

Cape Sable Seaside Sparrow

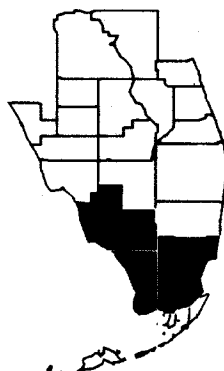
Ammodramus maritima mirabilis

Federal Status: Endangered (March 1967)

Critical Habitat: Designated (August 1977)

Florida Status: Endangered

Figure 1. Florida distribution of the Cape Sable seaside sparrow



Cape Sable seaside sparrows are medium-sized sparrows restricted to a small region of the southern Florida peninsula. They are non-migratory residents of fresh water to brackish marshes. The Cape Sable seaside sparrow has the distinction of being the last new bird species described in the continental United States prior to its reclassification to subspecies status. The restricted range of the Cape Sable seaside sparrow, and the changes in habitat that have occurred as a result of changes in the distribution, timing, and quantity of water flows in South Florida, have led to its listing and continue to threaten the subspecies with extinction.

This account represents a revision of the existing recovery plan for the Cape Sable seaside sparrow (FWS 1983).

Description

The Cape Sable seaside sparrow is a medium-sized sparrow, 13-14 cm in length (Werner 1975). Of all the seaside sparrows, it is the lightest in color (Curnutt 1996). The dorsal surface is dark olive-grey and the tail and wings are olive-brown (Werner 1975). Adult birds are light grey to white ventrally, with dark olive grey streaks on the breast and sides. The throat is white with a dark olive-grey or black whisker on each side. Above the whisker is a white line along the lower jaw. A grey ear patch outlined by a dark line sits behind each eye. The lores of the head are yellow. The leading edge of each wing has a small yellow patch near the alula. The legs and bill are grey (Curnutt 1996). There are no noticeable differences in markings between the sexes. However, there are significant differences in the sizes of specific body parts between the sexes (Werner 1975). Young birds differ from adults in that they do not have whisker marks, lack the yellow lores, and have brown streaking on the back.

the plant community on Cape Sable from one dominated by fresh water plants to one dominated by salt tolerant plants; as a result, Cape Sable seaside sparrows no longer use this area.

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

Studies completed since the 1970s document that *Muhlenbergia* (muhly) prairies are the preferred habitat of the Cape Sable seaside sparrow and support the highest densities of sparrows (Kushlan and Bass 1983, Werner and Woolfenden 1983, Pimm *et al.* 1994). For example, in the 1970s and 1980s, the largest populations of Cape Sable seaside sparrows were supported by muhly prairies. The suitability of this vegetative community for the sparrow is driven by a combination of hydroperiod and periodic fires (Kushlan and Bass 1983). Fires prevent hardwood species from invading these communities and prevent the accretion of dead plant material, both of which decrease the suitability of these habitats for Cape Sable seaside sparrows. In the Taylor Slough area, Werner (1975) found that sparrow numbers increased annually in areas that had been burned up to three years previously. Four years after a fire, he expected the suitability of these habitats to decline sharply. Recent analyses suggest that this is a localized response to fire and that, typically, sparrow numbers increase up to 10 years post-fire (J. Curnutt, University of Tennessee, personal communication 1997). Taylor (1983) found that the response of the sparrow population following fire is dependant on the rate of vegetation recovery, the soil depth, and the amount of exposed pinnacle rock. At sites where soil depth is 40 cm or greater, or on soils without pinnacle rock, vegetation recovery is rapid and the birds recovered more quickly following fire. At sites where soil depths are less than 20 cm, and where considerable pinnacle rock occurs, the birds begin to reoccupy sites four years post fire.

Little is known about the wintering habitat of Cape Sable seaside sparrows. Birds have been observed near tree islands in December but may additionally be wintering within the salt marshes of the southern Everglades (Pimm *et al.* 1996). Because the birds are secretive by nature, radio telemetry will be necessary to determine wintering habitat.

Critical Habitat

Critical habitat for the Cape Sable seaside sparrow was designated on August 11, 1977 (50 CFR 17.95). The critical habitat, as designated, does not adequately account for the distribution of the present-day core subpopulations, or the areas necessary for the birds to maintain a stable population. An important area west of Shark River Slough, which until 1993 supported one of two criti-

spicuous perch and functions to both mark territories and attract mates. The song lasts approximately 1.5 seconds and may be repeated 10-13 times per minute. Singing by males occurs most often during early morning and late afternoon and evening, with unmated males singing the most persistently. As the temperature rises over the course of the day, the time spent singing decreases.

Reproduction and Demographics

Nesting occurs from late February through early August (FWS 1983). The majority of nesting occurs in the spring when marl prairies are dry. Cape Sable seaside sparrows usually raise two broods in a season, although they may raise a third brood if weather conditions allow (Kushlan *et al.* 1982, FWS 1983). Sparrows build new nests for each successive brood. Nest cups are placed approximately 14 cm above the ground and are constructed with grasses (Werner 1975, Lockwood *et al.* 1997). Sparrows construct their nests with materials that are locally common and sometimes place taller grasses over the nest cup to conceal the nest. Nests are placed in clumps of grasses composed primarily of *muhlenbergia* and *spartina* (Pimm *et al.* 1996). A typical nest is constructed using sawgrass as the base, and finer grasses for the lining. Most nests are constructed with dead material although one nest observed during the 1997 breeding season was constructed with some live material. Pimm (University of Tennessee, personal communication 1996) suggests that nesting will not be initiated if water levels are at a depth greater than 10 cm during the breeding season. The end of the breeding season appears to be triggered by the onset of the summer rains. When water levels rise above the mean height of the nests off the ground, sparrows cease breeding.

Werner (1975) found that Cape Sable seaside sparrows often retained the same mate for successive nest cycles but that some individuals changed mates after one nest cycle. Additionally, some males failed to pair during the entire breeding season. Interactions between male and female Cape Sable seaside sparrows include chasing behavior, food begging by the female, males carrying food to the female, and males carrying nest behavior while softly singing (Lockwood *et al.* 1997). Males chase females as often as they chase males. Often, females have difficulty flying any distance without being chased by a male into the grass (Werner 1975).

Cape Sable seaside sparrows lay three to four eggs in each clutch (Werner 1978). Incubation has been estimated to take 12 to 13 days (Sprunt 1968, Trost 1968). The young spend 9 to 11 days at the nest. Both parents rear and feed the young birds and may do so for an additional 10 to 20 days after the young fledge (Woolfenden 1956, 1968, Trost 1968). Fledglings often occur in groups of two to seven and are occasionally alone. They are incapable of flight until they are approximately 17 days of age; when approached, flightless fledglings will freeze on a perch until the threat is less than a meter away, and then run along the ground (Werner 1975, Lockwood *et al.* 1997).

There are conflicting data on the reproductive potential of the Cape Sable seaside sparrow. Werner (1975) documented a 62 percent nest success rate in the Taylor Slough area, demonstrating a high reproductive potential for this

that the primary cause for the birds' drastic decline was a result of the impounding and flooding of the high salt marsh on which they depended. The invasion of hardwoods on the remaining higher marsh also contributed. On the St. Johns River, the demise of the dusky seaside sparrow was a result of habitat changes caused by drainage and frequent anthropogenic-caused dry season fires.

The plight of the dusky seaside sparrow is an important lesson to be learned from and should be considered when developing recovery objectives for the Cape Sable seaside sparrow. The dusky seaside sparrow, like the Cape Sable seaside sparrow, was a victim of our manipulation of the natural hydrologic regime. One of the reasons the recovery plan for the dusky seaside sparrow failed was because it failed to recognize how critical the changes in the natural hydrological regime were to the bird (Walters 1992). The recovery plan failed to incorporate the history of water management and the linkage of the U.S. Army Corps of Engineer's Upper Basin Diversion Project to the plight of the dusky. The Upper Basin project narrowed the flood plain of the St. John's River from approximately 20 miles to barely two miles wide, and citrus and pasture replaced the native landscape.

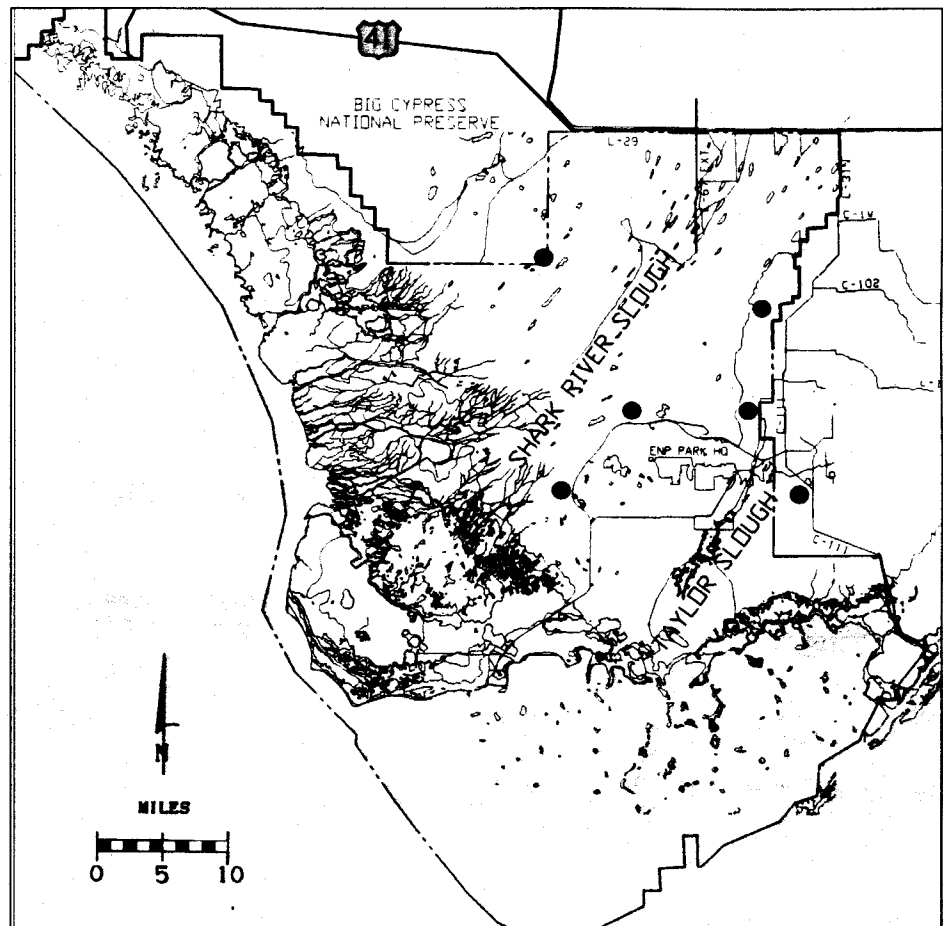
The problems cited above have a familiar ring when contemplating recovery for the Cape Sable seaside sparrow. In the case of the dusky, none of the recovery objectives were met. We need to be certain that we react differently for the Cape Sable seaside sparrow or we will suffer similar consequences. As of today, the majority of the recovery objectives identified in the Cape Sable seaside sparrow recovery plan in 1983 remain unaccomplished, and population numbers are declining. Flood control for agriculture and urban dwellings has taken precedence over re-establishing more natural hydropatterns in Cape Sable seaside sparrow habitat. If we do not begin to implement recovery objectives that restore the natural hydrologic conditions, thus allowing the native vegetative communities to exist, we will be forced to accept that, once again, we have failed.

The Cape Sable seaside sparrow evolved in a variable environment. This variability allowed an abundance of organisms with different habitat needs to co-exist. For example, the endangered snail kite (*Rhostrhamus sociabilis plumbeus*) requires areas of deep water that support apple snails for optimal foraging habitat; the endangered wood stork (*Mycteria americana*), requires water levels to drop to concentrate fish during the breeding season. These conditions differ from those breeding conditions required by the Cape Sable seaside sparrow who, as stated above, require less than 10 cm of surface water to nest successfully; yet these species evolved to co-exist in the Everglades system and could do so because of the large spatial extent and diverse environmental conditions available in the South Florida landscape (Davis and Ogden 1994). If we manage the system to mimic the conditions that historically existed, the needs of the Cape Sable seaside sparrow should not conflict with other native Everglades species.

Status and Trends

The Cape Sable seaside sparrow (*A. mirabilis*) was listed as an endangered species on March 11, 1967, pursuant to the Endangered Species Preservation

Other subpopulations of the Cape Sable seaside sparrow show similar changes in distribution and abundance. Cape Sable seaside sparrows were ini-



tially located in the Ochopee marshes of the Big Cypress basin by Anderson (1942), but few birds have been found since the mid-1980's. The decline of this subpopulation has been attributed to fires and salinity changes associated with altered hydrology (FWS 1983).

western portion of its range, west of Shark River Slough and in the Big Cypress National Preserve, water management practices that change the hydroperiod from short- to long-hydroperiod wetlands during the breeding season, and that have resulted in changes in the habitat, also threaten the Cape Sable seaside sparrow. West of Shark River Slough, subpopulation A has been reduced from greater than 2,600 individuals in the early 1980s, to only 272 individuals in 1997. In the early 1980s, subpopulation A represented greater than 50 percent of the population; in 1997, it represented only approximately 7 percent of the total population. This severe decline in one of two core subpopulations jeopardizes the long-term survival of the Cape Sable seaside sparrow.

The only remaining core subpopulation of the species, subpopulation B, declined slightly from 1992-1995, remained stable from 1995-1996, and increased in 1997. As stated above, it is not clear whether these changes represent natural variation or a response to some type of stressor, but, loss of individuals from this subpopulation increases the susceptibility of the population to extinction. The preservation of this subpopulation will be critical to the survival of the sparrow; re-establishment of subpopulation A will be dependent on the movement of birds from population B (J. Curnutt, University of Tennessee, personal communication, 1997).

The small total population size and small number of subpopulations jeopardizes the survival and recovery of the Cape Sable seaside sparrow. If the population size becomes too small to allow birds to recolonize areas that have been locally extirpated, the species will become much more prone to extinction. The Cape Sable seaside sparrow has been reduced to a single subpopulation (subpopulation B) that supports enough individuals to function as a source for recolonization (emigration) of other areas. Unfortunately, this subpopulation is located in an area that is prone to wildfires and is limited in geographic extent.

Competition and predation also threaten the Cape Sable seaside sparrow. Raccoons (*Procyon lotor*) and rice rats (*Oryzomys palustris*) may be the chief predators. Werner (1978) stated that predation by feral cats and dogs, anthropogenic fires, and human land exploitation could have caused the population declines of the sparrow in the Ochopee region.

Management

South Florida's ecosystems have been severely degraded by the Central and Southern Florida Project which encompasses 4,660,000 ha from Orlando to Florida Bay, and includes about 1,600 km each of canals and levees, 150 water control structures, and 16 major pump stations. This system has disrupted the natural volume, timing, quality and flow of surface and ground water throughout the Everglades. In recognition of the detrimental affects that this flood control system has had on the ecosystems in South Florida, numerous hydrologic projects, whose purposes are to aid in the restoration of South Florida's ecosystems while maintaining flood control, are in various stages of planning and implementation. These hydrologic restoration projects will provide us with the some of the tools necessary to restore habitat critical to the recovery of the Cape Sable seaside sparrow.

It is critical to recognize, up front, that there lies some level of risk inher-

Modified Water Deliveries Project, at a minimum, needs to be completed, and other actions associated with the overall restoration will need to occur. The FWS believes alternative strategies must be devised to reduce the impacts to Cape Sable seaside sparrows associated with present-day structures and operational schedules, including those associated with flood control. For example, interim measures should include actions that reduce the adverse effects of regulatory releases on Cape Sable habitat and result in conditions that more closely mimic those of the historical system. During periods of drought, rainfall delivery formulas which result in more natural hydropatterns should be implemented.

Changes in hydropatterns within the historical range of the Cape Sable seaside sparrow have occurred as a result of the construction of the Central and Southern Florida Flood Control Project (C&SF), its associated operational schedules, and flood control regulatory releases. Vegetative communities within the range of the sparrow have been disturbed as a result of these changes in hydropatterns. Actions should be taken to restore vegetative patterns that more closely mimic conditions that existed prior to the C&SF project.

Limited information is available about the relationship of the Cape Sable seaside sparrow to fire. Werner's earlier work (1975) indicated that the use of areas declined dramatically four years after fire; however, there are several areas in Everglades NP utilized by sparrows that have not burned in 6-10 years. Werner's results may have been specific to the Taylor Slough region. Taylor (1983) found that the response of sparrows following fire appears to be a response to soil depth and other fertility factors. Sparrows re-occupy sites with shallow soil approximately four years after a burn, but populations may remain at low densities (2-5 males per 40.47 ha) for up to 10 years. On deeper soils or on soils without pinnacle rock, birds are present the second breeding season after a burn and increase in numbers through the fourth year (Taylor 1983). Curnutt (University of Tennessee, personal communication 1997) also found that sparrows numbers increase up to 10 years following a fire. Information is needed on the environmental factors that render an area unsuitable to sparrows and if managed burns are necessary to increase habitat suitability.

Subpopulation B of the Cape Sable seaside sparrow, centered around Old Ingraham Highway in Everglades NP, may be at risk because of fire. Studies need to be implemented to determine whether managed burns are necessary to sustain healthy muhly prairie communities; a comprehensive burn management strategy for Cape Sable seaside sparrow habitat within Everglades NP and Big Cypress National Preserve should be developed and implemented.

It is important to note that burn events at suboptimal times may eventually bring the population below minimum viable levels. When fire regimes are not manipulated appropriately, shrubs and other hardwoods become established, rendering the area unsuitable. Kushlan *et al.* (1982), recommends that burns be conducted in a mosaic of not more than 200 ha of burned and unburned areas. Additionally, the maintenance of historic water levels is critical and fire should not be substituted for lower water levels.

As stated earlier, Cape Sable seaside sparrows evolved in a naturally variable environment. Species evolving in variable environments develop behav-

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Recovery for the Cape Sable Seaside Sparrow

Ammodramus maritimus mirabilis

Recovery Objective: RECLASSIFY to threatened once recovery criteria are met.

Recovery Criteria

Before its listing as an endangered species in 1982, the distribution and abundance of the short-hydroperiod prairies that provide habitat for the Cape Sable seaside sparrow had decline by more than 50 percent because of the destruction, fragmentation, and degradation due to residential housing construction or agriculture. These areas are not restorable. Many of the remaining short-hydroperiod prairies that support the Cape Sable seaside sparrow have been converted into long-hydroperiod wetlands by water management practices in South Florida; the feasibility of restoring these areas is still uncertain. Consequently, this recovery plan outlines criteria for reclassifying the Cape Sable seaside sparrow from endangered to threatened.

This objective will be achieved if the loss of functional Cape Sable seaside sparrow habitat, as a result of current and past water management practices, and the invasion of woody and exotic species, is eliminated; if Cape Sable seaside sparrow habitat west of Shark River Slough and in Taylor Slough, which has been degraded by current and past water management practices, is restored so that it support breeding populations larger than those measured in those areas for 1981 for 10 years; when demographic information on the Cape Sable seaside sparrow supports, for a minimum of five years, a probability of persistence [$T_{(N)}$] that is equal to or greater than 80.0 percent (± 0.05), for a minimum of 100 years; when the rate of increase (r) for the total population is equal to or greater than 0.0 as a 3-year running average for at least 10 years; when a minimum of two stable, self-sustaining core breeding areas are secured; if three auxiliary sites (in addition to two core areas) are maintained and are used for breeding by a minimum of 10 percent of the total population for a minimum of two out of every five years during a 10 year period; when a stable age structure is achieved in the core populations and two other subpopulations; when a minimum population of 6,600 birds is sustained for an average of 5 years, with all fluctuations occurring above this level; and when the health ecosystem of the Cape Sable seaside sparrow is protected from the effects of water management practices throughout the species' historical range.

Species-level Recovery Actions

S1. Determine the distribution and status of Cape Sable seaside sparrows.

S1.1. Continue and expand distribution surveys. Conduct annual distribution surveys in all areas known to have historically supported Cape Sable seaside sparrows. Expand distribution surveys as appropriate, based on results of previous nesting and telemetry surveys. Surveys information will be used to approximate total population numbers.

- S2.2.2. Recover the core subpopulation west of Shark River Slough.** Between 1981 and 1993, an important core area west of Shark River Slough supported nearly half of the total sparrow population. By 1996, the number of sparrows utilizing the habitat west of Shark River Slough had decreased by approximately 85 percent (Pimm *et al.* 1996 *op. cit.*). The main factor affecting sparrow habitat in this area is disruption of natural hydrologic patterns. The key to restoring this subpopulation will be the restoration of more natural flows to northeast Shark River Slough and a reduction of damaging regulatory releases through the S-12 structures.
- S2.2.3. Recover East Everglades-Taylor Slough subpopulations to levels consistent with restored hydropatterns.** The major factors affecting birds within these regions are fire and hydrologic conditions. To maintain populations in Taylor Slough and adjacent areas of eastern Everglades NP, the effects of water management and fire management programs should be considered. The effects of the operation of pump stations and adjacent canals should be evaluated. The effects of the fire program should also be evaluated, specifically, the effects of large area burns, including boundary burning.
- S2.2.4. Create opportunities for this species to recolonize former habitat, including Lostman's Slough, the historic Ochopee population, and any additional sites that may be suitable within Everglades NP, BICY, and the Everglades Wildlife Management Area.** Some sites used by Cape Sable seaside sparrows include areas that have been hydrologically managed to remain artificially dry. With the implementation of hydrologic restoration projects, these sites may no longer be suitable for Cape Sable seaside sparrows. Therefore, it will be critical to have identified additional sites suitable for colonization by Cape Sable seaside sparrows.
- S2.2.5. Restore disturbed habitats identified as potential Cape Sable seaside sparrow habitat.** Restore habitats for recolonization by Cape Sable seaside sparrows. Management techniques to restore disturbed Cape Sable seaside sparrow habitat may include controlled burning, hydrologic manipulation, and exotic removal.
- S2.3. Develop the appropriate water management regimes to protect Cape Sable seaside sparrows in Everglades NP, Big Cypress National Preserve, and the Everglades Wildlife Management Area.** The Cape Sable seaside sparrow is restricted to the marl prairies of South Florida that are in public ownership. Many of these prairies have been altered by water management practices. Protecting the existing core breeding populations of the Cape Sable seaside sparrow is critical to the species' survival and recovery; the ability of these populations to breed will depend on changing current water management regimes to improve this species breeding habitat.
- S2.4. Utilize federal regulatory mechanisms to protect the Cape Sable seaside sparrow and its habitat.**

- S2.6.1. Develop a protocol for a controlled propagation program for the Cape Sable seaside sparrow.** Develop protocol for a Cape Sable seaside sparrow controlled propagation program as per Department of Interior and Department of Commerce draft controlled propagation policy. The plan will identify the lead agency responsible for the effort, including the role of FWS facilities, personnel and resources, or those of non-FWS cooperators, as appropriate, and the estimated cost and duration of controlled propagation efforts.
 - S2.6.1.1. Review the controlled propagation protocol developed for the Dusky seaside sparrow, identify weaknesses and inconsistencies, and make the appropriate changes for Cape Sable seaside sparrows.** Protocol established for the Dusky seaside sparrow failed to accomplish the goal of keeping the population from becoming extinct. We can learn from our mistakes and develop better protocol for Cape Sable seaside sparrows.
 - S2.6.2. Develop a genetic's management plan for Cape Sable seaside sparrows and submit for approval.** Controlled propagation can only be initiated when supported by an approved genetic's management plan.
- S3. Conduct research on aspects of the life history and population ecology of Cape Sable seaside sparrows.** To properly manage habitat and to account for the effects of management actions and natural events, it is necessary to conduct certain studies on Cape Sable seaside sparrows. Overall, the goals of such studies are to understand the species' demographics, limiting factors, and the extent that habitat characteristics limit expansion of the population. This information will also be necessary to determine whether translocation and /or captive propagation is necessary or feasible.
 - S3.1. Continue research on the ecology of Cape Sable seaside sparrows outside of the breeding season.** Little is known about the behavior or habitat needs of the sparrow outside of the breeding season. Information on sparrow habitat use throughout the year will lead to better habitat management for the bird.
 - S3.1.1. Identify all areas that provide essential habitat for all life stages of the Cape Sable seaside sparrow.** Critical areas should be identified and managed appropriately.
 - S3.1.2. Determine seasonal movement patterns and colonizing ability.** Determine the movement patterns of adults outside of the nesting season and the dispersal and mortality of fledglings; this information will aid in understanding how the Cape Sable seaside sparrow colonizes suitable, unoccupied habitat.
 - S3.2. Better define the habitat requirements of the Cape Sable seaside sparrow.** The specific habitat needs of the seaside sparrow need better definition. It is necessary to determine habitat correlates of abundance, adult survival, nest placement, predation, and reproductive success. It is also important to determine roles of water regime and hydroperiod, physical structure of the grass community, the specific effects of brush and tree invasion and possibly other subtle habitat features required by the sparrows throughout the year. For example, what do sparrows do when all habitats are flooded during July-October?

- H1.1.1.** Review the impacts of Water Conservation Area 3A's regulation schedule on Cape Sable seaside sparrows in western Shark River Slough and northeast Shark River Slough. If found to be inhibiting the use of these areas by Cape Sable seaside sparrows, modify the regulation schedule to result in total deliveries to Shark River Slough (including regulatory releases) that correspond to a rainfall-delivery schedule. The frequency and quantity of flow associated with regulatory releases from Water Conservation Area 3A should be reduced to levels that maintain habitat west of Shark River Slough for Cape Sable seaside sparrows during the breeding season.
 - H1.1.2.** Place gaps in the L-67 extension levee at one-mile intervals or completely remove the levee. Although removal of the L-67 levee is a component of an authorized COE project (Modified Water Deliveries to Everglades National Park), its implementation is not scheduled for at least 10 years. If the current regulation schedule for WCA 3A is found to preclude sparrow use of the habitat west of Shark River Slough, implementation of the L-67 portion of the Modified Water Deliveries project should moderate the adverse affects of this schedule, and removal of the L-67 extension should receive priority. Removal of the L-67 extension will reduce the adverse effects of regulatory releases on the breeding habitat of the Cape Sable seaside sparrow west of Shark River Slough by allowing regulatory releases to distribute more naturally across all of Shark River Slough.
 - H1.1.3.** Review the effects of hydrologic restoration in Everglades National Park, Big Cypress National Preserve, and the Everglades Wildlife Management Area on areas utilized by Cape Sable seaside sparrows and make the appropriate management decisions. For example, if a specific restoration alternative is found to reduce the ability of the Cape Sable seaside sparrow to breed in that region, we need to determine whether that locality can be "sacrificed" for the good of the "whole" Everglades ecosystem (without causing the Cape Sable seaside sparrow's extinction) or whether alternatives for hydrologic restoration will be necessary to prevent the extinction of the Cape Sable seaside sparrow.
- H1.2.** Develop detailed habitat maps of Cape Sable seaside sparrow habitat. Collect detailed habitat information and enter this information into a GIS database.
- H1.3.** Monitor changes in habitat as a result of changes in hydrologic regimes and fire events. Using the detailed habitat maps developed per task 1.2, monitor changes in the distribution and suitability of the Cape Sable seaside sparrows' habitats over time.
- H1.4.** Determine the necessary management practices to maintain or restore Cape Sable seaside sparrow habitat (as identified by 1.2 above).
- H2.** Restore habitat in the Everglades and Big Cypress basins. Some habitats utilized by Cape Sable seaside sparrows in past years are no longer suitable. Restore these areas for recolonization by Cape Sable seaside sparrows.

- H5. Increase public awareness about short hydroperiod marl prairies and their key role in the Everglades ecosystem.** Produce brochures, signs, and other materials to educate the public about the ecological role of the Cape Sable seaside sparrow in the Everglades and the importance of preserving what limited short hydroperiod marl prairie remains. The public should understand that the continued existence of Cape Sable seaside sparrows is an indication of a healthy Everglades and that functional short-hydroperiod marl prairies are necessary to have a restored Everglades ecosystem