 16 major pump stations. This system has disrupted the volume, timing, direction, and velocity of freshwater flow.

Degradation of water quality, particularly runoff of phosphorus from agricultural and urban sources, is another concern for the snail kite. The Everglades was historically an oligotrophic system, but major portions have become eutrophic, primarily due to anthropogenic sources of phosphorus and nitrogen (cultural eutrophication). Most of this increase has been attributed to non-point source runoff from agricultural lands north of Lake Okeechobee, in the Kissimmee River, Taylor Slough, and Nubbin Slough drainages (Federico et al. 1981). Cultural eutrophication also is a concern in the Kissimmee Chain of Lakes. Nutrient enrichment leads to growth of dense stands of herbaceous emergent vegetation, floating vegetation (primarily water hyacinth [*Eichhornia crassipes*] and water lettuce [*Pistia stratiotes*]) and woody vegetation, which inhibits the ability of snail kites to forage along the shorelines of lake areas. Regulation of water stages in lakes and the WCAs is particularly important to maintain the balance of vegetative communities required to sustain snail kites.

Habitat loss to urban and agricultural development continues to occur, even within the current spatial extent of the habitat network. Habitat quality may be deteriorating as a result of increasing nutrients (Bennetts et al. 1994). Drying events also may be increasing above naturally occurring frequencies as a result of water management (Beissinger 1986).

Attempts to control, reduce and eliminate the spread of invasive and exotic species have also had negative effects on snail kites. Rodgers et al. (2001) describe a program to reduce impacts of aquatic plant management on snail kites. They found that the actions of several agencies in controlling aquatic plants have caused nest collapse, particularly in herbaceous vegetation such as cattail and bulrush. They state that these impacts in Lake Okeechobee and the Kissimmee Chain of Lakes were reduced through cooperation and improved communication between agencies. In addition to the potential collapse of nests, the Service is concerned about any excessive application of herbicides because this would reduce available habitat for apple snails. The Service has expanded on these coordination efforts to notify aquatic plant management groups during the kite nesting season on the location of active snail kite nests (Service 2006) to assist them in avoiding or minimizing take.

ENVIRONMENTAL BASELINE

The environmental baseline includes the effects of past and present impacts of all Federal, State, or private actions and other human activities in the action area; the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation; and the impact of State or private actions, which are contemporaneous with the consultation in progress.

Before 1962, artificial regulation of the water levels in Lake Istokpoga was minimal and lake levels would fluctuate approximately 3 to 6 feet every year. High water levels above 40 ft (with a maximum of 42.9 ft) occurred 14 times in 26 years (1936 to 1962). Lake levels dropped below 36.5 ft 7 times over that same time frame (minimum level was 35.4 ft).

After 1962 and the construction of the S-68 outlet structure, the lake was not allowed to fluctuate as much. A maximum level of 40.0 ft was set and the lake has only exceeded that level once since then. The primary reason for the constriction of lake levels at 40.0 ft is flood protection for residences that have been built near the lake even though there are previously connected cypress wetlands that exist above that elevation. These cypress wetlands are now hydrologically isolated from the lake and as a result regeneration of cypress trees is minimal. Low water events are also more restricted now. From 1962 to 1988, the lake dropped below 36.5 ft only once. After the new regulation went into place (in 1988), the lake again dropped below 36.5 ft once, but that was for the 2001 controlled vegetation enhancement project. The primary reason for the constriction of low lake levels is to ensure adequate water supply during the dry season. We believe that adverse changes in hydrologic and vegetative patterns have occurred due to management actions in Lake Istokpoga and the broader ecosystem. We also believe that there is a potential for reduction in apple snails since they are generally intolerant of desiccation.

Additional actions by the State that are appropriate to include in the environmental baseline are the attempts to control aquatic nuisance and exotic plants in the lake. The Florida Department of Environmental Protection has periodically treated the lake with fluridone to control hydrilla (*Hydrilla verticillata*), which became problematic in the late 1980s. The extent of hydrilla in the lake has ranged between 2,000 and 26,000 acres. The Florida Fish and Wildlife Conservation Commission (FWC) has been spraying pickerelweed along the western shoreline with herbicides since October 2001. The purpose of this is to reduce the amount of dense vegetation so as to improve fish habitat.

The Service has consulted informally on two previous Lake Istokpoga deviation requests. The 2001 request was for a temporary lowering to an elevation of 36.5 ft for 90 days extending until July 1, 2001. The drawdown was requested by the FWC and District to complement their vegetation enhancement project. This was an attempt to improve the littoral habitat by mechanically scraping 21 miles of shoreline and removing 1,308 acres (2,370,320 cubic yards) of floating plant tussocks (FDEP 2003). The spoil was used to create in-lake islands in the littoral zone. We evaluated the Corps determination and concluded that the action was not likely to adversely affect the Everglade snail kite, wood stork, bald eagle, or Audubon's crested caracara. Nor would the action modify snail kite critical habitat.

The 2004 deviation request was to delay the drop in lake stage from March 1 to May 15, 2004. The request would hold lake levels higher and allow more effective treatment of hydrilla by the FDEP. We concurred with the Corps' determination of no effect on Everglade snail kite, wood stork, Audubon's crested caracara, and bald eagle.

Status of the Species Within the Action Area

The action area for this deviation request encompasses only Lake Istokpoga. We generally have much less information about snail kite usage in Istokpoga than in other more traditionally used water bodies in Florida (*e.g.*, Lake Okeechobee and the WCAs). We only have frequent, systematic snail kite survey data for Lake Istokpoga from 2005 through 2007. Prior to that, there were no consistent surveys. We have evidence that snail kites historically used Lake Istokpoga (Sykes 1979). In 2005, there were four nests in Lake Istokpoga and all were successful resulting in nine fledglings. The survey data for 2006 have not been completely evaluated; however, only one kite nest was reported for Lake Istokpoga and it was not successful. The reason for nest failure is not known. We also do not know why only one kite nesting attempt was made. It may be due to the constant, high lake levels from January to March 2006 and then a rapid 2-foot recession over the next three months. It is also possible that habitat was better elsewhere in the system, or that nests were missed by the survey crew, or that this is within the natural variation in nesting for kites in Istokpoga. As of this writing in April 2007, the nesting season is incomplete; however, 13 adult kites and 3 kite nests have been identified with either chicks or eggs on Lake Istokpoga. Two of these are in herbaceous vegetation and one is in cypress. The herbaceous nests are in danger of collapse if water levels drop too low. The nest in cypress would not likely collapse; however, if the area around the tree dries, then predators may destroy the nest. Additionally, if the numbers of apple snails near the nest is reduced by drying, then the adult kites may have to fly farther to feed the chicks, or the juvenile kites from this nest may not be able to successfully forage after fledging.

The nesting success rate in 2005 was much higher in Lake Istokpoga than in Lake Okeechobee. We have presumed that this high success rate may be due to high quality kite foraging habitat (both habitat structure and snail abundance) along the western shore of the lake. The good success in 2006 may also be an artifact of the small number of nests, but we can conclude that conditions were at least adequate. We do not yet have snail density estimates for Lake Istokpoga, but we know that one researcher has attempted to collect some of this information earlier this year (Darby 2007). Therefore, we may be able to make some conclusions later this year about kite nesting and habitat quality in Lake Istokpoga. However, there is no existing monitoring program in place to follow up in assessing apple snail response to the drought and the deviation, if it occurs. We do know that snails can not tolerate extended periods (on the order of months) of desiccation. Therefore, it would be prudent to assess the effects of this drought on apple snail survivability and subsequent apple snail and snail kite reproduction.

Factors Affecting Species Environment Within the Action Area

Generally, operation of the C&SF Project and other hydrologic management has a significant effect on hydrologic conditions within most of the areas occupied by snail kites. The Corps, District, and St. John's River Water Management District manage water levels in snail kite habitat in accordance with many different local and regional water management plans and schedules. Water management plans affect water levels in marshes and lakes upon which snail kites rely, the rates of water level recessions in lakes and marshes, and the timing of high and low water events. These factors directly affect snail kite habitat suitability. Today, the fluctuations in water stage in Lake Istokpoga are, more or less, within the control of human management (within 0.25 foot). This is because of the capacity of the two outlet structures (S-68 and the G-85 on the Istokpoga Canal) and today's weather forecasting capabilities that allow District managers to prepare for high-water events. As a result, the SFWMD can meet the current regulation schedule most of the time. The current drought, which is covering the entire range of the snail kite, represents one of those times when water managers may be limited in their ability to meet the regulation schedule. In the event that kite habitat is impacted by water management in any given year, these changes may be reversible by restoring favorable hydrological conditions to the lake in subsequent years.

Low Lake Stages

Drydowns result from hydrologic management, including both intentional drawdowns to aid in habitat restoration, and drydowns that result from a combination of water management activities and unexpected environmental conditions, such as the 2000-2001 drawdown and drought. Extremely low lake levels expose the littoral zone to desiccation, thereby reducing snail abundance, and limiting the kite's ability to see and forage on snails. This may also reduce the amount of suitable herbaceous nesting substrate. All these factors combine to render the area unavailable as habitat for nesting kites. Apple snail populations can also be reduced, sometimes requiring years to rebound. During the development of the Minimum Flow and Level for Lake Istokpoga the District noted that 36.5 ft is the level at which harm to the submerged aquatic vegetation beds begins (District 2005).

The apple snail is not a very mobile creature. Unlike some other aquatic animal species, apple snails will not move extensively to follow the optimal water conditions that will vary with season and year (Darby et al. 2002). When a portion of the littoral zone inhabited by apple snails dries out because of lowering lake stage, the snails will aestivate in the detritus, and await the return of the water. After a period of time, the snails will die if the area remains dry. According to Darby (2006), adult apple snails show the following desiccation tolerances: a 3-month dry-out will kill 21 percent of the population; a 4-month dry-out will kill 50 percent of the population; and a 4.5-month dry-out will kill 63 percent of the population. Juvenile snails have even less tolerance to desiccation. For example, a 3-month dry-out will kill 40 percent a population of six-week old apple snails (10-15 mm in size). Considering that apple snails only live for a year to 18 months, it's easy to see how littoral zone dry out could adversely affect a lake's entire apple snail population especially if it occurs during peak snail breeding season (April to June). Therefore, when discussing the drying of the littoral zone, it is important to keep in mind not only how dry (*i.e.,* how low the water gets), but even more importantly, for how long and at what time of the year.

Recessions

Snail kite nests are almost always built over water; therefore, a rapid recession of water level can cause snail kite nests in herbaceous vegetation to collapse due to the weight of the nest. Recessions that completely dry out the area around the nest have the added impact of increasing the potential for nest predation. Apple snail reproduction can also be negatively impacted by recession if the area dries shortly after snails lay eggs. Newly hatched young snails are not able to survive long periods with water levels below ground. Rapid recession in spring months may result in reduced snail recruitment, and more stranded adult snails that will be unavailable to kites, consequently reducing snail kite foraging suitability.

Water Quality

Degradation of water quality, particularly runoff of phosphorus from agricultural and urban sources, is another factor potentially affecting snail kite habitats. As phosphorus concentrations increase, vegetational changes can occur in the littoral and nearshore zones. Increases in the spatial extent of nuisance algae or exotic plants can reduce kite foraging habitat.

Exotic and Invasive Vegetation
Exotic and invasive aquatic plants have had an impact on snail kite habitat within the lake systems and other areas. Species such as water hyacinth and water lettuce can grow rapidly within lake littoral zones, completely obscuring areas where kites forage, and can even affect littoral zone vegetation composition and cover by shading other species, changing the water temperature, and competing for space. Dense mats of these species make an area unsuitable for kite foraging. Hydrilla, for example, is an aquatic invasive plant that has become the dominant submerged species in Lake Istokpoga. In some cases, hydrilla has resulted in reduced apple snail densities. However, apple snails sometimes occur within hydrilla in high densities. Hydrilla infestations may cause changes in submerged plant species that will affect the abundance, sustainability, and availability of apple snails.

Efforts to control these invasive exotic plants have also affected snail kite habitat. The FWC has been selectively maintaining pickerelweed with herbicides (both aerially and with an airboat) since October 2001 in an attempt to improve fish habitat. Specific areas along the western edge of the lake are selectively treated to avoid damage to several small in-lake cypress trees in those areas. "Sparsely” vegetated areas of pickerelweed are maintained as such, while “densely” vegetated areas along the shoreline littoral zone are either broken up in smaller areas or thinned out to become sparsely vegetated areas. Pickerelweed around Big Island and Bumblebee Island marshes are not treated. It is unclear at this time whether or not herbicide usage in the lake is affecting snail kites. Certainly, if herbaceous vegetation that would otherwise be used for kite nesting is killed, then that could affect the kite population for that year. Additionally, herbicides often cause detrimental impacts to non-target species such as submerged aquatic plants, resulting in reduced suitability for apple snails.

Recreation
Recreational activities directly affect the suitability of kite habitat. Boat and airboat traffic throughout snail kite habitat can cause some local vegetation changes, and can temporarily affect the suitability of kite foraging habitat. In addition, these activities may result in disturbance to kites; boat wakes can also cause nests in herbaceous vegetation to collapse. Although the Service has no control over the operation of private watercraft, we believe that all federal and state watercraft should abide by recommended buffer zones that would minimize disturbance to nesting kites and other waterbirds (Rodgers and Schwickert 2003; Service 2006).

Critical Habitat (Environmental Baseline)

This section has focused on the species status within Lake Istokpoga. However, there is no critical habitat for the snail kite in Lake Istokpoga; therefore, there is no effect from this action on the snail kite’s critical habitat.

EFFECTS OF THE ACTION

The proposed action (Alternative 2) would allow water managers to drop lake levels to 35.5 ft thereby drying the entire 6,000-acre littoral zone and a portion of the nearshore zone unless substantial precipitation occurs. Lower than normal lake levels can be destructive to both apple snails and snail kites and their habitats. Kite nests are more likely to collapse, resulting in death of eggs or nestlings, because the proposed action would accelerate the rate of falling lake stages. Desiccation of the littoral zone can decrease the visibility of snails to foraging kites and kill apple snails. If drying of snail habitat occurs during the apple snail's peak breeding season (April to June), then recruitment into the following year's snail population could be severely reduced. Since apple snails generally only live for 12 to 18 months, a reduction in snail numbers could decrease snail reproduction and limit the available forage for kites. If the apple snail population becomes depressed, it may require several years of favorable environmental conditions to recover. Vegetational shifts in the littoral zone may improve or negatively impact nesting substrate for kites. Improvements may come from regeneration of woody species (willows and cypress) which generally are less likely to collapse than cattails and rushes. However, the increase in extent of exotic plants may outcompete native nest substrates especially herbaceous plants and other plants needed for snail reproduction. Excessive plant growth may also reduce kite foraging success and thereby reduce fitness of adults or young kites.

Based on the District's analysis, the lake would reach the floor of the existing regulation schedule (37.0 ft) around May 23. At this point, the deviation would be needed if no further rain occurred. Similarly, the bottom of the requested deviation (35.5 ft) would be reached in mid to late July 2007. However, assuming that rains are likely to occur during July, it is possible that the lake might not reach 35.5 ft or even drop below 36.0 ft.

The basis of our determination that the proposed action may adversely affect the snail kite is the increased probability that the littoral zone will become more dry and dry for a longer duration relative to the "No Action" alternative. Due to the relative lack of information for Lake Istokpoga, we await data on how severe the impact of the 2007 drought will be in terms of total kite population estimates, apple snail densities, and the return of successful kite nesting to Lake Istokpoga in subsequent years. These data will allow the agencies to make better decisions about the effects of lake levels on snails and kites and assist in the implementation of future revisions to the Lake Istokpoga water regulation schedule.

Critical Habitat (Effects of the Action)

The effects described above will occur outside of the snail kite's critical habitat. Therefore, we do not anticipate any effects of the action on critical habitat.

CUMULATIVE EFFECTS

Cumulative Effects on the Species and its Critical Habitat

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 will require a separate consultation pursuant to section 7 of the Act. Because the wetlands of Lake Istokpoga are subject to the Corps' jurisdiction and permitting under section

404 of the Clean Water Act, there are no cumulative effects on this species or its critical habitat for this action.

CONCLUSION

Without additional precipitation, the proposed deviation to the regulation schedule will likely cause injury or mortality to snail kite juveniles, nestlings, and/or eggs. The deviation is also likely to reduce the existing apple snail population for this, and possibly, subsequent years. This may result in harm to kites that may use the lake in subsequent years. One of the key objectives in sustaining an apple snail monitoring program is to determine the rate of recovery of apple snail populations after desiccation of the littoral zone. Negative impacts to the vegetational community are difficult to accurately predict given the relatively short duration of this anticipated action (about two to three months).

The Service agrees that periodically drying the littoral zone of Lake Istokpoga is likely to be ecologically beneficial. However, the rate of lake level drop and the duration that the lake remains at any specific elevation needs to be tied to a specific ecological goal, rather than a water supply goal. It is unclear at this time to what degree and frequency drawdowns should occur for the protection of snail kites. The Lake Okeechobee Watershed Project (LOWP) study team, in their development of a future Lake Istokpoga regulation schedule, predicted that a drawdown with a return frequency of twice in nine years for six weeks at about 36.0 ft would allow for beneficial oxidation of organic matter in the littoral zone to maintain a sandy substrate. They predicted that the oxidation of floating plant "tussocks" would lead to overall better lake habitat for fish and water birds. However, the team noted that adaptive management would be an important facet of that schedule's implementation because many of the effects are unknown and would need to be monitored and evaluated.

The presently proposed deviation to the schedule is expected to be in place for this year only. We recognize that this situation could arise again until the I-17 reservoir (back-up water supply) component of the LOWP comes on-line within the next 8 to 10 years.

We find that snail kite critical habitat is not affected by this action. After reviewing the status of the Everglade snail kite, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that this temporary deviation to the Lake Istokpoga regulation schedule, as proposed, is not likely to jeopardize the continued existence of the Everglade snail kite, and is not likely to destroy or adversely modify its designated critical habitat.

INCIDENTAL TAKE STATEMENT

Sections 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 a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to 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 essential behavioral patterns such as 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 Service will not refer the incidental take of any migratory bird for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C §§ 703-712), if such take is in compliance with terms and conditions (including amount and/or number) specified herein.

The measures described below are nondiscretionary, and must be undertaken by the Corps so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in action 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 the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. 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.

AMOUNT OR EXTENT OF TAKE

The Service anticipates that future incidental take of Everglade snail kites as a result of this action may be difficult to detect for the following reasons: the snail kite is relatively secretive and occupies expansive areas of marshes where it is unlikely that injury or mortality of individuals will be detected and where it is unlikely that all snail kites will be detected by monitoring crews. In cases where known kite nests fail, it may be difficult to determine that the deviation to the schedule was the cause. However, take of this species, in the form injury or death of kites, including eggs and nestlings is anticipated.

Incidental take is expected to occur in several forms. First, direct impacts on nests and nestlings are expected to occur. Rapid recession of lake stage during the kite nesting season can lead to nest failure from increased predation and potential nest collapse, particularly those that have been built in herbaceous vegetation. Additionally, recessions that occur during the peak of the kite breeding season may also reduce the abundance and availability of apple snails thereby leading to the potential starvation of nestlings. Based on the information known about the three existing nests, we authorize take in the form of injury or mortality of up to six eggs, nestlings, or juveniles. Additionally, we authorize take in the form of temporary harassment for up to four adult kites that are currently nesting. This take would occur during the implementation of Term and Condition No. 1 (artificially supporting the two herbaceous nests). We also authorize take for all breeding and non-breeding adults on Lake Istokpoga in the form of worse foraging conditions as a result of the deviation; however, we do not anticipate any mortality of adult kites.

At last count, there were 13 adult kites on Lake Istokpoga; therefore, we authorize take of up to13 adult kites in the form of harm or harassment as it relates to a reduction in foraging opportunities in Lake Istokpoga for 2007. No adult snail kites may be killed as a result of this action. We anticipate this action and its effects to be temporary in nature; therefore it is not expected that this species will be permanently extirpated from the action area as a result of the action.

If this action is short-term in nature (*i.e.,* one to two months), we do not anticipate that gross vegetational changes in the littoral or nearshore zones following refilling of the lake will occur and cause an adverse effect on snail kites. If the drought continues such that water levels in Lake Istokpoga do not return to normal by October 16, 2007, we may need to reevaluate the effects on vegetational patterns in the littoral and nearshore zones.

EFFECT OF THE TAKE

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.

REASONABLE AND PRUDENT MEASURES

Because the scope of the action was limited to water management decisions in response to the 2007 drought, we have limited our Reasonable and Prudent Measures to those that will assist in reducing the incidental take associated with the water management deviation, and those that will be useful in better assessing the impacts of similar actions in future droughts. The Service was directly involved for only a month or so, and due to the urgent nature of the need to deal with the drought conditions, we had little input on the development of alternatives. The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of Everglade snail kites.

1. Nest collapse, while an occasional natural part of the snail kite's life history, may be exacerbated by this action. It is possible, if correctly done, to artificially support the nest prior to it collapsing. This is a last resort that would only be attempted if the nests would not collapse otherwise.

2. The Service believes that water stage targets should be set to allow the District to declare a timely end to the deviation. The hydrologic record for Lake Istokpoga indicates that, given adequate rainfall, lake stages can normally be managed in a narrow range. The Service believes that there is less risk to water supply in declaring an end to the deviation in this water body, compared to areas such as Lake Okeechobee or the WCAs. If water stage reaches 39 ft by October 2007, we believe that the District should declare an end to the deviation. To fairly share the risk associated with this uncertainty, we believe that at least Phase 1 water restrictions should remain in effect until the deviation is ended.

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. In the event that the deviation is not granted, these terms and conditions will not apply; otherwise, these terms and conditions are nondiscretionary.

1. At about the time the lake stage reaches the level at which the deviation is needed (37.0 ft), any kite nests in herbaceous vegetation that are determined to be at risk of collapse will be artificially supported using three PVC posts (or similarly suitable material) placed under each active nest that is placed in herbaceous vegetation. This will be done by experienced kite biologists and monitored for success. Service biologists are ready to assist in carrying out this work. We would likely need logistic support, such as provision of an airboat, to accomplish this.

2. If lake stage rises to 39.0 ft by October 2007, the deviation will be ended. At least Phase 1 water cutbacks will remain in effect in the northern and southern Indian Prairie Water Use Basins until the deviation has ended. In the event that lake stage does not reach Zone B of the schedule in the fall of 2007, and the District might seek a continuation of the deviation for the dry season of 2008, reinitiation of consultation will be required.

Upon locating a dead, injured, or sick specimen of any threatened or endangered species, initial notification must be made to the nearest Service Law Enforcement Office (Fish and Wildlife Service; 9549 Koger Boulevard, Suite 111; St. Petersburg, Florida 33702; 727-570-5398). Secondary notification should be made to the Florida Fish and Wildlife Conservation Commission; South Region, 3900 Drane Field Road, Lakeland, Florida, 33811-1299; 800-282-8002. Care should be taken in handling sick or injured specimens to ensure effective treatment and care or in the handling of dead specimens to preserve biological material in the best possible state for later analysis as to the cause of death. In conjunction with the care of sick or injured specimens or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

The Service believes that no more than three nests containing up to six eggs or chicks will be incidentally taken as a result of this action. We also believe that the adults kites present on the lake may experience harassment in the form of reduced forage (apple snails) for this year as a result of the deviation. 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 action. 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 use 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 further minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. Other than the continuation of ongoing programs to track the number and fate of snail kite nests throughout the species' range, the Service has only one conservation recommendation at this time.

1. We believe that one crucial life history parameter currently lacking adequate information is determining the direct and empirical correlation of snail kite foraging and nesting success in Lake Istokpoga with the distribution and density of apple snails in the lake. In addition to better establishing this relationship in Lake Istokpoga, we must know more definitively about the time required for apple snails to become re-established at peak densities in the littoral zone after disturbances, particularly extreme droughts, such as the one we are currently experiencing in 2007. Additionally, apple snail density information should provide empirical evidence on what degree of impacts on the snail kite may be expected in less severe or less prolonged low water levels. This would give us a better sense of the balance of ecological benefits and risks in moderate drying of the littoral zone, which is a goal of the Lake Okeechobee Watershed Project. We recommend that the Corps implement or fund apple snail monitoring within the littoral zone of Lake Istokpoga. Although Dr. Darby (University of West Florida) has recently sampled apple snail populations along the western shore of Lake Istokpoga, there is no existing monitoring program in place to follow up in assessing apple snail response to the drought and the deviation, if it occurs. The monitoring would resume after the lake levels begin to substantially increase and should be conducted annually for a minimum of 3 years in order to encompass long-term effects. The scope of monitoring should allow an analysis across the bathymetric gradient of the western littoral zone, from the shoreline to the waterward edge of the littoral zone, and the littoral zones around Big and Bumblebee Islands. It will also include general observations relating to the suitability of the vegetative habitat for snails and foraging snail kites.

REINITIATION NOTICE

This concludes formal consultation on the proposed action. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency 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, as defined by the action area measures provided in this project description; (2) new information reveals effects of the agency's action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency 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.

Thank you for your cooperation and effort in protecting fish and wildlife resources. If you have any questions regarding this project, please contact me at 722-562-3909.

Sincerely yours,

Paul Souza
Field Supervisor
South Florida Ecological Services Office

cc:
Corps, Planning Division, Jacksonville, Florida (Catherine Byrd, Barbara Cintron)
District, West Palm Beach, Florida (Tom Kosier, Susan Sylvester)
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Table 1. Acronyms and abbreviations used in this document.

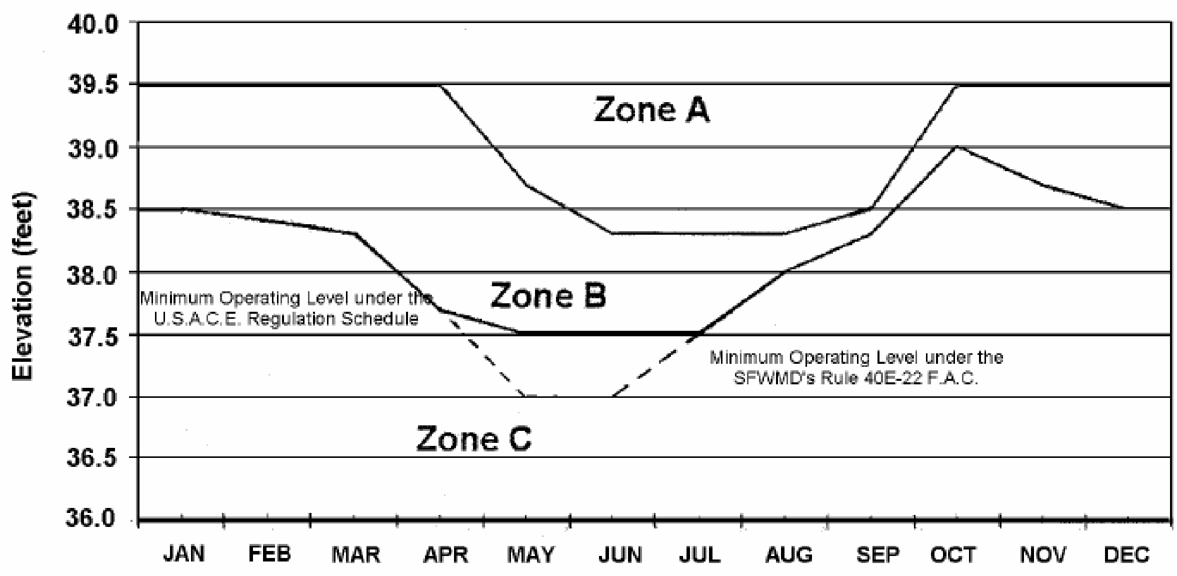
Acronym/ Abbreviation	Definition
Act	Endangered Species Act of 1973, as amended (87 Stat. 884; 16 U.S.C. 1531 *et seq.*)
C&SF	Central and Southern Florida
cfs	cubic feet per second
Corps	U.S. Army Corps of Engineers
District	South Florida Water Management District
ENP	Everglades National Park
ft	feet
FDEP	Florida Department of Environmental Protection
FWC	Florida Fish and Wildlife Conservation Commission
LOWP	Lake Okeechobee Watershed Project
MSRP	South Florida Multi-Species Recovery Plan
NGVD	National Geodetic Vertical Datum
Service	U.S. Fish and Wildlife Service
WCA(s)	Water Conservation Area(s)

Table 2. The total number of days needed for lake stage to reach the minimum elevation for two temporary deviation alternatives and at four levels of reduction of agricultural water supply demands.

	Reduction of demand			
Alternative	0%	15%	30%	45%
Alt 1 (36.5 ft)	50	54	59	64
Alt 2 (35.5 ft)	87	94	100	106

Table 3. Everglade snail kite critical habitat units and acreage.

Critical Habitat Unit Description	**Acres**
St. John's Reservoir, Indian River County	2,075
Cloud Lake and Strazzula Reservoirs, St. Lucie County	816
Western Lake Okeechobee, Glades and Hendry Counties	85,829
Loxahatchee National Wildlife Refuge, Palm Beach County	140,108
WCA-2A, Palm Beach and Broward Counties	106,253
WCA-2B, Broward County	28,573
WCA-3A, Broward and Miami-Dade Counties	319,078
ENP, Miami-Dade County	158,903
TOTAL	**841,635**



Zone	Releases
A	Through all outlets
B	For agricultural demands only
C	No releases to be made

Figure 1. Lake Istokpoga regulation schedule (District 2005).

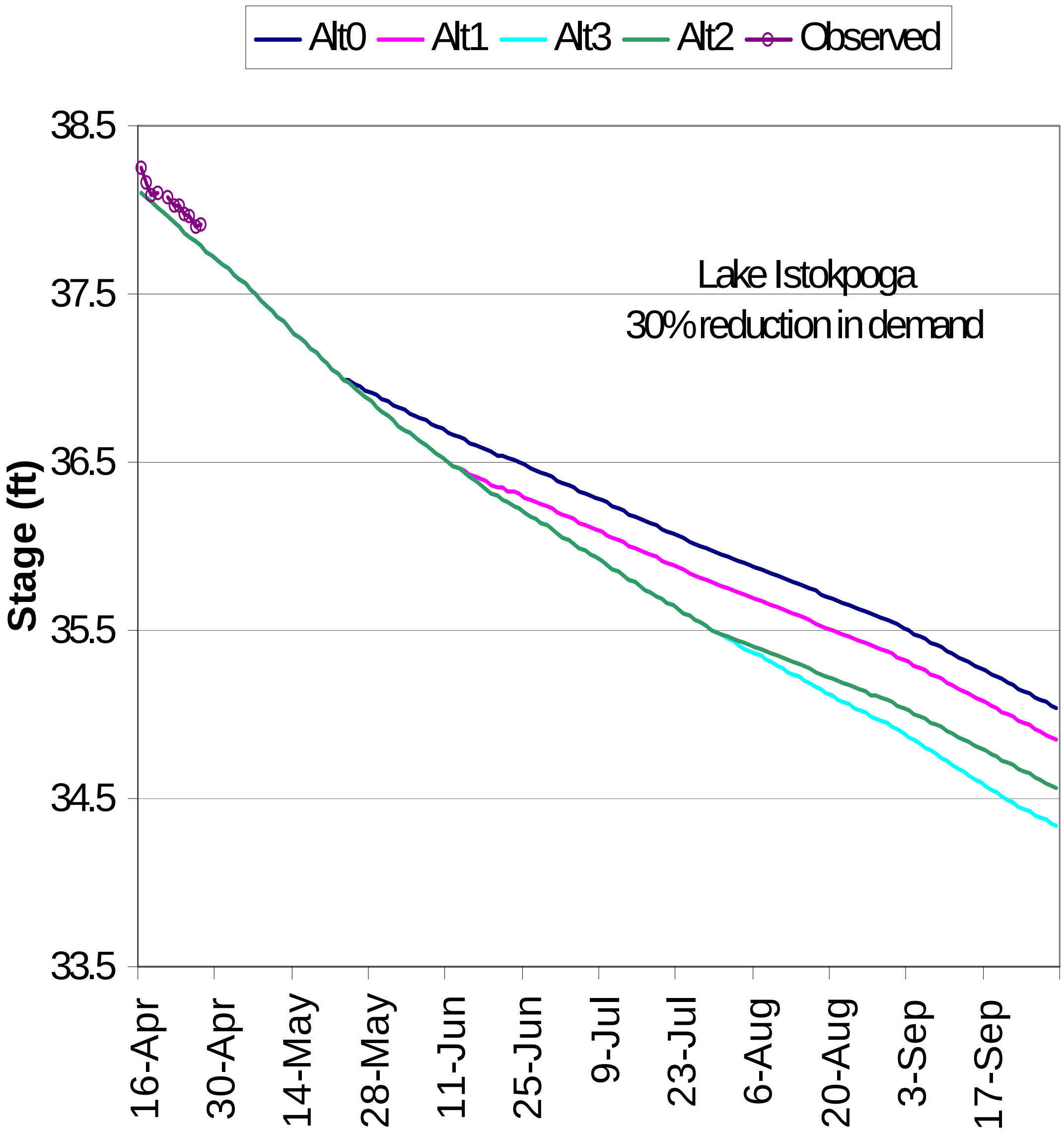


Figure 2. The performance of alternatives based on anticipated water levels in Lake Istokpoga over time (Kosier 2007).

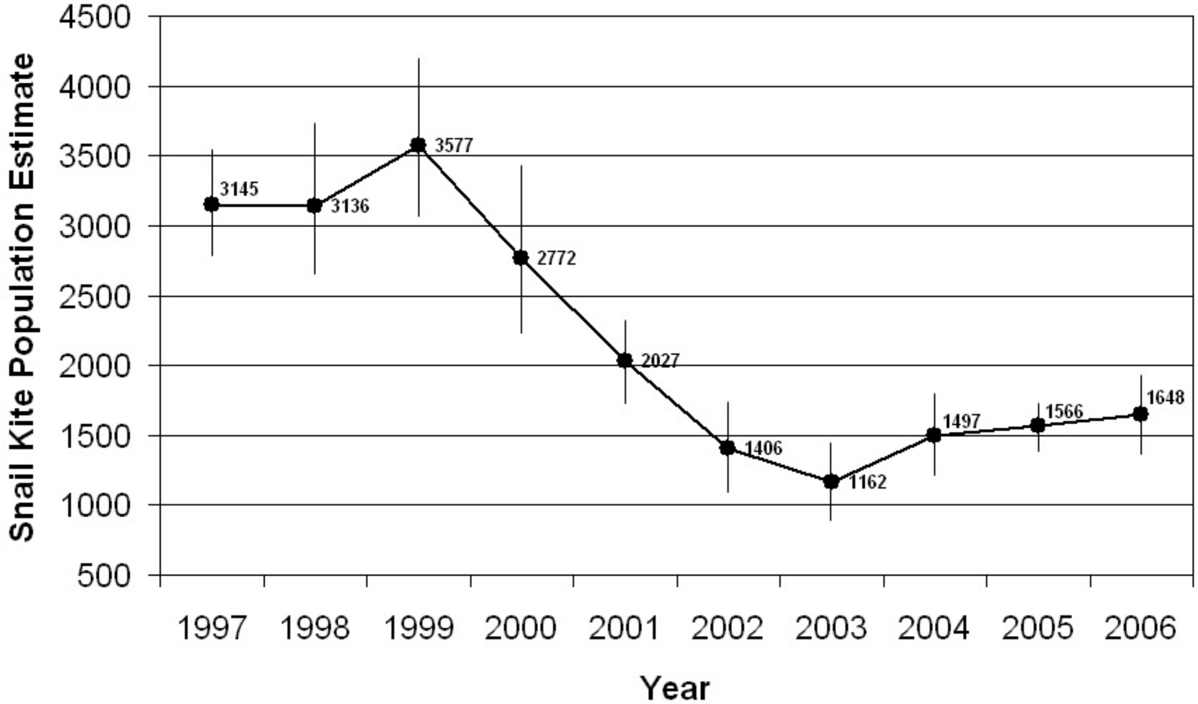


Figure 3. Estimates of state-wide snail kite population size between 1997 and 2006. Error bars correspond to 95 percent confidence intervals (Martin pers. comm. 2007).

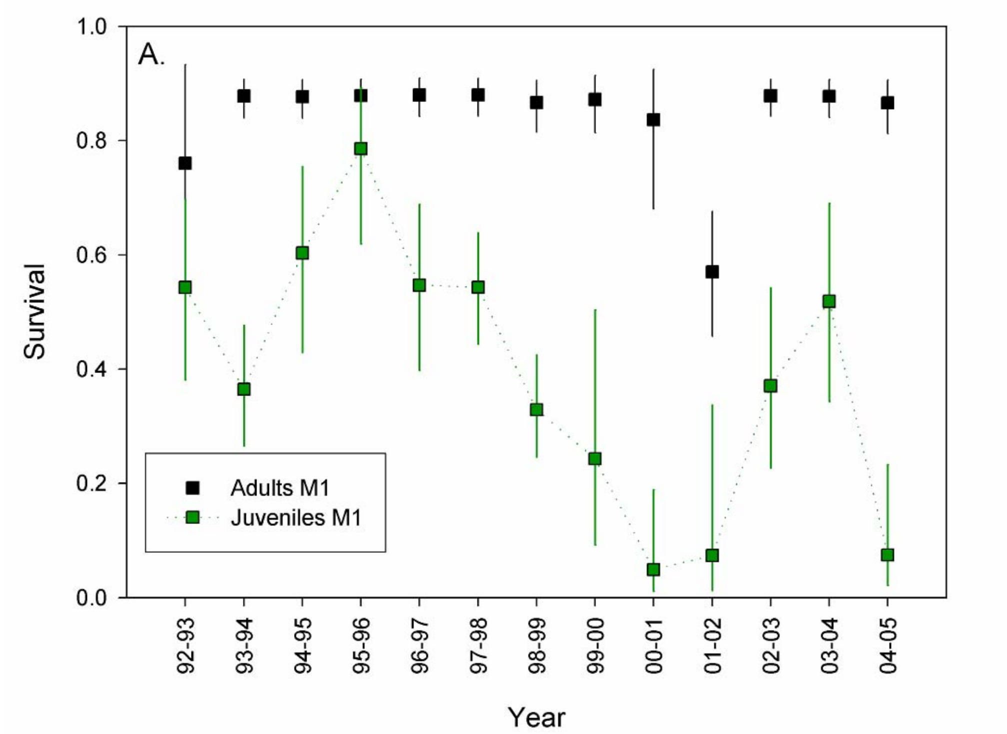


Figure 4. Model-averaged estimates of adult (black squares) and juvenile (white circles) survival (φ) between 1992 and 2005. Error bars represent 95 percent confidence intervals (from Martin et al. 2006).