Report T-672
Status of the Cape Sable Sparrow

Everglades National Park, South Florida Research Center, P.O. Box 279, Homestead, Florida 33030

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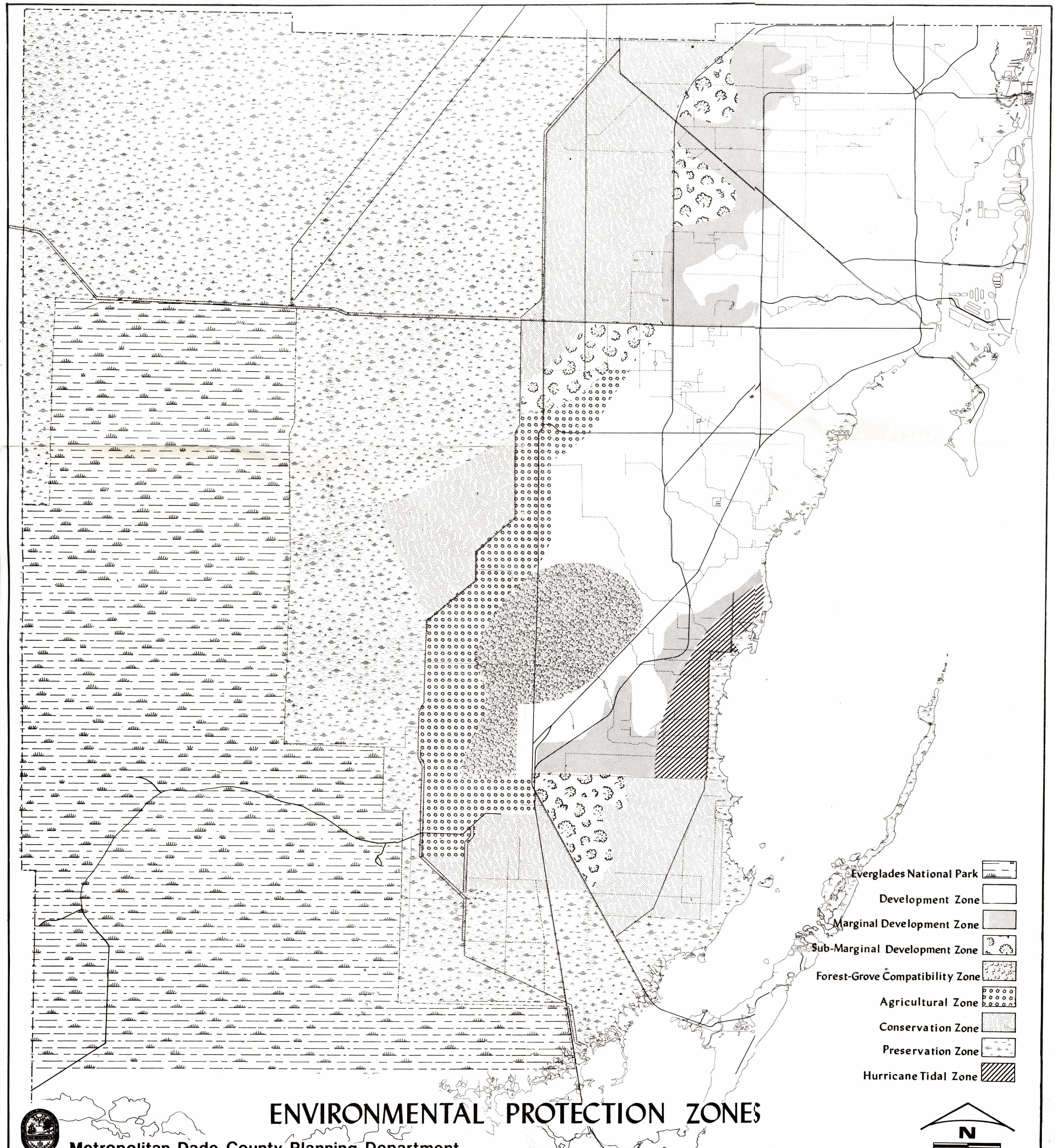

ENVIRONMENTAL PROTECTION ZONES

Metropolitan Dade County Planning Department

INTRODUCTION

The Cape Sable sparrow (Ammospiza maritima mirabilis), a subspecies of the seaside sparrow endemic to extreme southern Florida, has elicited considerable interest and concern since its discovery in the early 1900's. Before being relegated to subspecific status (Eisenmann et al. 1973), it was considered to be the last bird species described from the United States (Howell 1919, Stimson 1968). The sparrows were widely believed to have been exterminated from Cape Sable by a hurricane in September 1935 and were not rediscovered there for 35 years (Werner 1971).

The limited distribution, and apparently catastrophic history, of the Cape Sable sparrow resulted in its being classified as endangered under the original Federal listing of endangered species in 1967. Discoveries, apparent losses, and rediscoveries of sparrow populations in various areas have characterized its known history. One reason for its being little understood is the habitat it occupies. Unlike other races, which are confined to coastal salt marshes, the Cape Sable sparrow occurs predominantly in inland freshwater marshes. Such unexpected choice of habitat made it less likely for such populations to be discovered, and as a result, the status and distribution of the sparrow have remained poorly known. In an attempt to characterize the distribution and habitat use of the Cape Sable sparrow, we undertook extensive surveys from 1978 to 1980, and a census covering all available habitat in 1981. As a result, we have found that the sparrow is much more widely distributed than was previously thought. In this report, we document the present range of the Cape Sable sparrow, characterize its use of habitat, and provide an estimate of its population size.

METHODS

Surveys were conducted in known and suspected sparrow habitat in extreme southern Florida, primarily south of U.S. Highway 41 (Fig. 1). Urban and agricultural areas were excluded. Our census covered all of the treeless coastal and inland freshwater marshes and prairies of extreme southern Florida, except the deeper marshes of Shark River Slough (Fig. 1).

Preliminary surveys were conducted from early April through late June 1978-80. We covered easily accessible areas on foot. More remote areas where sparrows had been previously observed and other potential habitat were surveyed using a Bell C-47 helicopter equipped with pontoons. We began our flights at approximately sunrise and continued for 3 to 4 hours. To census a site, we landed and shut off the engine. While walking around the aircraft for about 10 minutes, we listened for singing sparrows. When a singing bird was detected, we moved near and recorded the number of birds seen or heard. In these preliminary surveys, small patches of habitat were covered thoroughly. Whereas, in large areas of suitable habitat, we surveyed selected sites several km apart. One to 10 sites were surveyed each morning. In 1981, we censused all potential habitat systematically from March 31 through June 16. All potential habitat was gridded into blocks 1 km on a side, which were plotted on U.S. Geological Survey 7.5 minute orthophoto quadrangles (Appendix I). We conducted our census at the intersection of the grid lines. The

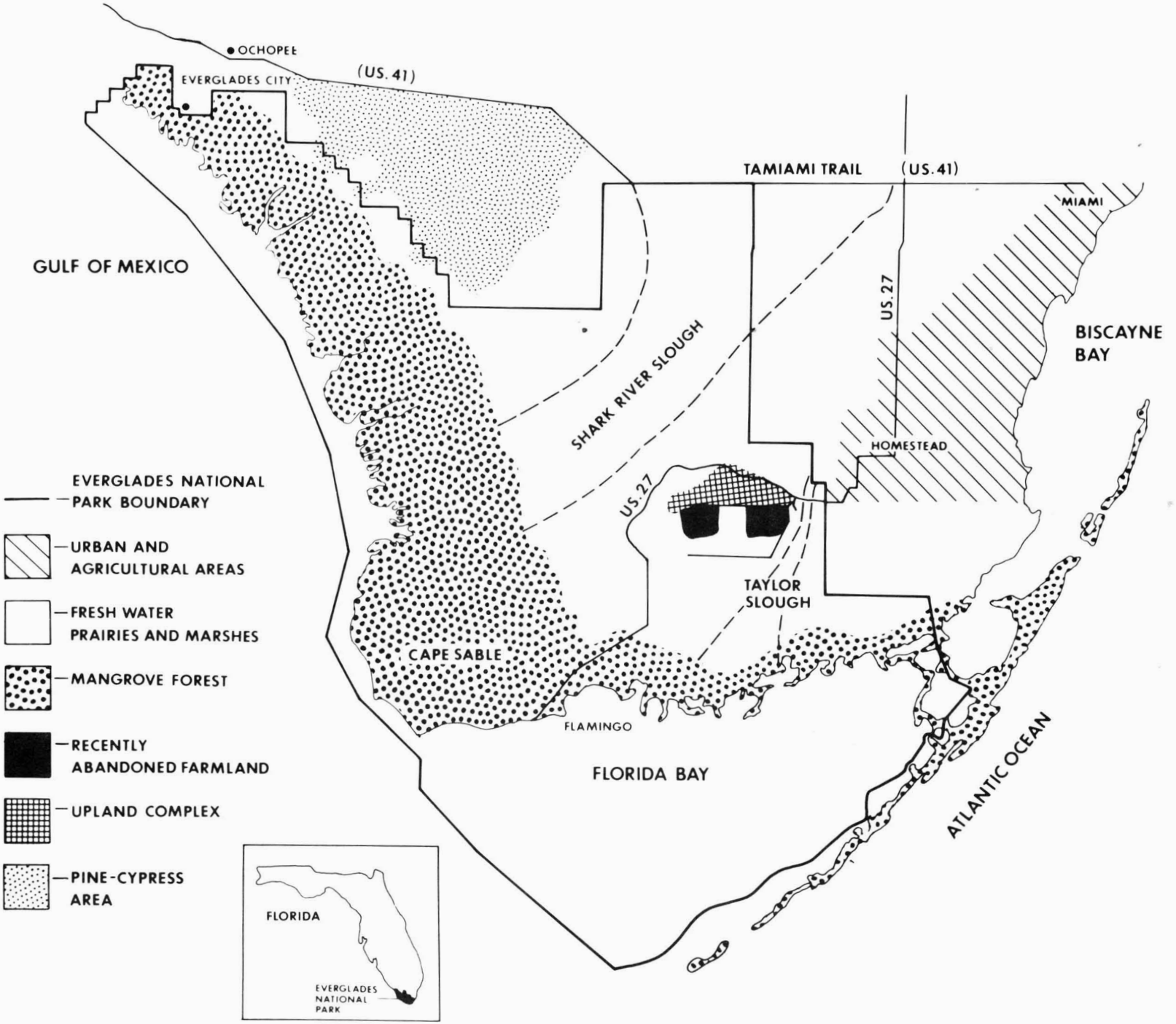

Figure 1. Map of extreme southern Florida, showing localities, major plant communities and physiographic areas.

number of birds seen or heard and characteristics of the plant community were recorded.

At each census location, we were able to hear a sparrow located within 200 m. We believe we censused singing birds within an area of 12.6 ha around the helicopter landing point. The number of birds observed in the 12.6 ha plot represents the minimum number of singing males there and is taken to be representative of the density of singing males in the adjacent 1 km^2 block. We obtained a population estimate by multiplying the average density of birds per km^2 by the number of occupied square kilometers, then doubled the number to include uncounted females.

HABITAT DESCRIPTIONS

We characterized the habitat in each plot according to its dominant plant cover. Freshwater prairies and marshes included muhly prairie, mixed prairie, cordgrass marsh, sawgrass marsh, cat-tail marsh, and black rush marsh. Forest communities included mangrove swamp forest, cypress swamp forest, pine forest, or hammock forest. In nearly all cases, we found sparrows only in the first three marsh and prairie communities listed.

Muhly prairie is a mixture of grasses, sedges, and forbs in which graminoids predominate. This community occurs on marl soil and has a short (1-6 months) hydroperiod. Muhly (Muhlenbergia filipes), a bunchgrass, dominates plant community structure in frequency and cover (Olmsted, Loope, and Rinitz 1980). In some areas black-top sedge (Schoenus nigricans) is the dominant clumped species, and muhly is secondary. The bunchgrasses are 60-90 cm high. Sawgrass (Cladium jamaicense) is a constant associate and is usually 20-30 cm taller than muhly or black-top sedge. Schizachyrium rhizomatum and Rhynchospora sp. also occur. Overall, the community may contain up to 20 species of graminoids and 50 species of forbs. Graminoids make up 98% of plant cover, which varies with hydroperiod, soil depth and fire history. Large areas of muhly prairie have sparse, 10-25%, cover (Olmsted in prep.).

Except for lacking muhly, mixed prairie is similar in composition to the muhly prairie. The absence of muhly changes the structure of the community, by eliminating the grassy clumps. A greater mixture of species includes Rhynchospora sp. and grasses, especially Panicum virgatum. Sawgrass is always present.

The remaining marsh communities are dominated by their indicator species. Cordgrass marsh is composed primarily of Spartina bakeri. Sawgrass marsh has a longer hydroperiod than the prairie communities and occupies the central, deeper-water cores of the southern Everglades, Shark River Slough, and Taylor Slough (Fig. 1). Cat-tail marsh is dominated by Typha sp., up to 3 m tall. Black rush marsh, dominated by Juncus roemerianus, occurs within and near the coastal mangrove swamps in inland, nontidal, situations.

Mangrove forest swamps are dominated by Rhizophora mangle, Avicennia germinans, or Laguncularia racemosa. Cypress swamp has Taxodium distichum as its dominant overstory tree. Cypress swamp and pine forests of Pinus elliottii

comprise the Big Cypress Swamp, northeast of Shark River Slough. Pine forest and hammock forests of tropical hardwoods, form the remaining upland complex of plant communities of southern Florida. Much of the area naturally occupied by these communities has been subjected to agricultural and urban development.

RESULTS

History of known distribution

The Cape Sable 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). The sparrow was found to range along much of the coast west of Flamingo (Fig. 1) (Stimson 1956, Werner 1971). Although Howell (1919) found that sparrows were only "moderately numerous," they were rather widely distributed in the prairies inland from the beach. The population survived the hurricane of 1929 (Howell 1931), but it was widely thought (Nicholson 1938, Stimson 1956, 1968) to have been extirpated by the hurricane of September 1935, despite observations to the contrary (Semple 1936, Dietrich 1938). Burleigh (1939) did not find them on a search in the winter of 1938.

When first discovered, the sparrow occupied seasonally flooded prairie, dominated by short, sparse cordgrass, Distichlis spicata, and Sesuvium portulacastrum (Holt and Sutton 1926, Semple 1936, Nicholson 1928, Stimson 1954, Werner 1978). Comparison of early descriptions and photographs (Holt and Sutton 1926) with current conditions shows that this area, once occupied by extensive cordgrass marsh, is now dominated by mangroves, bare mud flats, and stands of halophytic forbs (Batis maritima, Sesuvium portulacastrum, Borrichia frutescens). The plant community change was initiated by the hurricane of 1935 and resulted in a marked decrease of potential sparrow habitat on Cape Sable. Stimson (1956) searched for and failed to find sparrows there in 1949. Werner and Woolfenden (1982) suggest that by the time of that survey most of the habitat may no longer have been suitable for the sparrow. In 1970 Werner (1971) rediscovered sparrows on Cape Sable in several small residual interior stands of cordgrass marsh. At that time, Werner found 4 singing males and netted 5 juveniles in a 2 day effort. In much more limited surveys in 1975, 1 male was found (Werner 1975).

Cape Sable sparrows were discovered west of the true Everglades (Shark River Slough) in the southeastern Big Cypress Swamp in 1928 (Nicholson 1928). They were separated from the occupied area on Cape Sable by bays and mainland mangrove forests. An error in reporting the location of these observations, later corrected by Stimson (1954, 1956), prevented immediate confirmation of this discovery. Our knowledge of the distribution of sparrows in this area during the 1950's resulted from the work of Stimson and his colleagues (Stimson 1956, and references therein). He found that the sparrows were widely distributed as far east as the western edge of the southern Everglades. However, by the early 1960's, he (Stimson 1969) concluded that the population had been extirpated by widespread and frequent fires. Birds were found in the area in surveys conducted from 1970 to 1975, but Werner and Woolfenden (1982) concluded that they were rare at that time.

Sparrows were found in coastal marshes near Ochopee in 1942 (Anderson 1942). By the mid-1950's, Stimson (1956) determined that the birds were dispersed south of Ochopee in marshes between the mangrove swamps and cypress swamps. He reported a hiatus in distribution between these sparrows and those in the southern Big Cypress Swamp. In recent decades the habitat in these marshes has been changing. From 1970 to 1975, it appeared to Werner (1975) that Juncus roemerianus and Eleocharis sp. were replacing Spartina bakeri and Distichlis spicata. Mangroves also have shown a long-term encroachment inland, although this invasion may have been checked by freezes in 1977. Some of these changes were probably associated with altered hydrologic conditions in the area, and a high frequency of fires. Werner (1975) found sparrows at 6 scattered sites in this area from 1970-1975 and noted a decline in both the number of sites and number of individuals seen during the course of his study.

Sparrows were reported east of the true Everglades in Taylor Slough in 1972 (Ogden 1972). These birds occupy the prairie west of Homestead, north into the East Everglades, and southwest in Taylor Slough to the mangroves (Fig. 1). Werner (1975) found this population to be patchily distributed over an area of about 10,000 ha. The sparrow apparently existed in this area before its official discovery, as a previously overlooked observation occurred in 1957 (Werner and Woolfenden 1982). Based on his surveys in 1974 and 1975, Werner concluded that this area supported most of the remaining sparrow population. Using information on sparrow density from his study plots, he estimated the population there to be between 1900 and 2800 birds (Werner 1978).

In the early 1970's, therefore, Werner (1975) had found that the sparrow persisted in each of the areas where it had previously been known to exist, but that very few individuals remained at Ochopee, on Cape Sable, or in the southern Big Cypress Swamp. Birds near Ochopee were undergoing a decline, while birds on Cape Sable were confined to small patches of remnant cordgrass marsh. The largest population was the newly discovered one near Taylor Slough. Figure 2 summarizes the sparrow's known range at the end of Werner's study.

Combining Werner's information with that of earlier workers, we can estimate the maximum known historic range of the Cape Sable Sparrow (1918-1975 (Fig. 3)). As discussed above, it appears that not all areas were occupied simultaneously nor was each area densely occupied throughout the historical period.

Censuses of 1978-81

In our preliminary censuses conducted in 1978-1980, we attempted to determine the location and status of persisting populations (Fig. 4, 5, 6). In 1978, censusing places where Werner had last found birds, we heard or saw birds at 2 sites on Cape Sable, at one site near Ochopee, and at 11 of 12 sites surveyed in Taylor Slough (Fig. 4). In 1979, we were unable to find birds in their previous locations on Cape Sable, because most of that habitat had burned that year. We found birds at 2 sites near Ochopee and in 11 of 20 sites surveyed near Taylor Slough (Fig. 5). In 1980, we were unable to find birds on Cape Sable or near Ochopee. A more complete survey in the Big Cypress Swamp found birds at 12 of 21 sites surveyed. We also found sparrows at 32 of 50 sites censused near Taylor Slough (Fig. 6).

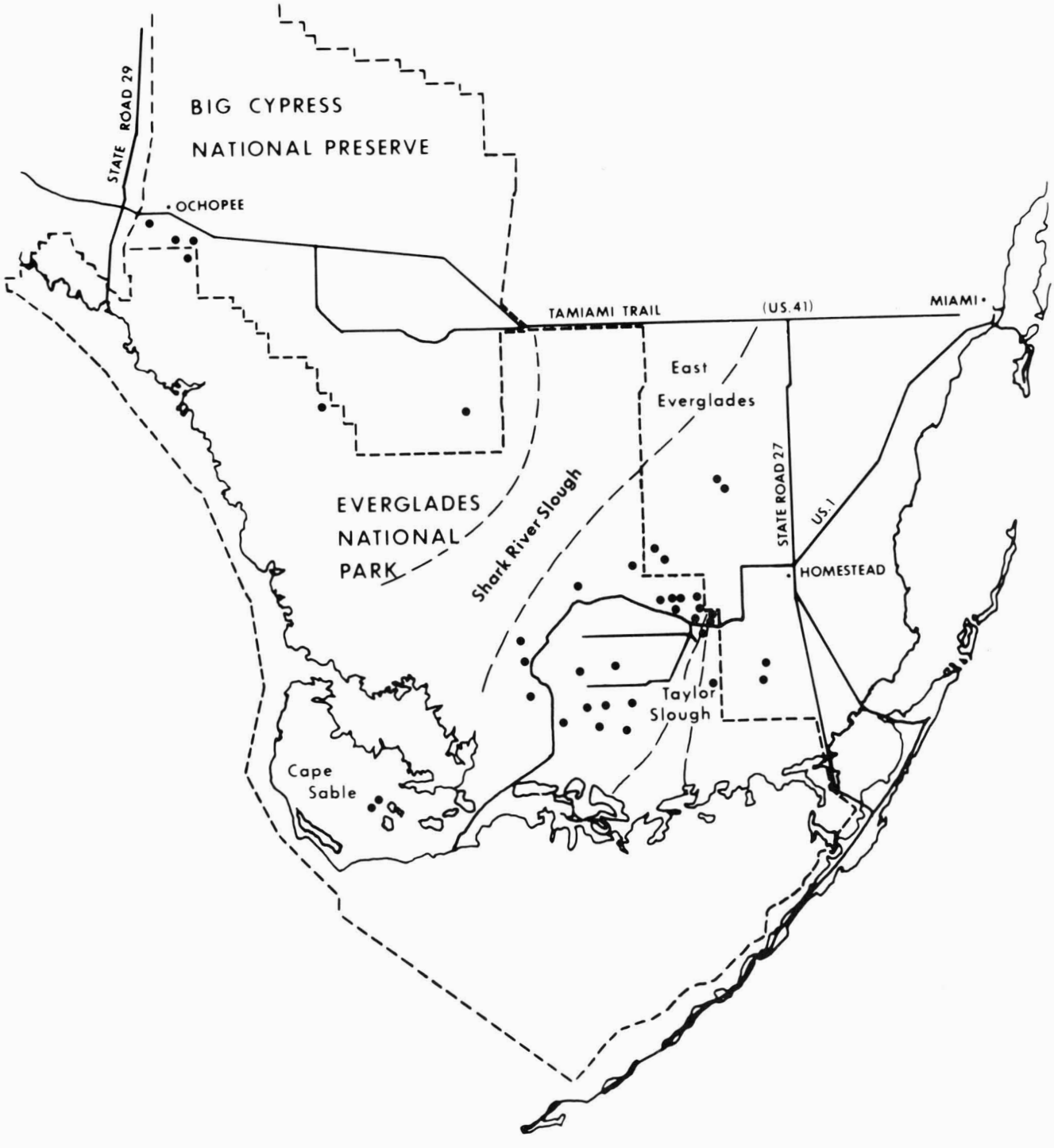

Figure 2. Known distribution of the Cape Sable sparrow in 1970-1975. Locations where sparrows were found by Werner (1975) are indicated by dots.

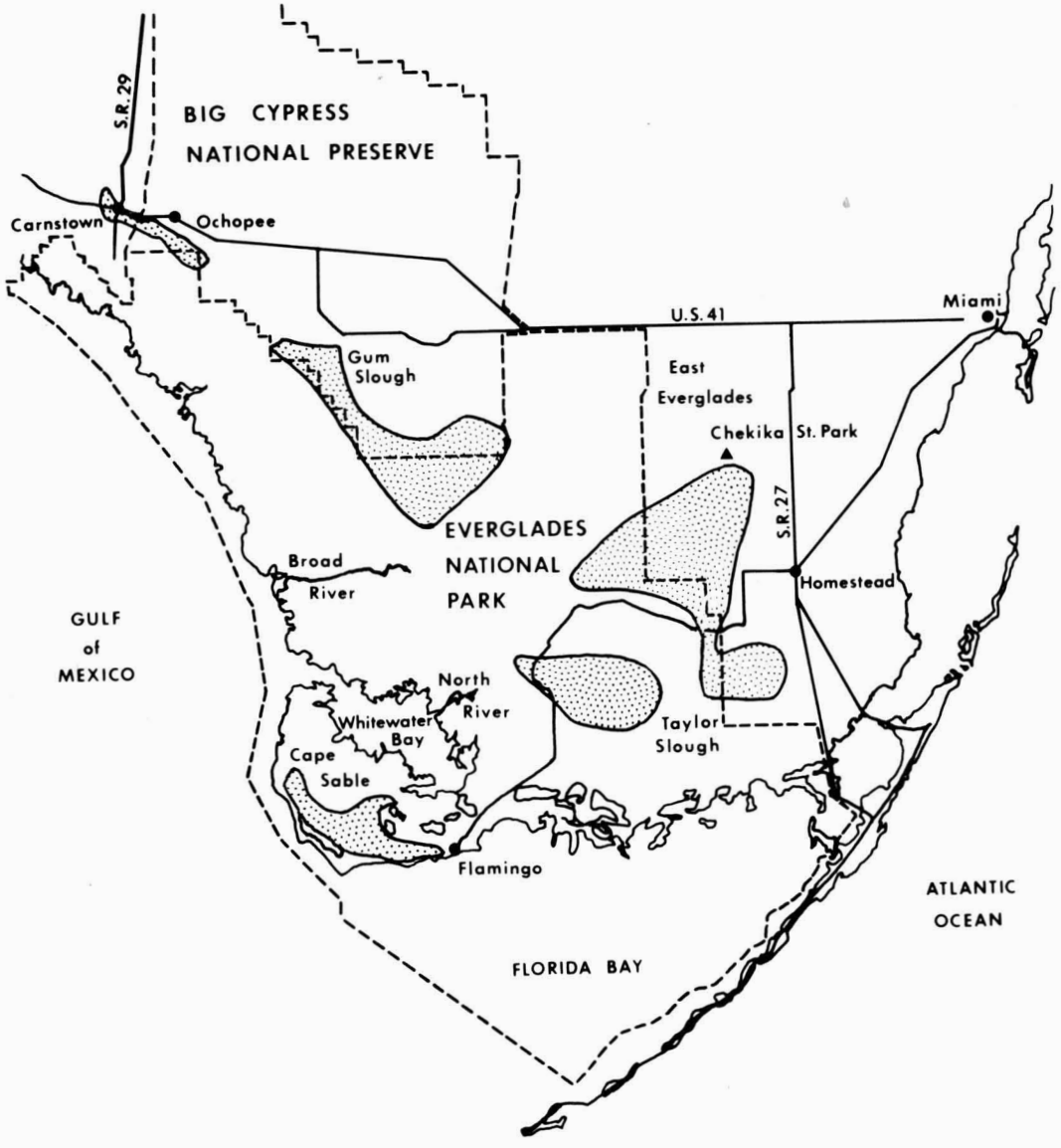

Figure 3. Maximum extent of the known range of Cape Sable sparrows, 1918 through 1975. The sparrow was probably absent from some of these areas through some or most of the period. See text.

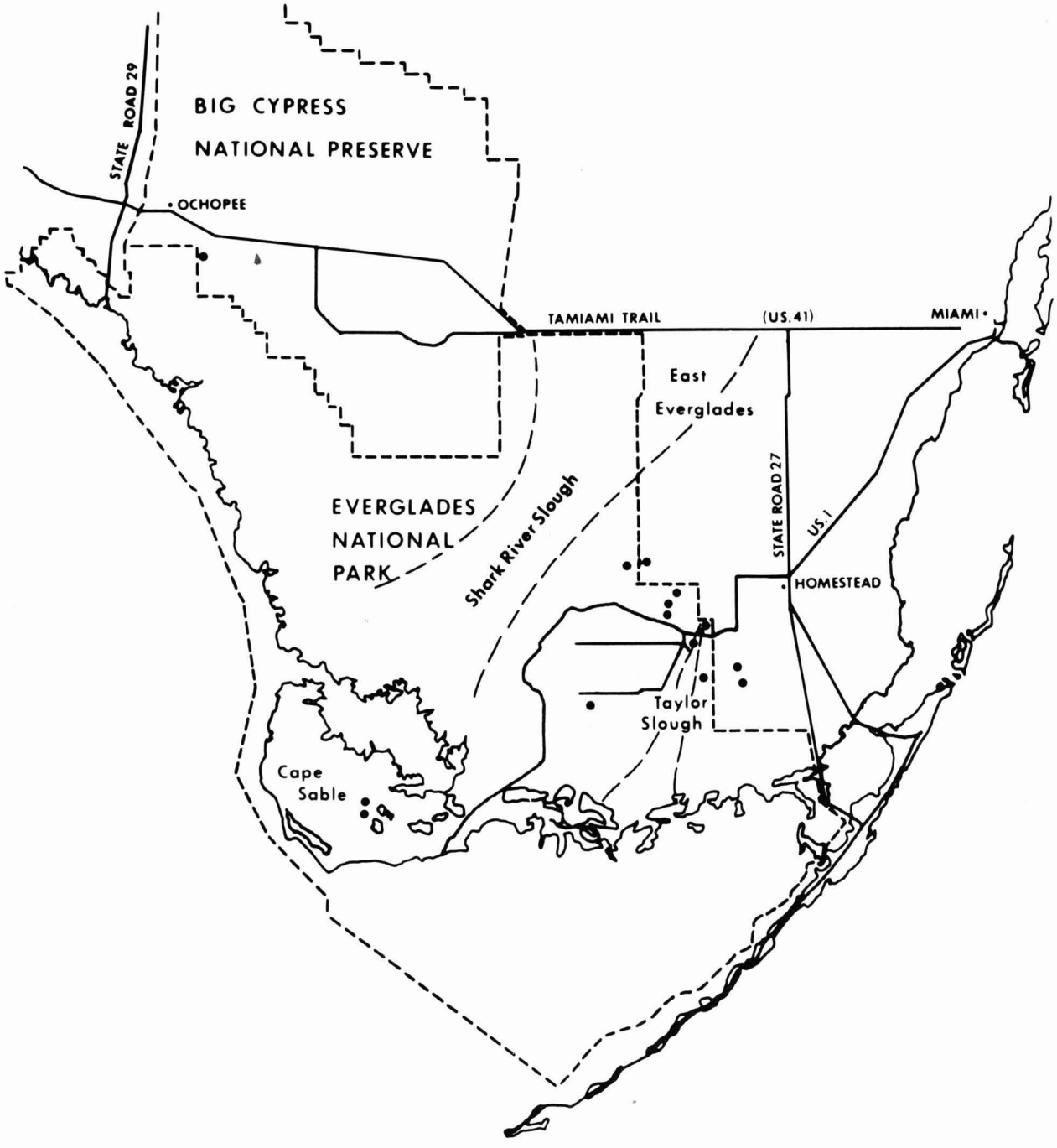

Figure 4. Locations where Cape Sable sparrows were found in 1978.

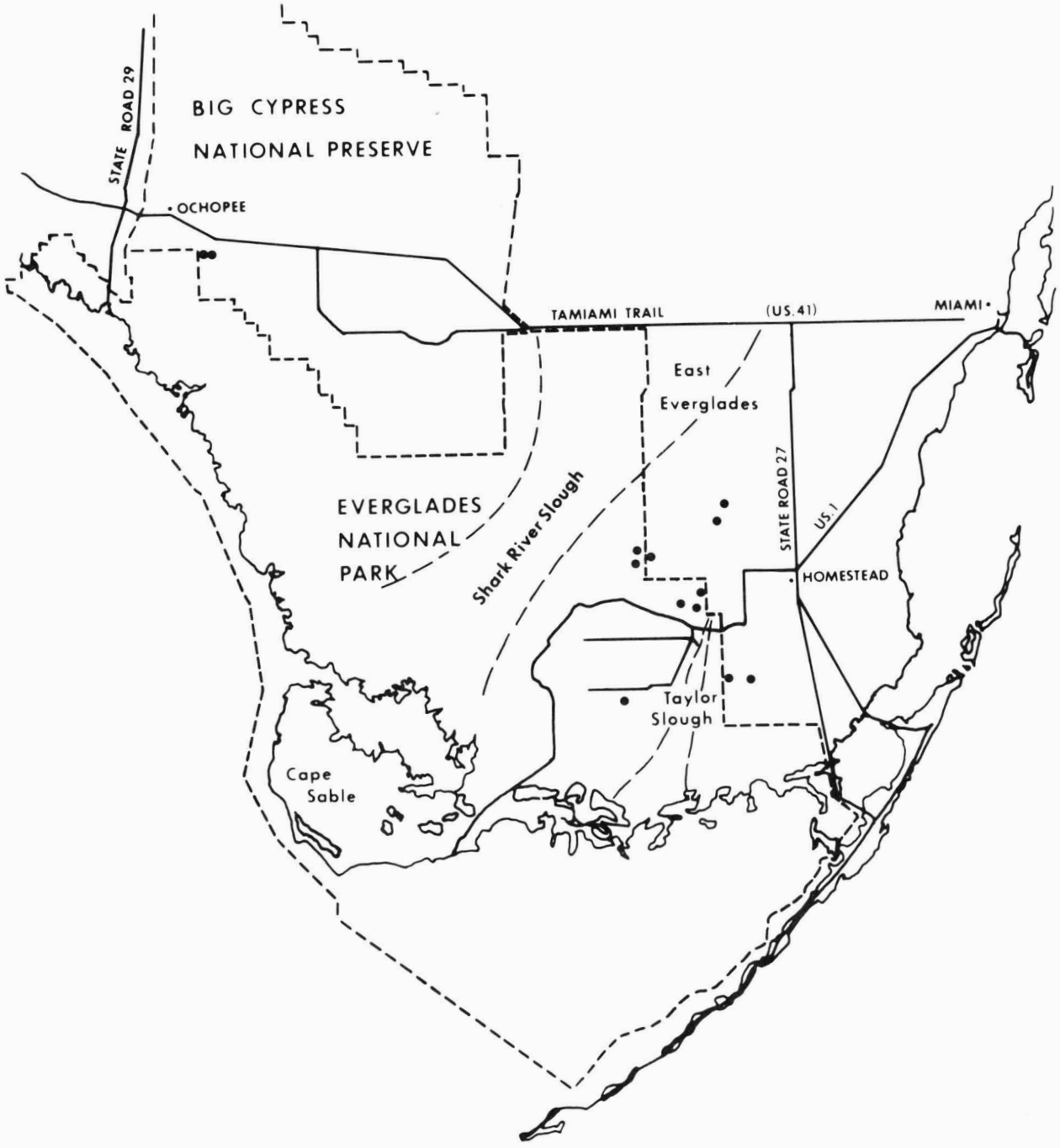

Figure 5. Locations where Cape Sable sparrows were found in 1979.

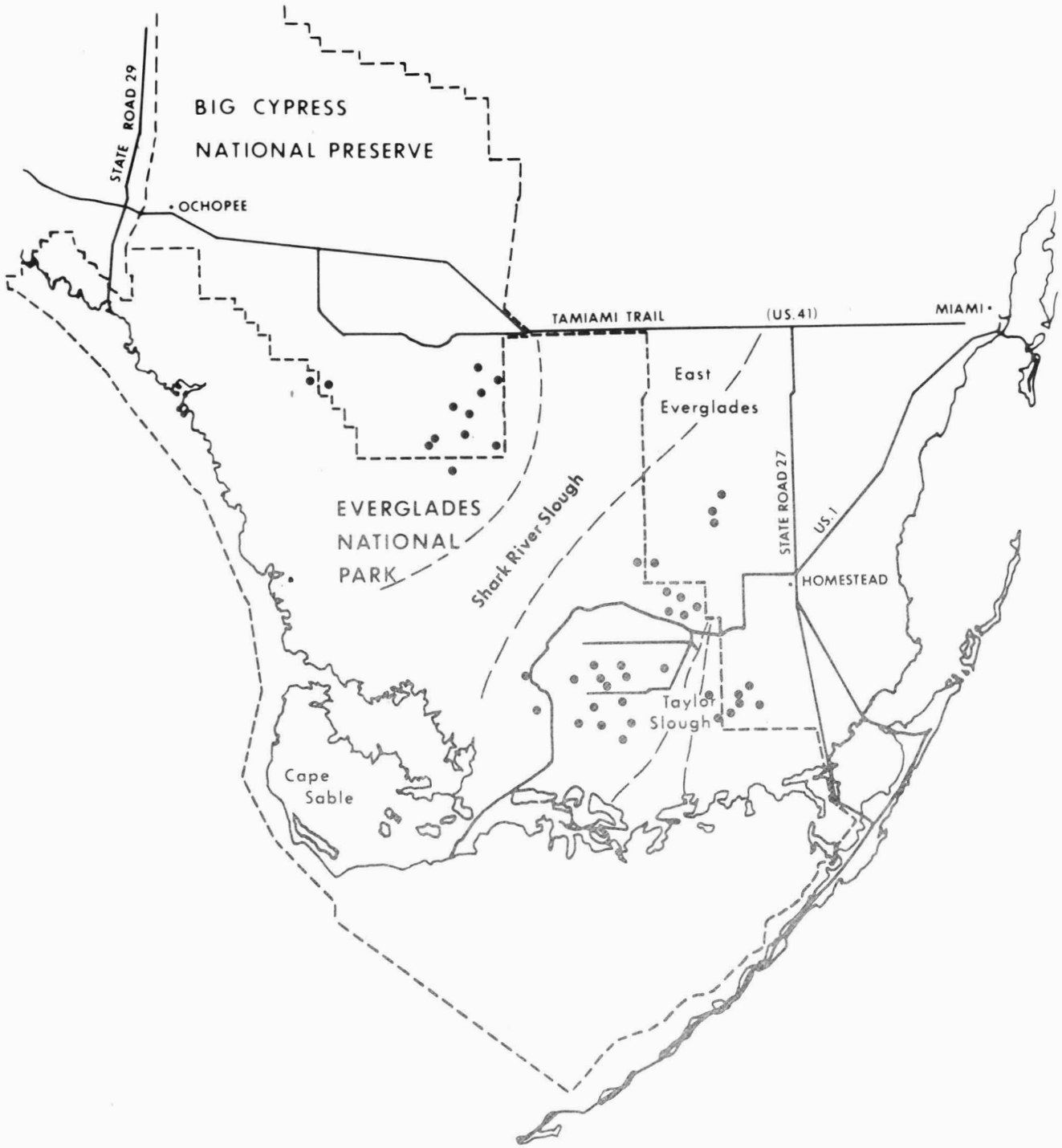

Figure 6. Locations where Cape Sable sparrows were found in 1980.

This 3-year survey period demonstrated a continued retraction of sparrow distribution from that of 1975 at Ochopee and at Cape Sable, with birds not being found at these sites in the last year of the survey. However, the rediscovery of a large and well-dispersed population west of Shark River Slough and expansion of the known distribution of sparrows near Taylor Slough suggested that a substantial total population remained. To determine precisely the distribution of the remaining birds, censuses were made 1 km apart throughout the known or otherwise suitable range. All prairie habitat was surveyed along with adjacent marginal habitat dominated by sawgrass, cypress trees, mangrove trees, or hammocks.

The results show that, as of 1981, the Cape Sable sparrow was widely distributed over large areas of southern Florida west and east of Shark River Slough (Fig. 7). The location of all spots censused and the data obtained at each are given in Appendix II. Overall, 864 locations representing 864 km^2 were censused (Table 1). We found 278 or 32% of these locations to be occupied by Cape Sable sparrows. Sparrows therefore occurred over 27,800 ha.

The census results for each of four subpopulations are shown in Table 1. We saw no sparrows at 5 sites on Cape Sable, representing total coverage of all remaining habitat there. Similarly, we found no birds near Ochopee. In Taylor Slough and the southern Big Cypress Swamp, however, we counted over 400 birds at the 278 sites. Forty percent of the plots surveyed near Taylor Slough were occupied by sparrows. The high percentage of occupied census plots reflects the clear demarcation between suitable prairie habitat and the surrounding unsuitable habitats of tall sawgrass marsh, pine forest, mangrove forest, hammock forest, or developed land which we did not census. As a result the periphery of the census area was well defined and most of our census plots were in suitable habitat. The 28% occupancy of the Big Cypress area was due to the complex interdigitation of marginally unsuitable habitats and isolated patches of prairie habitat that required censusing. The habitat in the two large areas occupied by sparrows is probably grossly equivalent because the number of birds per occupied site was similar.

Habitat use

During the 1981 census, we also determined characteristics of the habitat used by Cape Sable sparrows. Most birds occurred in habitat dominated by the grass, Muhlenbergia , and 67% of the occupied habitat was muhly prairie (Table 2). Muhly and the similar mixed prairie together accounted for 96% of the habitat occupied by sparrows. Furthermore, half of all muhly and mixed prairie habitats surveyed, which included essentially all of that available in the study area, supported sparrows. We found sparrows in only 8 of 61 sites dominated by cordgrass, the typical seaside sparrow habitat, and at 2 plots that contained cypress trees. Werner (1975) and our data demonstrate that sparrows do not prefer habitats containing trees or brush. Sparrows also were not found in deeply flooded sawgrass dominated marshes. Of the 175 sites in sawgrass-dominated marsh, no sparrows were found there.

It is conceivable that the value of habitat to sparrows could be indexed by the number of singing male birds seen per occupied site. Within the admittedly coarse resolution of this method, it does not appear that the occupied habitats were

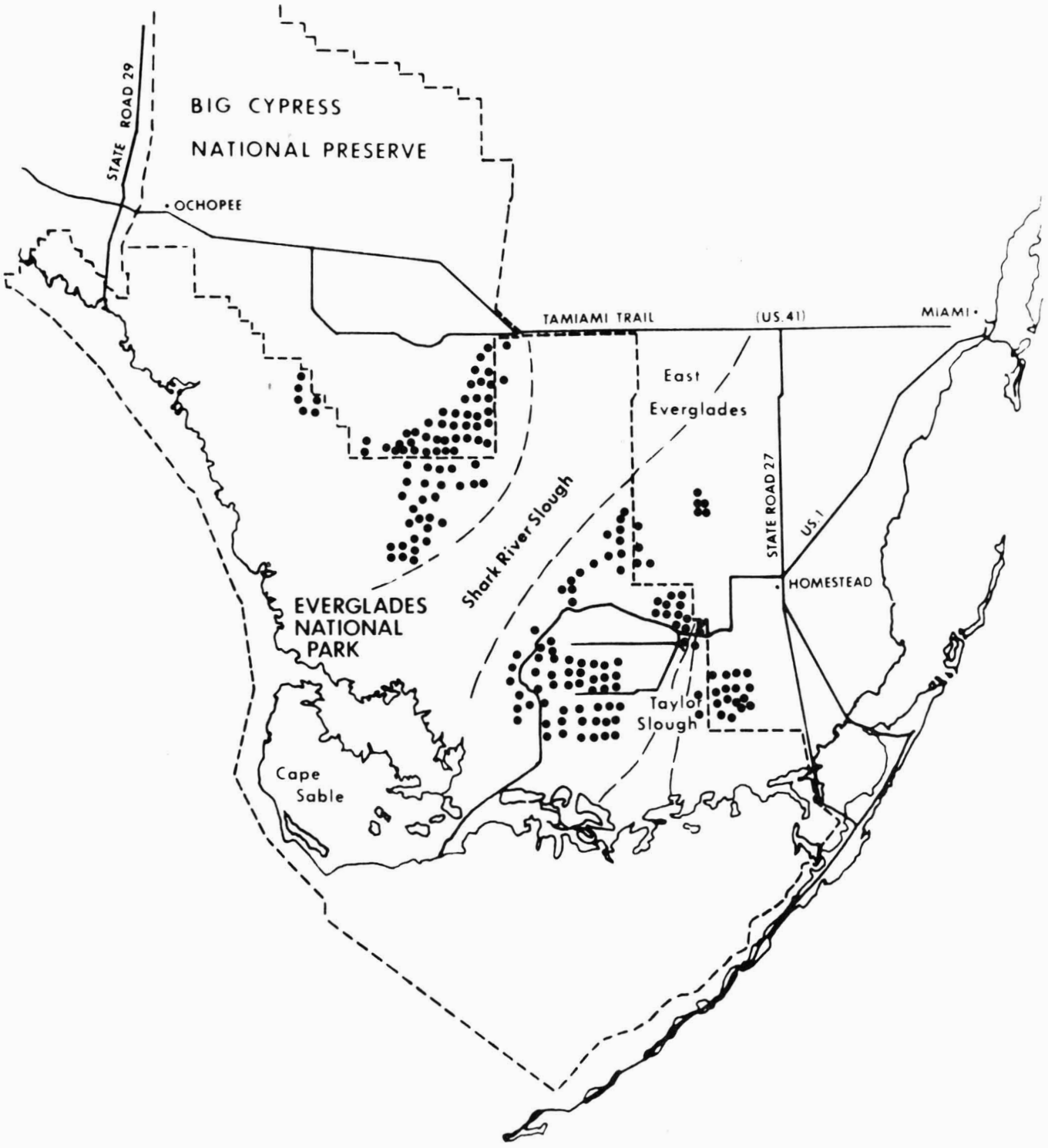

Figure 7. Distribution of Cape Sable sparrows based on censuses conducted in 1981. Suitable habitat was censused at locations 1 km^2 apart. Due to scale, not all occupied locations are shown.

Table 1. Cape Sable sparrows found on censuses conducted in 1981 in four areas of southern Florida.

Subpopulation Areas	Number of Sites	Number of Sites Occupied	Number of Birds Seen	Percent of Sites Occupied	Birds per Site	Birds per Occupied Site
Taylor Slough	396	155	248	40	0.6	1.6
Big Cypress	443	123	168	28	0.4	1.4
Ochopee	24	0	0	0	0	0
Cape Sable	5	0	0	0	0	0
Totals	864	278	416	32	0.5	1.5

Table 2. Habitats occupied by Cape Sable sparrows, 1981.

Habitat Type	Number of Sites	Number of Sites Occupied	Number of Birds Seen	Percent of Sites Occupied	Birds per Site	Birds per Occupied Site
Muhly prairie	371 (43)[1]	186 (67)[2]	290	51	0.8	1.6
Mixed Prairie	164 (19)	82 (29)	111	50	0.7	1.3
Cordgrass Marsh	61 (7)	8 (3)	12	13	0.2	1.5
Sawgrass Marsh	175 (20)	0 (0)	0	0	0	0
Other	93 (11)	2 (1)	3	2	0.03	1.5

[1]Percentage of total habitats surveyed.

[2]Percentage of total habitat occupied.

grossly dissimilar. The situation is more complicated than our census revealed, however, because Werner (1975) and Taylor (1982) found differences in breeding bird density among sites, related to their fire history.

Population estimate

Using the method described above, we estimate the population of adult Cape Sable sparrows in 1981 to be 6640, or rounded to 6600. Werner (1976) had estimated that the Cape Sable sparrow population in 1975 was between 2000 and 3000 birds. He arrived at this figure by extrapolating population densities within measured plots in Taylor Slough over the area of known occurrence. The range of estimates, set by extrapolating sparrow density on good and on poor plots, was 1800 to 27800 individuals. However, considering only the study site most typical of Taylor Slough as a whole, he estimated the population there to be 1900 to 2800 sparrows. Having found very few sparrows in areas other than Taylor Slough, he suggested that this subpopulation accounted for 95% of the population and thereby incremented his estimate slightly to account for other birds. Our data suggest that in 1981 the Taylor Slough population accounted for 3700 sparrows. The primary difference between the two estimates of total population (3000 vs 6600) is in our addition of the Big Cypress subpopulation. Because we undoubtedly did not count all birds at each stop, we consider our estimate to be a minimum one. Thus we conclude that the Cape Sable sparrow population seems to be in excess of 6600 adults as of 1981.

DISCUSSION

Our census data suggest that the Cape Sable sparrow has a larger population than previously thought. Over 6600 birds are widely distributed over much of its maximally occupied historic range (Fig. 3, 7). Despite this optimistic result, it is apparent that the Cape Sable and Ochopee subpopulations have been extirpated or at least reduced to very low numbers. These coastal populations, should they persist, are now marginal relative to the remaining population, which is concentrated in the extensive marsh prairies of inland southern Florida. The apparent loss of birds from Cape Sable seems primarily a natural phenomenon reflecting changes in the vegetation regime, whereas the loss of birds from the Ochopee area was probably man-caused because of drainage and fires (Kushlan et al. 1982)

Current and future threats to the Cape Sable sparrow seem to be habitat alteration from hurricanes, fire, drainage, and development. The nature of these threats and proposals for management are discussed in Kushlan et al. (1982). Hurricanes appear to have caused substantial, apparently irreversible, changes to some coastal habitat. Werner and Woolfenden (1982) concluded that the birds probably have (and would) survive the direct effect of hurricanes. Long-term habitat change, however, may have a devastating effect, as was demonstrated on Cape Sable. Too frequent or too severe fire, especially combined with drainage, can markedly affect sparrows. Werner (1975) and Taylor (1982) discuss the role of fire and its use as a management tool.

The greatest threat at present to an extant population is in the East Everglades, where loss of habitat to drainage, frequent fires, invasion of exotic trees, and agricultural and urban development is occurring. Contraction of the population

because of loss of habitat, has rendered parts of the proclaimed critical habitat unsuitable for sparrows. This can be seen by comparing the critical habitat as of 1981 to present distribution of sparrows (Fig. 8) in the East Everglades. Should it be considered desirable to preserve that segment of the population, specific management is required to protect this habitat. Birds in the East Everglades have become an increasingly isolated and marginal group.

The apparent disappearance and reappearance of the Cape Sable sparrow from known habitat is a matter of some interest. Much of our lack of information on the sparrow's historic distribution is undoubtedly due to the difficulty in gaining access to much of the area. It also was due to the occurrence of the Cape Sable sparrow over vast areas of freshwater marsh, where self-respecting seaside sparrows would not be expected to occur. However, we do not believe that all the reported disappearances are artifactual. We doubt that birds would have been missed by Stimson (1956) on Cape Sable in 1949, by Werner (1975) in the Big Cypress in the early 1970's, or by Robertson (1955) in Taylor Slough in the early 1950's. Considering the dramatic effects of fire on habitat occupancy by sparrows (Werner 1975, Taylor 1982), it seems likely that fires covering large areas too frequently would render considerable habitat unsuitable. Reoccupancy would require a slow recolonization for this fairly sedentary bird. This conclusion suggests that unnatural fire must be controlled and used as a management tool in sparrow habitat (Kushlan et al. 1982, and Taylor 1982) and that our population estimate may represent a high point in a fluctuating population cycle.

Nonetheless, as of 1981, a substantial population persists over a large area of freshwater muhly and mixed-species marsh. The population is influenced by fire, water conditions, and plant community distribution. Peripheral population segments are threatened by man-caused habitat disruption, but the preponderance of the population is under Federal jurisdiction in Everglades National Park and Big Cypress National Preserve. We conclude that the status of the Cape Sable sparrow is more secure than previously thought, but the persistence of marginal peripheral populations requires direct management, and the survival of the subspecies depends on maintenance of natural water and fire regimes.

ACKNOWLEDGEMENTS

We especially would like to acknowledge Harold W. Werner, whose work allowed our own to follow, and Ingrid C. Olmsted who provided advice on plant identification and supplied the descriptions of the plant communities used in this paper. We thank too our fine helicopter pilot, Donald Mitchell, without whose skill this study could never have succeeded. We also thank our colleagues for their advice and encouragement, especially William B. Robertson, Jr., Lloyd L. Loope, Dale L. Taylor, Peter C. Rosendahl, Herbert W. Kale, II, and James Baker. We thank Dee Childs for typing the manuscript.

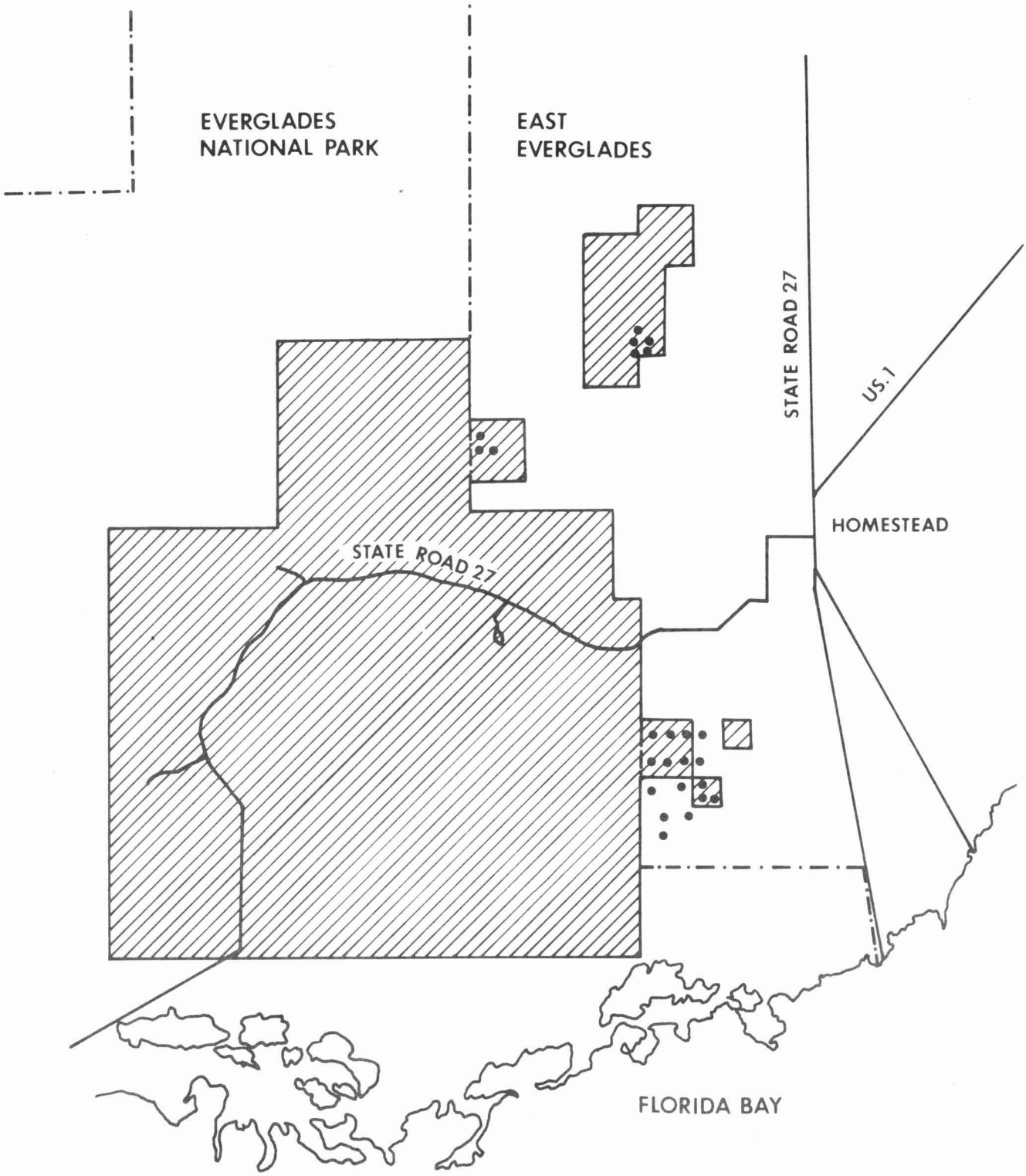

Figure 8. Critical habitat of the Cape Sable sparrow compared with current distribution of birds in the East Everglades. Much of the isolated habitat in the East Everglades is no longer suitable for the birds.

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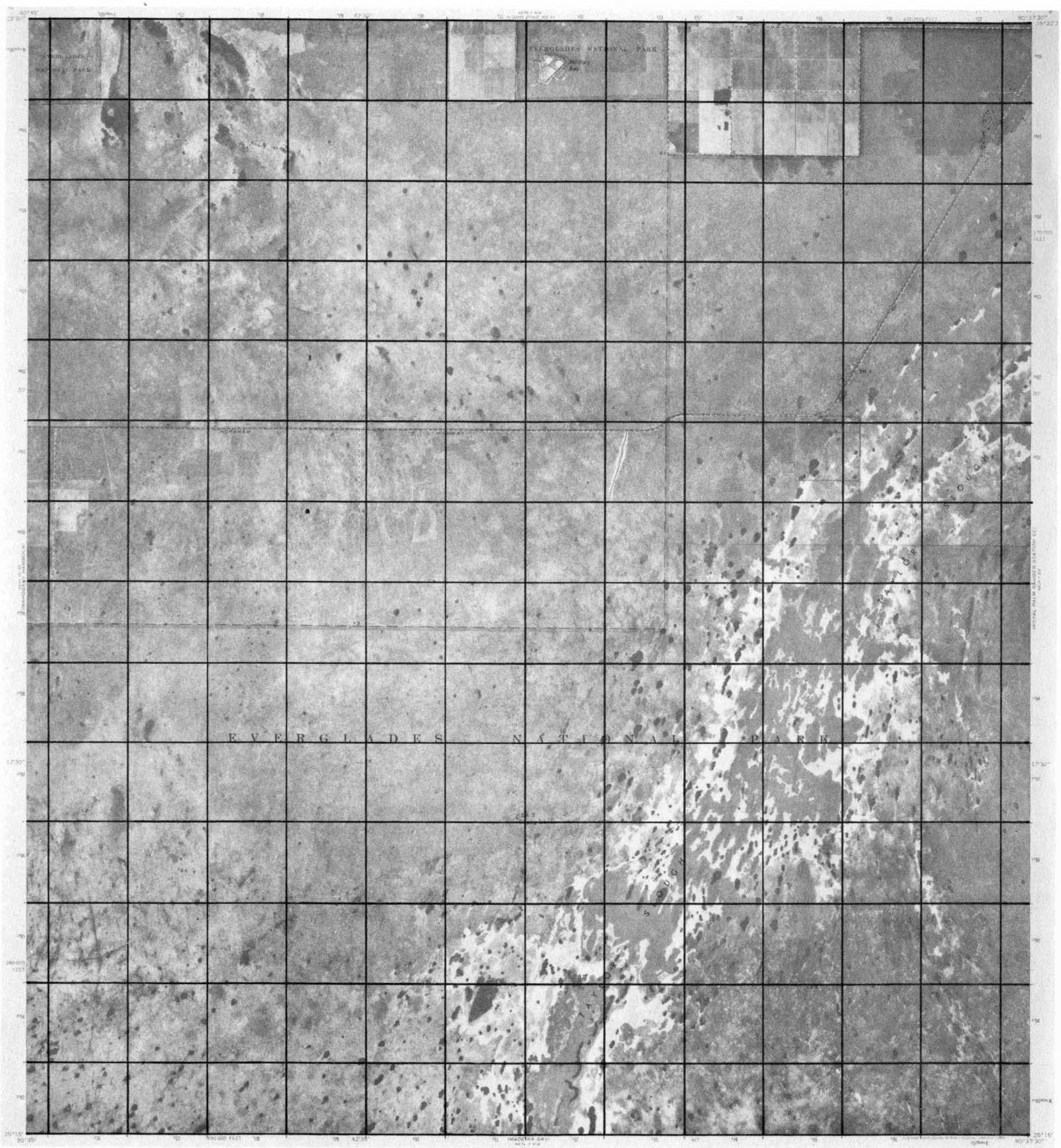
Appendix I. U.S. Geological Survey 7.5 minute orthophoto quadrangle gridded into blocks 1 km on a side.


EVERGLADES NATIONAL PARK
EVERGLADES NATIONAL PARK
TAYLOR SLOUGH
TAYLOR SLOUGH

Appendix II. Cape Sable sparrow survey maps with location of all spots censused and data obtained, 1981. ● = survey site where Cape Sable sparrows were found. ○ = survey site where Cape Sable sparrows were not found. 1, 2, 3, . . . = number of sparrows detected.

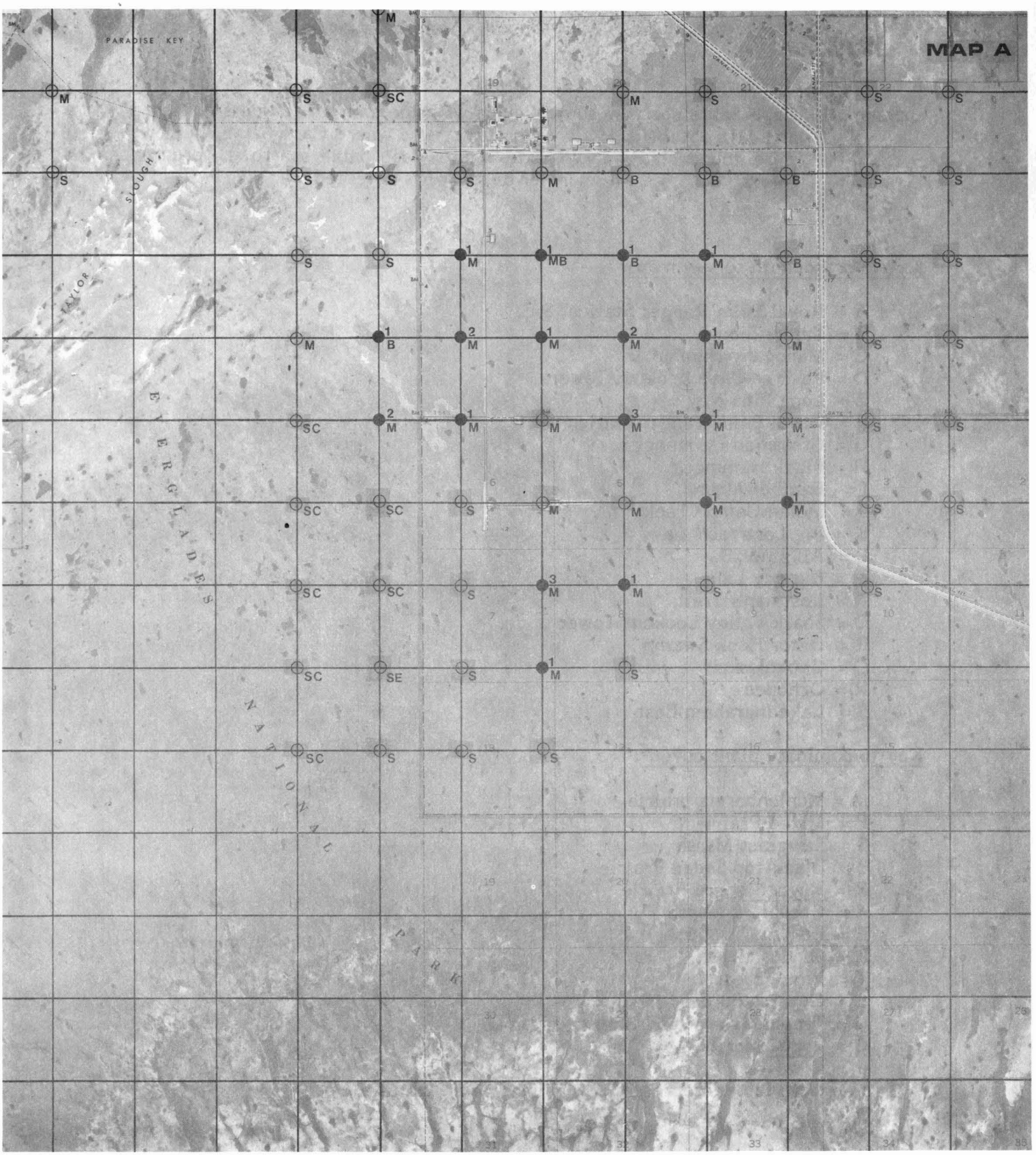
Key to orthophoto survey maps:

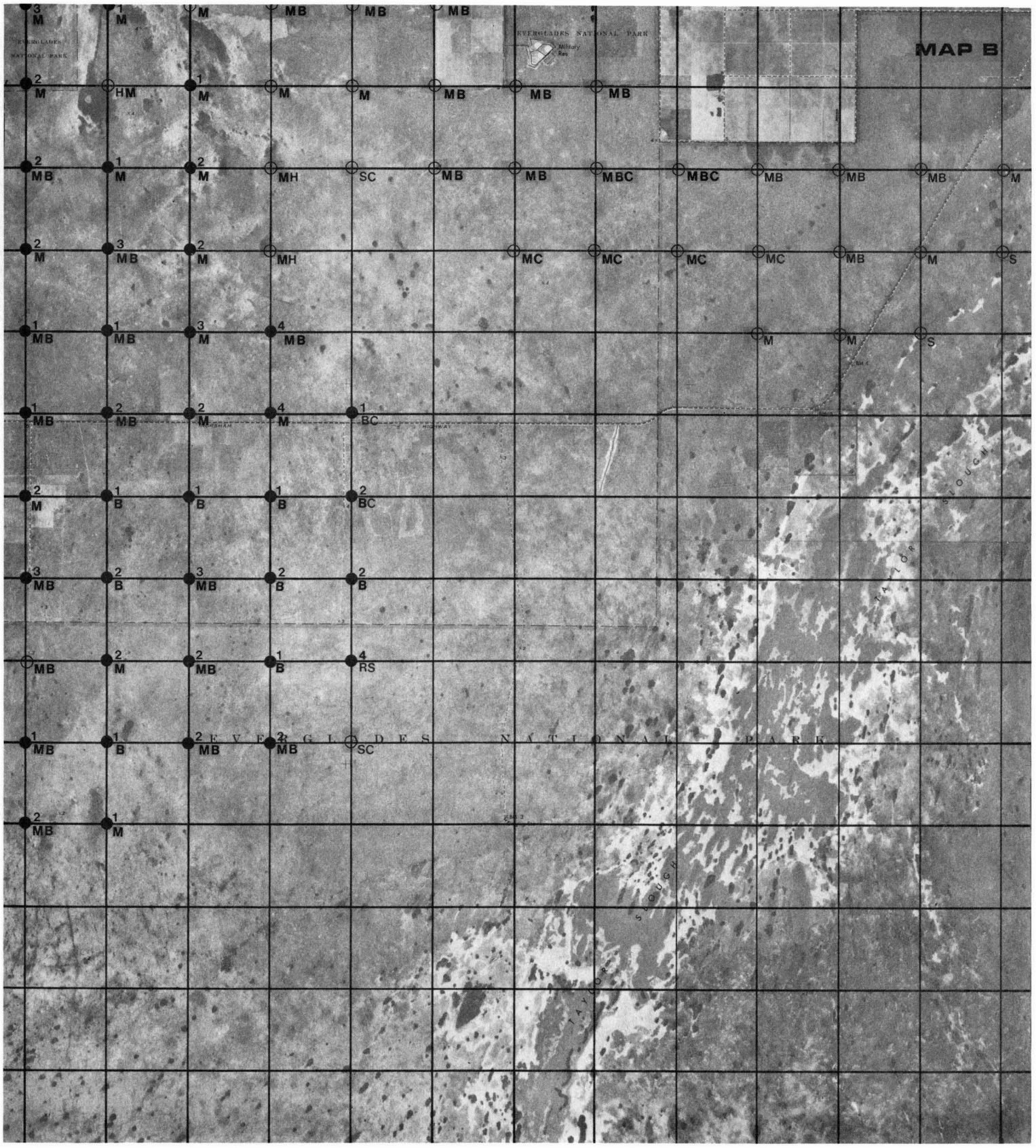
A = Royal Palm Ranger Station, S.E.
B = Taylor Slough
C = Mahogany Hammock
D = Pa-Hay-Okee Lookout Tower
E = Long Pine Key
F = Royal Palm Ranger Station
G = Grossman Hammock
H = Black Hammock
I = Panther Mound
J = Indian Camp Creek
K = Big Lostman's Bay
L = Alligator Bay
M = Big Boy Lake
N = Lostman's Trail
O = Shark Valley Lookout Tower
P = Gator Hook Swamp
Q = Chokoloskee
R = Ochopee
S = Lake Ingraham East

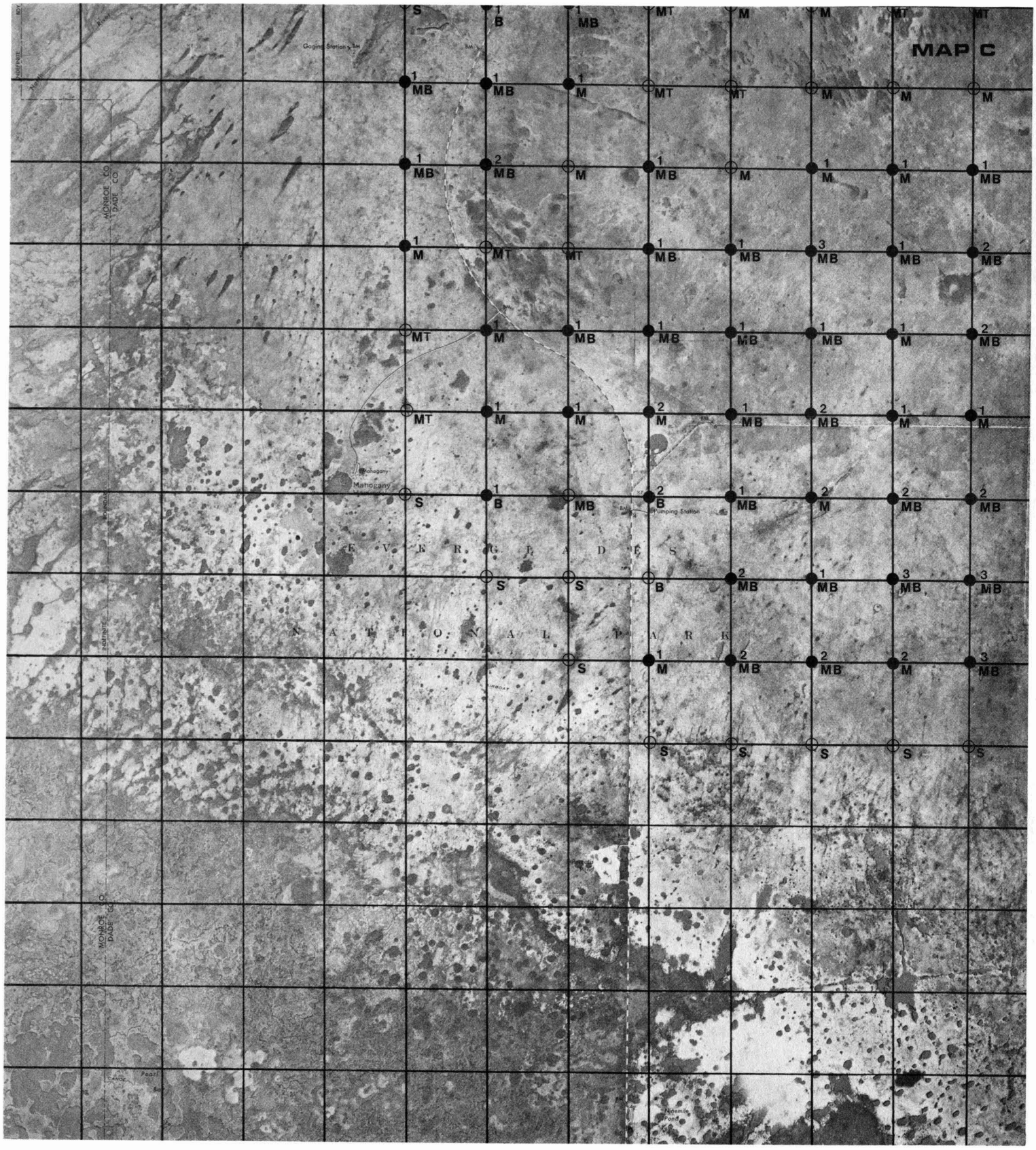
Key to dominate plant cover*:

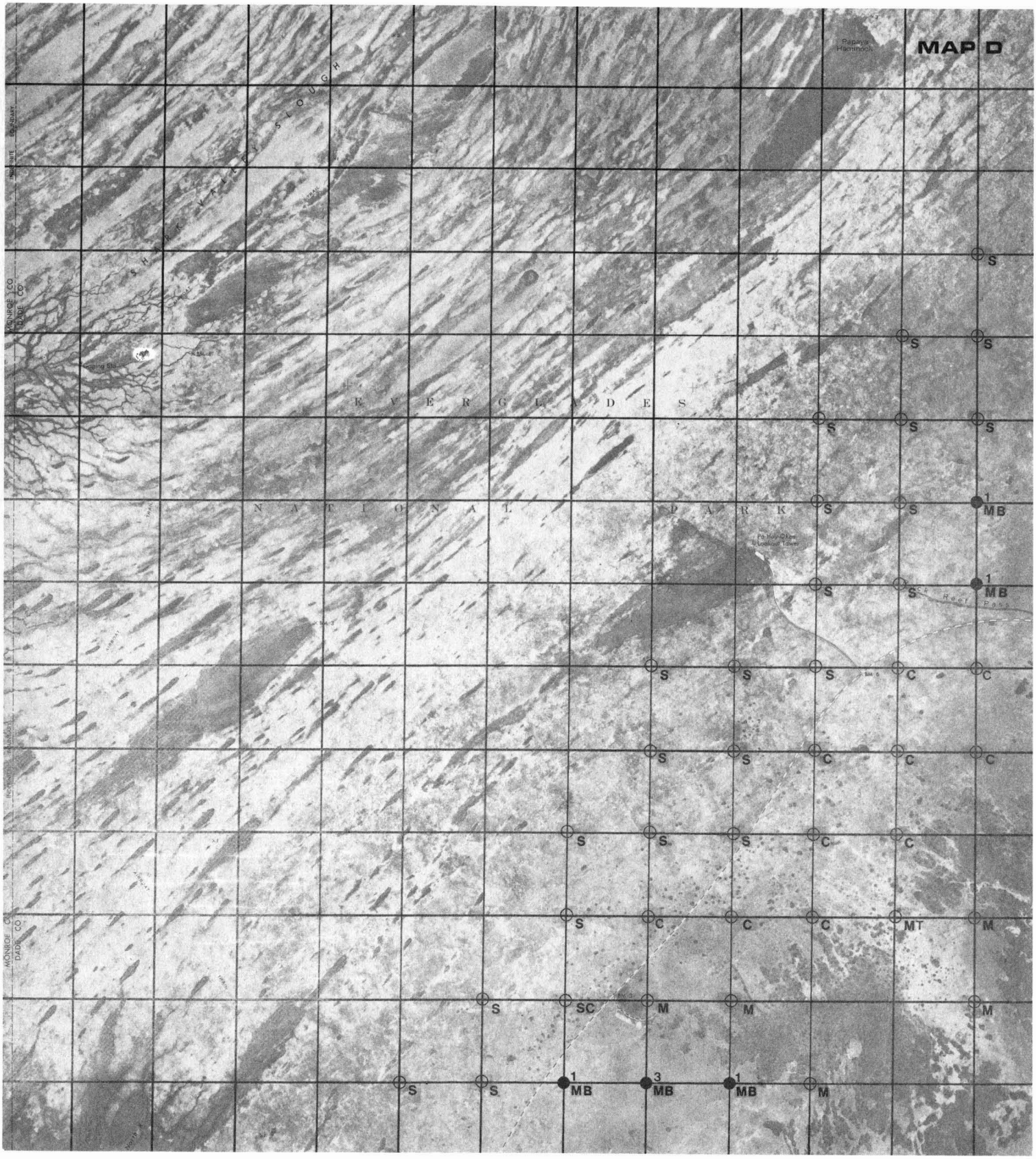
M = Muhlenbergia prairie
P = Mixed Prairie
S = Sawgrass Marsh
B = Black-top Sedge Prairie
R = Rhynchospora Prairie
A = Cordgrass Marsh
E = Eleocharis Marsh
J = Juncus Marsh
T = Pine Forest
C = Cypress Forest
H = Tropical Hardwood Hammock
G = Typha Marsh

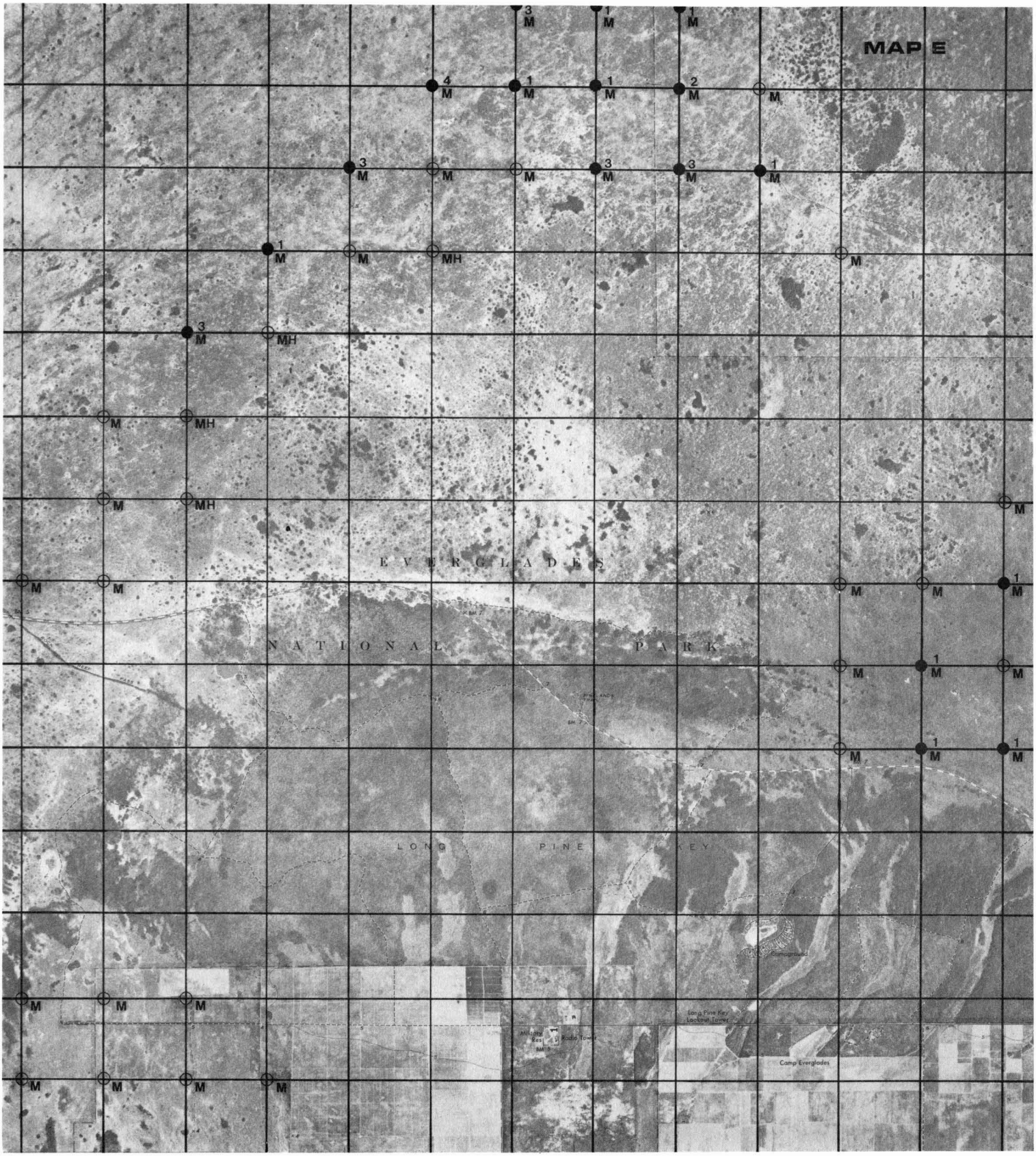
* Two or more letters represent a combination of habitats.

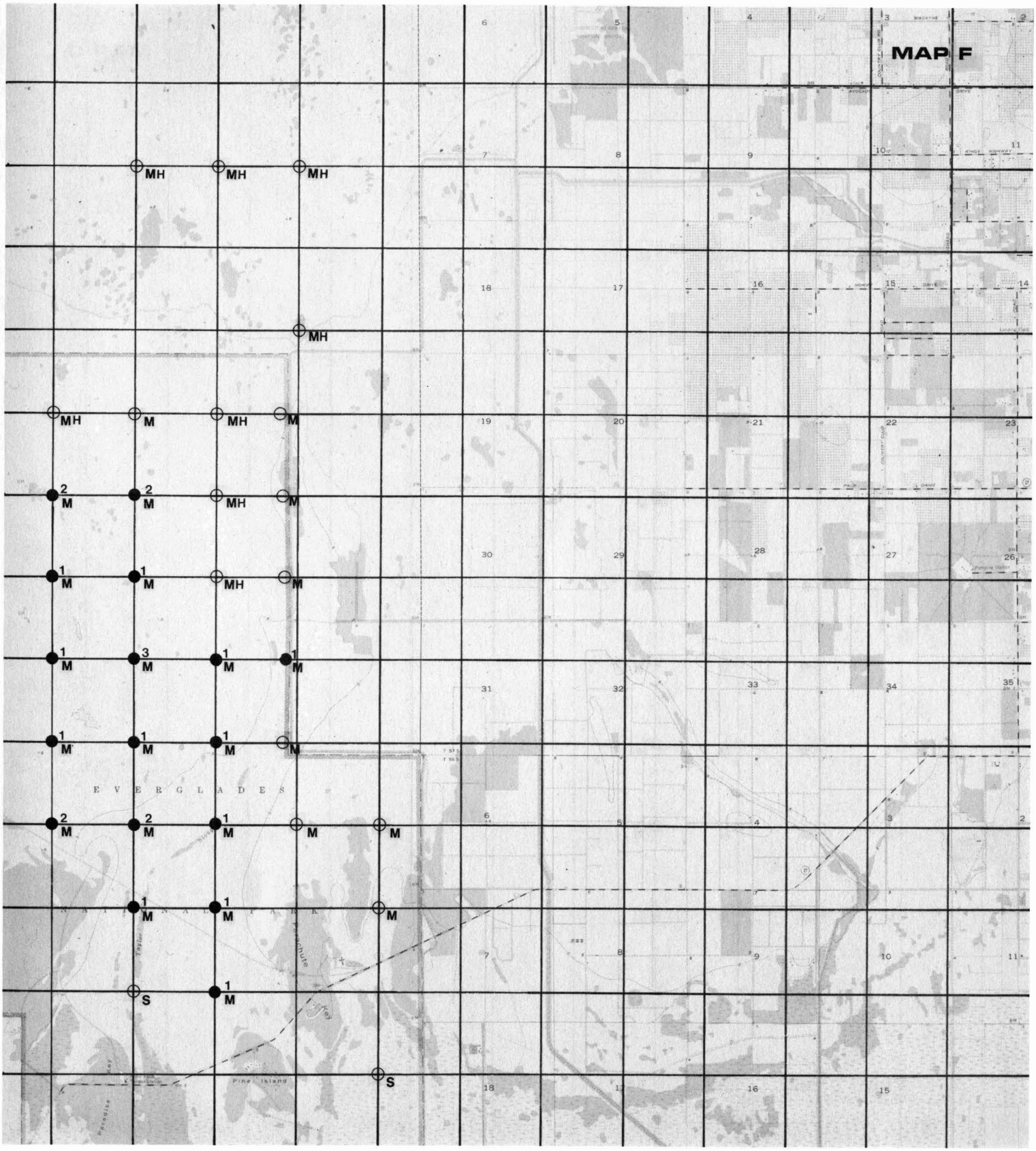

MAP A
PARADISE KEY
TAYLOR SLOUGH
EVERGLADES
NATIONAL
PARK

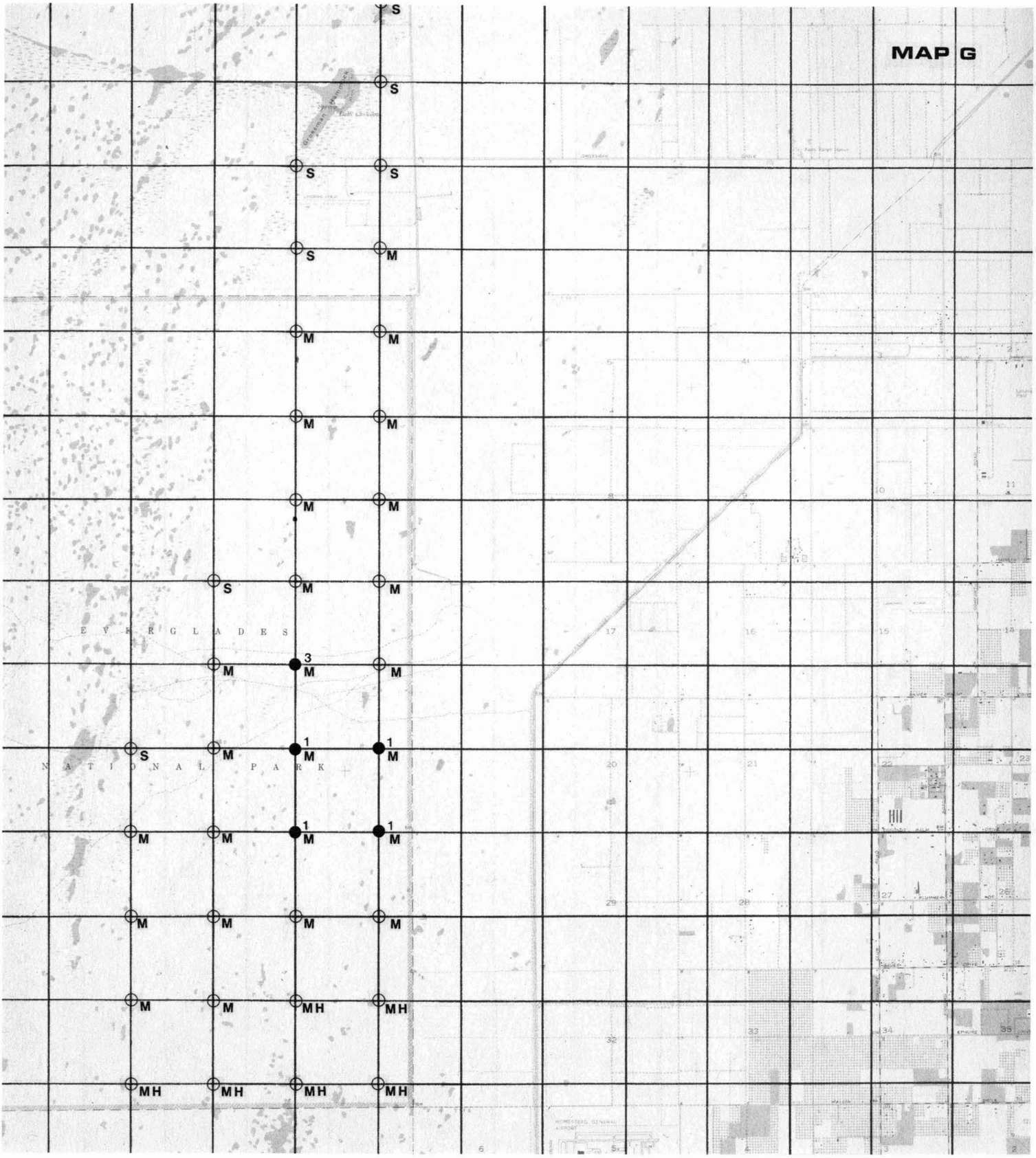

MAP B
EVERGLADES NATIONAL PARK
Military Res
EVERGLADES NATIONAL PARK
TAYLOR SLOUGH
TAYLOR SLOUGH

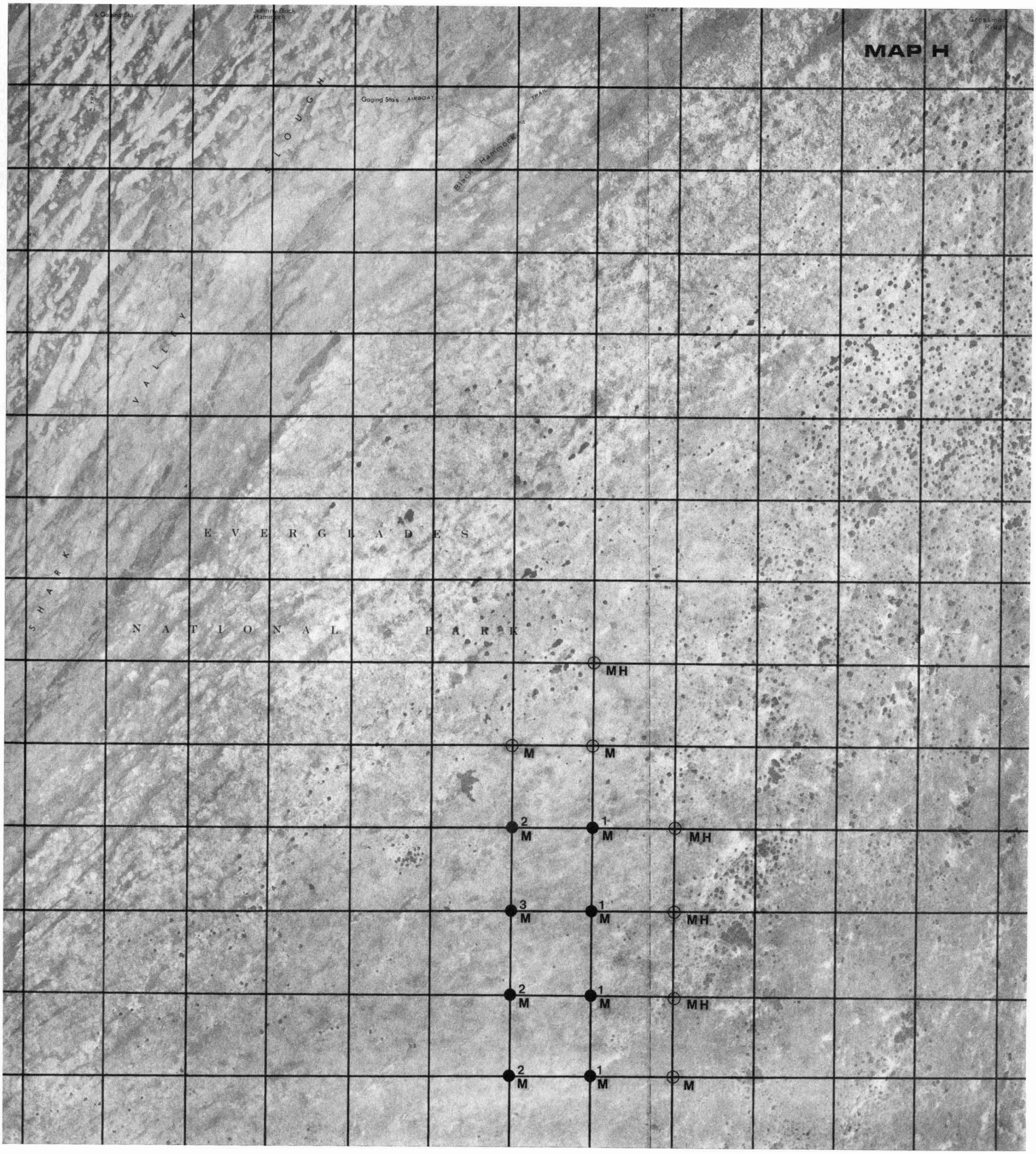

MAP C
EVERGLADES
NATIONAL PARK
Gaging Station
Mahogany
Pumping Station
MONROE CO
DADE CO

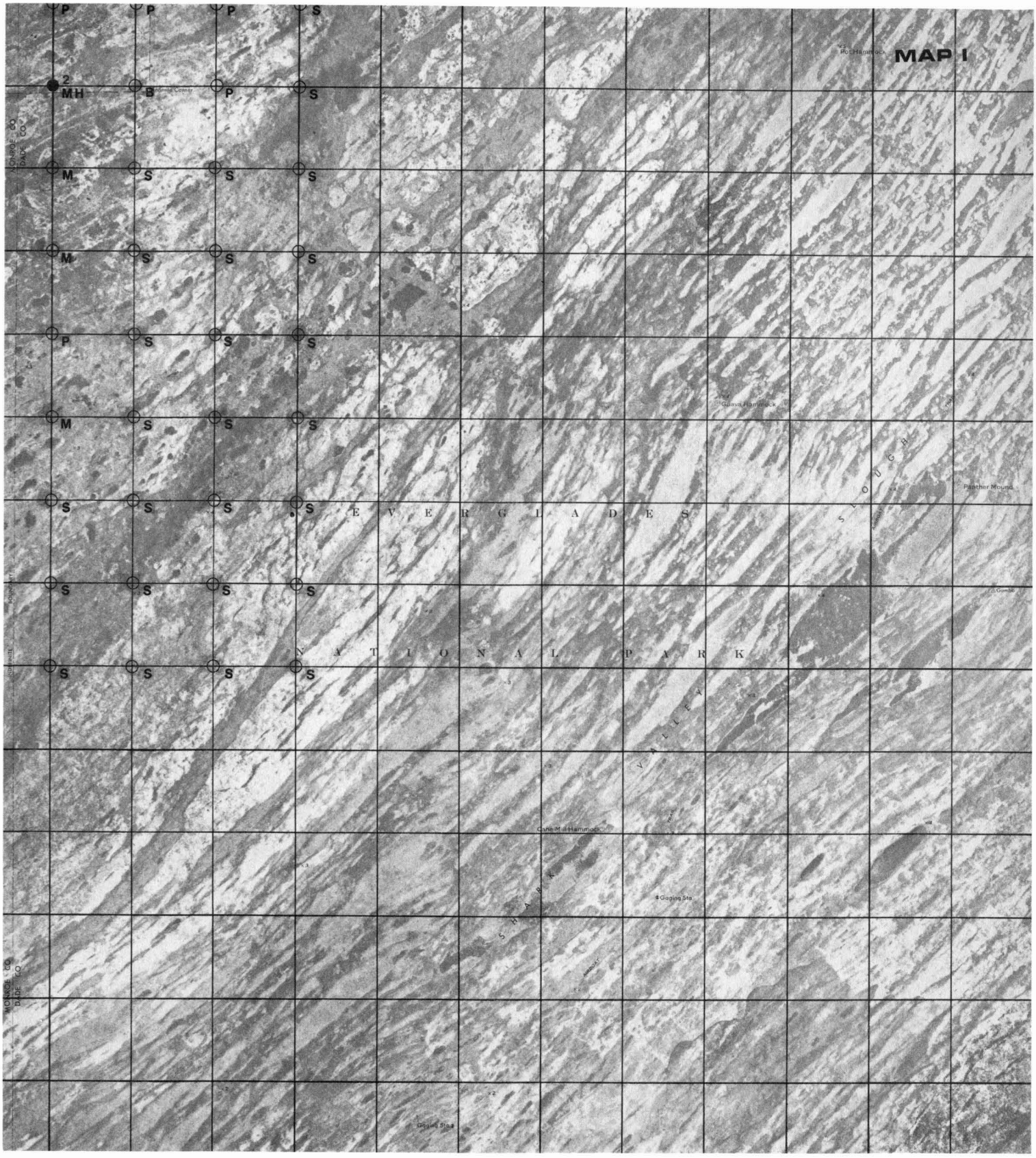

MAP D
EVERGLADES
NATIONAL PARK
SHARK RIVER SLOUGH
MONROE CO
DADE CO
Papaya Hammock
Ft Homestead Lookout Tower
Royal Palm
S
C
M
MT
SC
1 MB
3 MB

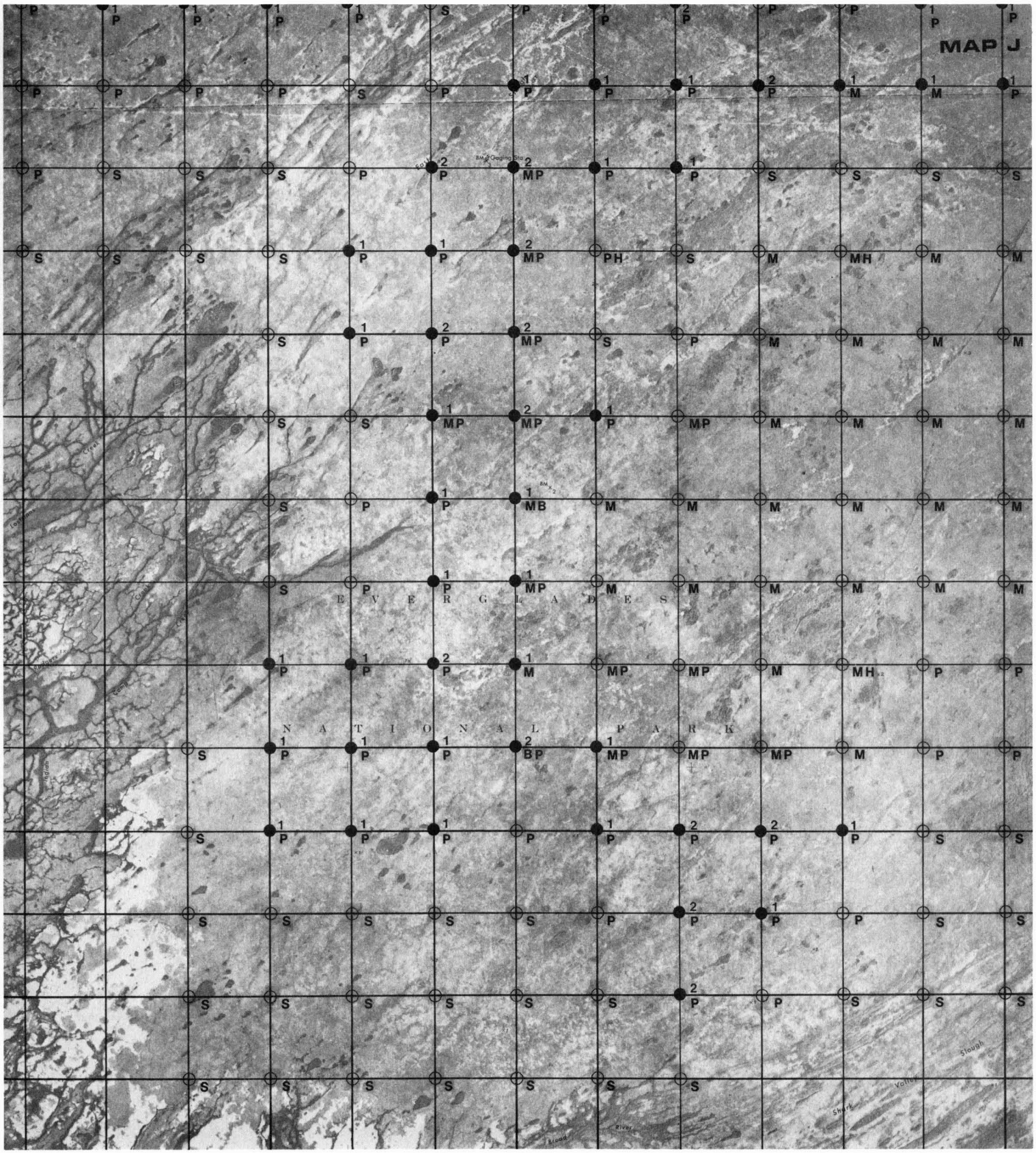

MAP E
EVERGLADES
NATIONAL PARK
LONG PINE KEY
Long Pine Key Lookout Tower
Camp Everglades

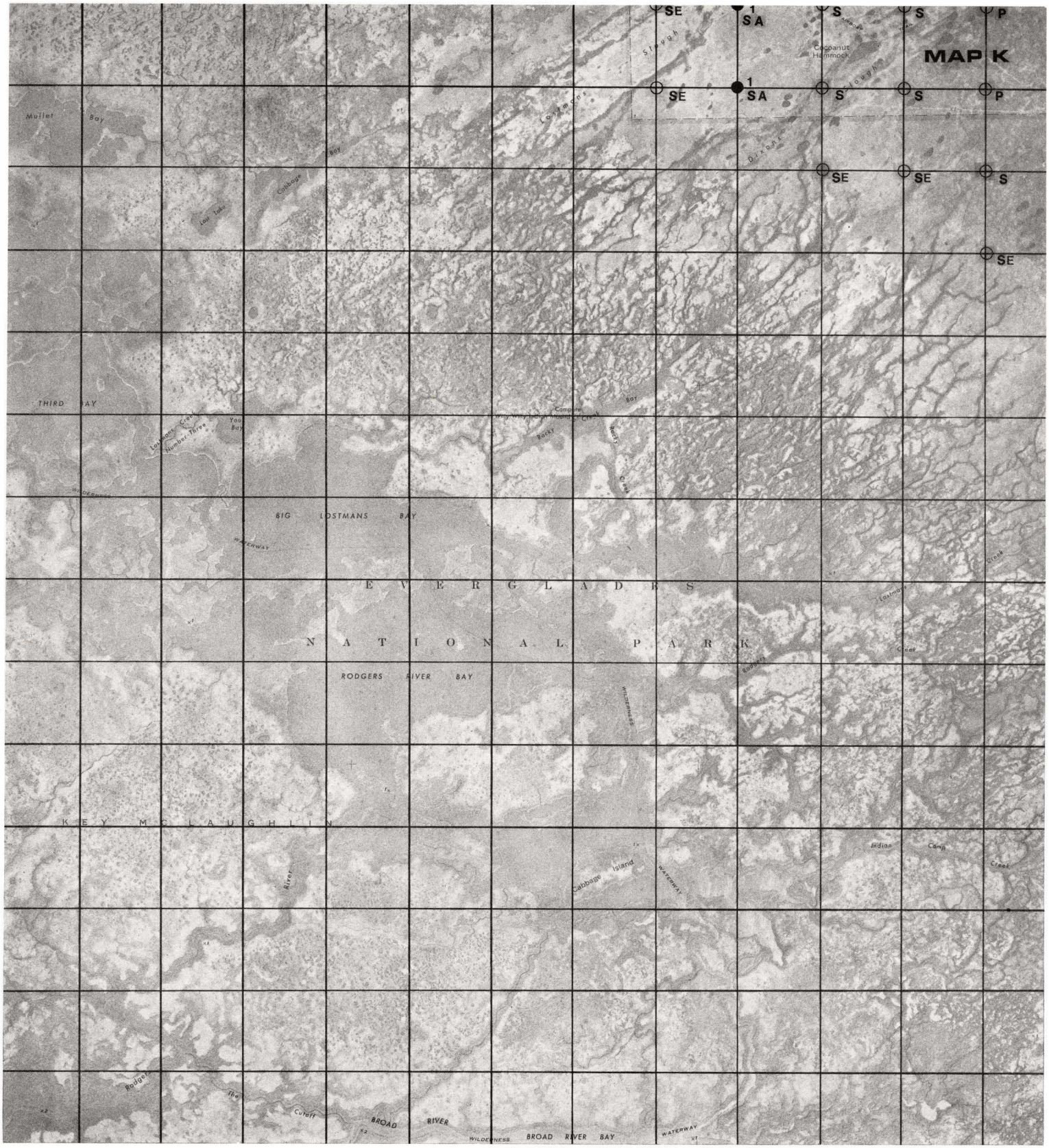

MAP F
MH
M
S
EVERGLADES
NATIONAL PARK
Pine Island
Parachute Key
Taylor Slough
Paradise Key

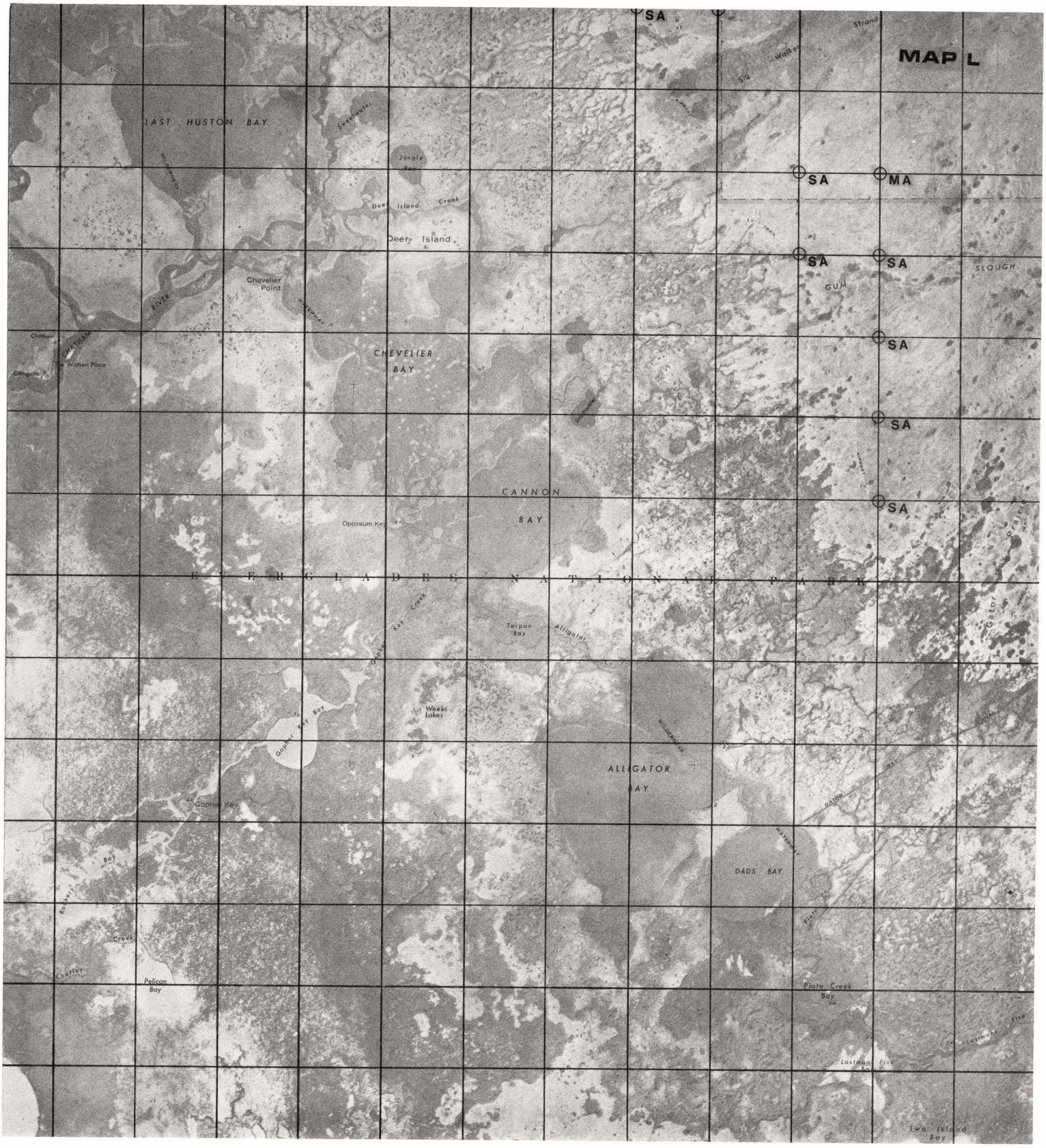

MAP G
EVERGLADES
NATIONAL PARK

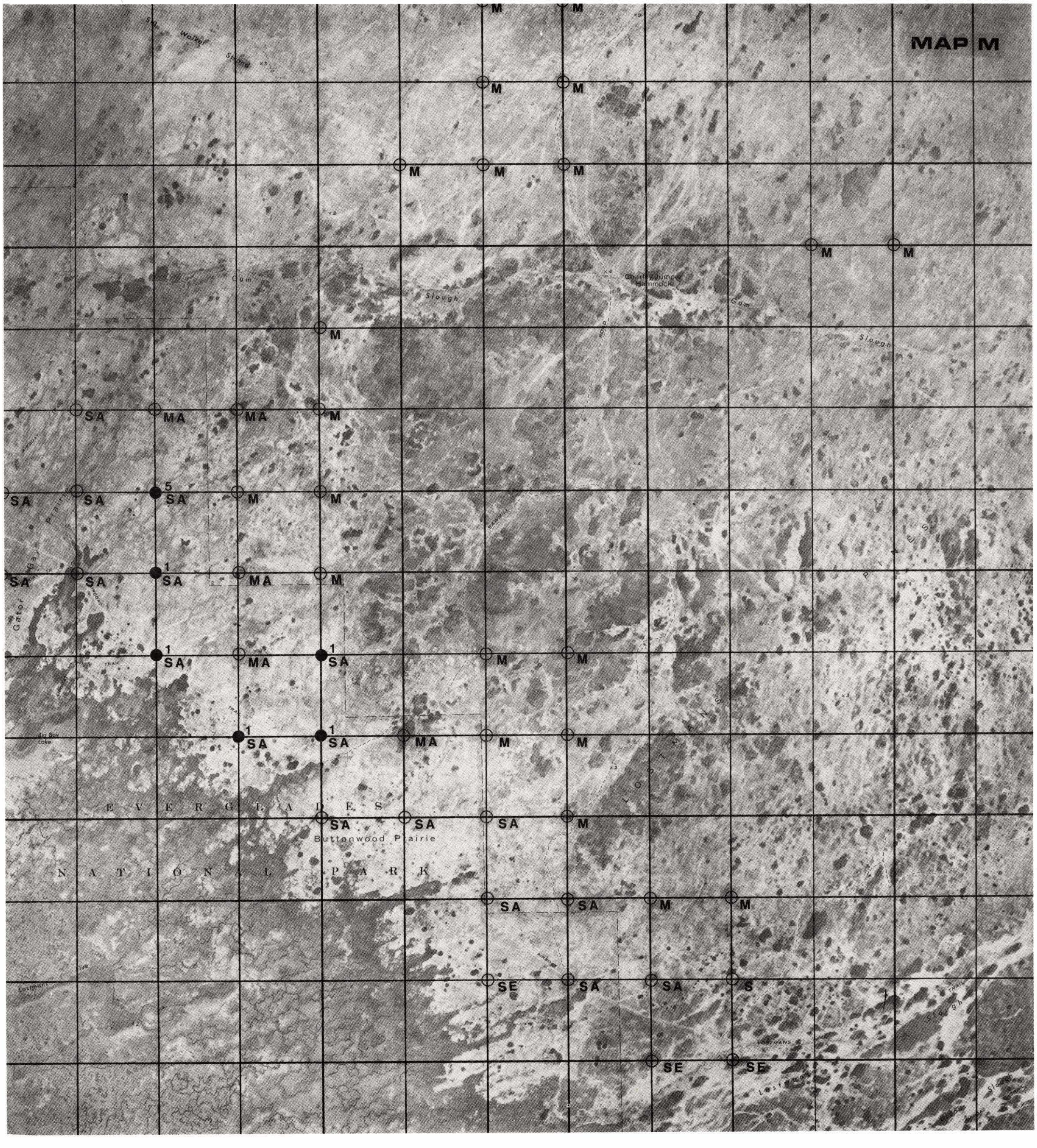

MAP H
Gaging Sta.
Johnny Buck Hammock
SLOUGH
Gaging Sta's AIRBOAT
TRAIL
Black Hammock
VALLEY
SHARK
EVERGLADES
NATIONAL PARK
MH
M
M
2
M
1
M
MH
3
M
1
M
MH
2
M
1
M
MH
2
M
1
M
M

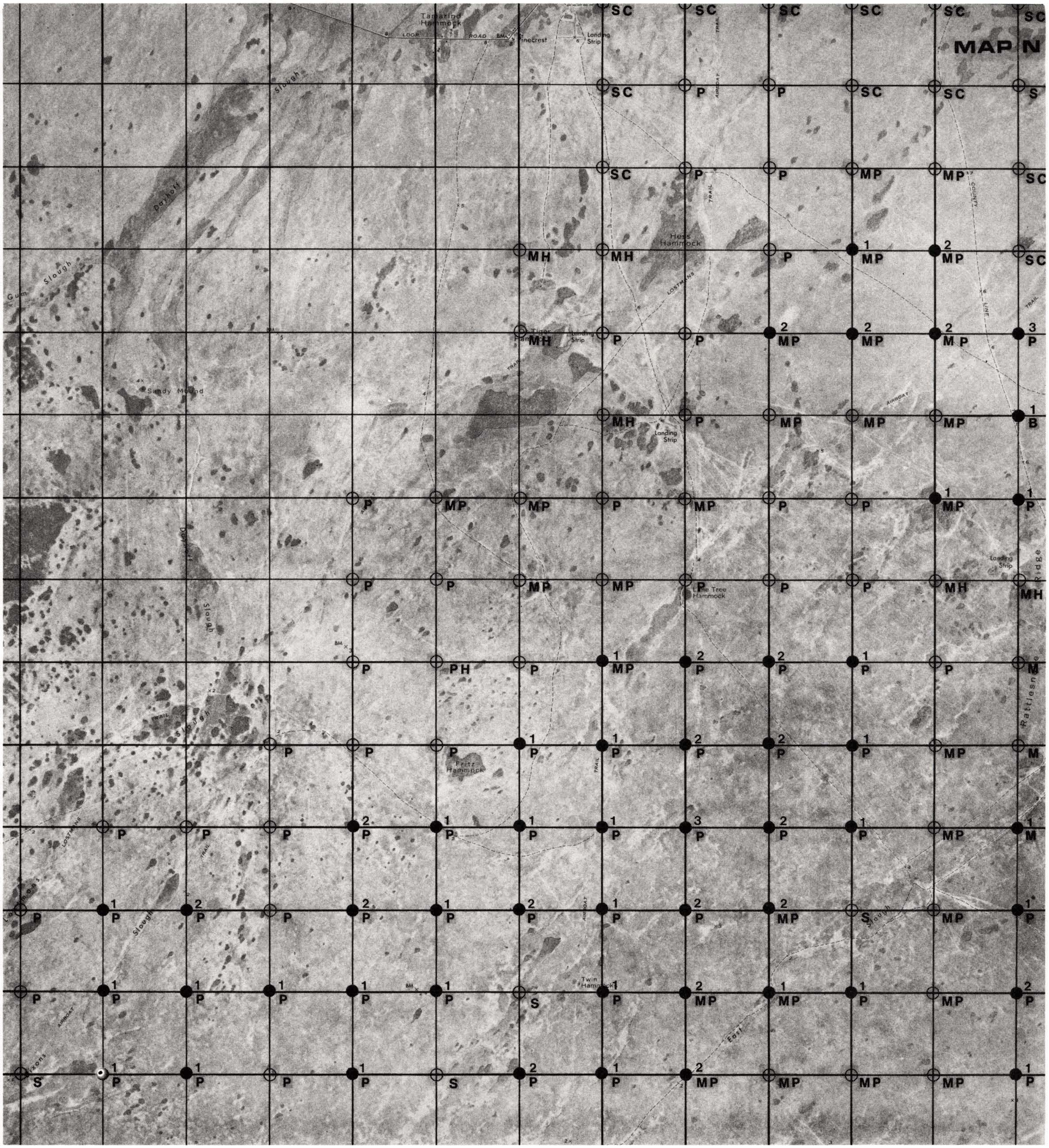

MAP I
Pine Hammock
Guava Hammock
Panther Mound
Cane Mill Hammock
Gaging Sta
Gaging Sta
EVERGLADES
NATIONAL PARK
SLOUGH
VALLEY
SHARK
MONROE CO
DADE CO
MONROE CO
DADE CO

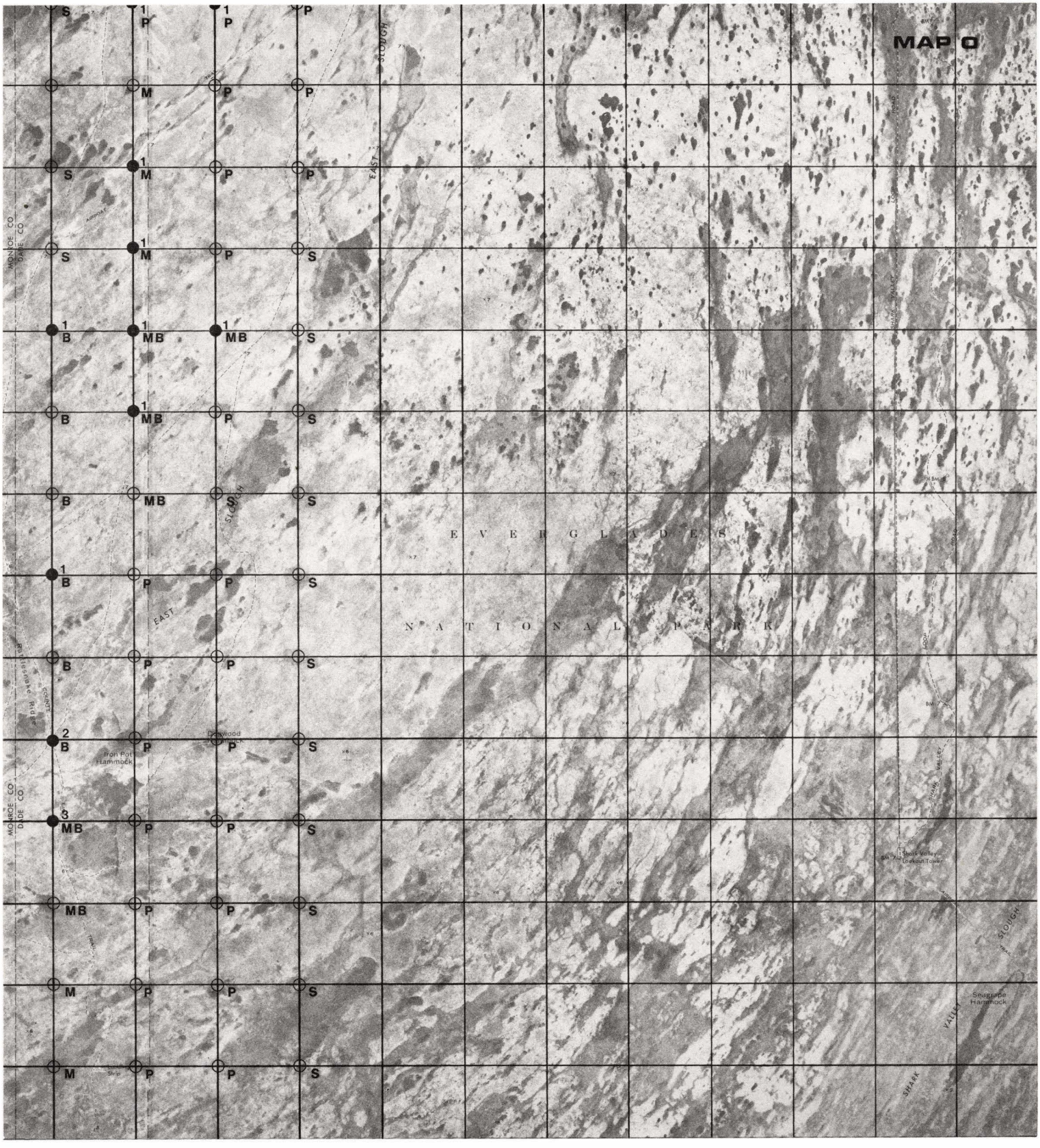

MAP J
EVERGLADES
NATIONAL PARK

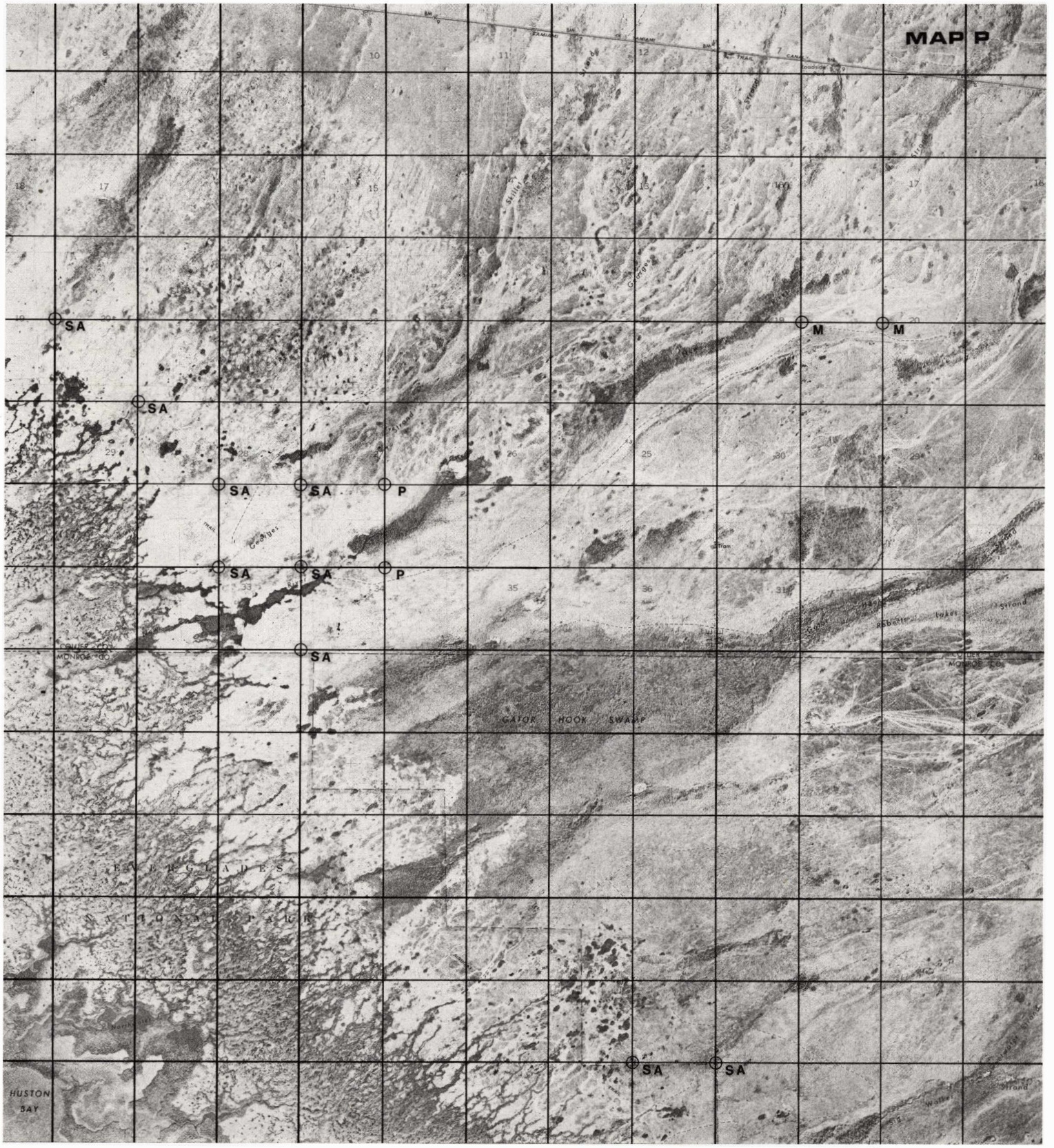

MAP K
SE
SA
S
P
Mullet Bay
Coconut Hammock
Sawgrass
Long Pine
Dry Bay
Cabbage
Log Tables
THIRD BAY
Lostmans Creek
Number Three
Compine
Rocky Creek
BIG LOSTMANS BAY
WATERWAY
EVERGLADES
NATIONAL PARK
RODGERS RIVER BAY
KEY MCLAUGHLIN
Cabbage Island
Indian Camp Creek
Rodgers River
Cutoff
BROAD RIVER
WILDERNESS
BROAD RIVER BAY

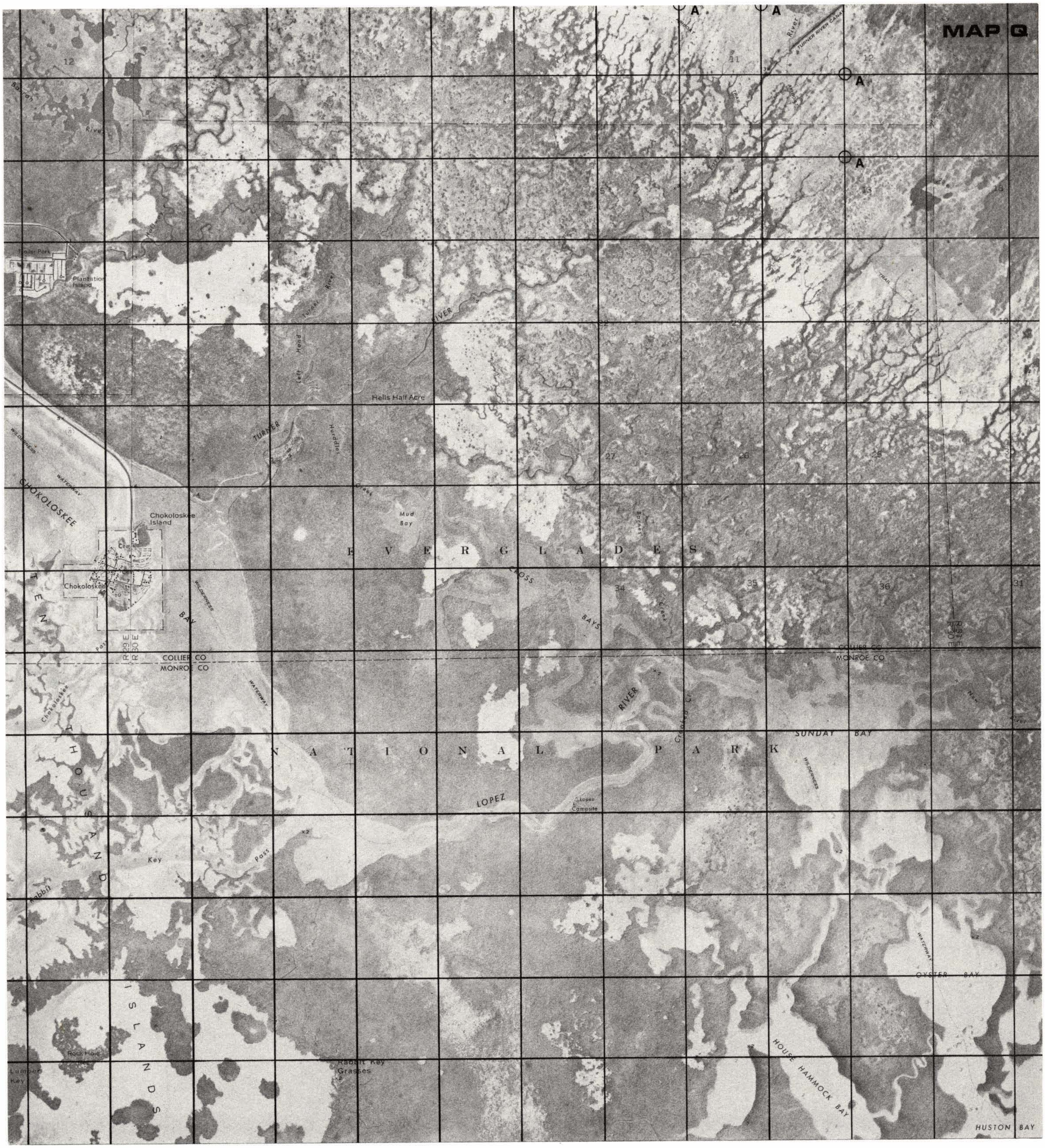

MAP L
SA
MA
LAST HUSTON BAY
Jungle Bay
Deer Island Creek
Deer Island
Chevelier Point
RIVER
CHEVELIER BAY
The Watson Place
GUM
SLOUGH
CANNON BAY
Opossum Key
Tarpon Bay
Alligator
Weeks Lakes
ALLIGATOR BAY
Gopher Key
DADS BAY
Pelican Bay
Plate Creek Bay
Two Island Bay

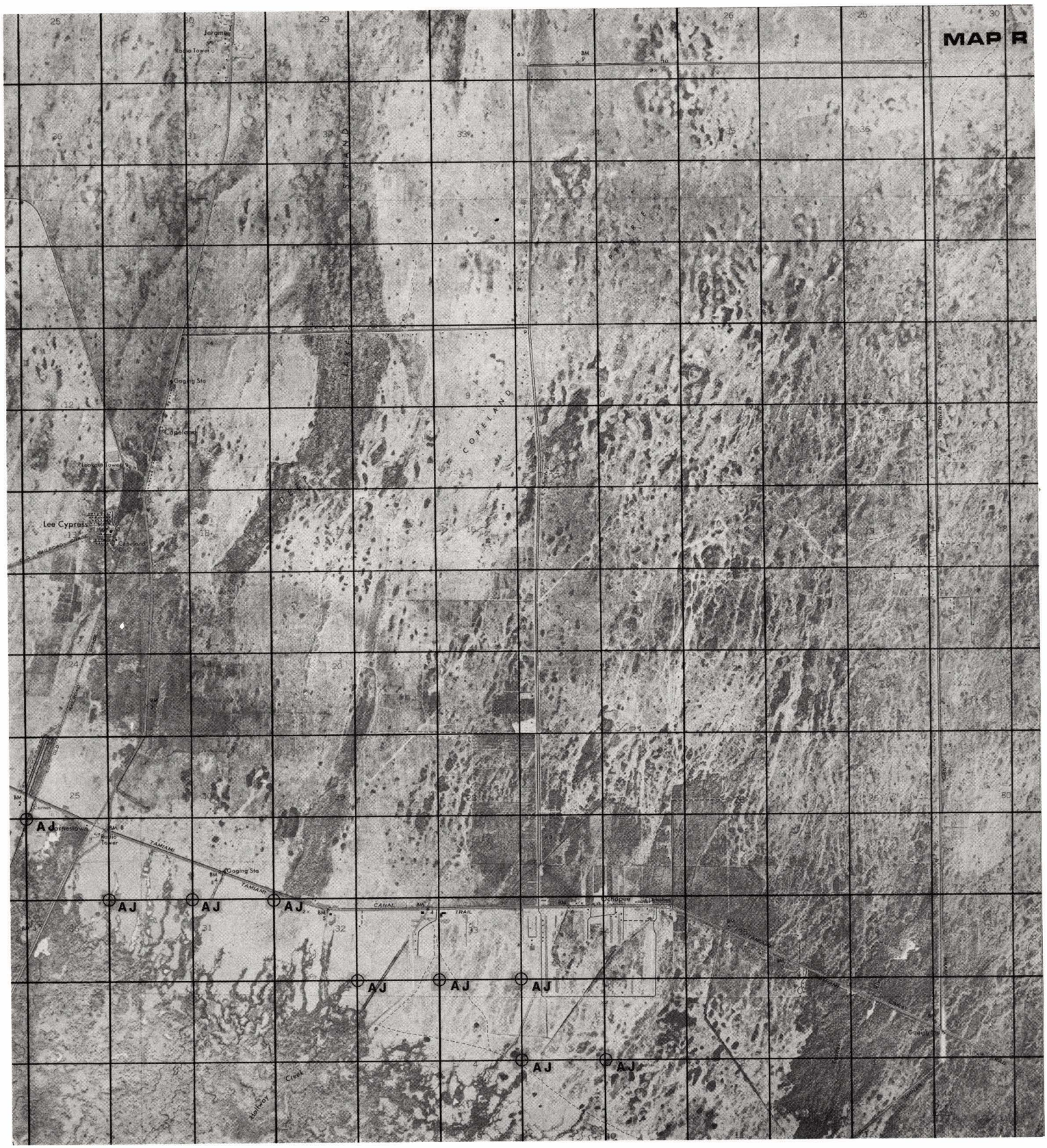

MAP M
Gum
Slough
Charley Jumper Hammock
Buttonwood Prairie
E V E R G L A D E S
N A T I O N A L P A R K
Big Bay Lake
LOSTMANS
PINES
Slough


MAP N
Tamarind Hammock
LOOP ROAD
Pinecrest
Landing Strip
Slough
Dayhoff Slough
Gum Slough
Hess Hammock
LOSTMANS TRAIL
Sandy Mound
Tiger Hammock
Landing Strip
Landing Strip
Lone Tree Hammock
Landing Strip
Rattlesnake Ridge
Fritz Hammock
Twin Hammock
East Slough
Slough


MAP O
EVERGLADES
NATIONAL PARK
EAST
SLOUGH
MONROE CO
DADE CO
Iron Pot Hammock
Dagwood Hammock
Shark Valley
Observation Tower
Sougarpe Hammock
SHARK
VALLEY
SLOUGH


MAP P
SA
SA
SA
SA
P
SA
SA
P
SA
M
M
SA
SA
GATOR HOOK SWAMP
HUSTON BAY


MAP Q
Plantation Island
Hells Half Acre
TURNER
RIVER
Mud Bay
Chokoloskee Island
Chokoloskee
CHOKOLOSKEE
BAY
E V E R G L A D E S
CROSS
BAYS
COLLIER CO
MONROE CO
N A T I O N A L P A R K
SUNDAY BAY
LOPEZ
Lopez Campsite
Key
Pass
Rabbit Key Grasses
OYSTER BAY
HOUSE HAMMOCK BAY
HUSTON BAY


MAP R
COPELAND
Lee Cypress
Gaging Sta
TAMIAMI
TRAIL
CANAL
AJ
AJ
AJ
AJ
AJ
AJ
AJ
AJ