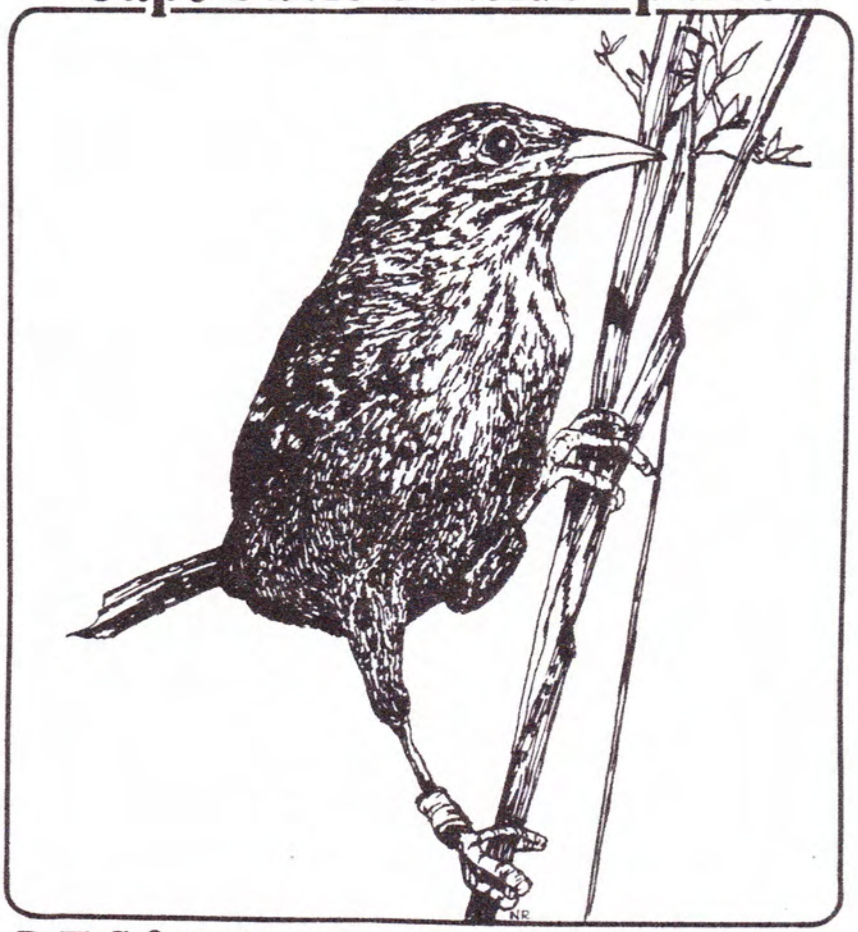
Cape Sable Seaside Sparrow



RECOVERY PLAN

CAPE SABLE SEASIDE SPARROW RECOVERY PLAN

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PART I - INTRODUCTION

The Cape Sable seaside sparrow (Ammodramus [=Ammospiza] maritimus mirabilis), a subspecies of the seaside sparrow restricted to extreme southern Florida, has elicited considerable interest and concern since its discovery in the early 1900's. Before being relegated to subspecific status, it was well known as the last bird species described from the continental United States (Howell 1919; Stimson 1968). It was widely believed to have been exterminated by a hurricane in September 1935, but discoveries, apparent losses, and subsequent rediscoveries of the bird in various areas repeatedly brought it to public attention and aroused concern for its conservation which led to its Endangered status and declaration of Critical Habitat.

The sparrow was discovered by A. H. Howell in 1918 on the coastal prairie of Cape Sable, at the southwest tip of the Florida peninsula (Howell 1919). He described his specimens as Thryospiza mirabilis, defined by plumage characteristics and size. Griscom (1944) and Beecher (1955) considered it to be an extremely light colored seaside sparrow (Ammospiza maritima). Stimson (1956, 1968) commented on similarities in the behavior of Cape Sable seaside sparrows and dusky seaside sparrows (then A. nigrescens). In recent years taxonomic reviews tended to merge both these forms with the polytypic A. maritima, a view formally adopted by the American Ornithologists' Union (AOU) in 1973 (AOU 1957; Eisenmann et al. 1973). The scientific name of the seaside sparrow was officially changed to Ammodramus maritimus in 1982 (AOU 1982).

It is not completely distinctive in plumage and recent studies suggest that its behavior is similar to that of other subspecies. It is unique among seaside sparrows in its ecological setting because it is a bird of inland marshes and flooded prairies in a subtropical, seasonally dry environment. The limited distribution and apparently catastrophic history of this subspecies of the seaside sparrow resulted in its being classified as Endangered under the original Federal listing of Endangered species in 1967. Most Cape Sable seaside sparrow habitat lies within areas managed by the National Park Service.

The seaside sparrow (*Ammodramus* [=*Ammospiza*] *maritimus* *mirabilis* [Wilson]) is widespread along the Atlantic and Gulf coasts of North America from Massachusetts to Texas (Fig. 1). Within this range it is restricted primarily to a narrow band of coastal salt marsh habitat. Nine subspecies were recognized by the AOU (1957), six of which Howell (1932) recorded as nesting in Florida. Kale and Post (pers. comm.) have indicated that the species is in need of taxonomic revision. Their studies have suggested that the birds formerly recognized as *A. m. pelonota* on the Florida east coast are not distinguishable from the more northern *A. m. macgillivraii* and have been extirpated in the southern part of their range (Kale pers. comm.). *A. m. juncicola* of the Florida Gulf coast may not be a valid subspecies, and birds once called *A. m. howelli* of the Florida panhandle are referrable to *A. m. fisheri* (Post pers. comm.). On the mid-Florida east coast, the dusky seaside sparrow (*A. m. nigrescens*) formerly occurred

Figure 1. Range of the seaside sparrow (from Robbins et al. 1966; and Kale in press).

along the St. Johns River and on Merritt Island (Baker et al. 1979). Along the Florida west coast A. m. peninsulae ranges south to Tampa. The Cape Sable seaside sparrow, occurring only in extreme southern Florida, is disjunct from breeding populations of other seaside sparrows. Figure 2 shows the current distribution of seaside sparrows in Florida, based on Howell (1932) and Kale (in press). Another subspecies, probably the northern seaside sparrow (A. m. maritima), is known to occur in southern Florida. It is a rare winter resident found primarily in coastal areas.

The recent history of the dusky seaside sparrow is pertinent to development of a conservation strategy for the Cape Sable seaside sparrow. The dusky seaside sparrow has been studied by Sharp (1969a, 1970), Trost (1968), and Baker (1973), and a recovery plan has been approved (Baker et al. 1979). It appears that this subspecies is biologically extinct in the wild (Delany et al. 1981). Sykes (1980) reviewed its status and management options on Merritt Island. He concluded that impounding and flooding of the high salt marsh on which the sparrow depended was the primary cause for its drastic decline there. Invasion of hardwoods on remaining higher marsh also was important. On the St. Johns River, Sykes (pers. comm.) believes that the demise of the dusky seaside sparrow was due to habitat changes caused by drainage and frequent man-caused fires during the dry season. Williams (pers. comm.) suggests that the specific reasons for the decline are not completely understood, and it was the lack of such information that resulted in the loss of these birds.

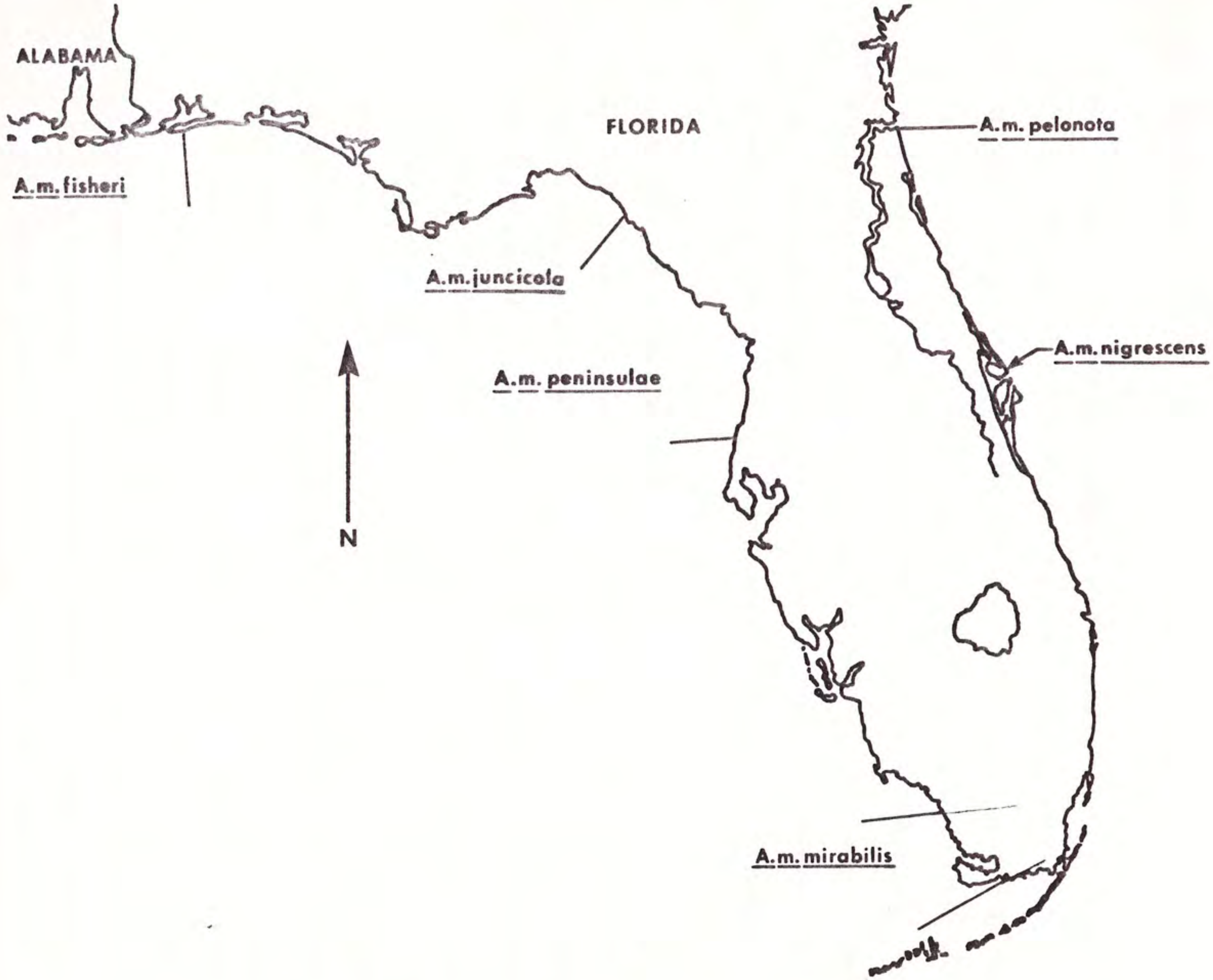

Figure 2. Range of seaside sparrow subspecies in Florida (from Howell 1932; and Kale pers. comm.).

A. Biology

The biology of the Cape Sable seaside sparrow has been studied by Werner (1975, 1976), Werner and Woolfenden (in press), and Taylor (in press). Information from studies of more northern populations of seaside sparrows is also pertinent (e.g., Woolfenden 1956, 1968; Norris 1968; Sharp 1969b; Post 1974; Tomkins 1941; Greenlaw in press; Trost 1968; Sykes 1980; Austin 1968a,b; Sprunt 1968). Current knowledge of the biology of the Cape Sable seaside sparrow, including spatial relations, movement, and breeding has been summarized by Robertson in Kushlan et al. (1982).

Cape Sable seaside sparrows exhibit some territorial activity throughout the year (Grimes in Stimson 1968). It appears that males remain on or near their breeding territories year round (Kushlan et al. 1982). Werner and Woolfenden (in press) for the Cape Sable seaside sparrow and Post and Greenlaw (1975) for northern seaside sparrows have described and analyzed the vocal and visual displays associated with territorial activity. The territorial arrangement of Cape Sable seaside sparrows consists of a mosaic of defended areas used for breeding, nesting and feeding (Kushlan et al. 1982, Werner pers. comm.). In Taylor Slough, activity ranges of adjacent pairs overlap considerably (Werner 1975; Werner and Woolfenden in press), suggesting that the defended territory is a nest-centered area smaller than the breeding season home range (Kushlan et al. 1982). Territory size appears to be inversely correlated with population density, which in turn is strongly related to length of time since the last fire (Werner 1976).

Peak densities of 20 pairs/40 ha measured by Werner (1976) in Taylor Slough seem to fall near the middle of the range of densities reported for other seaside sparrow subspecies with similar territorial spacing (Woolfenden 1956; Norris 1968; Sharp 1969b; Post 1974). Territorial behavior in seaside sparrows is adjustable (Post 1974; Greenlaw pers. comm.). Greenlaw (pers. comm.) has suggested, based on censuses of large areas, that territory distribution may be rather uniform with local, sometimes annually shifting, concentrations of birds in areas of suitable vegetation. This may also occur to a lesser extent with Cape Sable seaside sparrows, but there is no suggestion of the existence of a tightly clumped territorial system.

Seaside sparrows characteristically have an uneven distribution of breeding populations in areas of seemingly uniform habitat (Tomkins 1941; Howell in Stimson 1968; Werner 1975). Post (1974) showed that patchy breeding distribution of seaside sparrows in a marsh on Long Island resulted from groupings in spots where marsh vegetation of the year before had not been flattened by winter storms and thereby provided the only available cover for nests when nesting began. Greenlaw (in press), on the other hand, has found territories in low density in scattered areas of persistent grass. Thus, the supposed coloniality of seaside sparrows is best considered a matter of nest site selection (Post 1974; Kushlan et al. 1982). In the Cape Sable sparrow, the more than 10-fold variation in breeding density that Werner (1975) found seems most likely to be related to the fire mosaic within herbaceous communities and to the effects of fire extent and fire-free time interval on the availability of cover (Taylor in press).

In all marking studies of seaside sparrows, the males have proved to be restricted in their movements. Werner (1975) found that many males used the same area for 2 years and some held essentially the same territory for 3 consecutive years. Trost's (1968) data for the dusky seaside sparrow showed much the same degree of site tenacity, although Sykes (1980) recorded a movement in excess of 1 km. Post (pers. comm.) found that once a male seaside sparrow is established as a breeder, it tends to return to the same area. If something happens to make a territory unsuitable for nesting and adjacent habitat is occupied, it is possible that a male Cape Sable seaside sparrow may disappear from the breeding population, but this possibility needs to be determined. Post and Greenlaw (in press) found that female seaside sparrows on Long Island showed as strong a site tenacity as did males, judged by similar return rates for both sexes. Movement and mortality of adult female Cape Sable seaside sparrows are unknown.

Observers of several subspecies note that independent young soon disperse to distances of several hundred meters to several kilometers, determined in part by the distribution of suitable habitat (Tomkins 1941; Woolfenden 1956; Trost 1968). Werner (1976) believed that "... the post-breeding emigrations of the fledglings provide the principal mechanism of population mobility...." Sharp (pers. comm.) has suggested that such movements as exist are particularly important to population maintenance in habitat subject to periodic perturbations. It seems probable that juveniles tend to choose their adult activity area at the time they initially disperse. Current habitat distribution and adult population density seem likely to be major factors determining the distance and direction of dispersal by juveniles. The fate of juveniles and the extent of their ability to colonize distant areas need to be determined. It is especially important to know whether surplus birds return to natal areas or move into other suitable habitat, and how fires affect their ability to colonize an area.

Shifts of location may occur in the Cape Sable seaside sparrow, as Taylor (in press) found increased densities in remaining habitat after nearby areas burned. The extent of movement of adult birds and their colonizing ability is an important factor in their management. If movement of adult Cape Sable seaside sparrows is restricted, it becomes unlikely that drastic habitat alternation would be compensated by population shifts, except to nearby habitat. Movement patterns of adults outside the nesting season should be determined, perhaps by radiotelemetry. What happens to adults when their territory is altered, especially by fire, needs to be understood.

Nesting biology of the Cape Sable seaside sparrow was studied by Werner (1975). Greenlaw (pers. comm.) suggested that seaside sparrow nesting habitat can be characterized as being a marsh with moderately dense, clumped, persistent and live grasses 0.5 m or more high, having sufficient open space among the stems to permit movement, and small scale patchiness that creates localized openings in the grass cover. Sparrows nest in the persistent and tall grass. This type of habitat is subject to occasional flooding and flooding of nests by storm tides can be a major cause of nest loss (Post 1974; Greenlaw pers. comm.). The Cape Sable seaside sparrow is unusual in occurring in non-tidal situations and in accomplishing much of its nesting in dry marsh, before the rainy season begins (Kushlan et al. 982). Its breeding season typically extends over nearly half the year (Stimson 1968; Werner 1975), beginning as early as late February and persisting into early August. It is usual for Cape Sable seaside sparrows to nest two or three times per season irrespective of the fate of earlier attempts (Werner 1975, 1978). The amount of summer nesting, which essentially means the number of third broods attempted, may depend mainly on the characteristics of individual rainy seasons, as nesting activity tends to decrease abruptly when the marsh becomes flooded (Werner 1978). In the absence of deep flooding, nesting activity apparently does not diminish through mid-summer (Werner 1975). Werner (pers. comm.) doubts that sparrows will nest once flooding begins, thus direct losses to flooding are insignificant in the Taylor Slough population (Werner 1975). There seems to be nothing likely to be limiting in the requirements of seaside sparrows for nest construction materials (Kushlan et al. 1982). Nests for all subspecies, including the Cape Sable seaside sparrow, seem to be built of readily available local materials, lined with finer grades of the same material. The Cape Sable seaside sparrow builds a new nest for each successive brood in a season (Werner 1975) suggesting that nesting material is easily at hand. Werner (1975) found that Cape Sable seaside sparrows fail to nest in marshes when shrub invasion begins. Baker (1978) reported that dusky seaside sparrows tended to vacate marshes dominated by shrubs and were not generally found closer than 50 m to dense stands of trees and shrubs. Werner (pers. comm.) has suggested that brush invasion may increase use of an area by red-winged blackbirds (Agelaius phoeniceus), which may adversely affect the sparrows, but precisely how bushes impact sparrows requires study.

Cape Sable seaside sparrows usually lay a clutch of three or four eggs (Stimson 1968; Werner 1975, 1978). From his work in Taylor Slough, Werner (1975, 1978) determined that the incubation period of the Cape Sable seaside sparrow was more than 11 days. Opinion and observation on other subspecies of seaside sparrows has tended to converge on an incubation period of 12 or 13 days (Sprunt 1968; Trost 1968). Young Cape Sable seaside sparrows spend 9 to 11 days in the nest (Werner 1978) and when they leave it they are active as pedestrians, although unable to fly, and are attended by parents on the natal territory for 10 to 20 additional days, a timing of events similar in other subspecies (Trost 1968; Woolfenden 1956, 1968). Werner (1975) noted that on abandonment fledglings tended, for a short time, to form groups with activity centers near natal sites. Kushlan et al. (1982) discussed the sparrow's population dynamics. The Cape Sable seaside sparrow, as studied in Taylor Slough, appears to be markedly successful. Werner (1975) reported that 34 young fledged from 55 eggs laid in 1974 and 1975, a nesting success rate of approximately 62 percent.

The approximate annual rate of survival of adult males is 90 percent, higher than expected for temperate passerines and more similar to tropical passerines (Kushlan et al. 1982). If we assume a population of 100 adult male Cape Sable seaside sparrows, each of which is assumed conservatively to be associated with two 4-egg nesting attempts per year, and if we also assume a balanced sex ratio among juveniles, then the population of males could maintain its numbers if 93 percent of the juvenile males did not survive their first year to breed. Because it is likely that first-year mortality is actually closer to 50-75 percent, this population has the ability to maintain itself or expand (Kushlan et al. 1982).

B. Population status

The historic status of the Cape Sable seaside sparrow was summarized by Kushlan et al. (1982) and Kushlan and Bass (in press). Its current distribution was determined and each location described by Bass and Kushlan (in press). For ease in planning conservation efforts, it is convenient to divide the sparrow's known range into the following four population centers: Cape Sable, southern Big Cypress Swamp, Ochopee, and Taylor Slough (Fig. 3). Sparrows were discovered in these four areas in 1918, 1928, 1942, and 1972, respectively. Such a subdivision in no way implies sparrows in the population centers are reproductively isolated, nor is this the only division possible. The history, vegetation, and management problems of sparrows in each population center were discussed in detail by Kushlan et al. (1982).

On Cape Sable, the sparrow was known to range along the southern coast from Flamingo to Northwest Cape inland as far as the Fox Lakes (Stimson 1956; Werner 1971). Howell (1919) found that the species was "moderately numerous." Although the birds may not have been abundant, they were rather widely distributed in the prairies inland from the beach front. The population survived the hurricane of 1929 (Howell 1932), but it was widely thought to have been extirpated by the hurricane of September 1935 (Semple 1936). Werner (1971) rediscovered this segment of the population in 1970.

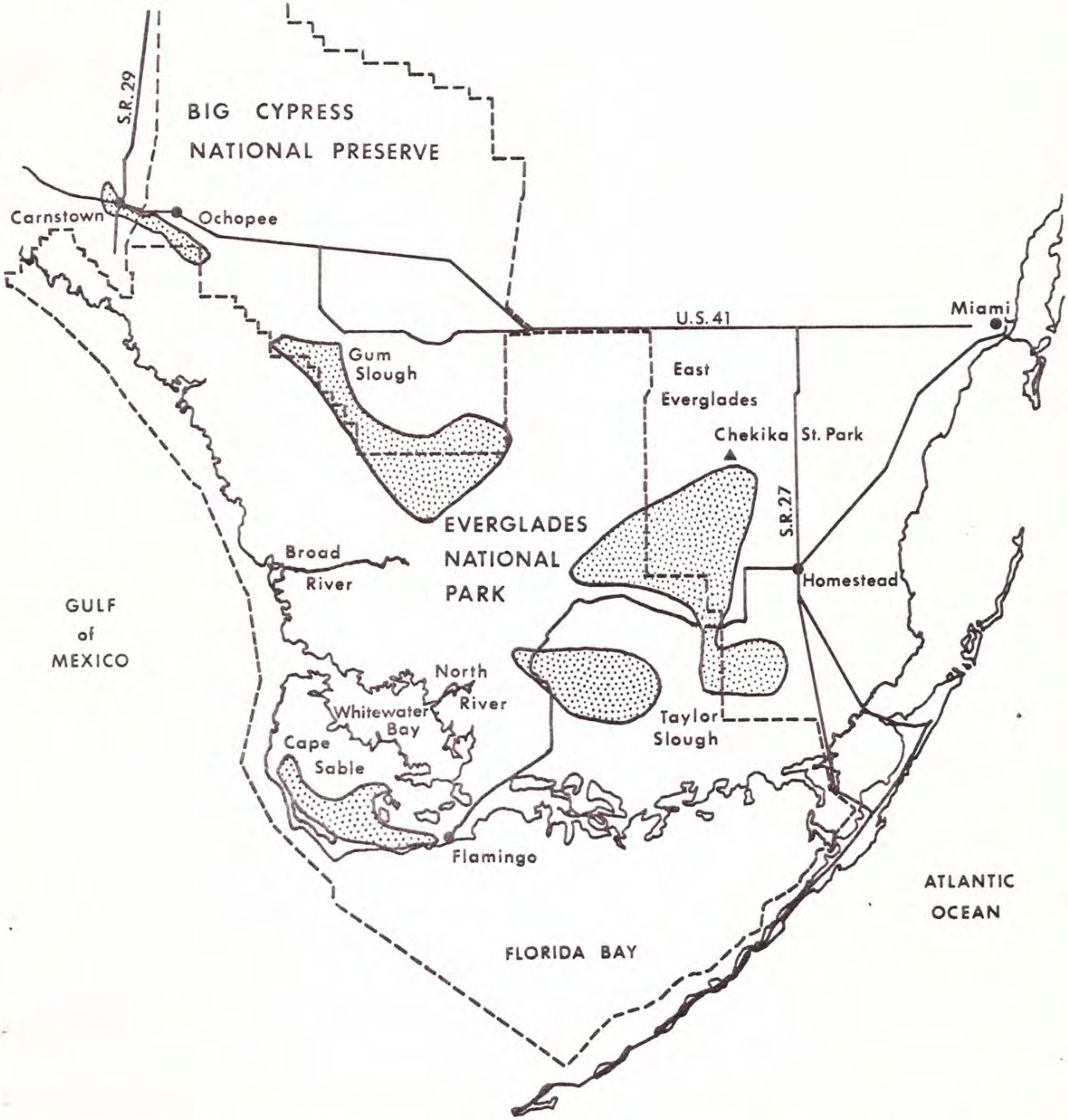

Figure 3. Maximum documented historic range of the Cape Sable seaside sparrow as known before 1978.

When first discovered on Cape Sable, sparrows occupied seasonally flooded cabbage palm (Sabal palmetto) prairie, dominated by short, sparse cordgrass (Spartina bakeri), salt grass (Distichlis spicata), and sea purslane (Sesuvium sp.) (Holt and Sutton 1926; Semple 1936; Nicholson 1928; Stimson 1954; Werner 1978). The area once occupied by extensive cordgrass prairie is now dominated by mangroves (Rhizophora mangle), bare mud flats, and stands of halophytic forbs (saltwort, Batis maritima; sea purslane; sea oxeye, Borrichia sp.). This change was caused by the hurricane of 1935, and there is no evidence that the cordgrass prairie is being reestablished (Kushlan et al. 1982). As a result, a marked decrease of potential sparrow habitat has taken place on Cape Sable in recent years. When rediscovered, Cape Sable seaside sparrows in this area were in small and localized groups. They occupied the only three extensive patches of cordgrass marsh that remain on Cape Sable. (Fire is a factor in the persistence of cordgrass habitat on Cape Sable.) No birds were located in surveys conducted immediately following a lightning-caused fire of 1979, or in 1980 or 1981 (Kushlan and Bass in press). The vegetation changes on Cape Sable appear to be caused primarily by the natural processes and, as a result, the low population levels of sparrows there are a natural phenomenon. Continued monitoring of the area formerly occupied by sparrows is needed to determine recovery potential of this population segment, which apparently has, for many years, been a small portion of the total Cape Sable seaside sparrow population.

Sparrows were first found near Ochopee by Anderson (1942). Stimson (1956) located birds north of the Huston River through Ochopee and Carnestown.

The vegetation in the coastal marshes near Ochopee also appears to be changing. From 1970 to 1975, it appeared to Werner (1975) that black rush (Juncus sp.) and salt grass were replacing cordgrass and spike rush (Eleocharis sp.). Mangroves also have shown a long-term encroachment inland, although this invasion was checked by freezes in 1977. Some of these changes were probably associated with altered hydrologic conditions in the area. The hydrology of the Ochopee marshes has not been studied in detail, but it appears to have been altered by canals (Rosendahl and Sikkema 1981). Hydroperiods may have changed, probably shortened, as a result of the drainage effects of canals connecting upland marshes to tidewater (Kushlan et al. 1982). Effects on the Ochopee well fields and a history of increasing conductivity measurements show seasonal saltwater intrusion as far inland as salinity barriers near the Tamiami Trail (Rosendahl and Sikkema 1981). Development, a high incidence of human use, and man-caused fires directly impact vegetation. During the period 1972-1976, the incidence of fire in the Ochopee area was over 30 times that occurring further south (Kushlan et al. 1982). In 1979, 2,600 ha burned in the Ochopee-Turner River area (Kushlan et al. 1982).

Few birds have occurred south of Ochopee in recent years. Werner (1975) found sparrows at six scattered sites in this area from 1970-1975, and noted a decline in both the number of sites and number of individuals seen. Sparrows are known to have been present in one cordgrass-saw grass (Cladium jamaicensis) marsh in 1978 and 1979 (Kushlan and Bass in press). The decline and possible loss of this population segment appears to be the result of man-caused fire and salinity changes. Additional information on the reasons for the population decline is needed, but it appears that unless habitat conditions are restored, there is little reason to expect improvement.

Nicholson (1928) found sparrows in the southern Big Cypress Swamp in the marshes northwest of the true Everglades. In the 1950's, Stimson (1956 and references therein) found the sparrow to be widely distributed along the western edge of the southern Everglades to the Broad River and Gum Slough. By the 1960's, however, Stimson (1969) concluded that this population segment had been extirpated by widespread and frequent fires. Birds were found in the area in surveys conducted in the early 1970's (Kushlan and Bass in press), but Werner and Woolfenden (in press) concluded that they were rare at that time.

Presently, sparrows occur in the area north and west of Shark Slough, between the coastal belt of cordgrass marsh and saw grass marshes of the Everglades (Bass and Kushlan in press). It appears that, unlike in the Ochopee area, the frequency and extent of recent fires in this area were not sufficient to impact sparrow habitat markedly. In 1980 and 1981, surveys indicated that the sparrows were well dispersed over the area from 1 km south of the Loop Road into the headwater marshes of coastal rivers (Kushlan and Bass in press). The population in the Big Cypress is estimated to be about 2,900 birds, occurring over all their historic range.

Sparrows were found south and east of the true Everglades in Taylor Slough in 1972 (Ogden 1972). The birds occupy the area west of Homestead, north to Chekika State Park in the area called the East Everglades, and southwest to the headwaters of the North River (Werner 1975). The population is patchily distributed over an area of about 10,000 ha (Werner 1975). The sparrow apparently existed in this area before its official discovery, as a previously overlooked observation occurred in 1957 (Werner 1975) and it seems likely that some Cape Sable seaside sparrows have occurred in at least part of this area through historic times (Kushlan et al. 1982). Taylor Slough, East Everglades, and nearby areas support a substantial population segment of the sparrow. Werner (1976) estimated that 1,900 to 2,800 sparrows occurred in this area. In the intensive survey of 1981, sparrows were found in 155 of 396 sites surveyed giving a total estimated population of 3,700 sparrows (Kushlan and Bass in press). The number of sparrows found at any one site ranged from one to six singing males. These surveys indicate that the overall distribution of sparrows in Taylor Slough has not changed since the early 1970's.

Although Cape Sable seaside sparrows are well dispersed throughout the Taylor Slough area, they especially inhabit seasonal marshes dominated by muhly grass (Muhlenbergia filipes). They also occur in mixed saw grass prairie and more elevated rocky areas dominated by the grass Schizachyrium rhizomatum. The vegetation of this area has been described by Hilsenbeck et al. (1979) and Olmsted et al. (1980). The muhly prairie is the driest of the graminoid communities of Taylor Slough, with a typical hydroperiod of 2 to 4 months (Kushlan et al. 1982). Muhly is fire-adapted, recovering immediately after a fire when soil moisture is adequate. Werner (1975) and Olmsted et al. (1980) found that muhly stands accumulate dead material rapidly beginning the first year following destruction of dead materials by fire. In stands several years old, the weight of dead material exceeds live material by three to five times (Werner 1975; Olmsted et al. 1980). Werner (1975) concluded that in his study site this makes the habitat unsuitable for nesting by Cape Sable seaside sparrows, and such habitats were sparsely used if unburned for 5 years.

In Taylor Slough and the East Everglades, invasion of native and exotic trees into prairies inhabited by Cape Sable seaside sparrows is a particular threat (Werner 1975). The exotic Australian pine (Casuarina sp.) is currently the most abundant of the exotic trees in the East Everglades, and in some locations Cape Sable seaside sparrow habitat has been lost because of the Australian pine invasion (Looper and Urban 1980; Hilsenbeck et al. 1979). Australian pine is to some extent held in check by fire, although abundant resprouting frequently occurs from root systems of young fire-killed trees. The exotic Brazilian pepper (Schinus terebinthifolius) (Ewell 1979) is invading prairies throughout the East Everglades, possibly in response to lowered water tables. It does not appear to be a threat to the sparrow where hydroperiods are long enough to also prevent invasion by native hardwoods. The exotic Melaleuca (Melaleuca quinquenervia), within the past 5-10 years, has invaded the area northeast of sparrow habitat in the East Everglades and is a potential threat to natural plant communities of Everglades National Park (Myers 1975; Woodall 1978). The scattered Melaleuca in the East Everglades, large areas of which have already been modified by canals, must be controlled if Cape Sable seaside sparrow habitat is to be preserved there. Herbicides are effective in control of Melaleuca (Woodall 1979). Hardwood invasion of Cape Sable seaside sparrow habitat, except for fire-adapted trees such as Malaleuca, can be checked by fire and maintenance of natural hydroperiods.

According to Werner (1975), man-caused fires in the East Everglades-Taylor Slough area have been destructive to Cape Sable seaside sparrows because of their timing and because of the large areas they affected. Without fire, however, habitat becomes unsuitable for sparrows because of litter accumulation and hardwood invasion. Incendiary fires occurring in the dry season can alter habitat and thereby affect nesting effort the following breeding season. To prevent fast traveling dry-season fires from moving into or out of Everglades National Park, the National Park Service, since 1971, has had a policy of attempting to burn annually along the park boundary. Fifteen fires have been attempted along this boundary over the past 8 years. Possible effects of repeated burning on Cape Sable seaside sparrow habitat should be considered in the fire-management plan of Everglades National Park and other agencies responsible for fire management in the East Everglades.

Despite being inundated each year, former muhly prairie sites in the East Everglades are used for farming. Meador (1977) found that farming converts seasonally inundated prairie with non-mycorrhizal soils to sites potentially able to support mycorrhizal woody species through soil aeration, addition of nutrients, and increase in soil volume. Therefore, farming for even a single season, in conjunction with rockplowing, obliterates the natural prairie vegetation. Rockplowing eliminates any site as habitat for the Cape Sable seaside sparrow.

Water levels in sparrow habitat in the northern regions of Taylor Slough are influenced by rainfall and water levels within northeast Shark Slough.

Hydrologic conditions in the area have been especially affected by nearby canals (Rose et al. 1981), including decreases in hydroperiod and shifts in seasonal flow patterns. Development in the East Everglades will further affect hydrologic conditions in Cape Sable seaside sparrow habitat in Taylor Slough to the extent that surface water conditions there are altered. Downstream habitat in Everglades National Park could also be similarly affected. To enhance water levels within Everglades National Park, a pumping station at the park boundary in Taylor Slough will become operational in 1982. This station will be capable of discharging 4,570 hm of water to Taylor Slough on a predetermined monthly schedule. Pumping surface waters to Taylor Slough is expected to increase hydroperiods in the extreme northern area of the slough (Rose et al. 1981). The effect of pumping will diminish south of Royal Palm and little noticeable effect is foreseen 6 km downstream from the pumping station (Rosendahl in Kushlan et al. 1982). Monitoring the effects of pumping is essential, and revisions in the schedule should be proposed if required.

The most important threat to the Cape Sable seaside sparrow occurs in the East Everglades, the only part of its range not under National Park Service management. Recently a series of detailed studies have been conducted on environmental and economic conditions in the area. These studies, including surveys of vegetation (Hilsenbeck et al. 1979) and wildlife (National Park Service, South Florida Research Center 1979), supported a detailed planning effort for zoning of the area by the Dade County Planning Department (1980). This plan divided the East Everglades into three management zones. Much of the currently designated Critical Habitat was classified as "transitional seasonal wetlands" in which farming is to be allowed. Farming there includes rockplowing, which requires dredge and fill permits issued by the U.S. Army Corps of Engineers. No farming or rockplowing should be permitted in Critical Habitat.

Present knowledge of the distribution of the Cape Sable seaside sparrow is derived from a complete census conducted in 1981 (Fig. 4) (Kushlan and Bass in press; Bass and Kushlan in press). During this census, sparrows were located at 278 of 864 sites surveyed. The sparrow remains widely distributed over a large area of southern Florida and continues to occupy much of its historically known range (Figs. 3 and 4). At present, sparrows appear to be rare or absent from the Cape Sable and Ochopee areas. The preponderance of the Cape Sable seaside sparrow population occurs in the Big Cypress Swamp and in and near Taylor Slough, and includes a minimum of 6,600 birds (Kushlan and Bass in press). Most sites are protected in Everglades National Park and the Big Cypress National Preserve. Some are in the East Everglades. All breeding sites in the East Everglades area were within the designated Critical Habitat for the species (U.S. Fish and Wildlife Service 1977). Specific locations of birds are shown in Bass and Kushlan (in press).

It seems that the Cape Sable seaside sparrow has not occupied all areas simultaneously nor has each area been densely occupied throughout the historical period (Kushlan and Bass in press). This apparent disappearance and reappearance of the Cape Sable seaside sparrow from known habitat is an interesting phenomenon. Most of the lack of information regarding the sparrow's historic

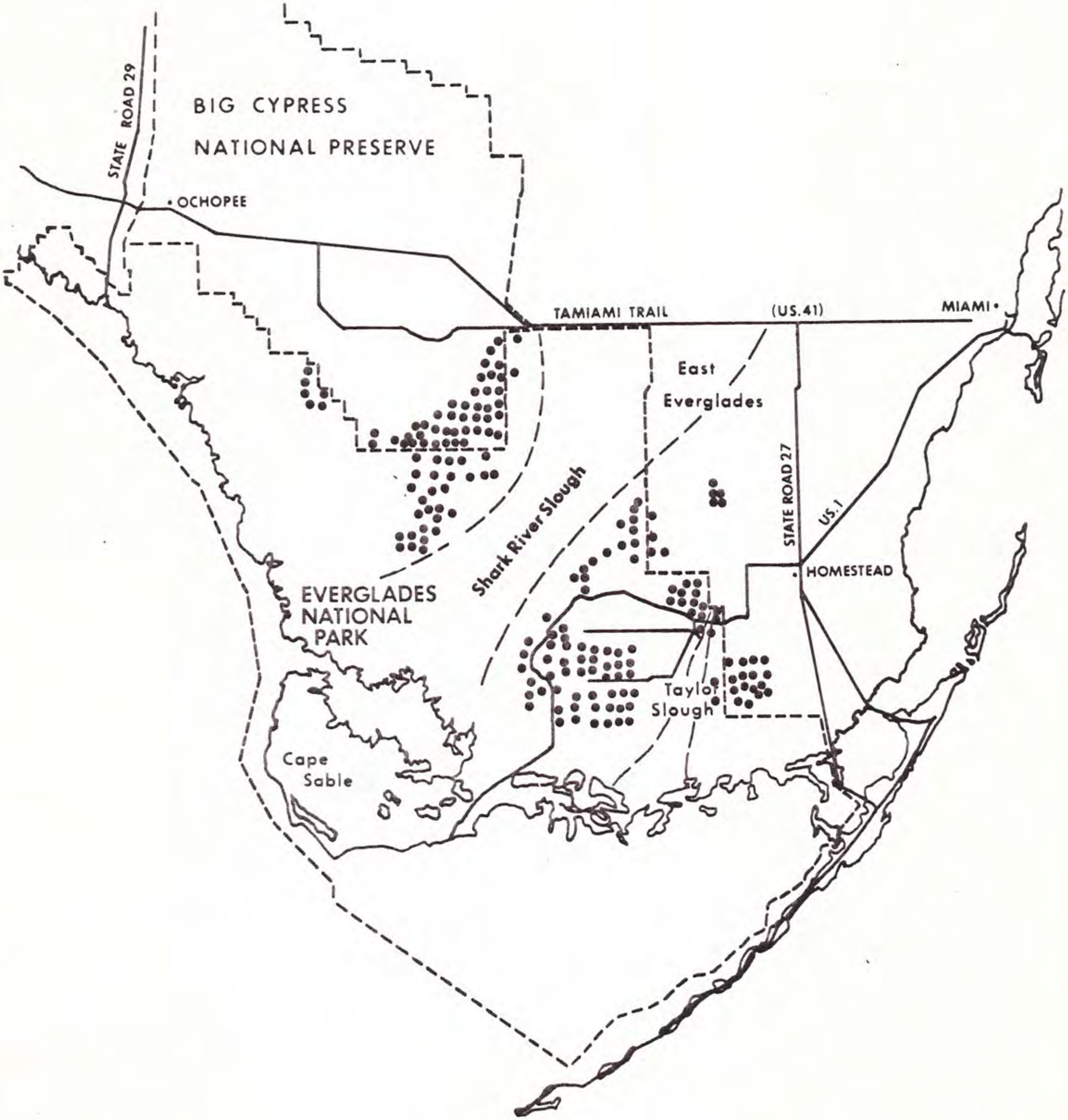

Figure 4. Distribution of the Cape Sable seaside sparrow. Solid dots indicate where birds were found in 1981.

distribution is due to the difficulty in gaining access to much of the area and to the occurrence of the sparrow in fresh water marshes, where it was not expected to occur. However, not all the reported disappearances are artifactual (Kushlan and Bass in press). Considering the dramatic effects of fire on habitat occupancy by sparrows (Werner 1975; Taylor in press) it seems likely that fires covering large areas too frequently would render considerable habitat unsuitable. Reoccupancy by this fairly sedentary bird would be slow (Kushlan and Bass in press). This suggests that a population estimate of a minimum of 6,600 birds may represent a high point in a fluctuating population cycle (Kushlan and Bass in press). Nevertheless, at present, a substantial population of the Cape Sable seaside sparrow does occur over a large area. It does not appear to be Endangered, as defined by the Endangered Species Act of 1973, as amended, but does qualify as Threatened. A reconsideration of its listing status is recommended.

The area included in the presently designated Critical Habitat of the Cape Sable seaside sparrow does not reflect current occupancy or needs of the sparrow. Because of alterations, probably irreversible, parts of the Critical Habitat are no longer occupied by sparrows (Bass and Kushlan in press). Thus, the extent of current Critical Habitat requires review. We consider essential habitat to be the area presently occupied by sparrows and adjacent habitat which has not been adversely altered by drainage, hardwood invasion, or substrate alteration. Based on the results of a recent survey in the East Everglades (Bass and Kushlan in press), Figure 5 shows the essential habitat of the Cape Sable seaside sparrow as it existed in 1981. Essential habitat must be protected from development and should be managed to protect sparrows. Possible management options include zoning or purchase and management by appropriate State or Federal agencies.

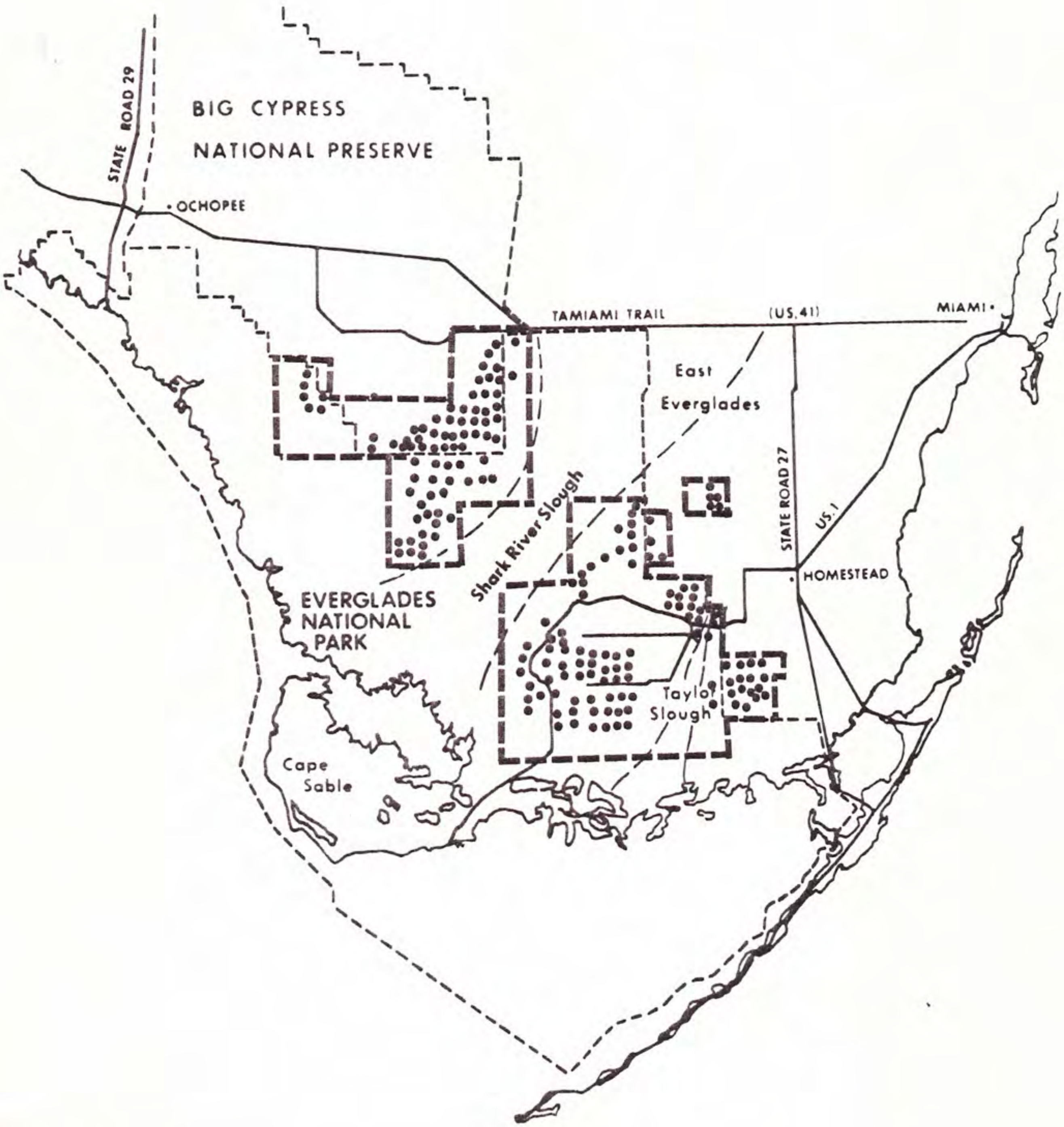

Figure 5. Essential Habitat of the Cape Sable seaside sparrow as of 1981.

C. Potential limiting factors

Based on the biological and distributional information discussed above; vegetation change, fire, development, and hydrologic alteration can be identified as the major limiting factors affecting the Cape Sable seaside sparrow (Kushlan et al. 1982). Based on existing information, it does not appear that competition, food supply, predation, or disease adversely influence the current status of the Cape Sable seaside sparrow (Kushlan et al. 1982).

The virtual extirpation of the Smyrna seaside sparrow (A. m. pelonota) from the Smyrna Beach area of northeastern Florida has been attributed to occupation of its habitat by black mangrove (Avicennia germinans) (Austin 1968a), and it is possible that part of the reason for the decline of the dusky seaside sparrow was habitat changes from invading saltbush (Baccharis sp.), extensive fires, and alteration of hydrologic conditions (Kale, Sharp, Sykes, and Post, pers. comm.). The reduction of the Cape Sable seaside sparrow population on Cape Sable was caused by natural vegetation change resulting from higher soil salinity following the hurricane of 1935 (Werner 1976, 1978). Similar habitat loss near Ochopee was man-caused, resulting from the construction of canals. Insofar as sparrows require prairie, uninterrupted by trees, the greatest threat to Cape Sable seaside sparrows is in the East Everglades and Taylor Slough because of the invasion of trees, especially exotic species, into their habitat. This must be controlled. This invasion is probably encouraged by lowering water tables (Kushlan et al. 1982).

Fire is both a limiting factor and an essential management tool. Unlike most other seaside sparrow populations, the Cape Sable seaside sparrow is adapted to life in vegetation that burns periodically (Kushlan et al. 1982). Werner (1976) found in his Taylor Slough study that population density peaked 3 years after a fire, decreased in the fourth, and declined to zero after 6 years. He reported that the population loss was correlated with a decrease in the ratio of living to dead matter. Timing is important, however. Fires late in the dry season during nesting and post-nesting threaten nests, adults, and newly fledged young (Kushlan et al. 1982). If burned too frequently, an area may never support a vigorous population of nesting sparrows and a small isolated group may actually be produced below the size necessary to sustain a population.

Sufficient information exists to provide prescriptions for management of fire in some habitats. Burning should occur in the wet season between August and November (Taylor in press). No burning should take place during nesting in the dry season between February and mid-July. Fires should be ignited by spot ignition or as a backing fire and controlled to result in a mosaic of patches of burned and unburned vegetation usually not more than 200 ha each. Line fires, large area fires, fires out of season, or too frequent fires should be controlled. The dense muhly prairies of Taylor Slough should be burned on a 5-year rotation. The time between fires for sparser prairies should be longer, on the order of 8-10 years, the specific timing to be determined (Taylor in press). At no time should large contiguous areas be allowed to burn in the same year. Mosaics of burned and unburned vegetation must be protected to supply suitable habitat adjacent to previously occupied sites. No more than 8-10 percent of the habitat should be burned in 1 year.

Prohibition of development and maintenance of a historic water regime are also critical in Cape Sable seaside sparrow habitat. Fire alone should not be used to compensate for changes such as shrub invasion caused by lowered water tables, but rather, historic water levels should also be maintained.

PART II - RECOVERY

A. Recovery objective.

The present population meets the criteria for Threatened status and should be reclassified as such. Delisting can be considered when the following criteria are achieved:

1. The reasons for the past fluctuations and/or declines in population are accurately determined;

2. Management techniques are employed which will insure the long-term protection and maintenance of the seaside sparrow's functional ecosystem throughout the species' historical range;

3. The population maintains a minimum of 6,600 birds; all fluctuations should be above this level.

B. Step-down outline.

1. Monitor distribution and abundance.

    11. Conduct distribution surveys.
    12. Develop methods of determining abundance and productivity, and estimate population abundance.

13. Review and revise Critical Habitat.

14. Review and revise listing status.

2. At a minimum, maintain present distribution and abundance.

21. Maintain Ochopee population.

211. Determine cause of decline of population.

212. Institute management required to maintain a population.

22. Maintain southern Big Cypress population.

221. Determine effects of fire and water-management programs.

222. Institute fire and water-management programs that do not negatively affect sparrows.

23. Maintain East Everglades-Taylor Slough population.

231. Maintain population in Taylor Slough.

2311. Determine effects of pump station in Taylor Slough and institute any required revisions to provide more natural water conditions.

2312. Perfect fire schedule in sparse prairies.

2313. Determine fire effects and institute any required changes in fire-management program.

2. Management techniques are employed which will insure the long-term protection and maintenance of the functional ecosystem throughout the species' historical range;

3. The population maintains a minimum of 6,600 birds; all fluctuations should be above this level.

Step-down outline.

1. Monitor distribution and abundance.

The population needs to be monitored yearly so that any decline can be reversed as soon as possible. Baseline data, i.e., current distribution and abundance, is available but methodology needs to be standardized.

11. Conduct distribution surveys.

A complete survey of the distribution of the Cape Sable seaside sparrow is needed to document current status. Much of this work has been completed (Bass and Kushlan in press). Surveys in all areas should be conducted yearly. More detailed surveys should be conducted in Ochopee and Cape Sable to confirm either the existence or extirpation of these population segments.

12. Develop methods of determining abundance and productivity and estimate population abundance.

Determining the abundance of the bird is also needed. A minimum estimate of the number of singing males was obtained using a helicopter survey (Kushlan and Bass in press). A more exact estimate should be developed. A promising technique is to determine population density in various habitats with respect to time since last fire. A population estimate might then be derived by monitoring history of each habitat. Alternatively, a more intensive breeding bird census program could be instituted especially in areas subject to management manipulations. It is also important to determine productivity of young each year. Survival rates by age-class and sex should also be determined. Mist net sampling during the summer is one possible technique. However, due to the patchy distribution of fledgling flocks, especially late in the summer, and the amount of labor needed to get sufficient data, this technique may not be the best (Werner pers. comm.). Another possibility is the use of a series of permanent transects located in the major population centers. This would help detect population trends of both adults and fledglings. Surveys during the peak of singing, and late in the season when flocks of fledglings are conspicuous, would be most useful (Werner pers. comm.). This technique also requires a good deal of labor due to the high variability in detectability; transects would have to be surveyed at least weekly.

13. Review and revise Critical Habitat.

Presently designated Critical Habitat does not adequately reflect the area occupied by the sparrow. The extent of Critical Habitat should be reevaluated. It should, at minimum, include those areas shown as essential habitat in Figure 5.

14. Review and revise listing status.

Present designation of the sparrow as Endangered does not adequately reflect its status. It should be considered for reclassification as Threatened.

2. At a minimum maintain present distribution and abundance.

Maintenance of the sparrow in the various population centers requires different approaches. Where possible, the seaside sparrow should be allowed and encouraged to recolonize formerly inhabited sites. In general, maintenance and/or restoration of the Cape Sable seaside sparrow in all areas will involve fire management, water management, and control of exotics.

21. Maintain Ochopee population.

The Ochopee population, occurring within Everglades National Park, is marginal and uses a minor proportion of available habitat. Because changes in the habitat seem to be man-caused, management actions may reverse habitat degradation and return it to more natural conditions. To do this, it is first necessary to determine specifically the causes of population decline with respect to fires, human access, and hydrology. It is then necessary to institute actions required.

22. Maintain southern Big Cypress population.

The birds of the southern Big Cypress Swamp represent about half of the known sparrow population. Critical factors affecting sparrow habitat in this area are fire and water conditions. Both of these factors are aspects of management programs in Everglades National Park and Big Cypress National Preserve, especially water management, fire management, and oil exploration and extraction. The effects of ongoing and proposed programs on sparrows need to be evaluated and non-damaging programs instituted if necessary.

23. Maintain East Everglades-Taylor Slough population.

The East Everglades-Taylor Slough birds also account for half of the known population. Sparrows are widespread in Taylor Slough.

231. Maintain population in Taylor Slough.

Within Taylor Slough, the major factors affecting birds are fire and water conditions. To maintain populations in the Slough and adjacent areas of Everglades National Park, the effects of water management and fire management programs should be considered. The effects of operation of the pump station and adjacent canals should be evaluated and changed if necessary. The effects of the fire program should also be evaluated, specifically, the effects of large area burns, including boundary burning. To the greatest extent possible, fire prescriptions in sparse prairies need to be perfected. Overall, restoration of a natural fire regime resulting in a mosaic of burned and unburned patches will best protect the sparrow and its habitat.

232. Evaluate and institute management in East Everglades.

Cape Sable seaside sparrows are in their greatest jeopardy in the East Everglades, the only area not under Federal land management. The distribution of birds in this area has contracted because of habitat changes caused by invasion of trees, rockplowing, and lowered water tables. Because of these irreversible changes, the extent of Critical Habitat needs to be reevaluated, as suggested in 13. Within this habitat, management options, including the use of fire and removal of exotics, must be instituted if this population segment is to survive. Evaluation of the need to zone or purchase essential habitat is required, as is assignment of agency responsibilities.

24. Monitor habitat on Cape Sable for recolonization.

As far as surveys can detect, the sparrow no longer occurs on Cape Sable. Events leading to its reduction in numbers were natural, and restorative management action is not possible or needed. Suitable habitat should be monitored for recolonization.

3. Conduct biological studies.

To properly manage habitat and to account for the effects of management action and natural events, it is necessary to conduct certain studies on the Cape Sable seaside sparrow. Overall, the goals of such studies are to understand limiting factors and the extent that habitat characteristics limit expansion of the population. Needed research includes the following:

31. Determine causes of patchy distribution.

Determine the underlying biological causes of the patchy distribution of nesting birds with emphasis on relative effects of social and ecological factors, especially vegetation characteristics of occupied versus unoccupied habitat.

32. Better define habitat requirements.

The functional ecosystem required by the seaside sparrow needs 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 other, probably subtle, habitat features required by the sparrows.

33. Determine individual patterns of habitat use.

Determine individual patterns of habitat use, time budgets, movements, foraging tactics, nesting, foraging activity areas, and year-to-year changes in territory use.

34. Evaluate genetic isolation and taxonomy.

Evaluate the nature of genetic isolation and revise taxonomy of seaside sparrow populations to determine the need and priority for protecting this subspecies.

35. Determine movements and colonizing ability.

Determine movement patterns of adults outside the nesting season and the dispersal and mortality of fledglings to provide information on the mechanisms of colonization.

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PART III

IMPLEMENTATION SCHEDULE

Priorities within this section (column 4) have been assigned according to the following:

Priority 1 - Those actions absolutely necessary to prevent extinction of the species.

Priority 2 - Those actions necessary to maintain the species' current population status.

Priority 3 - All other actions necessary to provide for full recovery of this species.

IMPLEMENTATION SCHEDULE

Cape Sable Seaside Sparrow

General Category	Plan Task	Task Number	Priority	Task Duration	Responsible Agency: FWS Region	Responsible Agency: FWS Program	Responsible Agency: Other *	Estimated Fiscal Year Costs: FY 1	FY 2	FY 3	Comments/Notes
I6	Distribution surveys.	11	2	1 yr.			NPS State	---	8,000	---	State assistance will be needed in East Everglades.
I1, I7	Develop methods for determining abundance/ productivity.	12	3	3 yr.			NPS	---	15,000	15,000	
I2, 04	Reevaluate Critical Habitat.	13	3	1 yr.	4			---	---	---	
I1, 04	Reevaluate listing status.	14	3	1 yr.	4			---	---	---	
M3	Maintain Ochopee population.	21, 211, 212	3	Cont.			NPS	---	10,000	10,000	
M3	Maintain Big Cypress population.	22, 221, 222	3	Cont.			NPS	---	10,000	10,000	
M3	Maintain Taylor Slough population.	231, 2311, 2312, 2313	3	Cont.			NPS	---	5,000	5,000	
M3	Evaluate and institute mgmt. in East Everglades.	232, 2321, 2322	2	Cont.			State	---	---	---	
I1, I2	Monitor Cape Sable habitat.	24	3	Cont.			NPS	---	1,000	1,000	
16	Determine causes of patchy distribution.	31	3	2 yr.			NPS	---	15,000	15,000	
13	Better define habitat requirements.	32	3	1 yr.			NPS	---	10,000	---	
I14	Determine individual patterns of habitat use, etc.	33	3	2 yr.			NPS	---	20,000	20,000	

IMPLEMENTATION SCHEDULE

Cape Sable Seaside Sparrow

General Category	Plan Task	Task Number	Priority	Task Duration	Responsible Agency			Estimated Fiscal Year Costs			Comments/Notes
					FWS						
					Region	Program	Other	FY 1	FY 2	FY 3	
15	Evaluate genetic isolation and taxonomy.	34	3	1 yr.			NPS	---	5,000	5,000	
18	Determine movements.	35	3	3 yr.			NPS	---	10,000	10,000	

* Abbreviations:

NPS = National Park Service
State = Florida Game and Fresh Water Fish Commission

GENERAL CATEGORIES FOR IMPLEMENTATION SCHEDULES *

Information Gathering - I or R (research)

1. Population status
2. Habitat status
3. Habitat requirements
4. Management techniques
5. Taxonomic studies
6. Demographic studies
7. Propagation
8. Migration
9. Predation
10. Competition
11. Disease
12. Environmental contaminant
13. Reintroduction
14. Other information

Management - M

1. Propagation
2. Reintroduction
3. Habitat maintenance and manipulation
4. Predator and competitor control
5. Depredation control
6. Disease control
7. Other management

Acquisition - A

1. Lease
2. Easement
3. Management agreement
4. Exchange
5. Withdrawal
6. Fee title
7. Other

Other - O

1. Information and education
2. Law enforcement
3. Regulations
4. Administration

* (Column 1) - Primarily for use by the U.S. Fish and Wildlife Service.

PART IV

APPENDIX

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