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# Cape Sable Seaside Sparrow

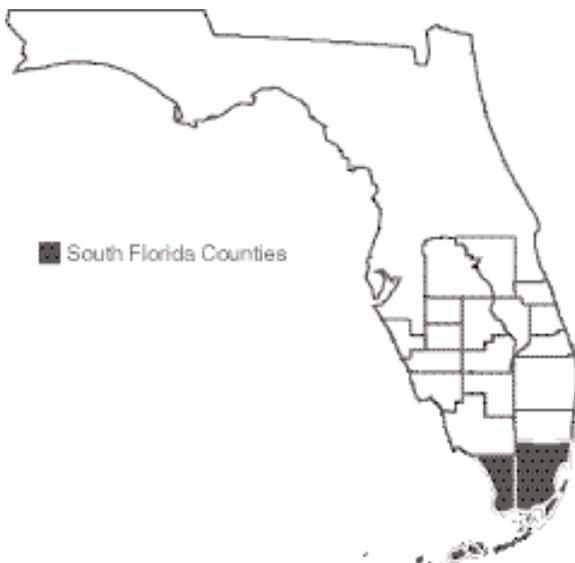
*Ammodramus maritimus mirabilis*

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<b>Federal Status:</b>	<b>Endangered (March 11, 1967)</b>
<b>Critical Habitat:</b>	<b>Designated (August 11, 1977)</b>
<b>Florida Status:</b>	<b>Endangered</b>
<b>Recovery Plan Status:</b>	<b>Revision (May 18, 1999)</b>
<b>Geographic Coverage:</b>	<b>Rangewide</b>

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Figure 1. County distribution of the Cape Sable seaside sparrow.



Cape Sable seaside sparrows (*Ammodramus maritimus mirabilis*) are medium-sized sparrows restricted to the Florida peninsula. They are non-migratory residents of freshwater 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 led to its initial listing in 1969. Changes in habitat that have occurred as a result of changes in the distribution, timing, and quantity of water flows in South Florida, 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).

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## Description

The Cape Sable seaside sparrow is a medium-sized sparrow, 13 to 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.

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## Taxonomy

Seaside sparrows are members of the family Fringillidae. There are nine recognized subspecies. Two of the subspecies, the Cape Sable seaside sparrow and the recently extinct dusky seaside sparrow (*Ammodramus maritimus nigrescens*), occurred in isolated and restricted ranges (Curnutt 1996), and were once considered separate species (AOU 1983). Howell (1919) originally described the Cape Sable seaside sparrow and named it *Thryospiza mirabilis*, based on its distinct plumage and size. Due to its light coloration, Griscom (1944) and Beecher (1955) considered it to be a form of seaside sparrow (*Ammospiza maritima*). Stimson (1956, 1968) noted similar behavioral characteristics to the dusky seaside sparrow, and, in 1973, the Cape Sable seaside sparrow was designated as a subspecies of the seaside sparrow (Eisenmann 1973). The scientific name of the Cape Sable seaside sparrow was officially changed from *Ammospiza maritima* to *Ammodramus maritima* in 1982 (AOU 1983). Because Cape Sable seaside sparrows utilize habitats markedly different from those utilized by other seaside sparrows, Curnutt (1996) proposes full species status for the Cape Sable seaside sparrow.

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## Distribution

The eight surviving subspecies of seaside sparrow are distributed along the east coast of the United States, from Massachusetts to southern Florida, and along the Gulf coast, from southeast Texas to the west coast of Florida. Cape Sable seaside sparrows have a very restricted range and occur only in the Everglades region of Miami-Dade and Monroe counties in South Florida (Figure 1). They are non-migratory and isolated from other breeding populations of seaside sparrows. The Scott's seaside sparrow, which is the closest in locality to the Cape Sable seaside sparrow, occurs 300 km to the north. When Howell first discovered Cape Sable seaside sparrows on Cape Sable in Monroe County, the sparrows were utilizing freshwater and brackish water marshes there. The original range most likely included all suitable habitat in south and southwestern Florida (Werner 1978), and extended from Cape Sable (south) to Ochopee (northwest), and east to Taylor Slough and the east Everglades. Presently, the known distribution of the sparrow is restricted to two areas of marl prairies east and west of Shark River Slough, and flanking Taylor Slough.

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## Habitat

In the 1930s, Cape Sable was the only known breeding range for the sparrow (Nicholson 1928); areas on Cape Sable that were occupied by Cape Sable seaside sparrows in the 1930s have experienced a shift in vegetative communities from freshwater vegetation to mangroves, bare mud flats, and salt-tolerant plants such as *Batis maritima* and *Borrchia frutescens* (Kushlan and Bass 1983). The hurricane of 1935 is believed to have initiated the succession of the plant community on Cape Sable from one dominated by freshwater plants to one dominated by salt tolerant plants. Sea level rise, reduced freshwater flows to the area resulting from upstream water management practices, and another hurricane in 1960 were also likely factors in this habitat change. As a result, Cape Sable seaside sparrows no longer use this area.

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**Cape Sable seaside sparrow.**

*Original photograph courtesy of  
Everglades National Park.*



The currently preferred nesting habitat of Cape Sable seaside sparrows appears to be a mixed marl prairie community that often includes 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, 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). Several studies (Armentano *et al.* 1995, Curnutt *et al.* 1998, Nott *et al.* 1998) have documented a tight correlation between increased hydroperiods resulting from current water management practices, and shifts in sparrow habitat areas from mixed marl prairie vegetation suitable for breeding to sawgrass-dominated vegetation that sparrows do not use for nesting. Qualitative observations (S. Pimm, University of Tennessee, personal communication 1998) suggest that some sparrow habitat areas west of Shark River Slough that were converted to unsuitable sawgrass-dominated vegetation types have now begun to recover under the somewhat dryer conditions observed in 1997 to 1998.

The suitability of short-hydroperiod, mixed marl prairie communities 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 3 years previously. Four years after a fire, he expected the suitability of these habitats to decline sharply. Taylor (1983) suggested that the response of the sparrow population following fire is dependent on the rate of vegetation recovery, the soil depth, and the amount of exposed pinnacle rock. Taylor (1983) found that on sites where soil depth was 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 4 years post fire (Taylor 1983). However, recent analysis suggests that a 4 year fire return frequency reduces habitat suitability and causes decline in resident sparrow populations (Curnutt *et al.* 1998). This most recent study observed increased sparrow numbers up to at least 10 years post fire (Curnutt *et al.* 1998). Results of a recent wintering ecology study (Dean and Morrison 1998) reveal that Cape Sable seaside sparrows remain in short hydroperiod mixed prairie habitats throughout the non-breeding season.

### **Critical Habitat**

Critical habitat for the Cape Sable seaside sparrow was designated on August 11, 1977 (50 CFR 17.95), before the full distribution of the subspecies was known (Figure 2). The critical habitat, as designated, does not adequately account for the distribution of the present-day core subpopulations, or the areas necessary for continued survival and recovery. An important area west of Shark River Slough, which until 1993 supported one of two core subpopulations (nearly half of the entire population), is not included within the designation, and has been undergoing detrimental changes in habitat structure as a result of water management practices. Additionally, other parts of the designated critical habitat have been converted to agriculture, and are no longer occupied by sparrows. Thus, Cape Sable seaside sparrow critical habitat requires significant review and redesignation. When redesignating critical habitat for the Cape Sable seaside sparrow, it will be important to include all potential habitat necessary for recovery, including areas not recently utilized by the birds. This will help to protect habitat for future expansion of existing subpopulations and provide for the natural variability associated with the Everglades ecosystem. Definition of constituent elements will be another important task when redesignating critical habitat. A key constituent element for the Cape Sable seaside sparrow should be a hydroperiod pattern that maintains the preferred vegetative communities for successful breeding. During the breeding season, surface water levels should be at or below the surface within the short-hydroperiod prairies, and should be achieved through adherence to a rainfall-driven operational schedule. Adherence to such a regulation schedule will provide for restoration of hydroperiods that best support Cape Sable seaside sparrows, in addition to other native Everglades species. Other constituent elements should include vegetative structure necessary to support successful breeding.

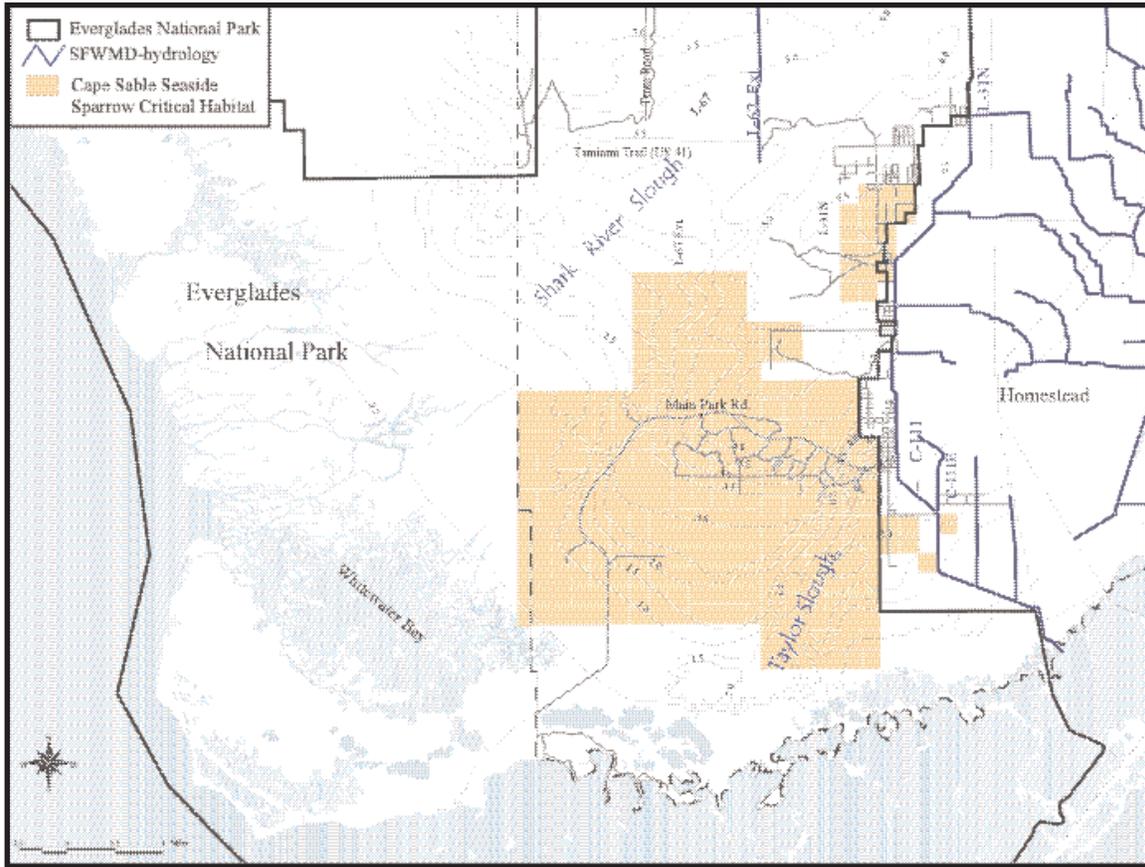


Figure 2. Cape sable seaside sparrow critical habitat.

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## Behavior

### Territoriality

The Cape Sable seaside sparrow is a non-migratory subspecies. As with many other seaside or savannah sparrows, males occupy and defend their territories during the breeding season. Cape Sable seaside sparrows defend territories centered around their nest sites that are smaller than their home ranges (Kushlan *et al.* 1982), but may include foraging habitat. Breeding activity by males, particularly singing behavior, appears to decrease with increased surface-water conditions (Nott *et al.* 1998, Curnutt and Pimm 1993).

### Vocalizations

The primary song of Cape Sable seaside sparrows is sung by males, and is composed of clicks and trills. The head bobs up and down during the introductory clicks and then tilts slightly up and back as the song is completed with a buzzy trill (Werner 1975). The primary song is normally sung from a conspicuous perch and functions to both mark territories and attract mates. The song lasts approximately 1.5 seconds and may be repeated 10 to 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. Singing ceases if water levels rise above approximately 10 cm (Lockwood *et al.* 1997).

### Reproduction and Demographics

Nesting has been observed from late February through early August (FWS 1983). The majority of nesting occurs in the spring when large areas of the marl prairies are dry. Cape Sable seaside sparrows usually raise one or 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 (Lockwood *et al.* 1997). 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 material 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 subspecies. However, Pimm *et al.* (1996), report a significantly lower success rate (42 percent) during the 1995 and 1996 breeding seasons, which were years with extremely high rainfall. Lockwood *et al.* (1997) report an 88 percent hatching rate, but only 40 percent of the eggs laid contribute to the total population each year. Kushlan *et al.* (1982) contend that the population has the ability to maintain or expand due to the 90 percent survival rate of males they observed, and the potential to produce two clutches of four eggs each breeding season. Other researchers estimate a 50 percent adult survival rate (Nott *et al.* 1998) and suggest that the population has a fairly low potential for expansion.

### **Foraging**

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

### **Movements**

The Cape Sable seaside sparrow is nonmigratory. The fidelity of breeding male sparrows to their territories is high; many male seaside sparrows will defend the same area for 2 to 3 years (Werner 1975). Short-range movements have been observed during the nonbreeding season. Preliminary results of a wintering ecology study (J. Lockwood, University of Tennessee, personal communication 1997) report that resighted banded adults during the 1996 to 1997 wet season moved short distances (less than 1 km) from the sites they were banded in during 1995 and 1996. Sparrows have been observed to congregate and fly short distances within their range (Dean and Morrison 1998,

S. Pimm, University of Tennessee, personal communication 1995). Dean and Morrison (1998) also observed several longer-range flights (5 to 7 km) during the nonbreeding season. However, each of these longer-range movements ended when the individual sparrow reached the edge of short hydroperiod marl prairie habitat. Dean and Morrison (1998) further suggest that large expanses of deep water or wooded habitats are barriers to long-range sparrow movements.

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### Relationship to Other Species

The Cape Sable seaside sparrow evolved in a variable environment. This variability allowed an abundance of organisms with different habitat needs to coexist. 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 which, as stated above, requires 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 restore more natural timing, volume and pattern of water flows, the needs of the Cape Sable seaside sparrow should not conflict with other native Everglades species.

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### Status and Trends

The Cape Sable seaside sparrow (*A.m. mirabilis*) was listed as an endangered species on March 11, 1967, pursuant to the Endangered Species Preservation Act of 1966 (32 FR 4001). That protection was continued under the Endangered Species Conservation Act of 1969 and the Endangered Species Act of 1973, as amended. The Cape Sable seaside sparrow was listed because of its limited distribution and threats to its habitat posed by large-scale conversion of land in South Florida to agricultural uses. Critical habitat for the Cape Sable seaside sparrow was designated on August 11, 1977 (42 FR 40685). Historically, the Cape Sable seaside sparrow was found in freshwater and brackish water marshes from Carnestown to the marl prairies adjacent to Shark River and Taylor sloughs, including the Cape Sable area. This area periodically experiences extensive flooding, fires, and hurricanes which may result in shifts in habitat suitability for the Cape Sable seaside sparrow created by changing vegetative composition and structure. Cape Sable seaside sparrows may have adapted to this natural disturbance by varying their distribution within their range as habitat suitability changed.

Howell (1919) found the Cape Sable seaside sparrow to be “moderately numerous” on Cape Sable when he first discovered them in 1918. The Great Labor Day Hurricane of 1935 is thought to have initiated vegetative changes in the Cape Sable area that were later responsible for extirpating the Cape Sable population of the sparrow. Reduced freshwater flow to the area due to upstream

water management practices, along with sea level rise, may also be contributing factors. In 1970, Werner rediscovered Cape Sable seaside sparrows in three cordgrass marshes on Cape Sable. By 1979, the Cape Sable subpopulation appeared to have been extirpated again; no sparrows were noted in surveys conducted on Cape Sable in 1979, 1980, or 1981 (FWS 1983). By 1983, the stands of *Spartina*-dominated vegetation that once covered extensive areas of Cape Sable had been reduced to small patches invaded by mangroves (Werner and Woolfenden 1983), and Cape Sable seaside sparrows have not been seen in this area since.

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

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

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

In 1981, Bass and Kushlan (1982) estimated a total of 6,656 birds in the six subpopulations (Table 1); two core subpopulations that held most of the sparrows, and four peripheral subpopulations. Core subpopulation A inhabited the marl prairies west of Shark River Slough extending into Big Cypress National Preserve and held an estimated 2,688 individuals. Core subpopulation B held approximately 2,352 birds inhabiting the marl prairies southeast of Shark River Slough near the center of Everglades NP. Peripheral subpopulation E, north of subpopulation B, held about 672 sparrows, while subpopulation C, located along the eastern boundary of Everglades NP, and subpopulation D, just to the southeast of subpopulation C, held about 400 birds each. Peripheral subpopulation F, the northernmost peripheral subpopulation located on the western edge of the Atlantic coastal ridge, was the smallest subpopulation with an estimated 112 birds. Bass repeated the survey in 1992, with population estimates similar to those in 1981.

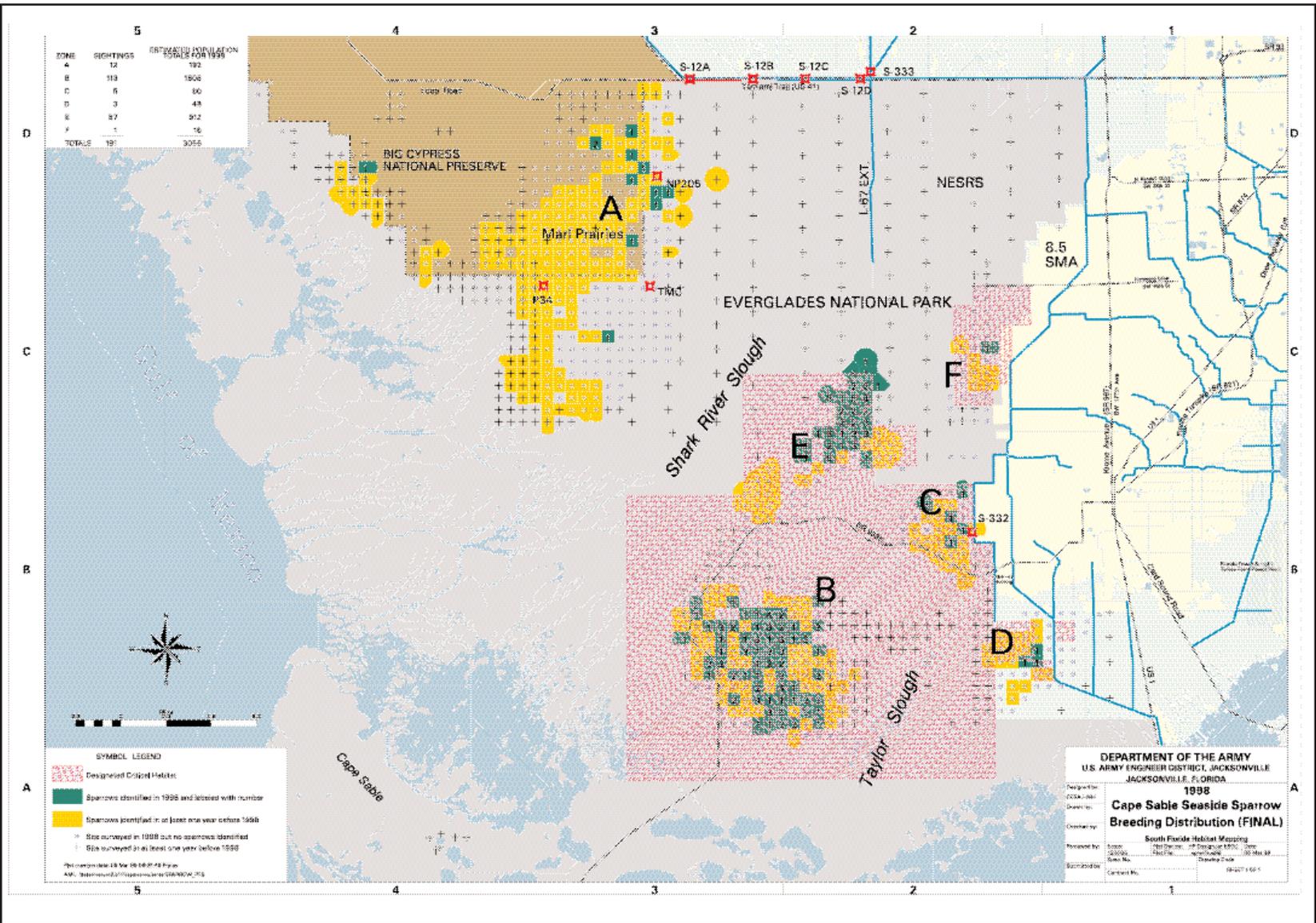


Figure 3. Breeding distribution and designated critical habitat of the Cape Sable seaside sparrow.

**Table 1. Cape Sable seaside sparrows population estimates from Everglades NP.**

Subpopulation	1981	1992	1993	1994	1995	1996*	1997	1998
A	2688	2608	432	80*	240	272	272	192
B	2352	3184	2464	2224	2128	1888	2832	1808
C	432	48	0	-	0	48	48	80
D	400	112	96	-	0	80	48	48
E	672	592	320	112	352	208	832	912
F	112	32	0	-	0	16	16	16
TOTAL	6656	6576	3312	2416*	2720	2512	4048	3056

Population estimate = Number of singing males counted X 16 (based on final proofed data sets from Everglades National Park as of 16 November 1998; except 1996 should be considered provisional, pending final proofing).

\* Estimate based on incomplete survey.

- No survey conducted.

Table 1 presents the results of the last eight censuses of the Cape Sable seaside sparrow (Bass 1998). The actual number of birds observed is corrected to give an estimate for the total population using the methods developed by Bass and Kushlan (1982). Logistical problems resulted in incomplete surveys in 1994.

In 1981 and 1992, the area west of Shark River Slough (subpopulation A) supported nearly half of the total Cape Sable seaside sparrow population. Starting in 1993, the number of individuals declined precipitously in this area. By 1994 and 1995, the birds were absent from this area except for a few locations (Pimm *et al.* 1994, Pimm *et al.* 1995), and the number of individuals had dropped to less than 10 percent of 1992 numbers. Population estimates improved slightly during the 1996 breeding season as the numbers of sparrows found west of Shark River Slough increased from approximately 240 in 1995 to 272 birds in 1996 and 1997 (Pimm *et al.* 1996). However, in 1998, the total number of birds west of Shark River Slough declined again to about 192 birds (Bass 1998).

Core subpopulation B increased by more than 800 birds from 1981 to 1992, declined slightly from 1992 to 1995, remained stable from 1995 to 1997, and decreased by approximately 1,000 individuals in 1998 (O. Bass, Everglades NP, personal communication 1998). It is not clear whether these changes in subpopulation B numbers represent natural variation or a response to some type of stressor, but loss of individuals from this subpopulation increases the susceptibility of the subspecies to extinction.

Curnutt *et al.* (1998) noted the following regarding the peripheral subpopulations: subpopulation C declined to 11 percent of its 1981 value by 1992. After 3 years of no birds, 48 birds were estimated in this area in 1996 and 1997 and 80 birds were estimated in 1998. Subpopulation D declined from 1981 to 1993, and was not counted in 1994. No birds were found in 1995, but 80 birds were estimated in this area in 1996, and 48 in 1997 and 1998. Subpopulation E decreased little between 1981 and 1992, fluctuated in the mid

1990's and increased to 912 in 1998. No sparrows were observed in subpopulation F in 1993, and only 16 birds were estimated in 1996 to 1998.

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

This combination of an approximately 90 percent decline in the western core subpopulation, a 60 percent decline in the overall sparrow population, and the significant risk of catastrophic fire in the sparrow's remaining core subpopulation B, has led the FWS to conclude that this subspecies is at significant risk of imminent extinction. The best scientific and commercial information available to the FWS also leads to the conclusion that current water management practices in the remaining Everglades are primarily responsible for declines in the sparrow population since 1992 and, therefore, jeopardize the continued existence of this endangered species. At this writing, negotiations are underway to develop a reasonable and prudent alternative to current water management practices that will avoid jeopardy conditions.

Competition and predation also threaten the Cape Sable seaside sparrow. Raccoons (*Procyon lotor*), snakes, rice rats (*Oryzomys palustris*), and hawks may be the chief predators (Lockwood *et al.* 1997, Dean and Morrison 1998). Predation by cottonmouth (*Agkistrodon piscivorus*) has been documented (T. Dean, Eagle Environmental, Inc., personal communication 1998). Lockwood *et al.* (1997) also suggest that increasing water levels are associated with significant increases in predation rates. Additional research on predation rates and their relation to water levels is needed.

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## 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. The Cape Sable seaside sparrow's short hydroperiod prairie habitat is contained entirely within the C&SF Project and has been extensively altered by this project (Nott *et al.* 1998). Because the sparrow's

habitat is primarily dependent upon proper hydrological conditions for its restoration and maintenance, improving the sparrow's habitat through changes in the current C&SF Project operations will be the highest priority recovery action for this subspecies.

In recognition of the detrimental effects that this water supply and flood control system has had on the ecosystems in South Florida, several hydrological projects which attempt to aid in the restoration of South Florida's ecosystems, while maintaining flood control, are in various stages of planning and implementation. Recent FWS analyses of these projects through section 7 consultation reveals mixed results in expected effects to the Cape Sable seaside sparrow. Details of these analyses are available in the August 7, 1998 biological opinions for the C&SF Project Comprehensive Review Study (Restudy) and the February 19, 1999, biological opinion for the Program of Modified Water Deliveries to Everglades NP Project (Modified Waters), C-111 Project and Experimental Program of Water Deliveries to Everglades National Park (Experimental Program). In summary, the Restudy, Modified Waters and C-111 projects are expected to provide improved habitat suitability and availability for the Cape Sable seaside sparrow as compared to current conditions. The FWS has concluded that Tests 1 to 7 of the Experimental Program are the primary cause of declines in sparrow populations since 1992 and have jeopardized, and will continue to jeopardize the continued existence of this endangered species. At this writing, negotiations are underway seeking to develop an acceptable reasonable and prudent alternative to the current Test 7 of the Experimental Program that would avoid further jeopardy conditions.

It will be critical to carefully monitor hydrology, vegetation and sparrow populations as new hydrological schedules are implemented in order to ensure that unexpected adverse effects to the Cape Sable seaside sparrow do not occur. With careful monitoring and continued close coordination with the FWS and other natural resource professionals, the Modified Waters and Restudy projects have the potential to provide significant progress towards recovery for this subspecies.

Fire management and control of exotic woody vegetation will also be essential to restoration and maintenance of Cape Sable seaside sparrow habitats. Early research in this area (Werner 1975) suggested that sparrow use of habitat areas declined dramatically 4 years after fire in the Taylor Slough area. Taylor (1983) suggested that the relationship may depend on soil depths, with sparrows reoccupying sites with shallow soils about 4 years after a burn and remaining at low densities (2 to 5 males per 40.5 ha) for up to 10 years. On deeper soils or on soils without pinnacle rock, sparrows were present in the second breeding season after a burn and increased in numbers through the fourth year. More recent research (Curnutt *et al.* 1998) documents increasing sparrow numbers up to at least 10 years following fire. Several recent authors (Curnutt *et al.* 1998, Nott *et al.* 1998, Pimm *et al.* 1996) agree that observed annual or biannual fire return frequencies over large areas of the sparrow's eastern habitats are directly linked to reduced hydroperiods in these areas produced by current water management practices, and are the most likely cause of declines, and failure to recover, in subpopulations F and C. This effect is exacerbated by invasion of exotic and other woody vegetation over much of the

eastern marl prairies, rendering the habitat unsuitable for sparrow breeding even when fire frequencies are reduced. In addition, subpopulation B habitat has not experienced a large-scale fire since 1989, and Everglades NP fire experts warn that occurrence of a large, possibly catastrophic fire in this area is only a matter of time. Additional research is necessary to determine optimum fire frequencies for each habitat area and to develop effective fire management techniques for restoring and maintaining suitable sparrow habitat.

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# Recovery for the Cape Sable Seaside Sparrow

*Ammodramus maritimus mirabilis*

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

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## Recovery Criteria

Before the sparrow's listing as an endangered species, the distribution and abundance of the short-hydroperiod prairies that provide habitat for the Cape Sable seaside sparrow had declined by more than 50 percent due to destruction, fragmentation, and degradation of habitat for residential housing construction or agriculture. These areas are probably not restorable. Many of the remaining short-hydroperiod prairies that supported the Cape Sable seaside sparrow have been converted into long-hydroperiod wetlands, or have been degraded due to increased fire frequencies and/or woody species invasion as a result of reduced hydroperiods by water management practices in South Florida. The feasibility of fully 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 plant 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; when demographic information on the Cape Sable seaside sparrow supports, for a minimum of 5 years, a probability of persistence [ $T(N)$ ] that is equal to or greater than 80 percent ( $\pm 0.05$ ), 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 three stable, self-sustaining core breeding areas are secured; when a stable age structure is achieved in the core populations; and, when a minimum population of 6,600 birds is sustained for an average of 5 years, with all fluctuations occurring above this level.

## 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 and peer review. Survey information will be used to approximate total population numbers.
- S1.2. **Incorporate information from wintering ecology studies on Cape Sable seaside sparrow habitat use into a GIS database.** Information on the distribution of Cape Sable seaside sparrows during the nonbreeding season should be incorporated into a GIS database.

- S1.3. Review and revise the current critical habitat designation based on distribution surveys.** Presently designated critical habitat does not adequately encompass the areas occupied by core populations and must be re-evaluated. Critical habitat should, at minimum, include habitat west of Shark River Slough that supports one of the two core subpopulations, and should include an analysis of wintering habitat requirements. Additionally, some of the currently designated critical habitat has been lost to agricultural development and may not be appropriate for inclusion in a revised designation.
- S1.4. Survey habitat components of both occupied and unoccupied habitat to determine why Cape Sable seaside sparrows are absent.** An improved understanding of Cape Sable seaside sparrow habitat selection within short-hydroperiod marl prairies will improve our ability to optimally manage sparrow habitats.
- S2. Protect existing populations of Cape Sable seaside sparrows.** Existing short-hydroperiod marl prairie must be protected and enhanced for Cape Sable seaside sparrows if the population is to survive. Current water management practices must be changed to restore more natural timing, volume, and placement of water flows.
- S2.1. Develop the appropriate water management regimes to protect Cape Sable seaside sparrows in Everglades NP, Big Cypress National Preserve, and the Southern Glades Wildlife and Environmental 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 and will depend on changing current water management regimes to improve this species' breeding habitat.
- S2.2. Conduct section 7 consultations on Federal activities that may affect Cape Sable seaside sparrows.** Numerous Federal activities to restore the Everglades ecosystem are in planning stages or are currently in operation. Cape Sable seaside sparrows are presently utilizing habitats that will be affected by these activities. Any Federal activities resulting in changes in hydropatterns within areas presently utilized by sparrows must receive thorough analyses with regard to effects on sparrows, and management decisions must be made that allow sparrow numbers to remain stable or increase.
- S2.3. Develop and implement Reasonable and Prudent Alternatives (RPAs) to avoid the likelihood of jeopardy.** Current water management practices are jeopardizing the continued existence of the Cape Sable seaside sparrow. RPAs that will avoid further jeopardy conditions must be developed and implemented.
- S3. Increase the distribution and abundance of the Cape Sable seaside sparrow.** Where possible, potential habitat should be managed to encourage (re)occupation by Cape Sable seaside sparrows. In general, maintenance and/or restoration of Cape Sable seaside sparrows in all areas will involve water management, fire management, control of exotics, and control of human-related habitat impacts (airboats, *etc.*).
- S3.1. 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 90 percent (Pimm *et al.*

1996). The main factor affecting sparrow habitat in this area is disruption of natural hydrological 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.

- S3.2. Recover East Everglades-Taylor Slough subpopulations to levels consistent with restored hydropatterns.** The major factors affecting birds within these regions are fire and related hydrological conditions. To maintain populations in Taylor Slough and adjacent areas of eastern Everglades NP and the Southern Glades Wildlife and Environmental Area, 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.
- S3.3. Restore disturbed habitats identified as potential Cape Sable seaside sparrow habitat, creating 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 National Park, Big Cypress National Preserve, and the Southern Glades Wildlife and Environmental Area.** Restore habitats for recolonization by Cape Sable seaside sparrows. Management techniques to restore disturbed Cape Sable seaside sparrow habitat may include controlled burning, hydrological manipulation, and exotic removal.
- S3.4. Re-establish subpopulations of Cape Sable seaside sparrows through translocation.** Every effort should be made to restore and maintain the short hydroperiod marl prairies. However, if efforts to manage water deliveries and habitat result in improved habitat conditions, but do not result in a stable or increasing Cape Sable seaside sparrow population, then translocation should be initiated as a last resort.
- S3.4.1. Develop a protocol for translocating Cape Sable seaside sparrows.** The necessary protocol to translocate Cape Sable seaside sparrows needs to be developed. DOI guidelines should be followed.
- S3.4.1.1. Determine the subpopulation levels that will trigger translocation.** Determine the number of sparrows within each subpopulation that will trigger implementation of translocation. Determine the length of time that each subpopulation should remain at these numbers before initiating translocation.
- S3.4.1.2. Determine the subpopulation levels at which the removal of individuals from the donor site has minimal risk.** Determine the minimum number of individuals necessary within a subpopulation before individuals can be removed without causing risk to the donor subpopulation.
- S3.4.1.3. Determine whether translocated individuals must have a specific age structure. A particular age structure may be necessary to improve chances for successful translocation.**

- S3.4.2. Identify recipient sites for Cape Sable seaside sparrows.** There is a need to determine where translocated birds should be placed. Should they be placed in proximity to occupied areas in order to establish a genetic link or do we place them as far from occupied habitat as possible?
- S3.5. Initiate controlled propagation *only* as a last resort for the recovery of Cape Sable seaside sparrows.** Captive propagation is to be used only when all other measures employed to maintain or improve the status of Cape Sable seaside sparrows in the wild have failed, and would be used to produce individuals for release back into the wild.
- S3.5.1. 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.
- S3.5.2. 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 a better protocol for Cape Sable seaside sparrows.
- S3.5.3. Develop a genetic management plan for Cape Sable seaside sparrows and submit for approval.** Controlled propagation can only be initiated when supported by an approved genetic management plan.
- S4. 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.
- S4.1. Continue research on the ecology of Cape Sable seaside sparrows outside of the breeding season.** Additional information about the behavior or habitat needs of the sparrow outside of the breeding season is needed. Information on sparrow habitat use throughout the year will lead to better habitat management for the bird.
- S4.1.1. 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.
- S4.1.2. Determine seasonal movement patterns and colonizing ability.** Determine the movement patterns of adults outside of the nesting season and the dispersal and mortality of adults and fledglings; this information will aid in understanding how the Cape Sable seaside sparrow colonizes suitable, unoccupied habitat.

- S4.2. Better define the habitat requirements of the Cape Sable seaside sparrow.** The specific habitat needs of the sparrow need better definition. It is necessary to determine habitat correlates of abundance, adult survival, nest placement, predation, and reproductive success. Determine individual patterns of habitat use, time budgets, movements, foraging tactics, nesting, foraging activity areas, and year-to-year changes in territory use.
- S4.3. Determine age-specific survivorship for Cape Sable seaside sparrows.** This information will be necessary to determine species' intrinsic rate of increase and persistence time and will be used to determine whether the species can be reclassified to threatened.
- S4.4. Determine age-specific fecundity for Cape Sable seaside sparrows.** This information will be necessary to determine the species' intrinsic rate of increase and will be necessary to determine whether the species can be reclassified to threatened.
- S4.5. Research predation rates and how water levels and other factors influence predation.** A better understanding of predation on the Cape Sable seaside sparrow and the factors that influence predation rates will assist in developing management strategies.
- S4.6. Continue development of population models for the Cape Sable seaside sparrow.** Development of individual-based population viability analysis and risk assessment models should continue. These models can be used to determine possible population responses to changes in its vital rates, particularly in response to water management, fire, and hurricanes.
- S5. Monitor Cape Sable seaside sparrow subpopulations to assure that further declines in range and numbers do not occur and that recovery actions are being implemented and are effective.** Monitoring will be essential in evaluating the success of management actions.
- S6. Increase public awareness about Cape Sable seaside sparrows.** 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 appropriately managing the limited remaining short hydroperiod marl prairies. The public should understand that the continued existence of Cape Sable seaside sparrows is an indication of a healthy Everglades and that to maintain the sparrow, higher priority should be given to managing the habitat for native faunal species as opposed to flood control.

### **Habitat-level Recovery Actions**

- H1. Prevent degradation of existing Cape Sable seaside sparrow habitat in South Florida.** Work with the COE, Everglades NP, Big Cypress National Preserve, GFC, and SFWMD to determine whether proposed restoration hydroperiods will degrade habitats in areas utilized by Cape Sable seaside sparrows or habitat designated as critical habitat. Habitat management should optimize habitats for all of South Florida's flora and fauna, without risking extinction of the Cape Sable seaside sparrow.
- H1.1. Review the effects of hydrologic restoration in Everglades NP, Big Cypress National Preserve, and the Southern Glades Wildlife and Environmental 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 alternatives for hydrologic restoration will be necessary to prevent the extinction of the Cape Sable seaside sparrow.

- H1.2. Develop detailed 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 H1.2, monitor changes in the distribution and suitability of the Cape Sable seaside sparrow's habitats over time to ensure that existing habitat is not degraded.
  - H1.4. Determine the necessary management practices to maintain or restore Cape Sable seaside sparrow habitat (as identified by S1.2 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.
- H2.1. Define the constituent elements of critical habitat for Cape Sable seaside sparrows. Constituent elements are a pivotal part of any critical habitat designation.** When redefining critical habitat for Cape Sable seaside sparrows, constituent elements must be included to allow the critical habitat designation to function as a tool aiding in recovery of the sparrow. Any new critical habitat designation must include hydrologic criteria and should capture the structure and composition of the sparrow's breeding and nonbreeding habitat.
  - H2.2. Establish and implement the appropriate hydrologic regimes necessary to support Cape Sable seaside sparrows.** This should be completed for the area west of Shark River Slough and for any areas identified as potential Cape Sable seaside sparrow habitat, and should include water delivery schedules, operational criteria for water control structures, and adjacent canal water level stages.
  - H2.3. Establish and implement the appropriate fire management necessary to support Cape Sable seaside sparrows.** This task will be especially important for the areas of subpopulations B through F.
  - H2.4. Remove woody species and/or exotics from disturbed habitats previously used by Cape Sable seaside sparrows.** This will allow sparrows to reoccupy these areas when necessary.
- H3. Conduct research on the habitat needs of the Cape Sable seaside sparrow.** Additional information is needed on habitat selection in relation to vegetative succession and factors that influence vegetative succession.
- H3.1. Conduct a quantitative study to better understand changes in dominant plant species that have occurred within the Cape Sable seaside sparrow's breeding habitat in response to local hydrological conditions in Taylor Slough, northeast Shark River Slough and west of Shark River Slough.** There is evidence that shifts have occurred in plant species composition within these regions as a result of altered hydroperiods. By gaining further information on these shifts and correlating changes in vegetation composition with hydroperiod conditions, we will be able to more effectively manage Cape Sable seaside sparrow habitat.

- H3.2. Implement a study to determine the natural and anthropogenic factors that regulate woody plant growth and colonization in short-hydroperiod prairies.** This information will aid in our ability to control woody invasion in short-hydroperiod marl prairies.
- H3.3. Develop methods to manipulate vegetative communities.** Many communities have shifted as a result of hydrologic practices and are in need of restoration for use by Cape Sable seaside sparrows. Management practices (hydrological, fire, and exotic control) should be developed to restore these communities.
- H3.4. Determine the effects of altered hydrologic patterns on the fire frequency of marl prairies.** This information will enable appropriate management of habitats that have been altered by hydrologic regimes over the past 20 years and development of appropriate burn programs.
- H3.5. Continue research on the effects of fire frequency on Cape Sable seaside sparrow habitat use.** Information on the species' response to fire frequency will better enable us to manage habitats appropriately for Cape Sable seaside sparrows.
- H4. Monitor Cape Sable seaside sparrow habitat by implementing a long-term vegetation monitoring program.** This program should be continued for a minimum of 10 years to incorporate inter and intra-annual variability in hydrologic and fire conditions resulting from different rainfall and water management scenarios.
- 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.

