

(NASA-CR-163122) A CONTINUATION OF
BASE-LINE STUDIES FOR ENVIRONMENTALLY
MONITORING SPACE TRANSPORTATION SYSTEM (STS)
AT JOHN F. KENNEDY SPACE CENTER. VOLUME 4:
THREATENED AND (University of Central

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KSC TR 51-2, Vol. IV of IV, Part 2
September 1980

NASA Contract Report 163122

A Continuation of Base-Line Studies for Environmentally Monitoring Space Transportation Systems at John F. Kennedy Space Center

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Threatened and Endangered Species of the Kennedy Space Center: Threatened and Endangered Birds and Other Threatened and Endangered Forms

National Aeronautics and
Space Administration

John F. Kennedy Space Center



VOLUME IV: PART 2
OF THE
FINAL REPORT
TO THE
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JOHN F. KENNEDY SPACE CENTER

A CONTINUATION OF BASE-LINE STUDIES FOR ENVIRONMENTALLY
MONITORING SPACE TRANSPORTATION SYSTEMS (STS)
AT JOHN F. KENNEDY SPACE CENTER

CONTRACT NO. NAS 10-8986

VOLUME IV OF IV: THREATENED AND ENDANGERED SPECIES
OF THE KENNEDY SPACE CENTER

Part 2: Threatened and Endangered Birds and
Other Threatened and Endangered Forms

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AUGUST 21, 1979

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PREFACE

This document is part of a University of Central Florida contract report, "A Continuation of Base-Line Studies for Environmentally Monitoring Space Transportation Systems at John F. Kennedy Space Center."

The entire report consists of four volumes and an executive summary, all identified as KSC TR 51-2; NASA CR 163122:

- Volume I: Terrestrial Community Analysis
 - Volume II: Chemical Studies of Rainfall and Soil Analysis
 - Volume III: Part I--Ichthyological Studies, Ichthyological Survey of Lagoonal Waters; Part II--Ichthyological Studies, Sailfin Molly Reproduction Study
 - Volume IV: Part I--Threatened and Endangered Species of the Kennedy Space Center: Marine Turtle Studies; Part II--Threatened and Endangered Species of the Kennedy Space Center: Threatened and Endangered Birds and Other Threatened and Endangered Forms
- Executive Summary

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THREATENED AND ENDANGERED BIRDS^a

Introduction

The U. S. Fish and Wildlife Service currently recognizes 211 endangered and three threatened species of birds in the world, and 67 endangered and three threatened species occur in the United States (Finnley, 1979). Of the six endangered species found in Florida, four occur at KSC (Table 1). A fifth may have occurred there in the recent past.

The state of Florida maintains its own official list of endangered, threatened, rare, and species of special concern - Rare and Endangered Biota of Florida - which was prepared by the Florida Committee on Rare and Endangered Plants and Animals under the sponsorship of the Florida Audubon Society and the Florida Defenders of the Environment (Kale, 1978). Thirty-seven species of birds from the state list are found within the environs of the Kennedy Space Center (Table 1).

Objectives

1. To serve as a clearing house through which information now being gathered by other agencies (U. S. Fish and Wildlife Services, Florida Game and Fresh Water Fish Commission, Florida Audubon Society, etc.) will be processed, synthesized, and succinctly reported to NASA/KSC.
2. To begin surveillance programs, primarily through the use of ground and aerial census, of threatened and endangered species which prove to be amenable to study by this technique.
3. To determine what threatened and endangered species reproduce on KSC lands.
4. To identify current and potential problems relating to these other threatened and endangered species.

Pertinent Literature

A survey of pertinent literature was conducted to determine the historical and current status of the rare, threatened, and endangered species found on the lands under NASA/KSC jurisdiction. Data gathered during this literature search were used to obtain a historical perspective and to aid in the analysis of the field data collected in this study. Published data were obtained from the following journals: American Birds, Audubon Field Notes, Auk, Bird Lore, Condor, Ecological Monographs, Oologist, Ornithologist and Oologist, and the Wilson Bulletin. Many individual publications and unpublished reports were also utilized. Because of the large number of species examined in this study, the pertinent literature for each bird will be cited within the appropriate species accounts.

^a Data gathering, analysis, and writing by E. Scott Clark.

Table 1. The status of endangered, threatened, rare, and species of special concern at Kennedy Space Center.

Bird	Classification			Breeding	Reference for Merritt Island Sightings			
	Federal (1)	Florida FGWFC (2)	Florida Audubon (3)		This Study	C. B. C.	Unpublished Reports	Published Sightings
Brown Pelican	E	T	T	Yes	+	+	+	+
Rothschild's Magnificent Frigatebird		T	T	No	+	+	+	
Great Egret			S	Yes	+	+	+	+
Snowy Egret			S	Yes	+	+	+	+
Reddish Egret			R	Yes	+	+	+	+
Louisiana Heron			S	Yes	+	+	+	+
Little Blue Heron			S	Yes	+	+	+	+
Black-crowned Night Heron			S	Yes	+	+	+	+
Yellow-crowned Night Heron			S	?	+	+	+	+
Least Bittern			S	Yes	+	+	+	
Wood Stork		E	E	Yes	+	+	+	+
Glossy Ibis			S	Yes	+	+	+	
White Ibis			S	Yes	+	+	+	+
Roseate Spoonbill			R	No	+	+	+	
Coopers Hawk			S	No	+	+	+	
Southern Bald Eagle	E	T	T	Yes	+	+	+	+
Osprey		T	T	Yes	+	+	+	+
Peregrine Falcon	E	E	E	No	+	+	+	
Merlin			U	No	+	+	+	
*Southeastern American Kestrel		T	T	?				
*Florida Sandhill Crane		T	T	No		?		
Black Rail			U	Yes		+		+
American Oystercatcher		T	T	Yes	+	+	+	
Piping Plover			S	No		+		
American Avocet			S	?	+	+	+	
Least Tern		T	T	Yes	+			
Royal Tern			S	Yes	+	+	+	
Sandwich Tern			S	?	+	+		
Casplan Tern			S	Yes	+	+	+	
Black Skimmer			S	Yes	+	+	+	
Florida Burrowing Owl			S	No	+			
Hairy Woodpecker			S	?		+		
Red-cockaded Woodpecker	E	E	E	?			?	
Florida Scrub Jay		T	T	Yes	+	+	+	+
Florida Prairie Warbler			S	?		+		
American Redstart			R	No	+	+		
Dusky Seaside Sparrow	E	E	E	Yes		+	+	+

*A subspecies of which the species has been reported, but it is unknown which subspecies was present.

(1) Endangered and threatened wildlife and plants. U. S. Dept. of Interior, Fish and Wildlife Service. Federal Register, Vol. 42, No. 135, July 14, 1977: 36420-36431.

(2) Wildlife Code, Florida Game and Fresh Water Commission, July, 1977.

(3) Inventory of Rare and Endangered Biota of Florida (1978).

(4) Christmas Bird Count - Merritt Island National Wildlife Refuge.

E = Endangered, T = Threatened, R = Rare, S = Special concern, U = Status undetermined

Methods and Procedures

Two census routes were established and a breeding bird survey was conducted to determine the species and number of birds listed in the Rare and Endangered Biota of Florida which occur on the Kennedy Space Center. A detailed study was also made on the Wood Stork (Mycteria americana) to determine its suitability as an indicator species. In addition, the birds using an impoundment east of Launch Complex 39-B were noted, and factors affecting species diversity and abundance examined.

Census Routes

Two survey routes, which were driven on alternate weeks (September 1976-April 1979), were designed to incorporate the major habitat types found on Merritt Island. Route A began at the northern end of the island at the intersection of U. S. 1 and S. R. 3 and terminated at Jerome Road (Figure 1). The census generally required 5 to 6 hours to conduct and covered 46 miles. This route was divided into three sections, each incorporating an active Bald Eagle territory. The first section followed S. R. 3 from the intersection of U. S. 1 to Haulover Canal. The second area ran from Haulover Canal to S. R. 402 and included Black Point Wildlife Drive. The third section covered the NASA security area from Wilson's corner south to Jerome Road. The A route was primarily pine flatwoods with a few mosquito control impoundments along the wildlife drive.

Route B started at the U. S. Fish and Wildlife Lab located 4.8 miles north of Wilson's Corner and terminated at the beach road east of LC 39-B (Figure 2). This survey was also divided into three sections. The first area was north of S. R. 402 and east of S. R. 3 and incorporates Playalinda Beach and Mosquito Lagoon. The second section was west of S. R. 3 and north of S. R. 402 and included the Black Point Wildlife Drive and the Indian River. The third area covered the territory south of S. R. 402. The survey generally required 6 to 7 hours to conduct and covered 42 miles. Beach, marsh, flatwoods, pond, savanna, hammock, and mangrove communities were represented in this census.

Only birds visible with the naked eye were counted, although binoculars and frequent stops were necessary for verification. Hard surface roads were generally driven at 35-40 mph, dirt graded roads at 20 mph and dike roads at 5-10 mph. At observation stops, both binoculars and a spotting scope were used to scan the area. The A route stops were at recently active or occupied eagle nests and pull-offs 5, 8, 11, and 13 of the Black Point Wildlife Drive. The B route stops were at the Canaveral National Seashore picnic area, Camera Pad 10, pull-offs, 5, 8, 11, and 13 of the Black Point Wildlife Drive, Indian River railroad bridge, NASA bus tour pull-off at LC 39-A, and the parking area across from LC 39-B on Playalinda Beach Road. During the Camera Pad 10 stop, the number of Brown Pelicans (Pelecanus occidentalis) that crossed an imaginary line to the east was counted for 30 minutes. The 30-minute pelican count was generally between 0800 and 0900.

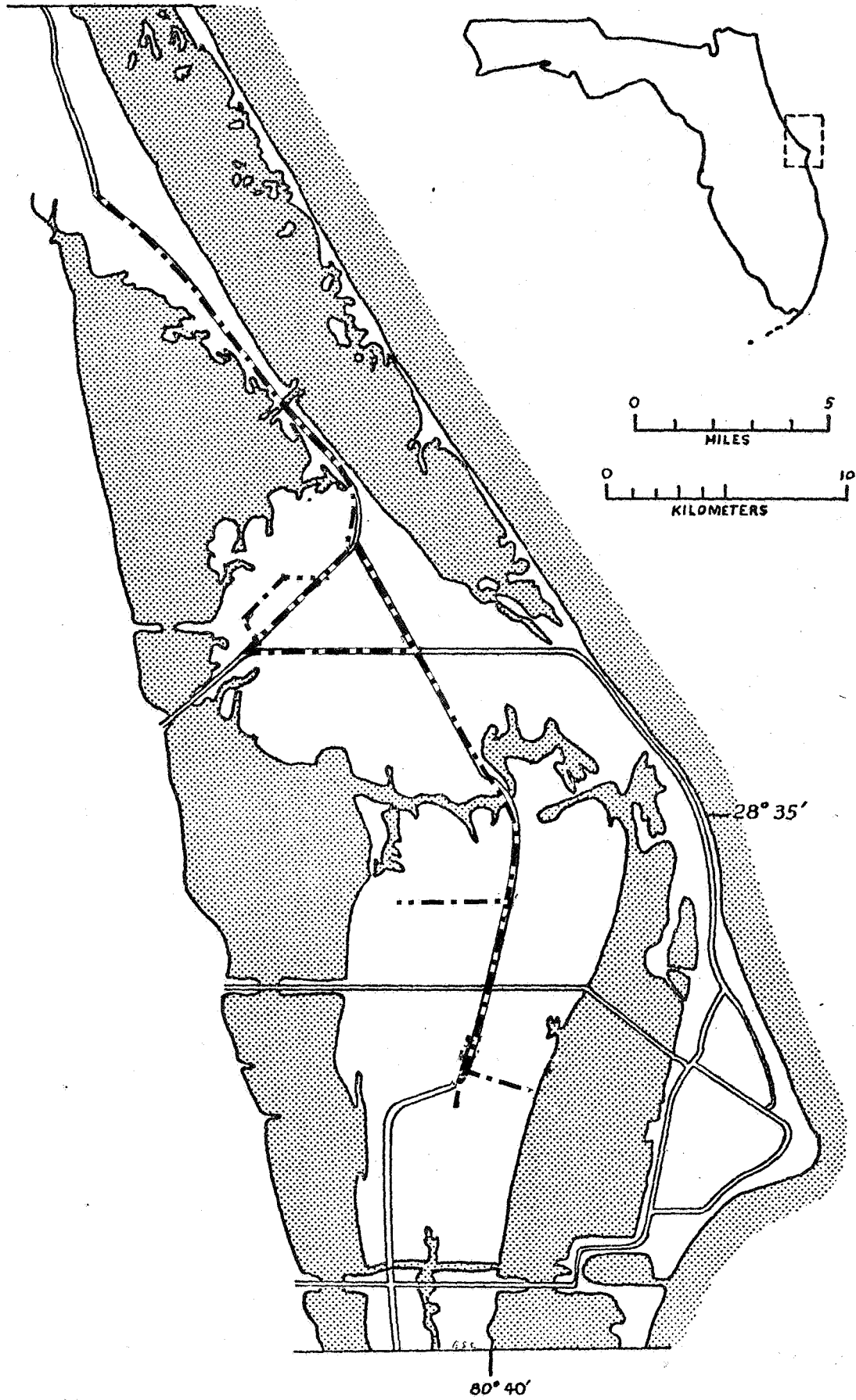


Figure 1. The area covered on census route A.

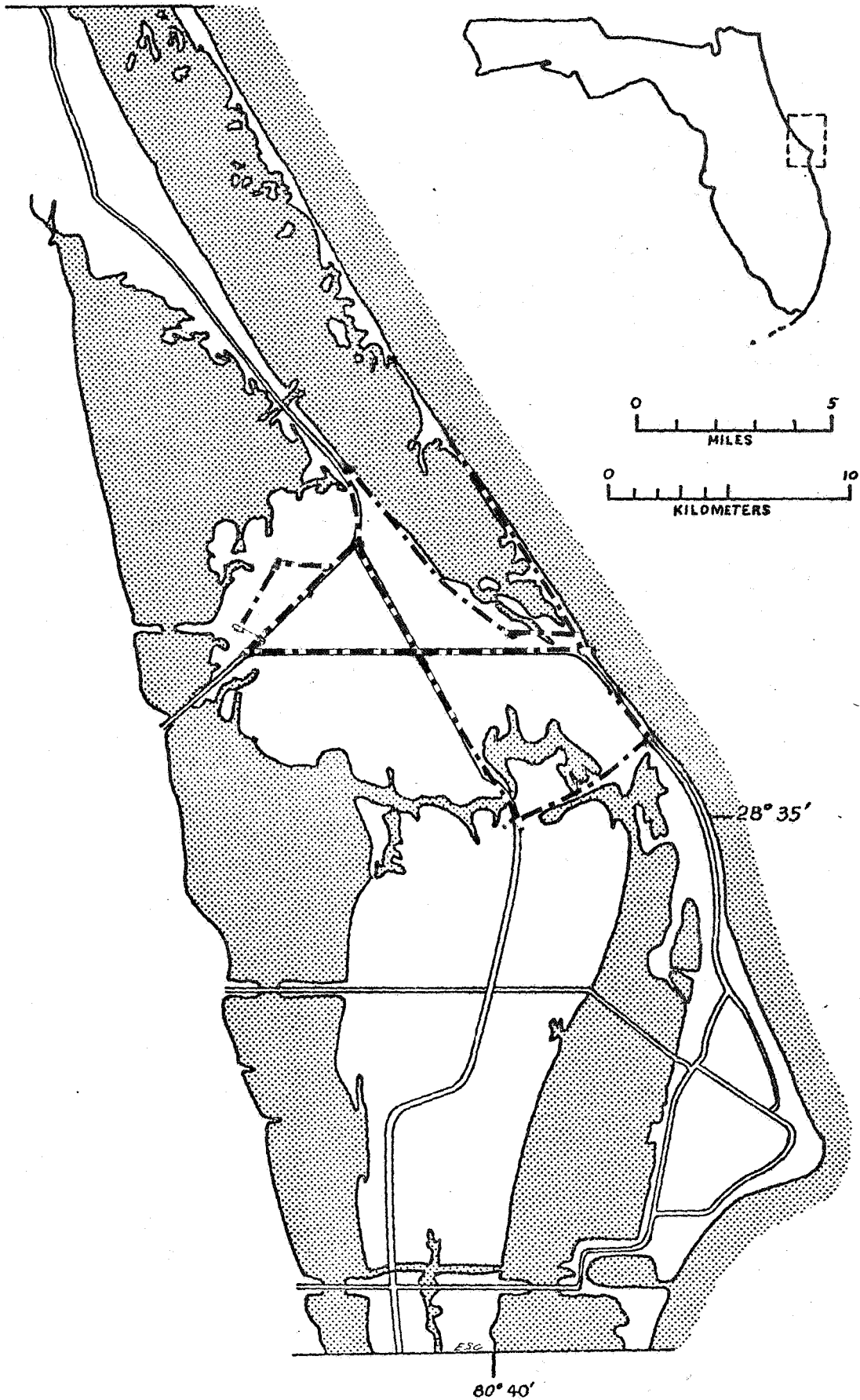


Figure 2. The area covered on census route B.

The total number of each species observed on route A or B was key punched on computer cards and the data stored on disc for later analysis. Graphs depicting the total number of each species observed were presented as three-point moving averages. This method of data presentation results in smoother curves and allows for variation in the census. The effect of conditions such as rain, which may result in abnormally high or low counts, are smoothed so that seasonal and yearly trends are more evident. For each bird the mean, standard deviation, range, and coefficient of variation of counts were examined for route A and B. The same variable was also computed by season.

Breeding Birds

Nest sites of many species were examined by both ground and aerial surveys. A light aircraft was used to locate breeding colonies, to identify species breeding, and to estimate numbers. Ground surveys of the nesting sites were used primarily to confirm the identity of species present, determine reproductive stages of the birds, and to confirm estimates of the number of each species present.

Wood Stork

A study of the Wood Stork was performed to gain insight into its breeding biology on Merritt Island. In addition to census and breeding bird data, information was collected on factors affecting the reproductive effort. A number of hydrologic and climatic conditions were examined using SAS - R^2 and SYSREG computer programs (Barr et al., 1976) to correlate the number of breeding adults, the initiation of nesting, and nest success.

Information from aerial flights was used to determine critical, primary, and secondary foraging grounds of the storks during the breeding season. Transects of the St. Johns River Basin from Lake Harney south to Lake Poinsett, and Merritt Island from Sykes Creek to New Smyrna Beach were flown once a month and the number of storks (exclusive of the breeding colony) noted.

Young storks about a month old were banded with U. S. Fish and Wildlife Service bands and tagged with numbered red patagial tags in a cooperative effort with John Ogden of the National Audubon Society. Since the juvenile storks disperse extensively, results of this effort were dependent primarily upon reports from the general public on the location of tagged birds.

Launch Complex 39-B

On alternate weeks (same dates as census route B) the number and species of birds using the large impoundment east of LC 39-B (Figure 3) were noted. The abundance and diversity of the five most common avian species found at this study site were correlated with the water levels of the impoundment using regression analysis. Seasonal oscillations were also examined.

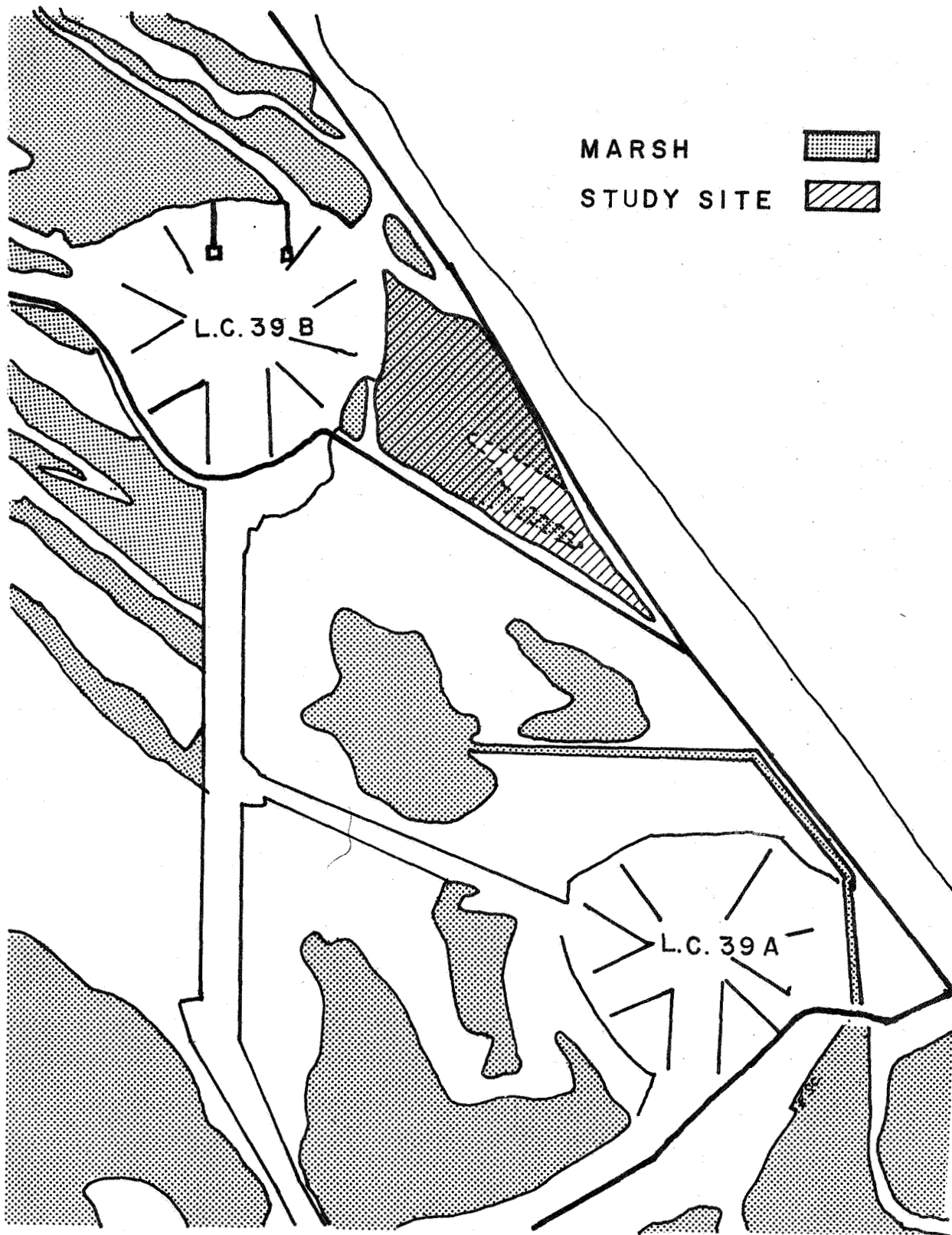


Figure 3. Location of the LC 39-B study site.

Results

Because of the large number of avian species examined in this study, the results have been summarized in a tabular form (Appendix Tables 1, 2, 3, and 4). Portions of the results which were not suitable for tabular or graphic evaluation have been included in the discussions of individual species.

The total number of each species noted on the ground surveys A and B can be found in Appendix Table 1 and 2 and graphs of three-point moving averages of the data are presented in Figure 4. The total count for each census route is divided into three groups - each representing a specific area of Merritt Island. These data can be found in Appendix Tables 3 and 4. The mean, standard deviation, range, and coefficient of variation for each route can be found in Appendix Tables 5 and 6.

The birds found breeding on Merritt Island and their respective breeding seasons can be found in Table 2. Estimates of the colonially breeding bird population in 1978 appear in Appendix Table 7. A description of the breeding habitats and estimates of the non-colonial breeding bird population are contained in the discussion. Maps of the breeding sites are found in Figures 5 through 10.

The results of the work on Wood Storks are included with the general bird accounts below. The location of stork feeding areas during the breeding season can be found in Figures 11 through 13 and the sightings of banded individuals mapped on Figure 14.

The number and species identity of birds found at the LC 39-B study site can be found in Appendix Table 8, and statistical analysis of this data is shown in Appendix Table 11 and the results depicted graphically in Figure 15.

Discussion

Brown Pelican

The Brown Pelican (*Pelecanus occidentalis carolinensis*) has declined drastically in North America since the 1950's. The native Brown Pelicans recently have failed to nest in Louisiana (1966) and Texas (1969) and have declined considerably in South Carolina. The apparent causes have been the effects of chlorinated hydrocarbons, ensnarement in monofilament fishing lines, and disturbance of nesting and loafing areas (Schreiber, 1978). The Florida population of about 13,000 breeding and 8,000 non-breeding birds has remained relatively stable over the last 10 years (Nesbitt et al., 1977). Some egg shell thinning has been noted in birds breeding on the west coast (Schreiber, 1978).

Although pelicans have been common on Merritt Island it was not until 1924 that a breeding colony formed. This colony, which was found on Pelican Island in the southern end of Mosquito Lagoon, apparently began as the result of the abandonment of the historic Pelican Island near Sebastian Inlet (Longstreet, 1925). The colony remained at this site at least through 1930 (Mills, 1931), even after some citizens of Titusville

Figure 4. Three-point moving averages of the total number of avian species noted on census routes A and B from September, 1976 to April, 1979.

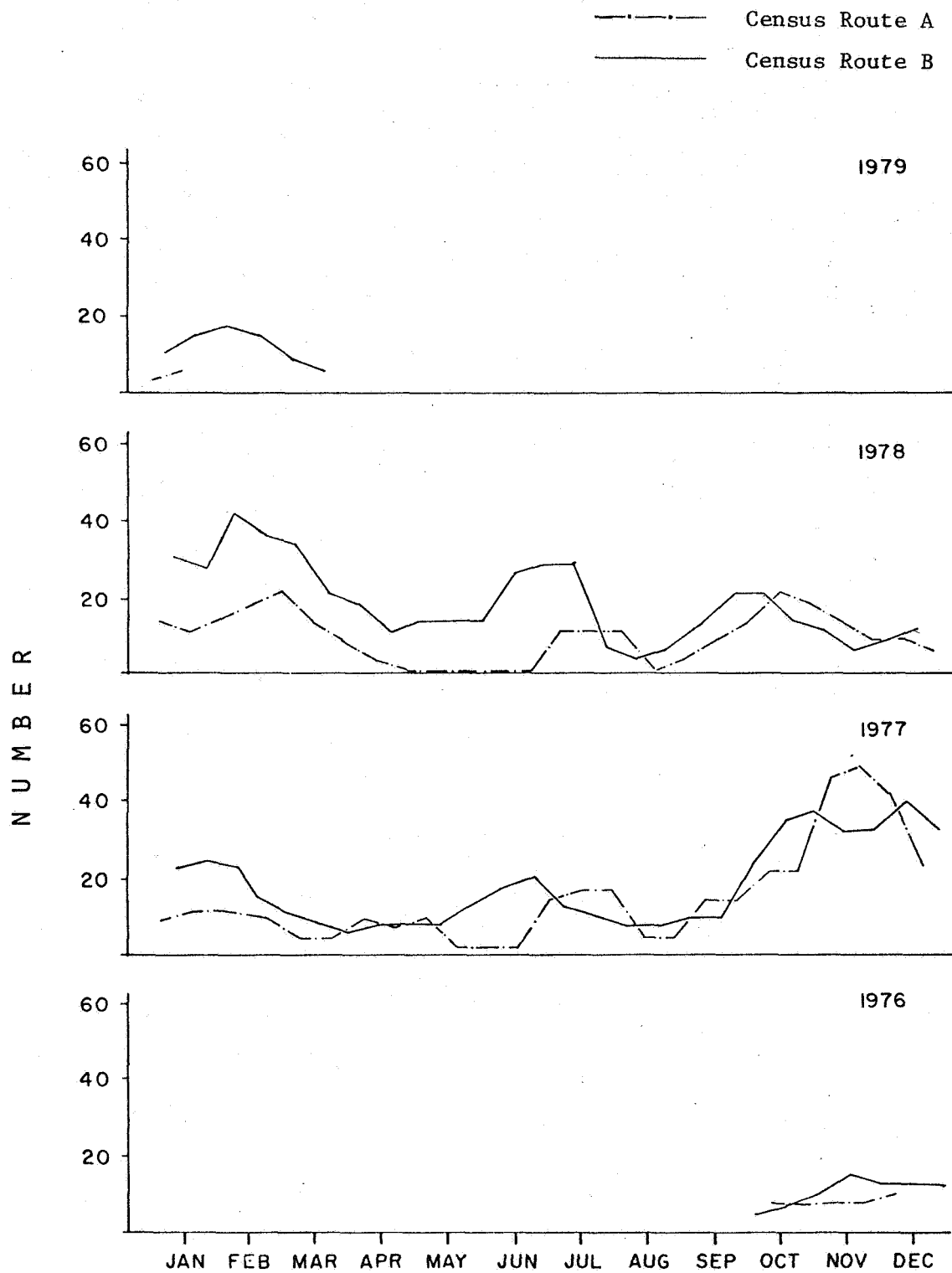


Figure 4. WOOD STORK (Sheet 1 of 19)

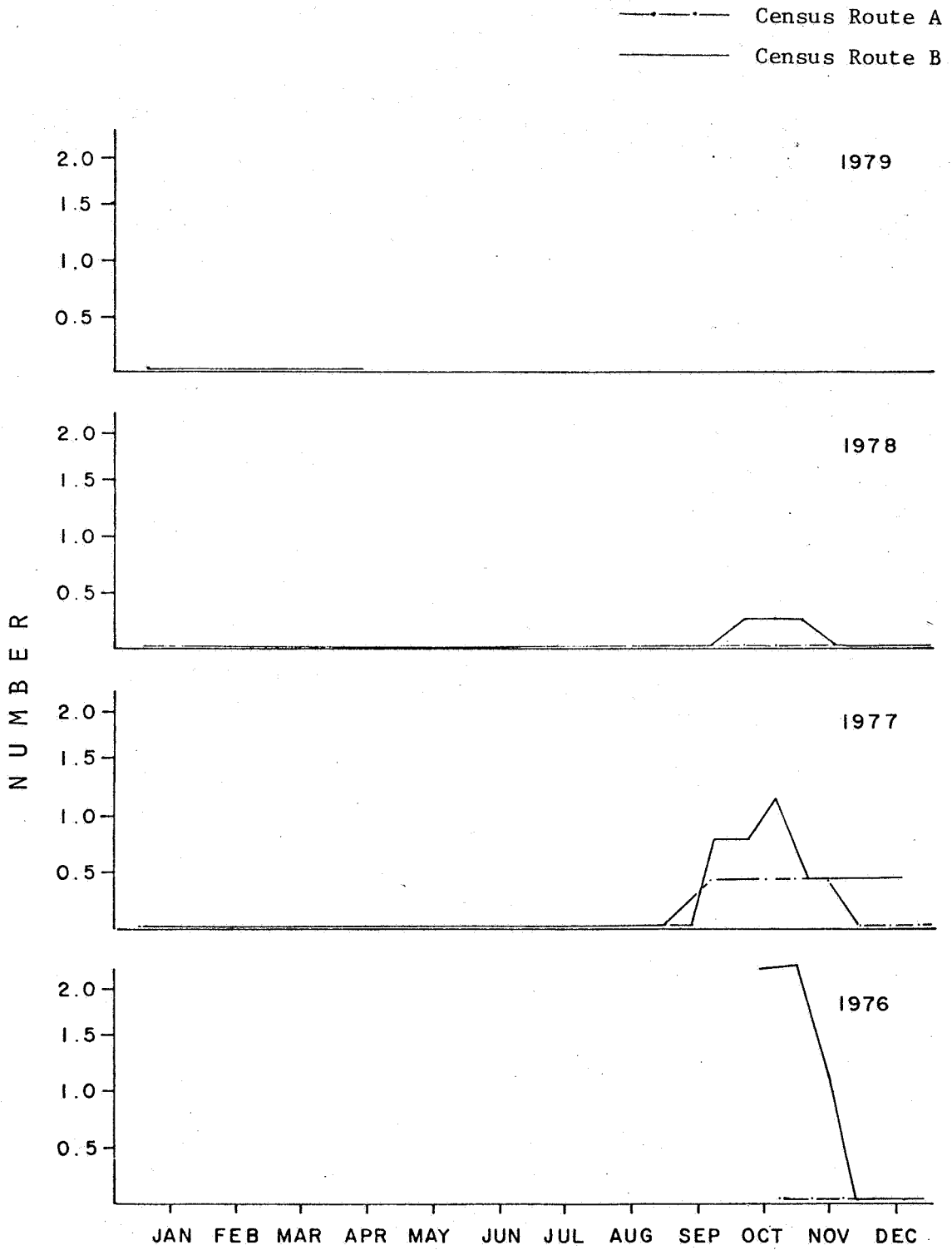


Figure 4. PEREGRINE FALCON (Sheet 2 of 19)

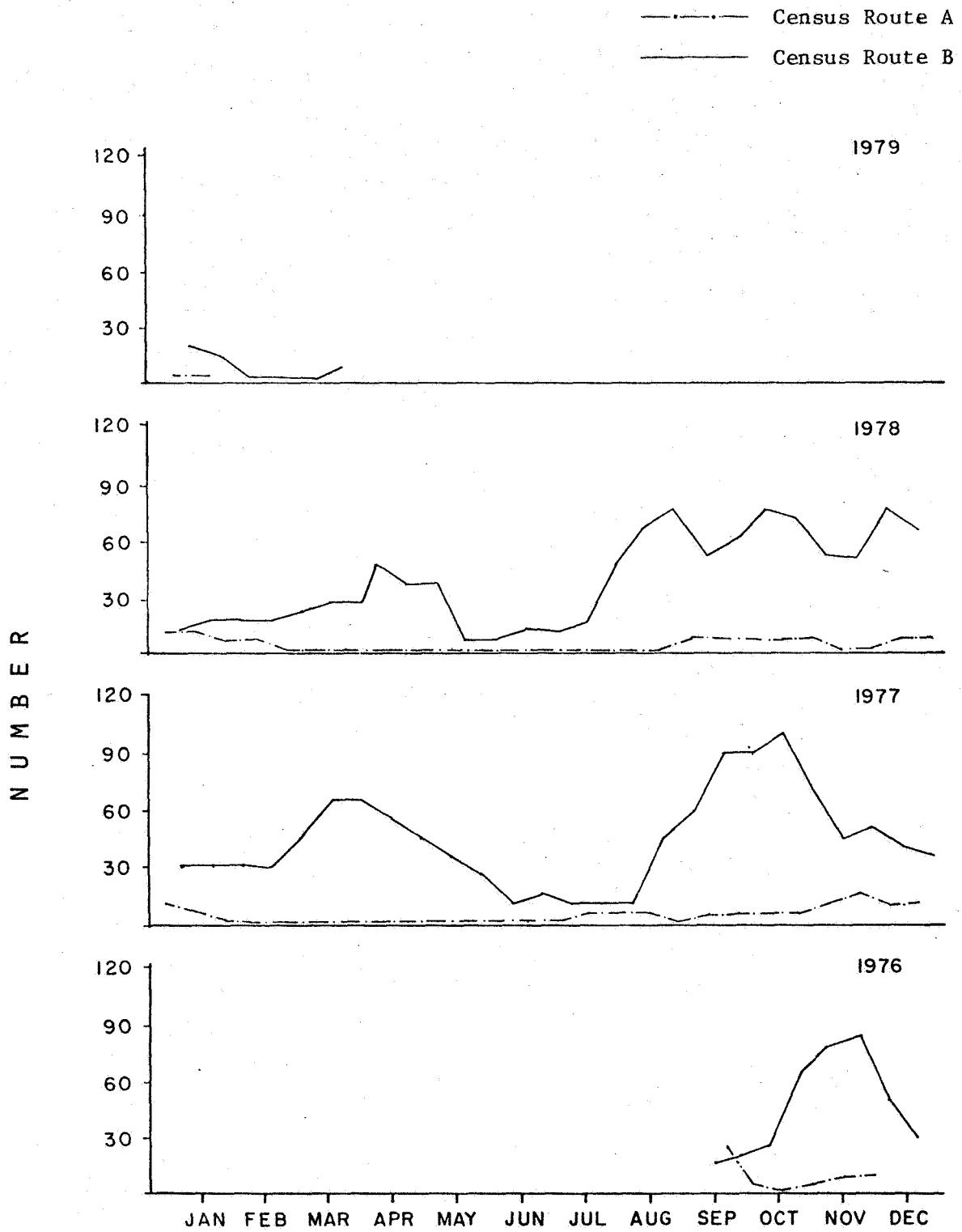


Figure 4. BROWN PELICAN (Sheet 3 of 19)

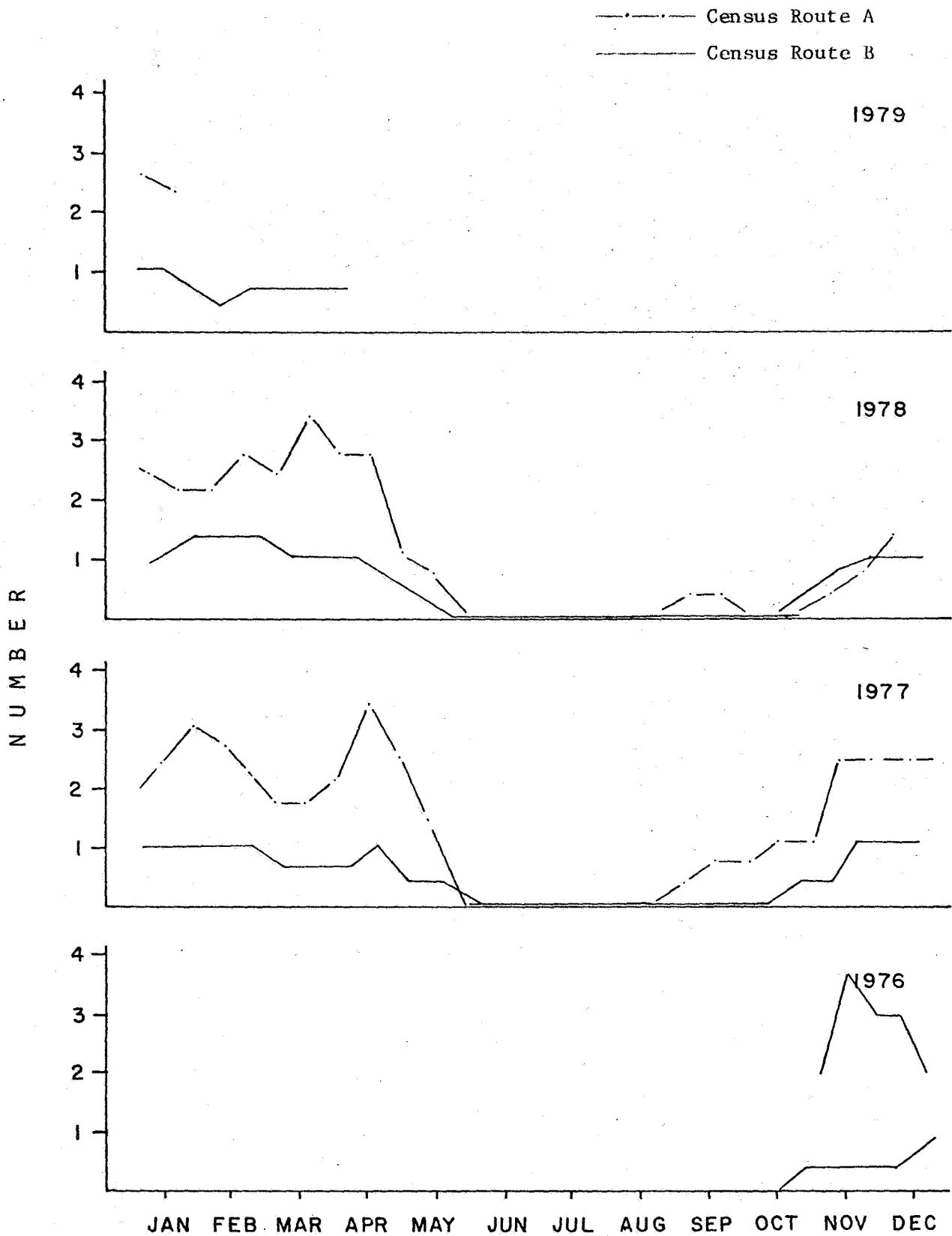


Figure 4. SOUTHERN BALD EAGLE (Sheet 4 of 19)

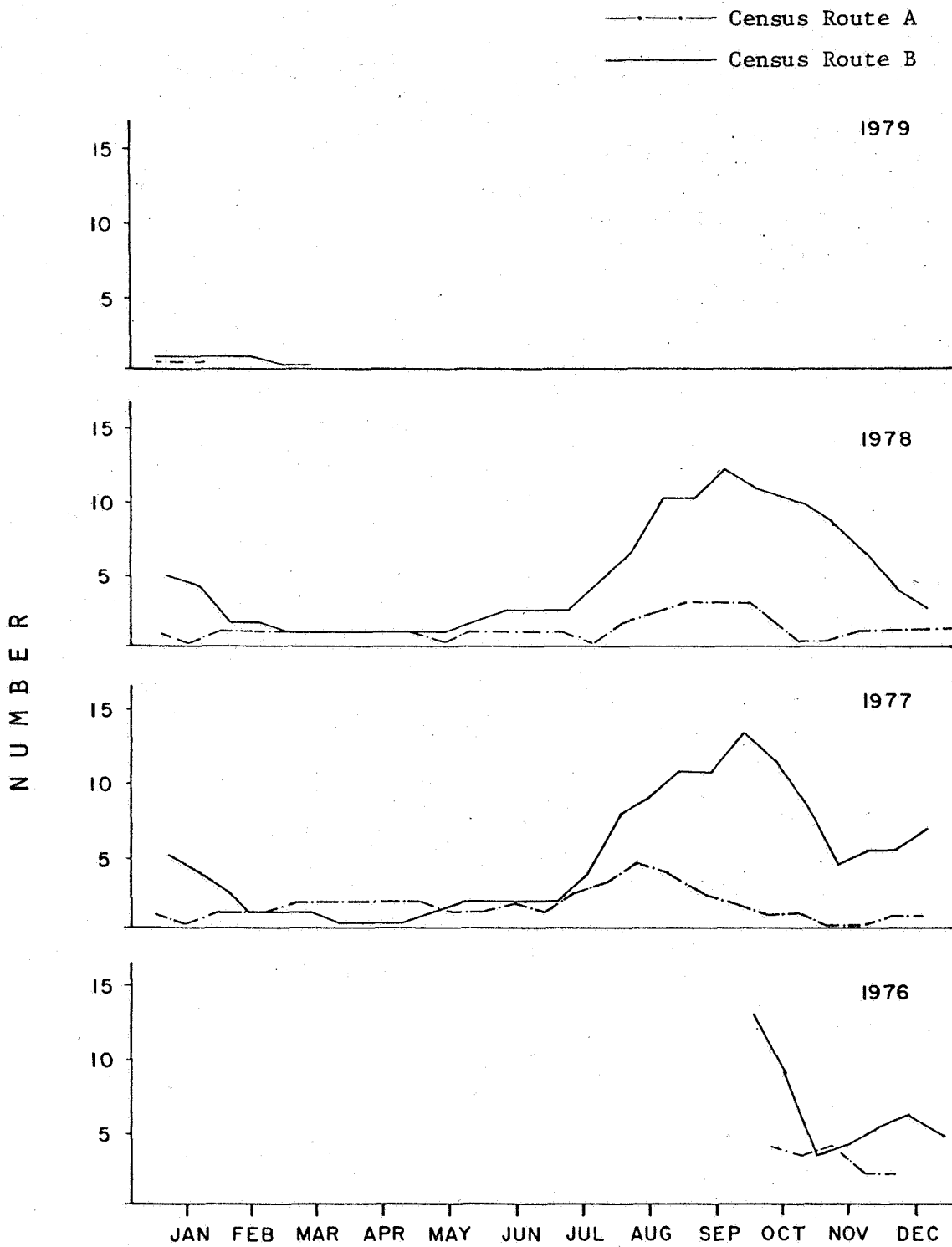


Figure 4. OSPREY (Sheet 5 of 19)

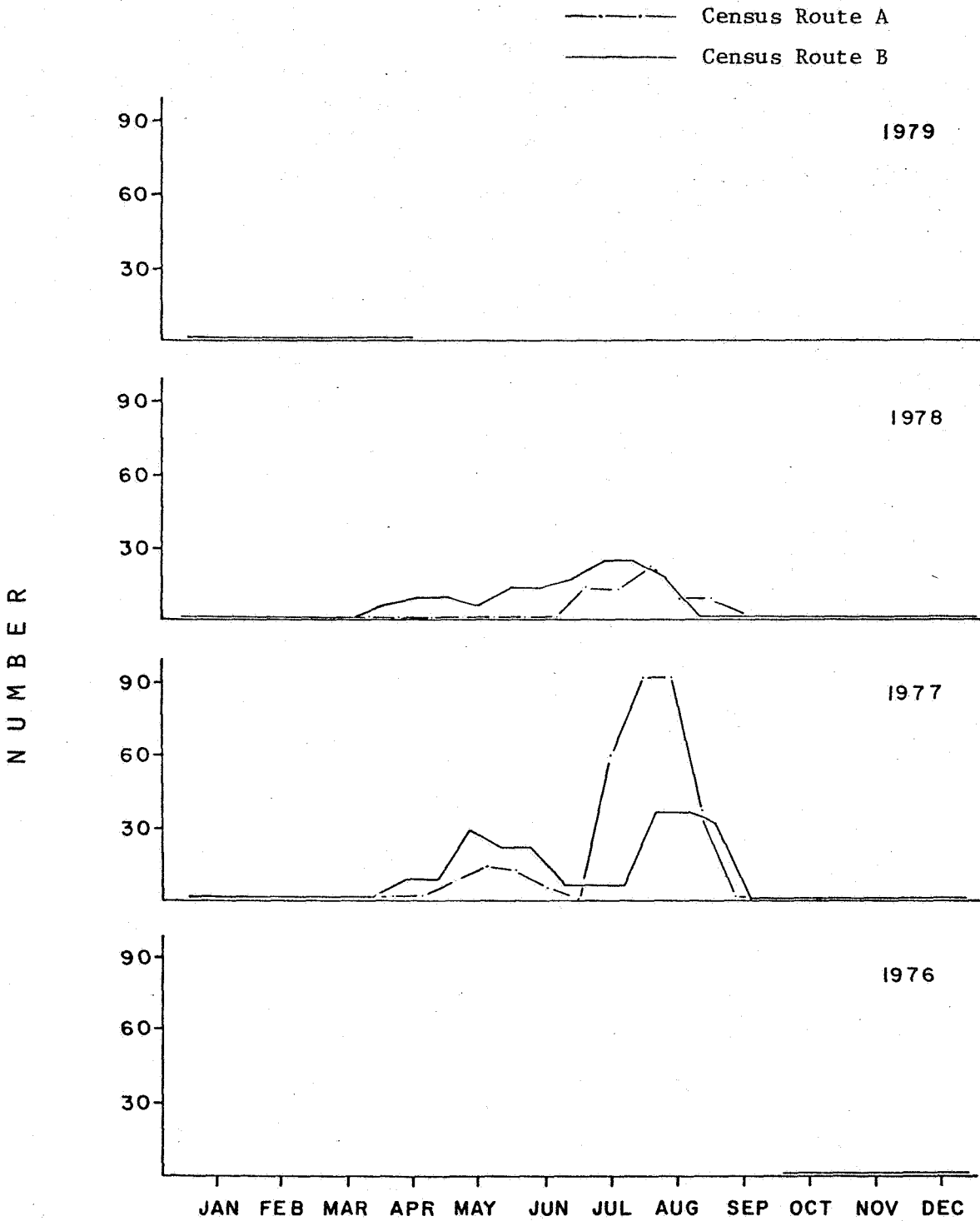


Figure 4. LEAST TERN (Sheet 6 of 19)

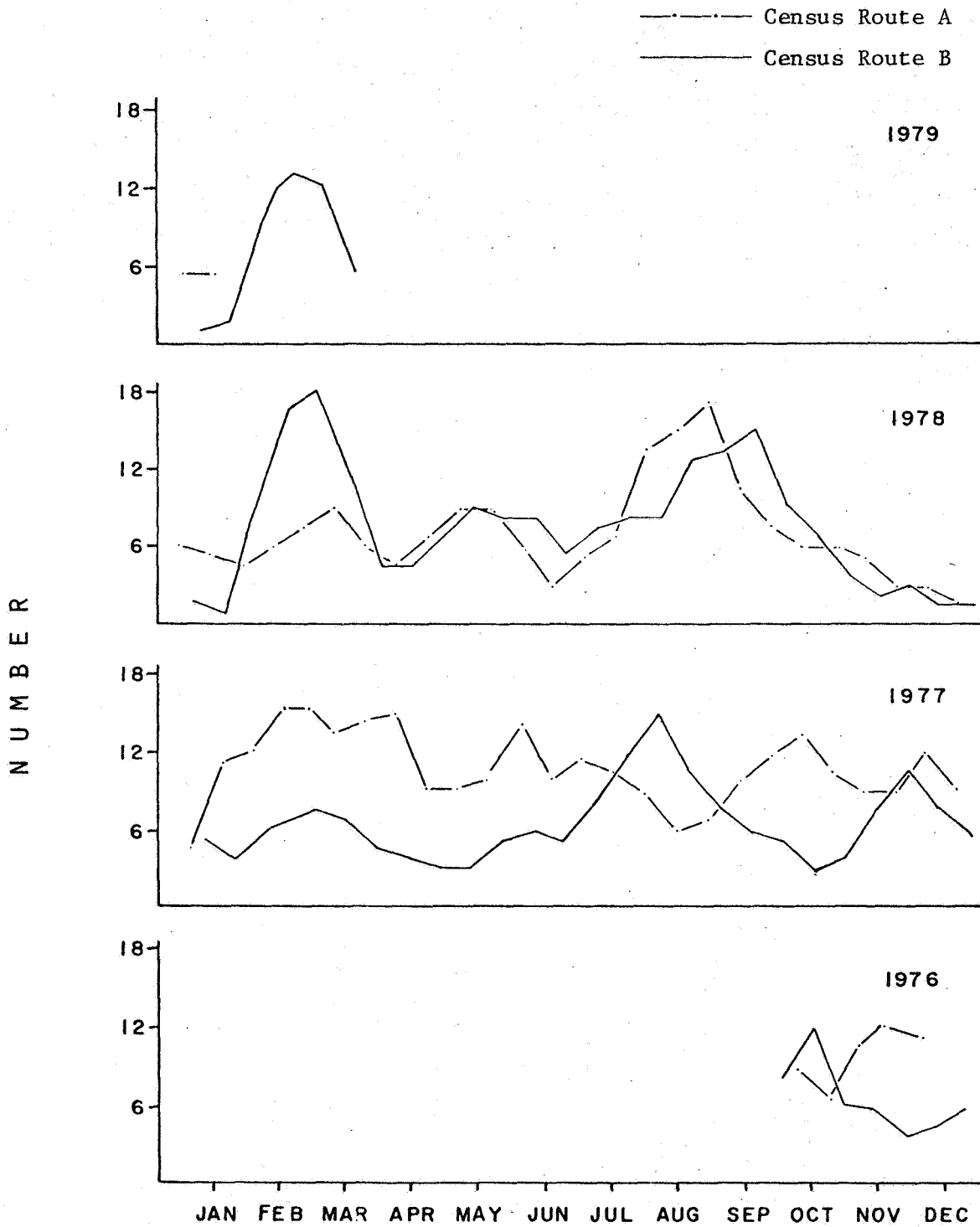


Figure 4. FLORIDA SCRUB JAY (Sheet 7 of 19)

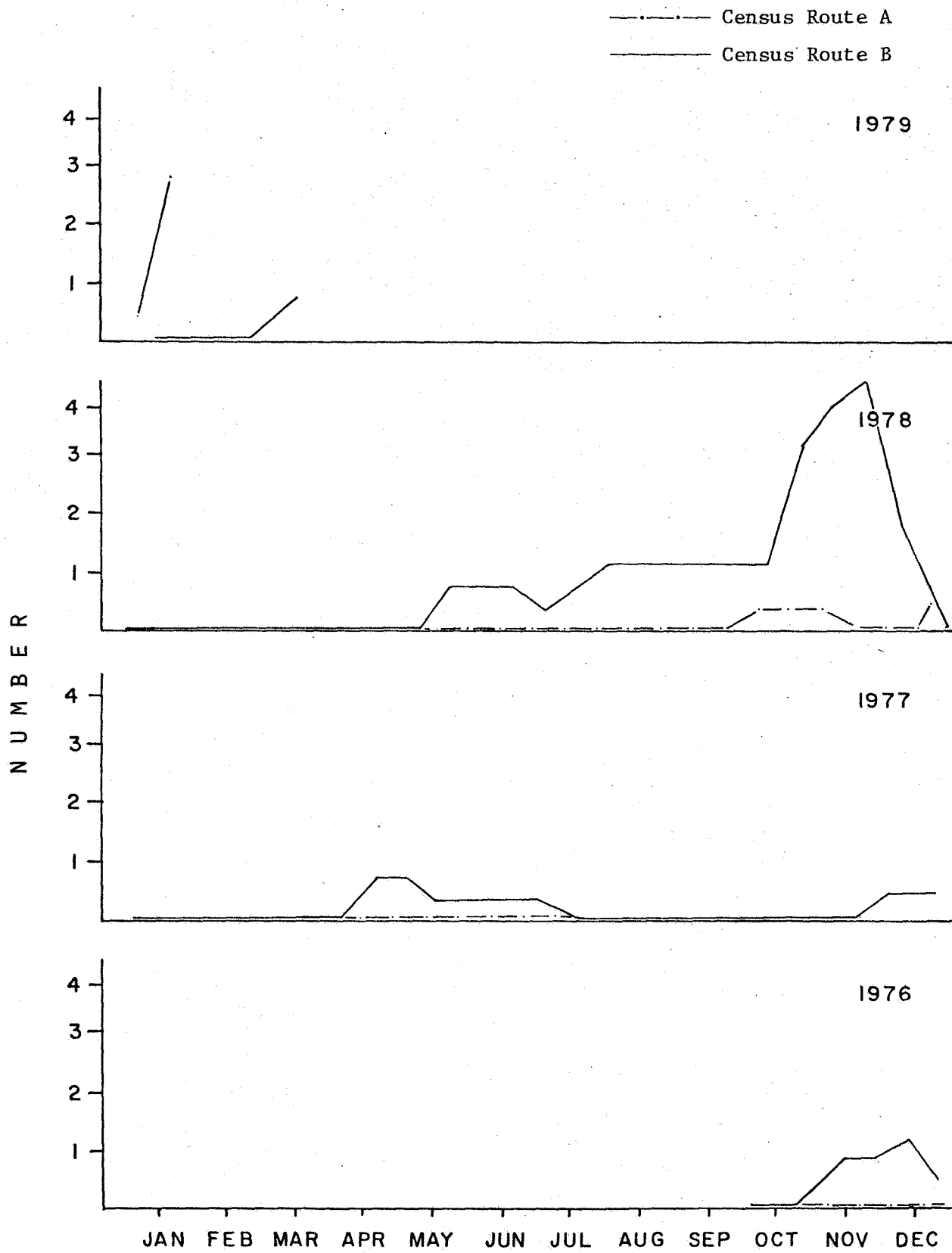


Figure 4. REDDISH EGRET (Sheet 8 of 19)

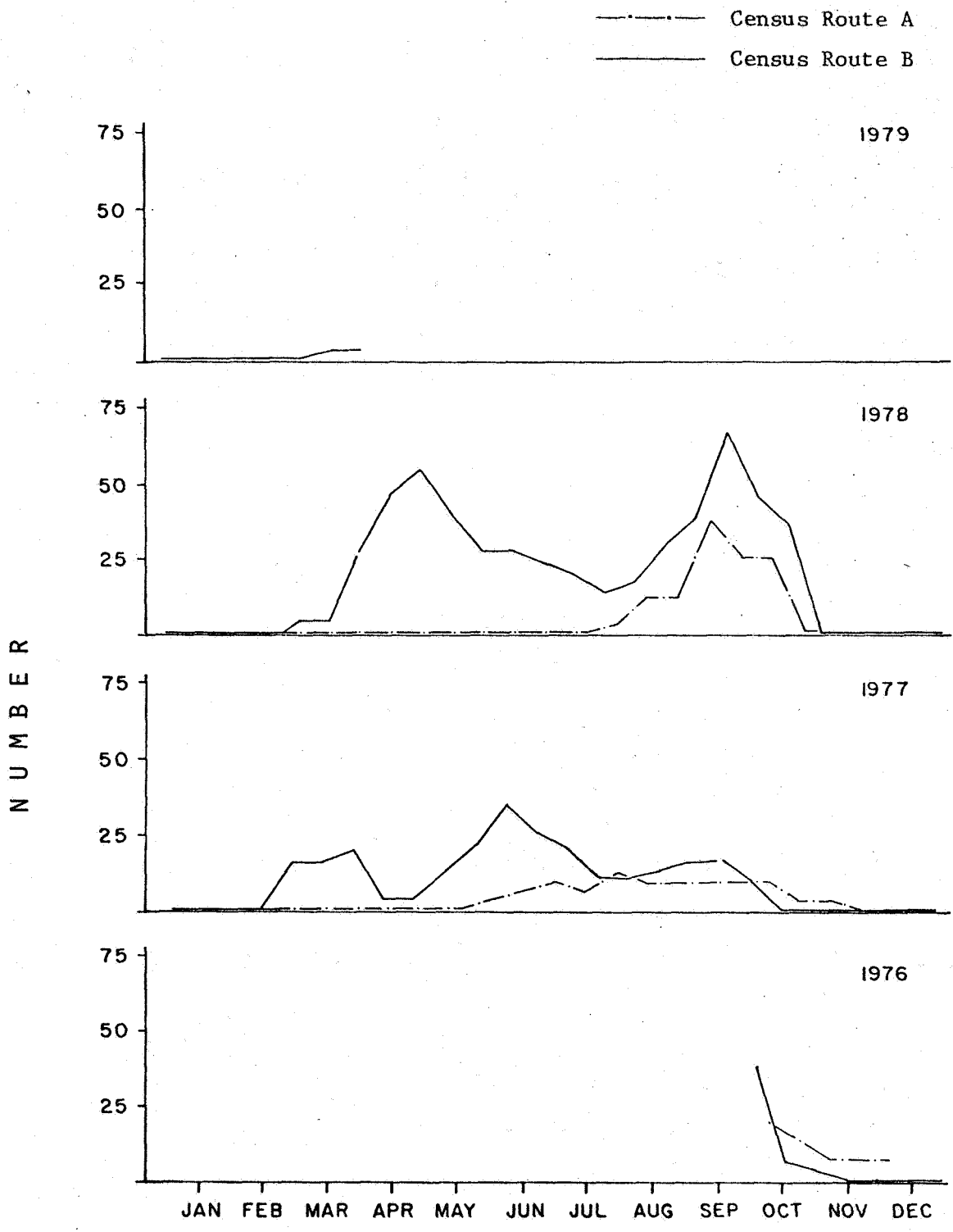


Figure 4. ROSEATE SPOONBILL (Sheet 9 of 19)

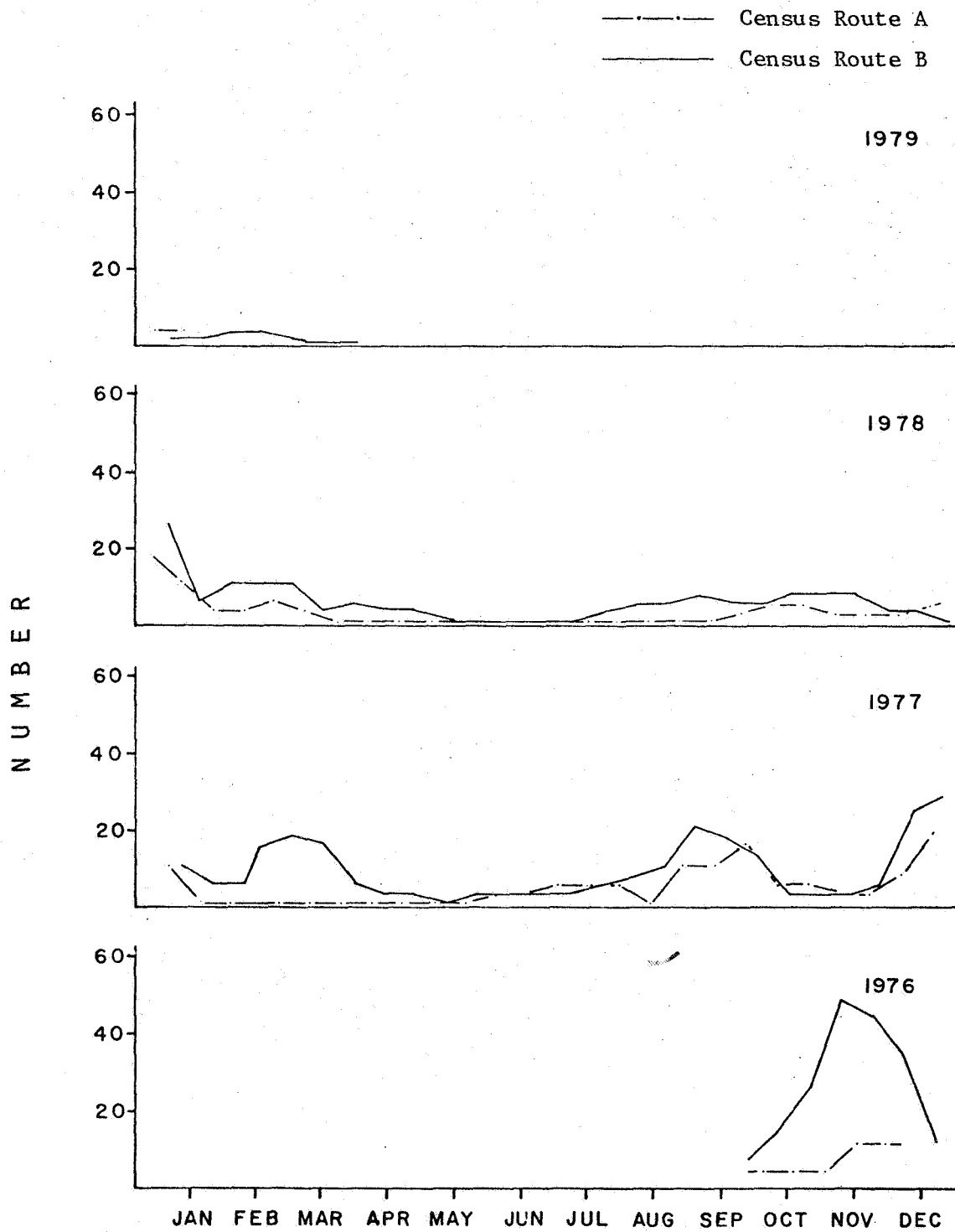


Figure 4. LITTLE BLUE HERON (Sheet 10 of 19)

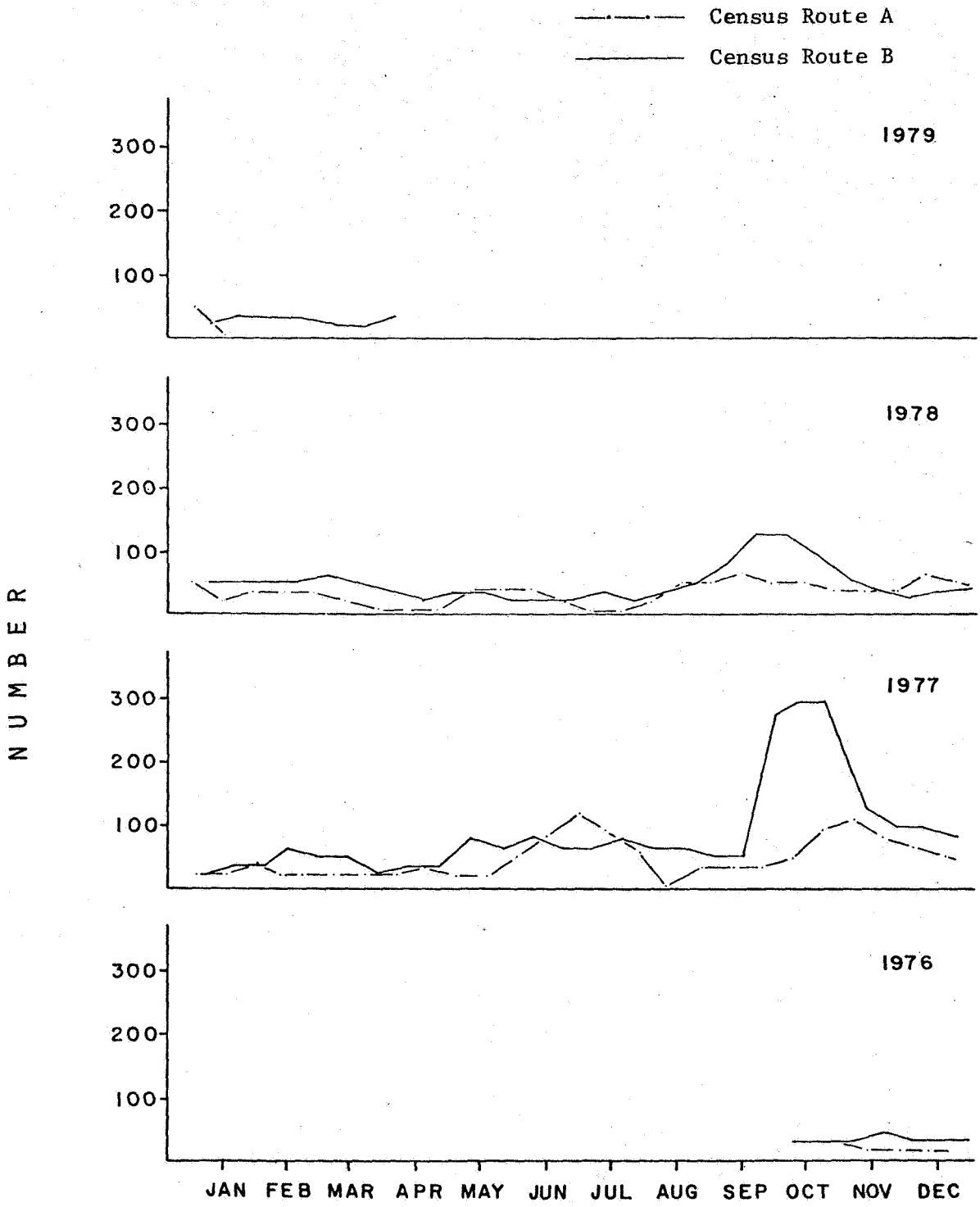


Figure 4. GREAT EGRET (Sheet 11 of 19)

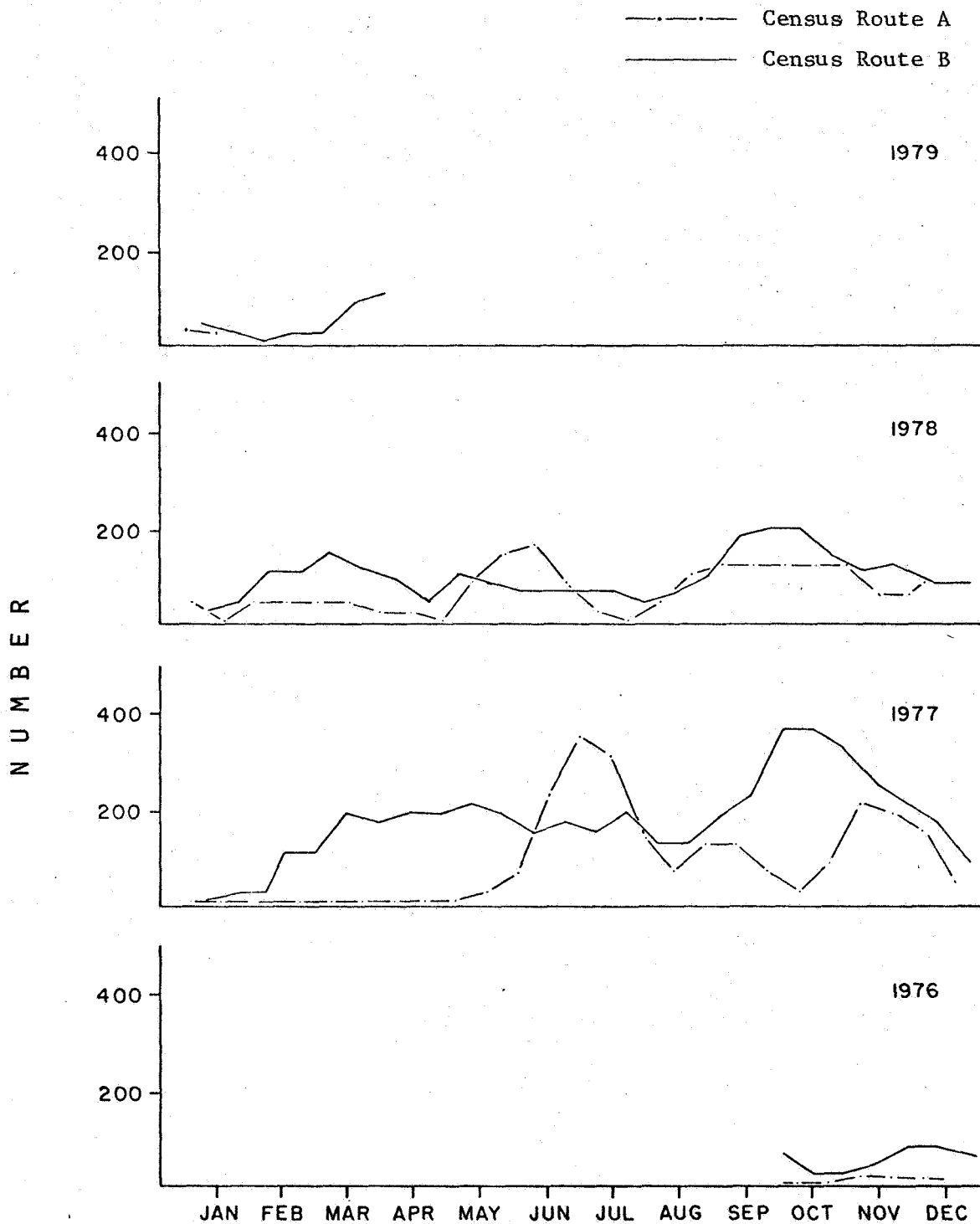


Figure 4. SNOWY EGRET (Sheet 12 of 19)

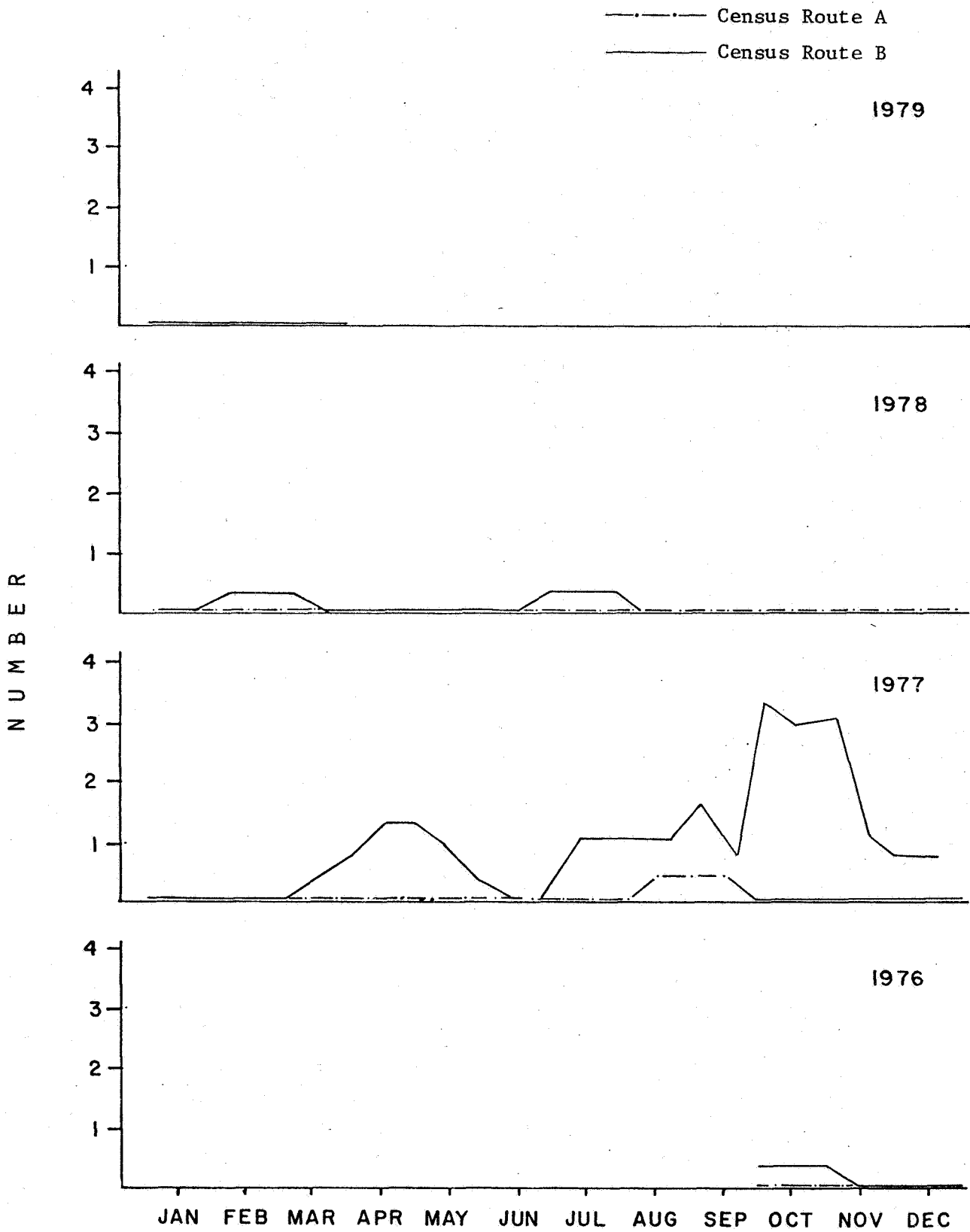


Figure 4. BLACK CROWNED NIGHT HERON (Sheet 13 of 19)

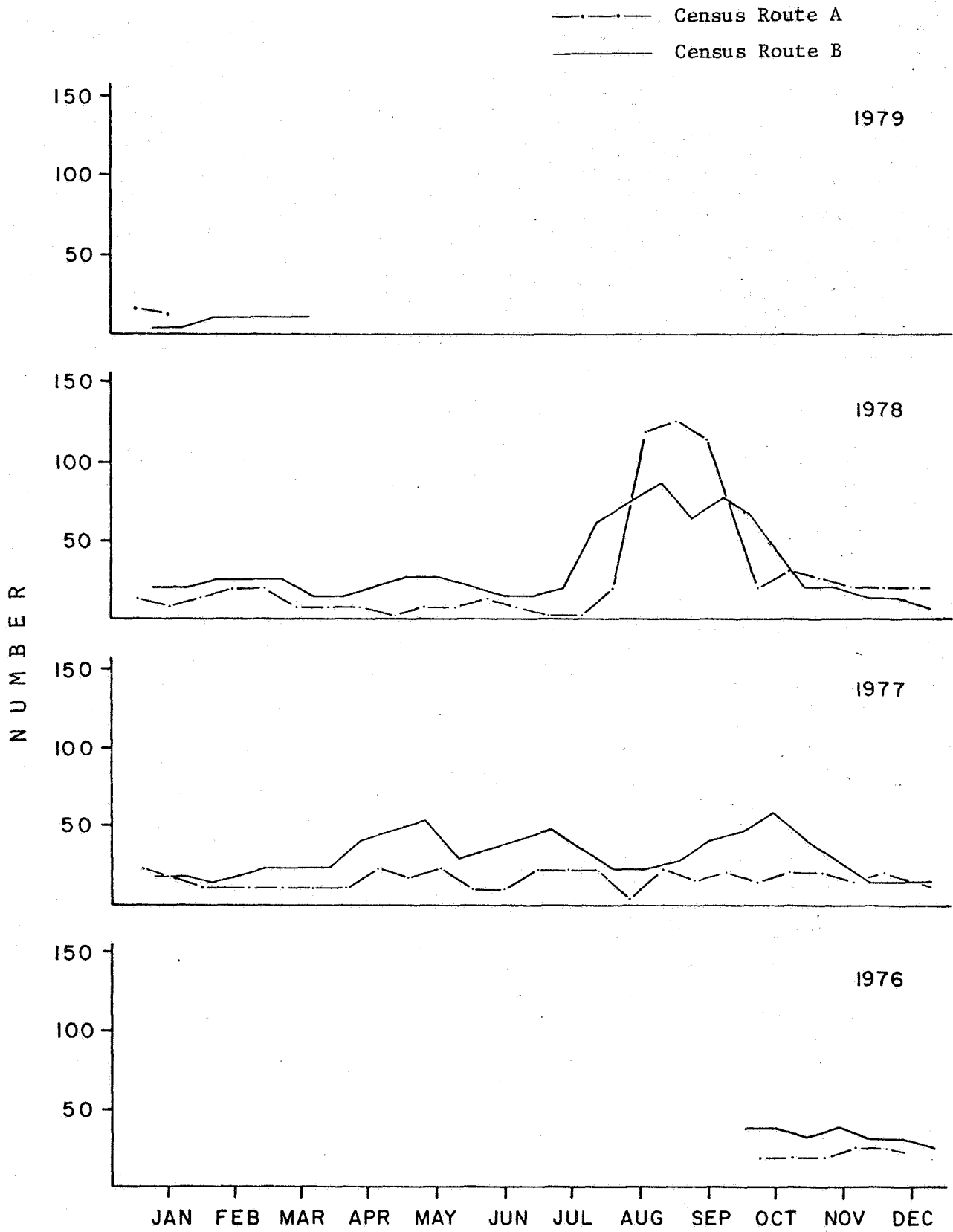


Figure 4. LOUISIANA HERON (Sheet 14 of 19)

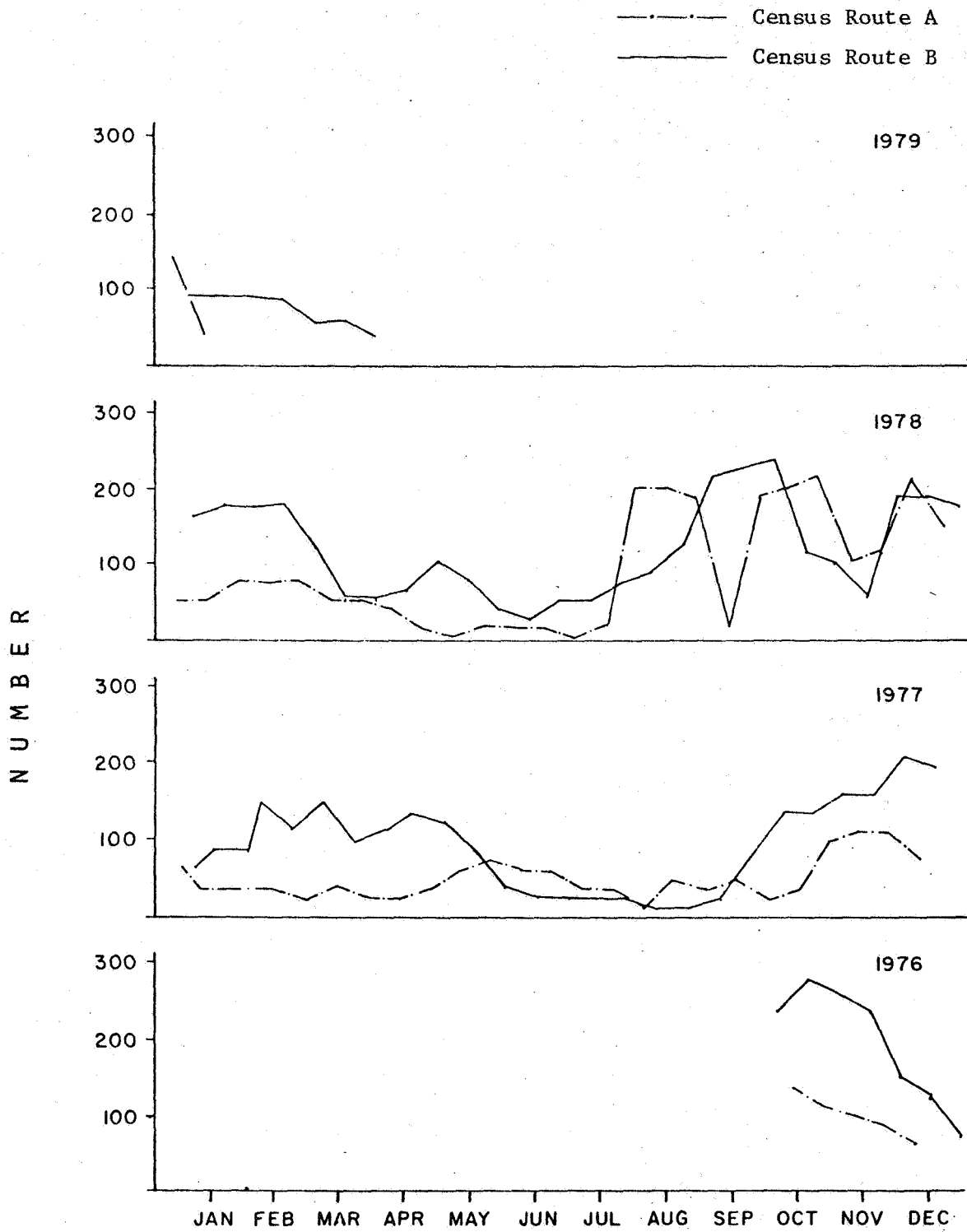


Figure 4. WHITE IBIS (Sheet 15 of 19)

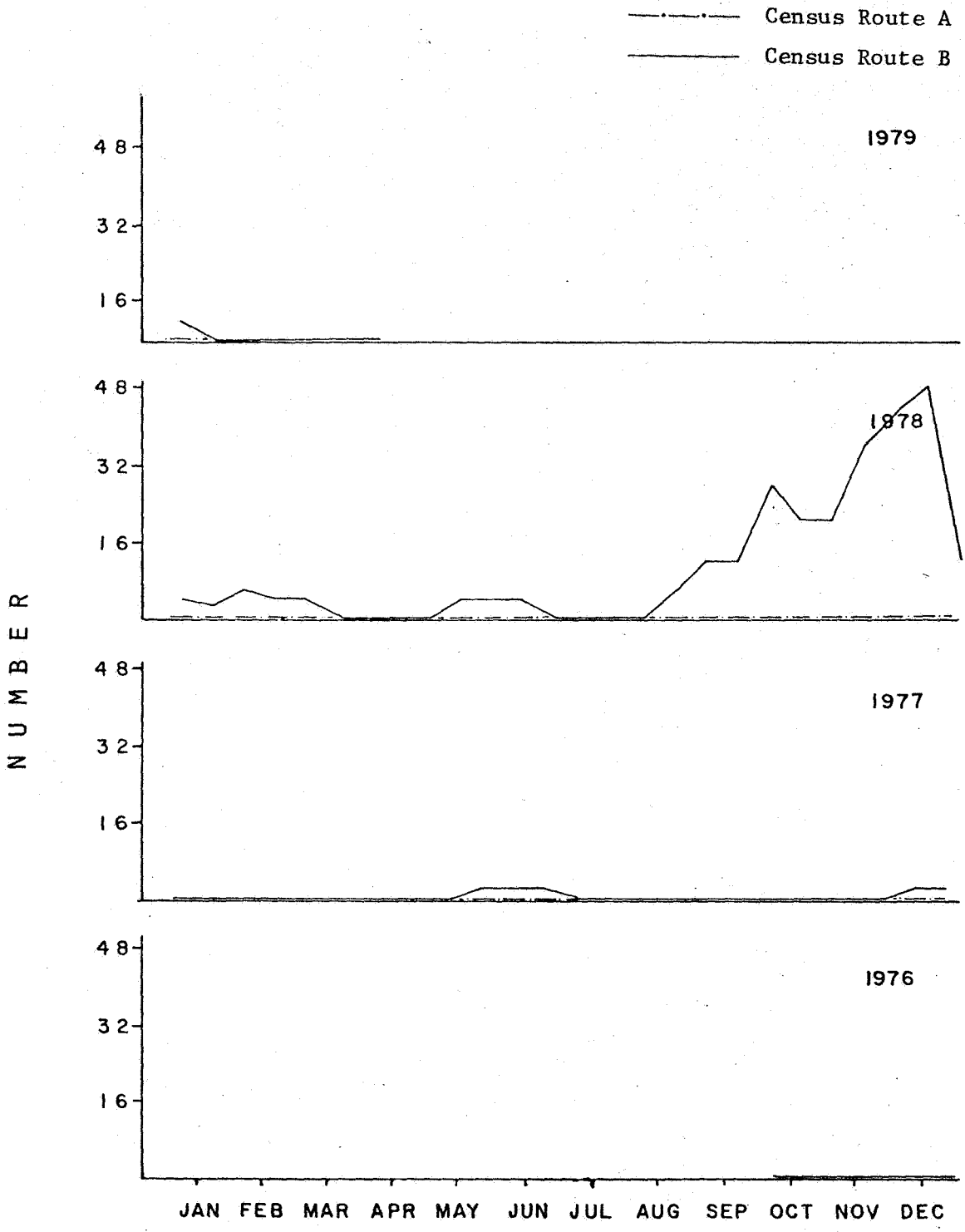


Figure 4. AMERICAN AVOCET (Sheet 16 of 19)

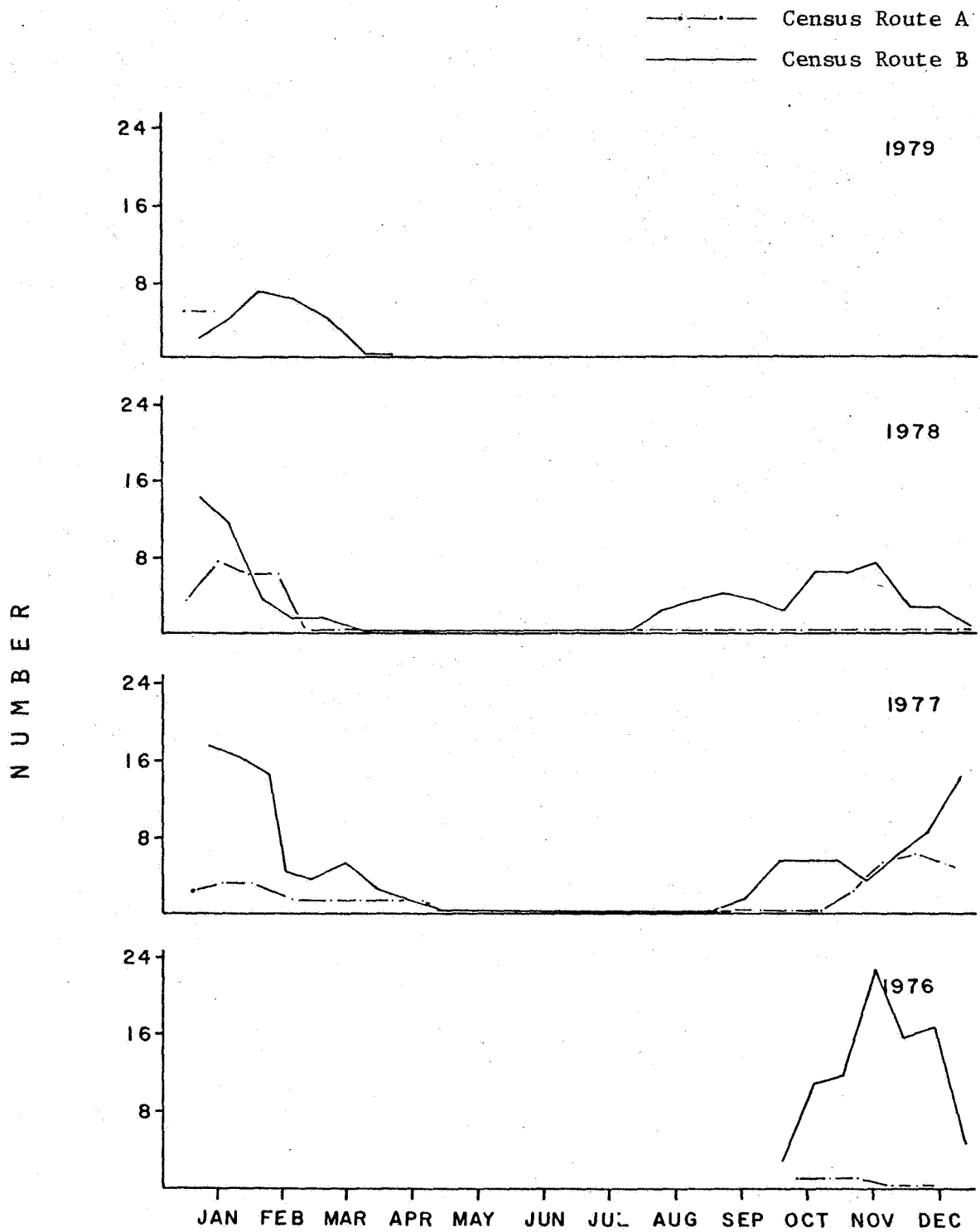


Figure 4. CASPIAN TERN (Sheet 17 of 19)

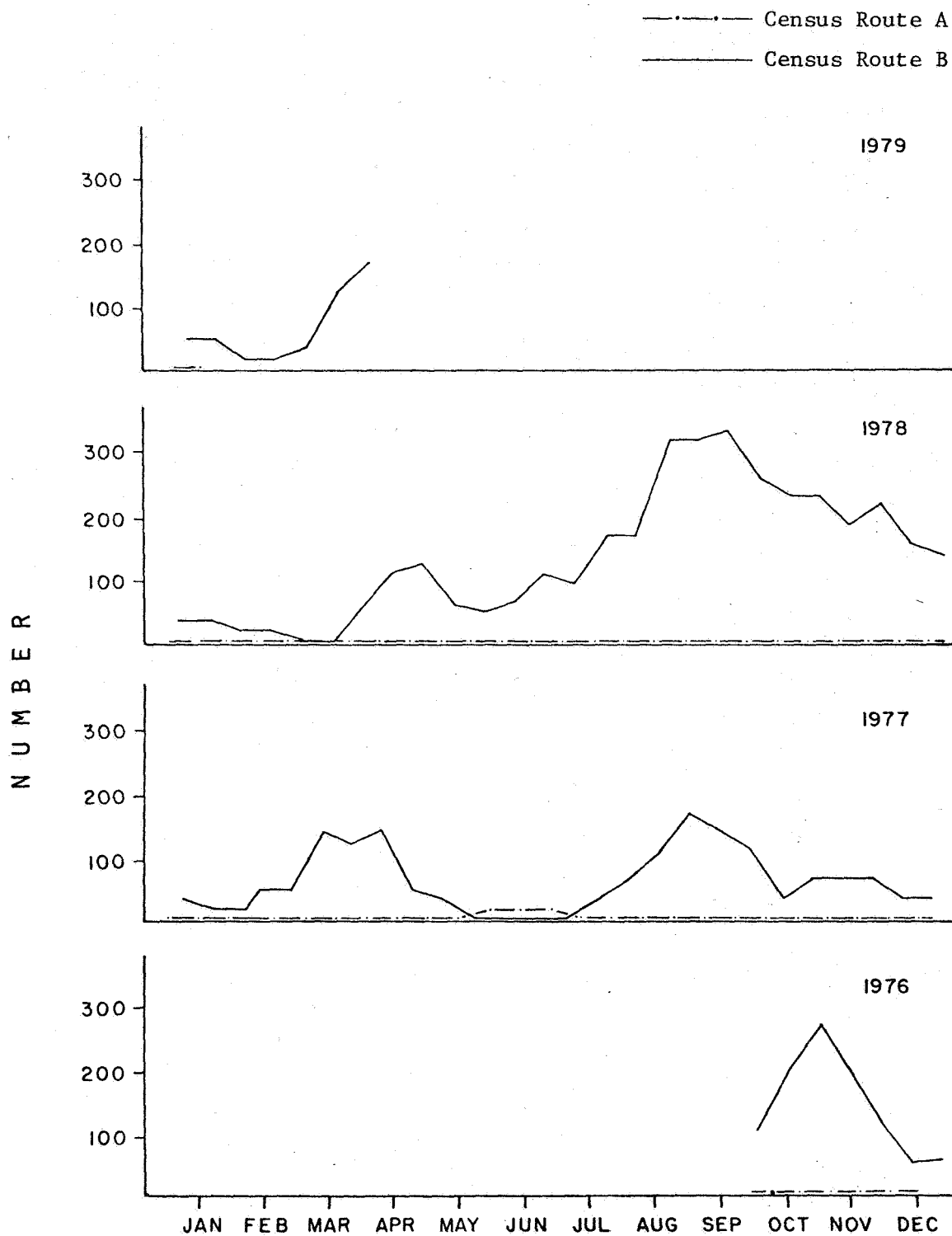


Figure 4. ROYAL TERN (Sheet 18 of 19)

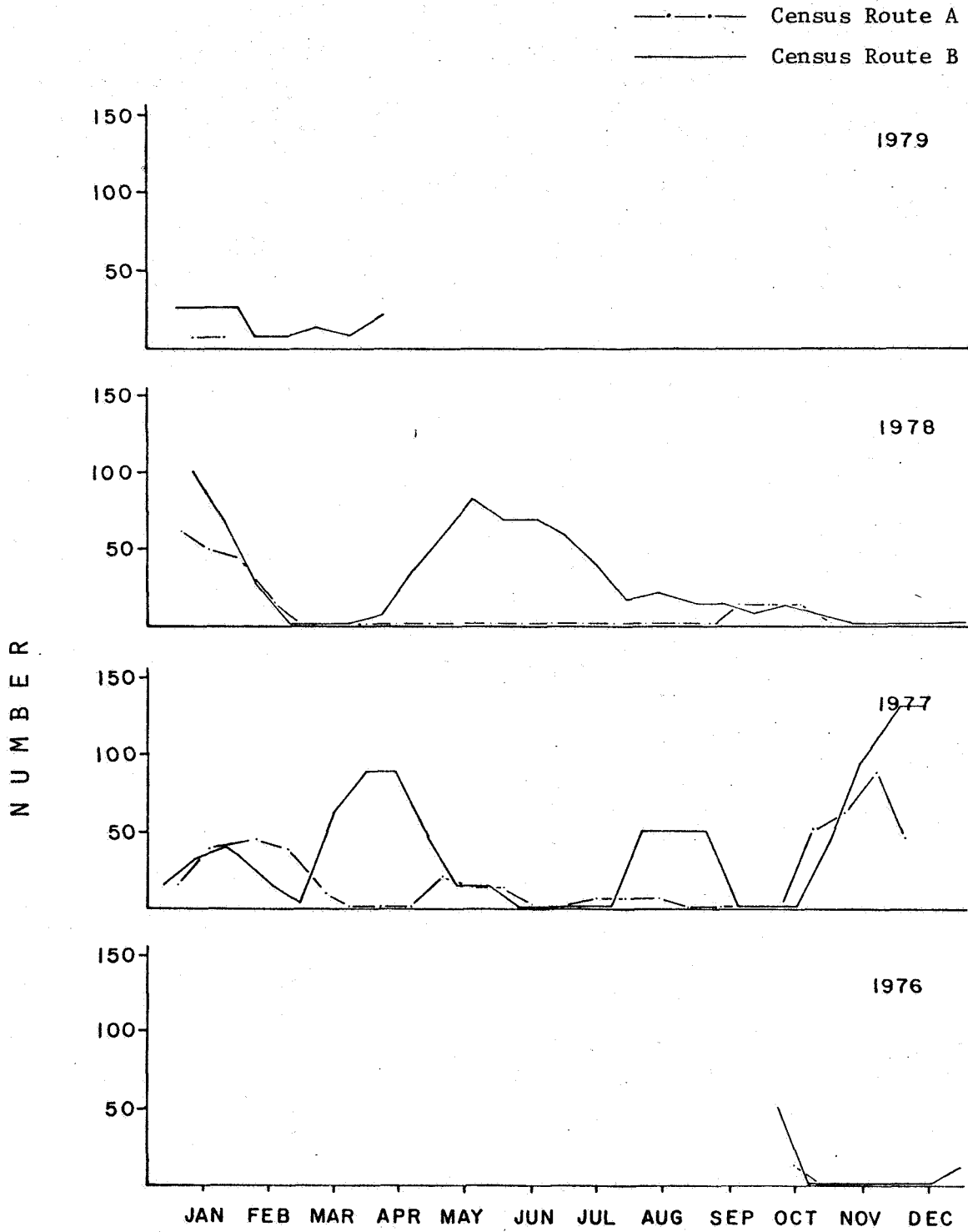


Figure 4. BLACK SKIMMER (Sheet 19 of 19)

Table 2

The occupancy periods of breeding birds at NASA/KSC. A + indicates known breeding time and a - indicates possible or suspected nesting time.

	<u>Jan.</u>	<u>Feb.</u>	<u>Mar.</u>	<u>Apr.</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>Aug.</u>	<u>Sep.</u>	<u>Oct.</u>	<u>Nov.</u>	<u>Dec.</u>
Brown Pelican	-	+	+	+	+	+	+	-				
Great Egret		+	+	+	+	+	-					
Snowy Egret		+	+	+	+	+	+					
Reddish Egret				+	+	+	-					
Louisiana Heron		+	+	+	+	+						
Little Blue Heron			+	+	+	+						
Black-crowned Night Heron			-	+	+	+						
Least Bittern				?	?							
Wood Stork	-	+	+	+	+	+	+	+				
Glossy Ibis			+	+	+	+	+	-				
White Ibis			+	+	+	+	-					
Southern Bald Eagle	+	+	+	+	-	-					-	+
Osprey	-	+	+	+	+	+	+					
Black Rail					-	+	+	?				
American Oystercatcher					-	+	+					
Least Tern					+	+	+	-				
Royal Tern					+	+	+	+				
Caspian Tern					+	+	+	+				
Black Skimmer					+	+	+	+				
Florida Scrub Jay			+	+	+	-	+					
*Dusky Seaside Sparrow			-	+	+	+	+	-				

*Probably now no longer nests, and may be extirpated.

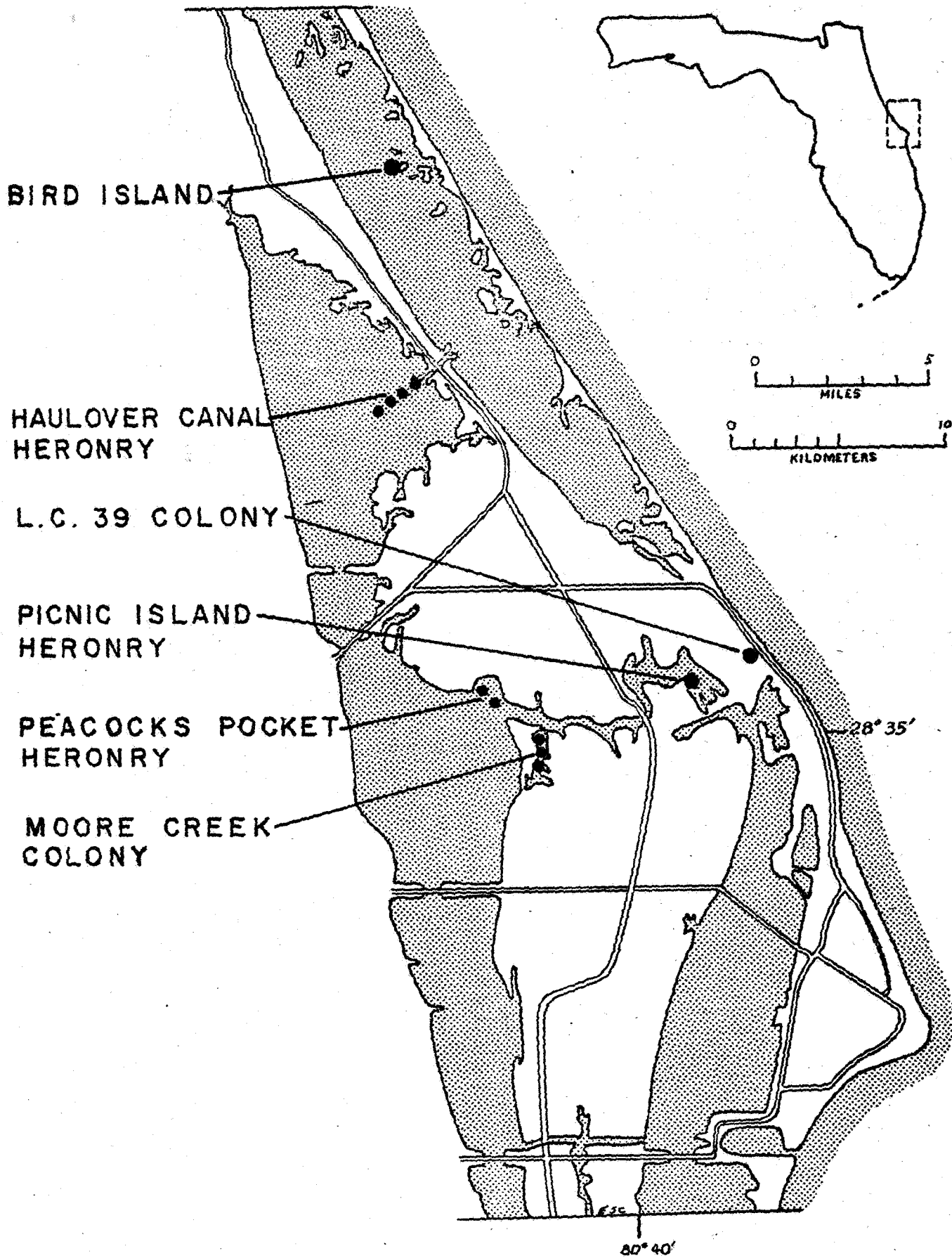


Figure 5. The location of wading bird colonies on NASA/KSC controlled areas from 1977 to 1979.

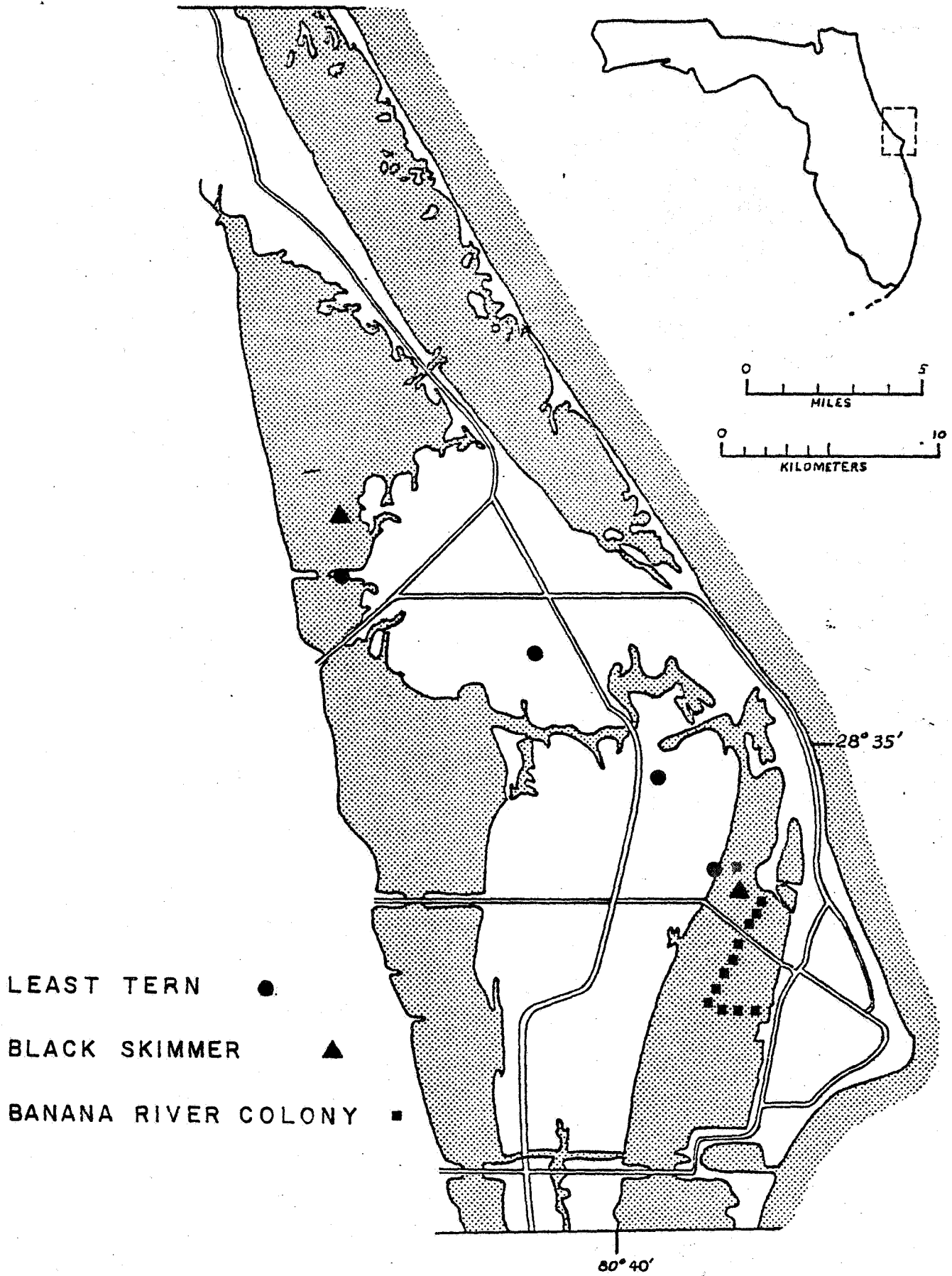


Figure 6. The location of gull, tern, and skimmer colonies on NASA/KSC controlled areas from 1977 to 1979.

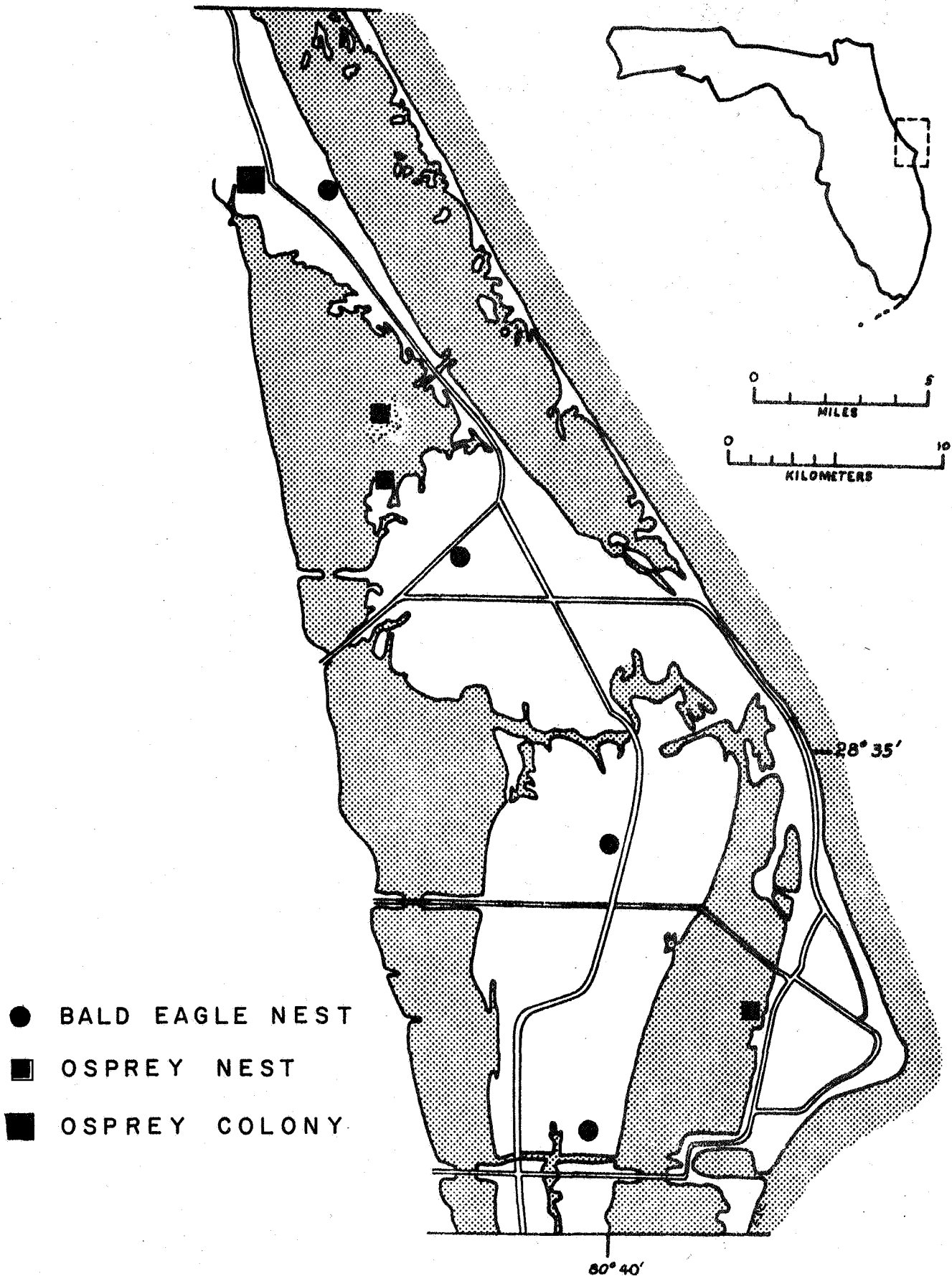


Figure 7. The location of Bald Eagle and Osprey nests.

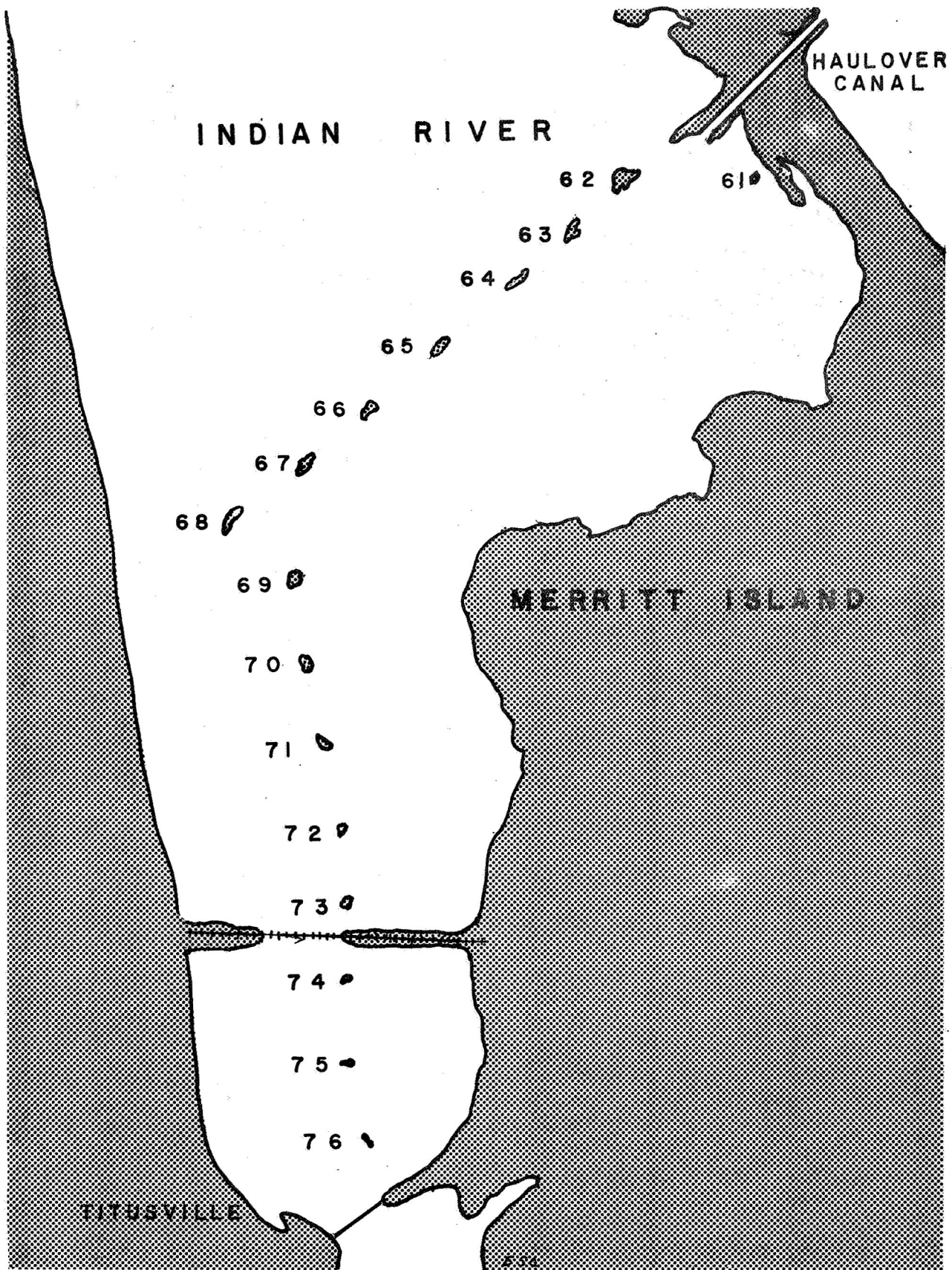


Figure 8. Spoil islands in the Haulover Canal heronry area.

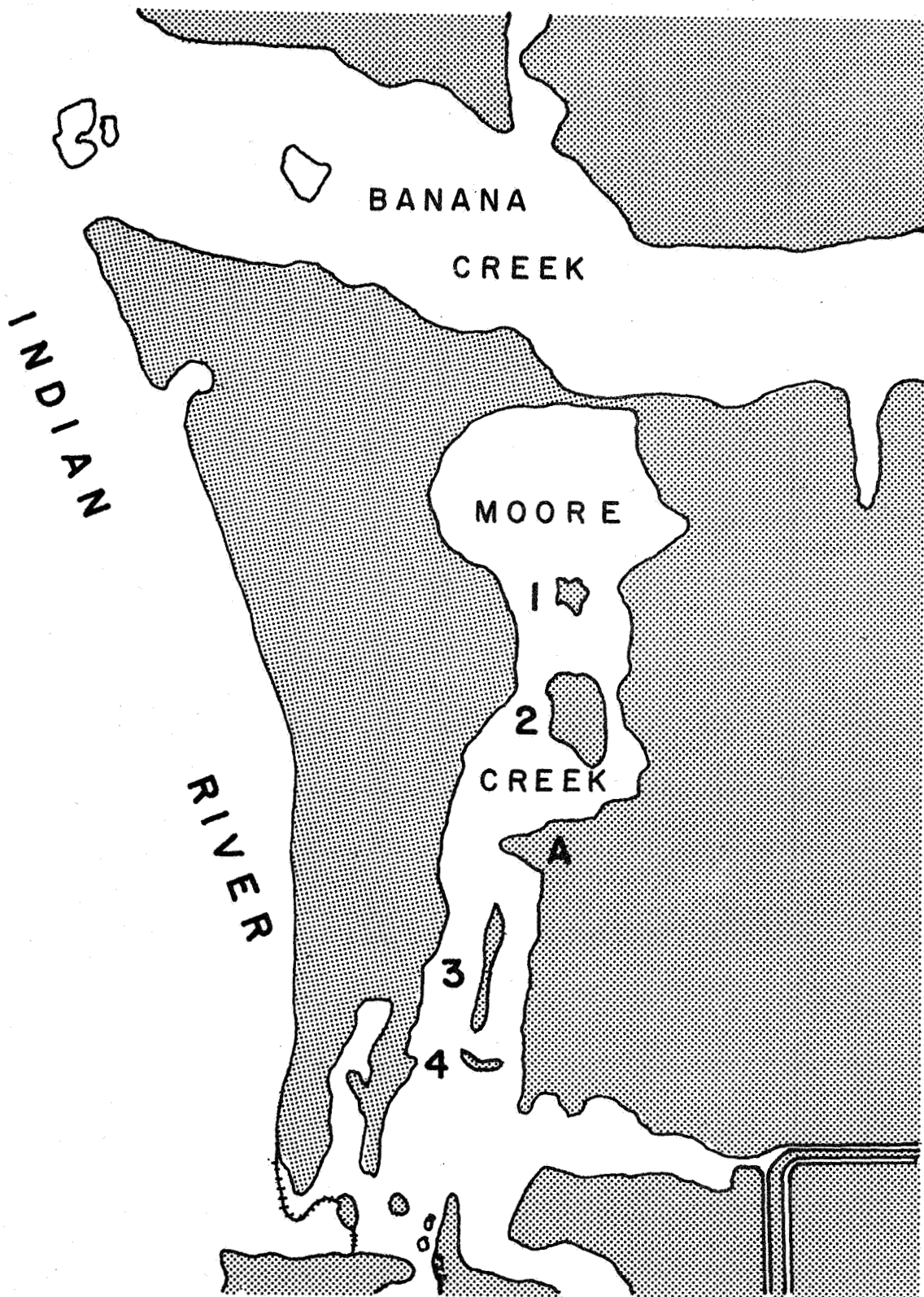


Figure 9. Nesting sites in the Moore Creek colony area.

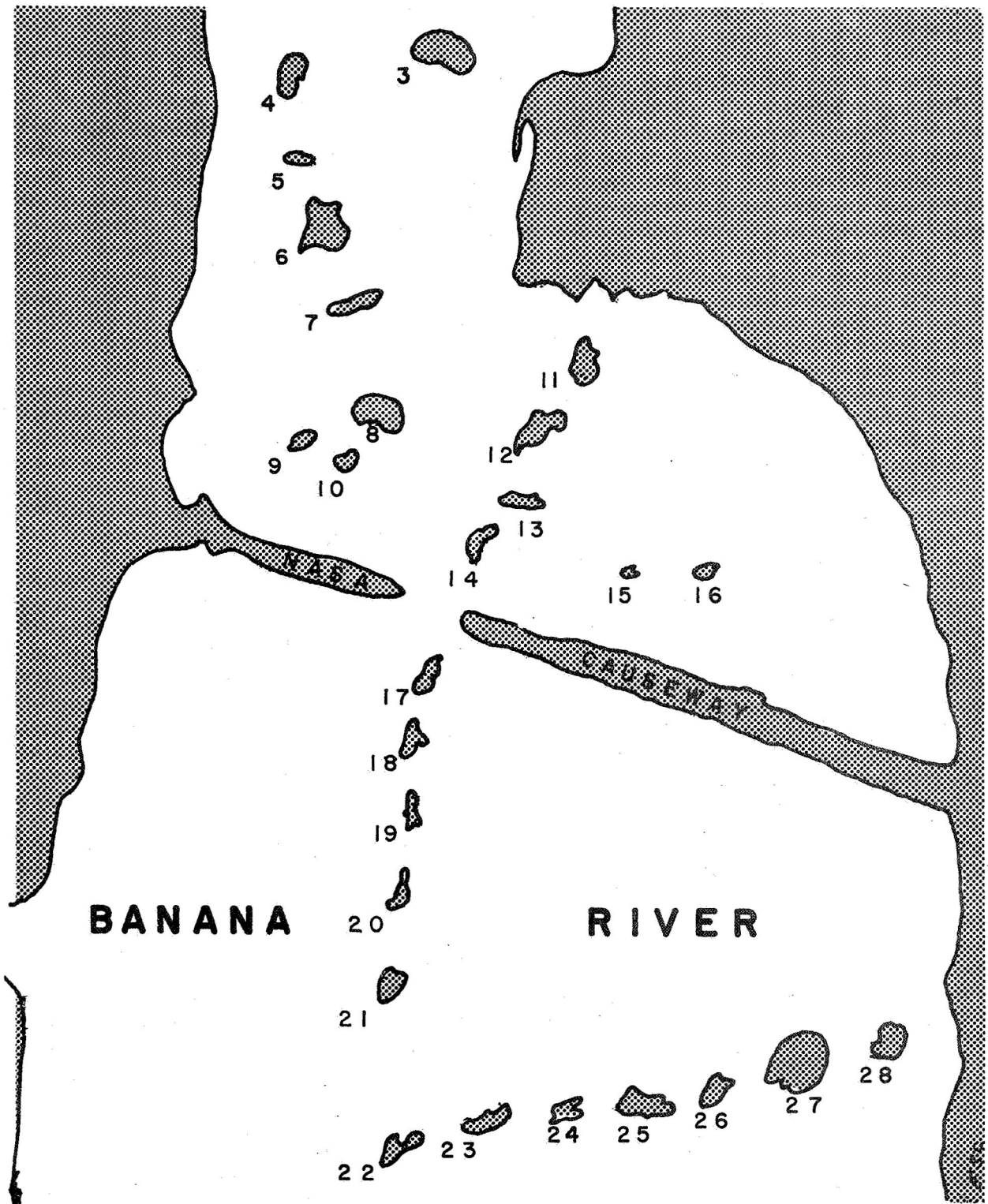


Figure 10. Nesting sites in the Banana River colony area.

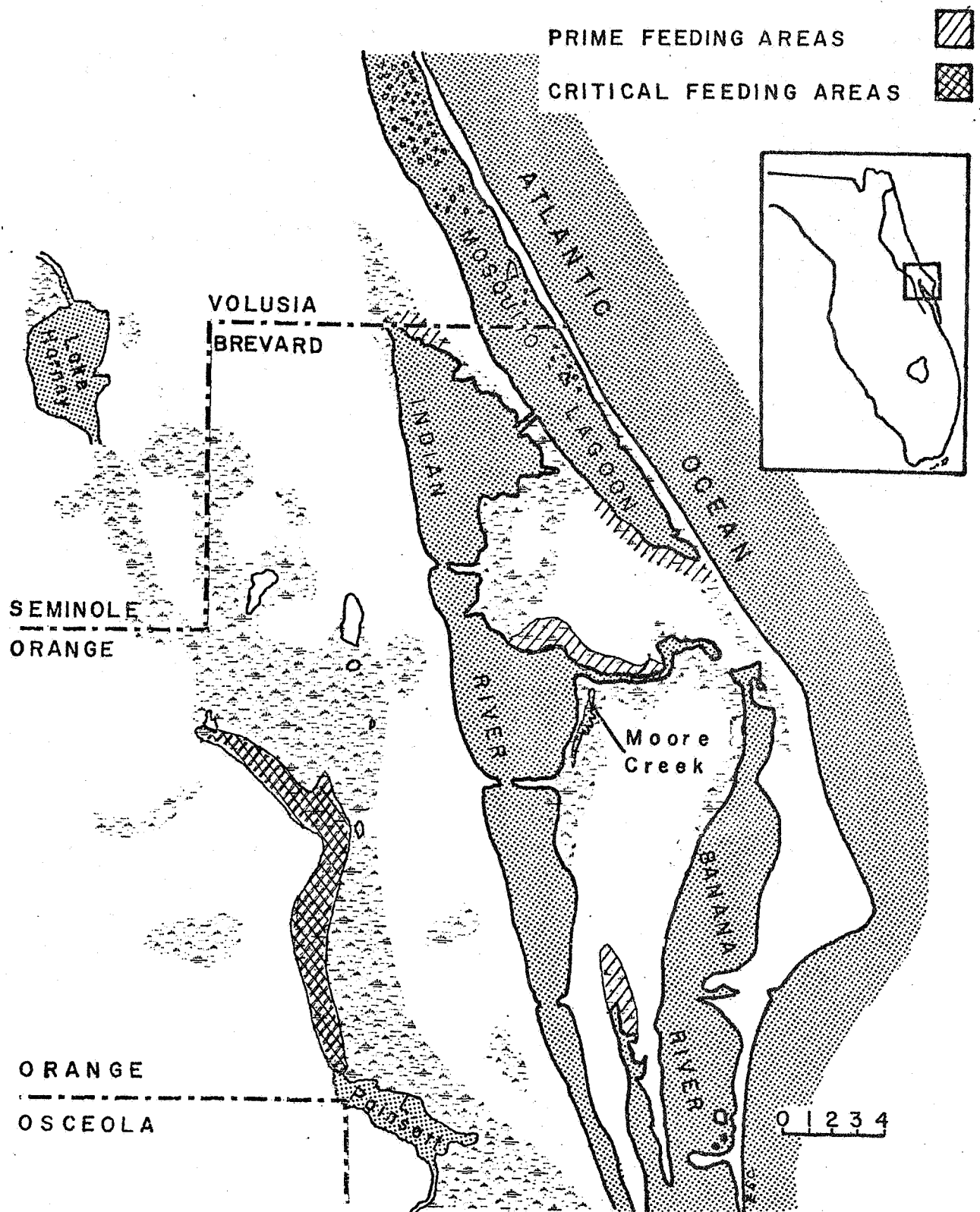


Figure 11. Feeding locations of Wood Storks nesting at the Moore Creek Colony in 1977.

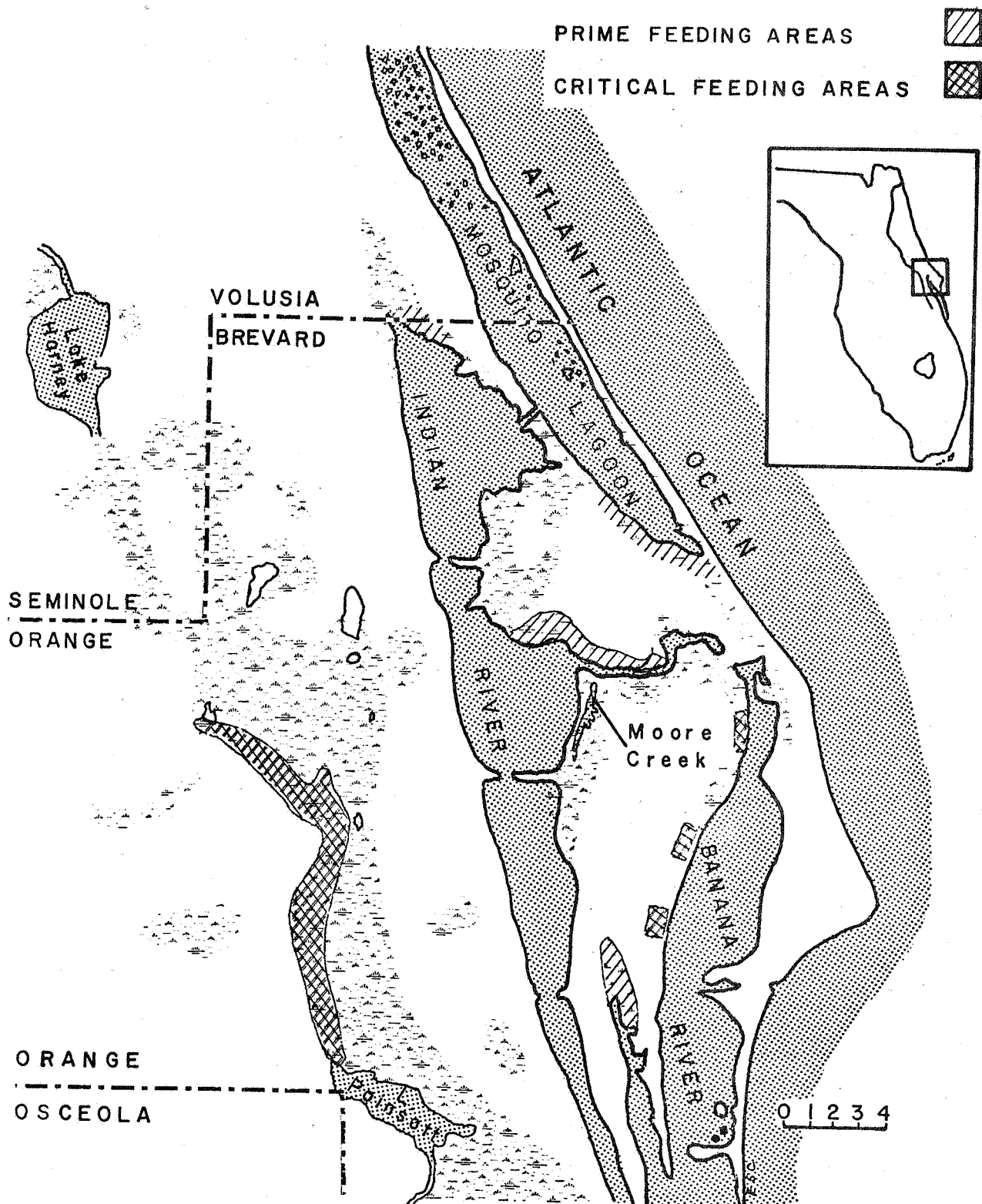


Figure 12. Feeding locations of Wood Storks breeding at the Moore Creek Colony in 1978.

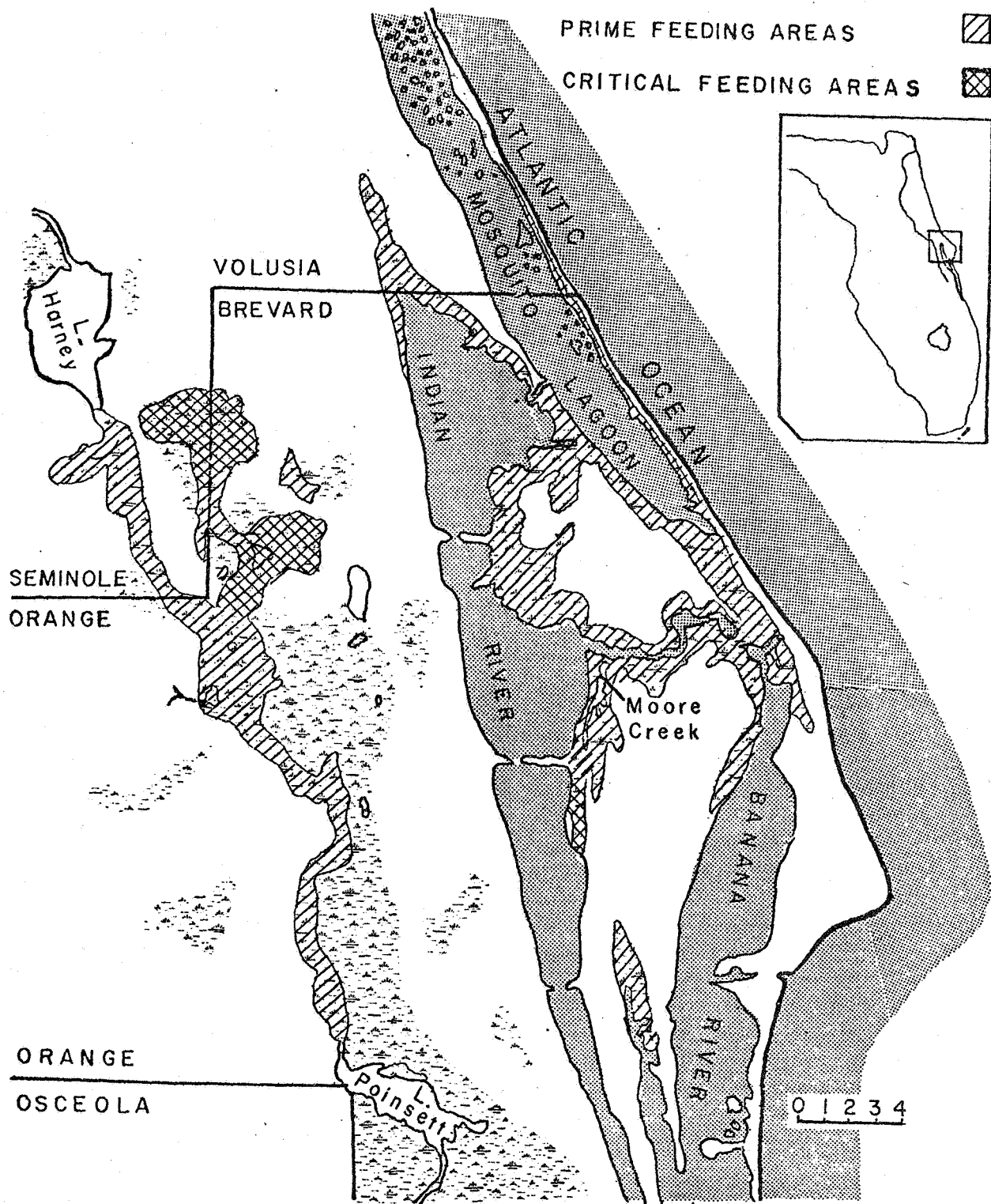


Figure 13. Feeding locations of Wood Storks nesting at the Moore Creek Colony in 1979.



Figure 14. Sighting location of Wood Storks banded and tagged at Moore Creek and Pelican Island colonies in 1977 and 1978.

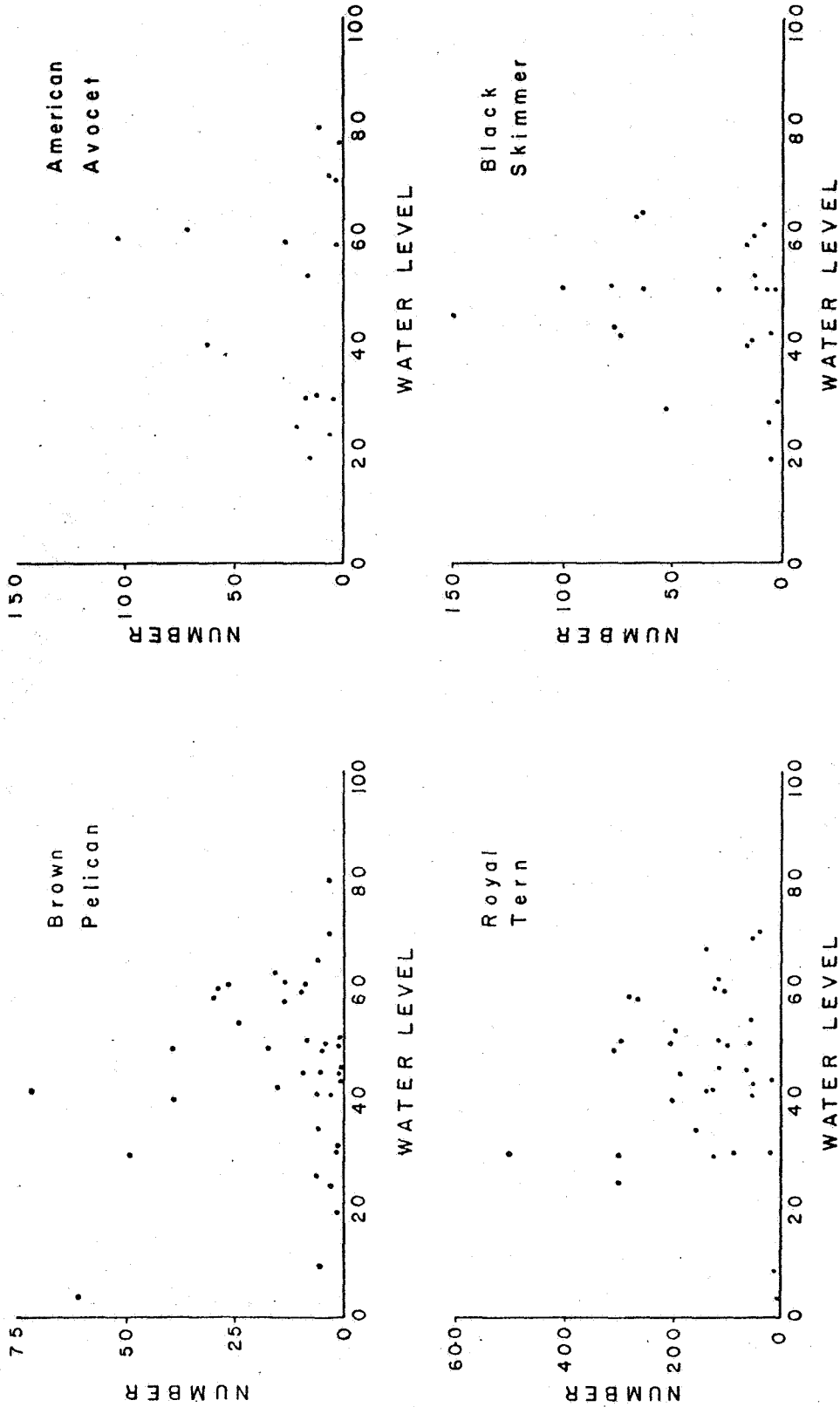


Figure 15. The relationship of the number of pelicans, terns, avocets, and skimmers noted at LC 39-B to the water level. Each point represents the number of birds and water level noted on a given day and 0 values are excluded.

shot and clubbed to death 1,000 to 2,000 young and adults in 1924 (Longstreet, 1931). The estimated breeding population in 1925 was 800 pairs (Longstreet, 1925) and the population had increased to 3,000 by 1930. Pelicans are not breeding on Bird (Crane) Island - a small mangrove island in Mosquito Lagoon about 1 km north of the Volusia-Brevard County line (Figure 5).

When pelicans began breeding at Bird Island is unknown, but it was at least 11 years ago because the Florida Fresh Water Fish and Game Commission has been censusing the colony since 1968. The population on the island has remained stable with a range of 250 to 550 pairs, and an average of 402 pairs during this period (Table 3).

Table 3
The number of pelican pairs found breeding on Bird (Crane) Island from 1968 to 1979 (Williams and Martin 1970) (Nesbitt et al. 1976) (Nesbitt, pers. comm.).

Year	Number	Year	Number
1968	550	1974	350
1969	300	1975	350
1970	350	1976	325
1971	500	1977	400
1972	500	1978	425
1973	250	1979	525

During the past 3 years the breeding season of the pelicans at Bird Island was quite variable. The birds began breeding in late March in 1978, and in mid-February 1979. The cause of this variability is not known, but may be related to climatic conditions and food supplies. The total breeding season generally lasts about 5 to 6 months. It is interesting to note that the pelicans breeding on Pelican Island in the southern end of Mosquito Lagoon in the 1920's and 1930's were fall breeders, beginning in August or September (Mill, 1931).

Pelicans are common on Merritt Island and these birds are frequently found diving for fish in the Atlantic Ocean, Mosquito Lagoon, Indian River, and the mosquito control impoundments. Pelicans in Florida feed primarily on fish, such as Brevoortia, Mugil, Sardinella, and Lagodon (Schreiber, 1978). The birds often are observed loafing on spoil islands, and mud flats near LC 39-B and the northern end of Banana River. The number of birds found on the census route declined during the summer, and then increased as the fall migrants moved south (Figure 4), often as far as Cuba. Camera Pad 10 is recorded in Table 3 and is shown graphically in Figure 16. As in the other census results, the largest number of birds were noted during the fall, and the fewest during the summer.

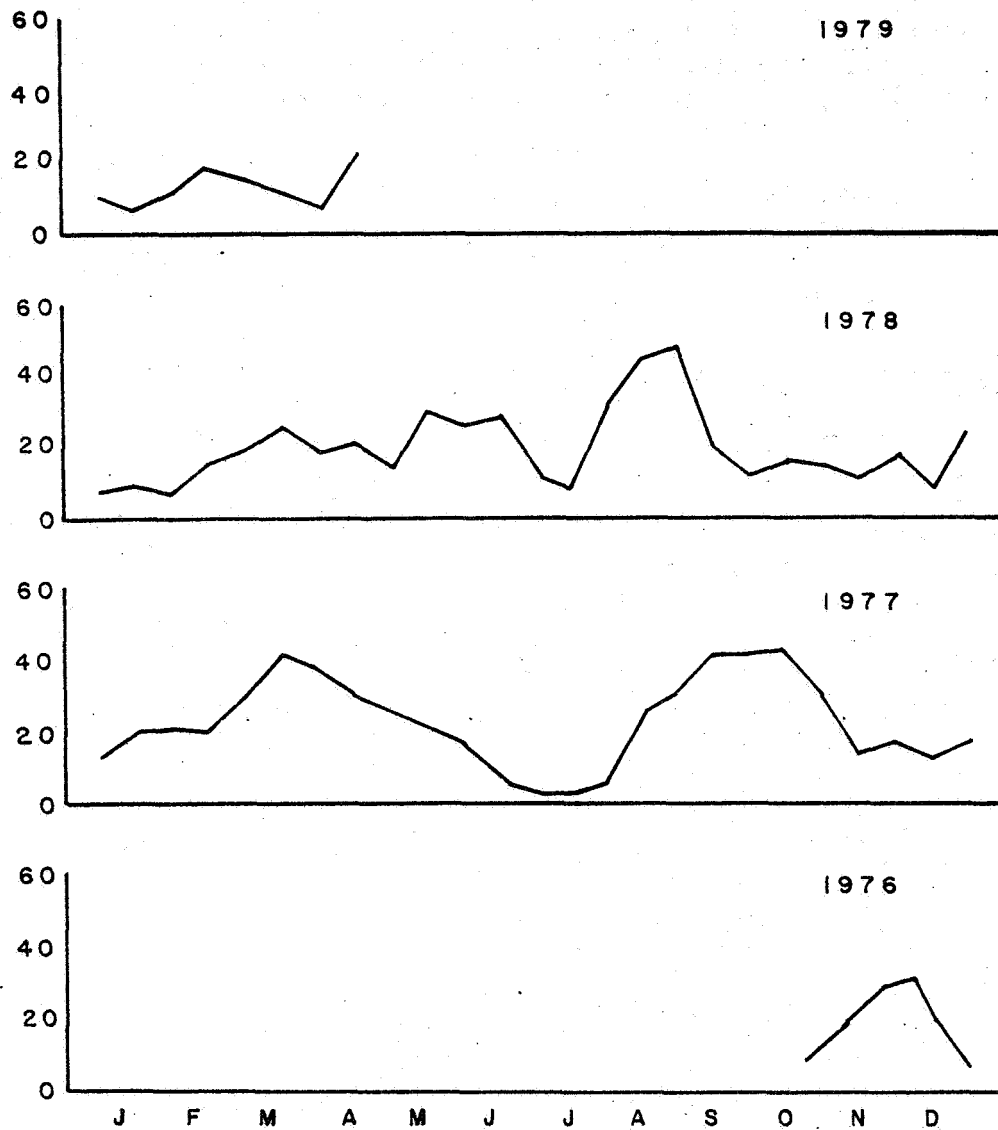


Figure 16. A three point moving average of the number of Brown Pelicans observed along Playalinda Beach along Camera Pad 10.

Magnificent Frigatebird

The Magnificent Frigatebird (Fregata magnificens rothschild) is frequently seen along the coastal areas of Florida, especially during the summer. Although no sightings of this bird were made on the census routes, it has been observed over the Atlantic Ocean and Mosquito Lagoon.

Reddish Egret

The Reddish Egret (Dichromanassa refescens) population in the United States is stable or increasing and is estimated to be about 1,900 breeding pairs, of which 1,600 are in Texas, 150 in Florida, and 150 in Louisiana (Paul, 1977). The original population is unknown, but the birds were greatly reduced at the turn of the century by plume hunters, and recovery has been very slow.

Reddish Egrets were abundant in Florida until the late 1800's and found breeding as far north as Cape Canaveral (Robertson, 1978). The birds were almost extirpated in the state by 1890, and the population did not begin to recover until the 1930's. Allen (1954) estimated no more than 150 birds in the early 1950's. Until the 1970's the birds bred only in south Florida (primarily Florida Bay), and only occasional nonbreeding birds were noted in and along the coasts of central Florida. Range expansion into former habitats began on the west coast of Florida in 1974 (Paul et al., 1975) and on the east coast in 1978 (Paul et al., in press). One pair was at the Haulover colony and the other on Riomar Island near Vero Beach (Kale, 1978; Paul et al., in press.) The current Florida population is estimated to be about 300 birds (Robertson, 1978).

The number of Reddish Egrets noted on the census routes has remained low although there has been a gradual increase in the number of sightings, especially of adults (Figure 4). Birds noted were generally seen in Mosquito Lagoon, at Black Point, and the coastal impoundments within 1/2 mile of the ocean.

The last recorded breeding for a Reddish Egret on Merritt Island was in 1872, although the birds probably continued after this date (Howell, 1932). In 1977 an adult Reddish Egret was sighted in the Haulover colony (Figure 5, 8); however, breeding was not verified. In 1978 a pair of egrets successfully reared two young in the Haulover colony (Figure 8), and in 1979 a pair unsuccessfully nested in the same colony. In both years, adult Reddish Egrets were noted in the colony in mid-April and egg laying began in early May. The 1978 fledglings were independent by the end of July.

Colonial Wading Birds

The colonial wading birds, Little Blue Heron (Florida caerulea), Great Egret (Casmerodius albus), Snowy Egret (Egretta thula), Louisiana Heron (Hydranassa tricolor), Black-crowned Night Heron (Nycticorax nycticorax), Yellow-crowned Night Heron (Nyctanassa violacea), Least Bittern (Ixobrychus exilis exilis), White Ibis (Eudocimus albus), Glossy Ibis (Plegadis falcinellus falcinellus), are still common in Florida, but they are listed as species of special concern because of the declines in their breeding populations and destruction of wetland habitats. The total population of wading birds in Florida declined from 2,500,000 to

500,000 birds during the late 1800's and early 1900's, primarily as a result of plume hunting. After hunting was outlawed, the birds recovered to a maximum of about 1,500,000 birds in the 1930's. Since then a decline has occurred and the estimated population (excluding Cattle Egrets) in 1960 was 300,000 birds and this number was further reduced to between 100,000 and 200,000 by 1974 (Ogden, 1978).

Historically wading birds were common on Merritt Island and the surrounding area (Maynard, 1874; Gunn, 1882; Vars, 1926; Ingersoll, 1928). There is a noticeable lack of breeding records on the island despite numerous visits by ornithologists attempting to collect the Dusky Seaside Sparrow. In April of 1880 (Gunn, 1882) a herony was found in a mangrove swamp in Banana Creek which contained Louisiana Herons, Green Herons, Little Blue Herons, Great Blue Herons, Snowy Egrets, Great Egrets, and a pair of Least Bitterns. From most of the records it appears the majority of the wading birds breeding in Brevard County did so on the St. Johns River (Allen, 1942; Bent, 1940; Gent, 1926). In the late 30's the Lake Washington rookery was reported to contain up to 25,000 White Ibis as well as egrets and herons (Longstreet 1937).

Census data (Figure 4) indicate that the wading bird populations fluctuated considerably. Since the birds are colonial feeders, large numbers may be observed at one time along the census routes, and they may be out of the census route area the following week. There appears to be a general increase in the number of waders sighted during the fall, and a decline in the spring. The increased number during the fall may be due to dispersal southward and movement to coastal areas when the mainlands are wet. The decreases during the spring result from movement into the breeding colonies.

The colonial wading birds were found nesting in several locations on the island. The largest colonies were on Bird Island in Volusia County, four Intracoastal Waterway spoil islands west of Haulover Canal, and three mangrove islands in Moore Creek. Birds were also found nesting on two islands in Peacocks Pocket at the mouth of Banana Creek, on two small mangrove islands in an impoundment north of the VAB (Picnic Island), and in mangroves in an impoundment between Pads A and B of LC-39. (Figure 5). Estimates of the avian population for these colonies in 1978 is presented in Appendix Table 9.

The Haulover colony is located on four 15-year-old spoil islands which vary in area from 0.8 to 36 hectares (Figure 8). Of the four spoil islands only one is within the NASA/KSC boundary, but all are included in this study because the birds use Merritt Island to forage during the breeding season, and both the young and adults are found on Merritt Island after reproduction. The most heavily used island is the one under NASA control, and the other islands primarily serve as a spill-over during good years. The vegetation found on these islands includes herbaceous plants such as seaside paspalum (Paspalum vaginatum), saltweed (Phloxeris vermicularis), and beggartick (Bidens pilsoa); shrubs like pellitory (Parietaria praetermissa), marsh elder (Iva frutescens), and groundsel (Baccharis halimifolia); and trees such as black mangrove (Avicennia germinans), Australian pine (Casuarina equisetifolia), white

mangrove (Laguncularia racemosa) and pokeweed (Phytolacca americana). In March the birds were noted loafing and/or roosting in the colony, however, nesting generally did not begin until early April. Most of the young hatched in May, and fledged in June or early July. After reaching independence the juveniles continued to loaf and roost on the islands for another month. The birds nesting on the Haulover heronry generally nested two weeks later than other colonies on Merritt Island. This variation in the initiation of nesting is probably related to the rainfall and water levels. In a dry year (1977) breeding began several weeks earlier than in a wet year (1978).

*Double-crested Cormorants, *Great Blue Herons, Great Egrets, Snowy Egrets, Louisiana Herons, Little Blue Herons, Black-crowned Night Herons, Cattle Egrets, White Ibis, and Glossy Ibis were found breeding on the first island (II-62 of Schreiber, 1978). In 1978 the same birds were noted with the addition of a pair of Reddish Egrets. The birds found on the island in 1979 were the same as 1978, except very few Glossy Ibis and no Double-crested Cormorants were noted.

Great Egrets, Snowy Egrets, Louisiana Herons, White Ibis, and Glossy Ibis were noted breeding in 1977 on the second island (II-63 of Schreiber, 1978). No birds nested on this island in 1978 or 1979.

In 1977 Louisiana Herons, Snowy Egrets, Cattle Egrets, and Glossy Ibis were observed on the third island (II-65 of Schreiber, 1978). The same birds, except Glossy Ibis, were noted there in 1978 and 1979.

In 1977 Great Egrets, Little Blue Herons, Louisiana Herons, Snowy Egrets, *Cattle Egrets, and Glossy Ibis were found breeding on the fourth island (II-66 of Schreiber, 1978). The same birds, except Glossy Ibis, were noted in 1978 and 1979. This island is used primarily by Cattle Egrets.

The Moore Creek colony is situated on several small islands composed exclusively of white mangrove (Laguncularia racemosa) in an impounded creek south of Banana Creek and west of the VAB. Considering the island from north to south (Figure 9); the first island is about 1 hectare in area, the second island is approximately 4 hectares, the third island about 1 1/2 hectares and the fourth island 0.5 hectare.

Although the White Ibis roost in the colony area in early March, most of the wading birds were not observed in the colony until April. Breeding was well underway in early May, and most of the birds had young in the nest within a month. Abandonment generally occurred by late July, although a few juveniles continued to remain in the colony for several more weeks. As in other colonies, the breeding cycle may shift several weeks. With three exceptions, the other avian species utilizing the colony, but not under study, had similar breeding cycles. The exceptions were the Great Blue Herons and the Double-crested Cormorants which were seen breeding on the islands as early as January, and Cattle Egrets which nested several weeks later than the other herons and egrets. Estimates

*Species not under consideration in this study, but included for completeness.

of the populations on each island in 1978 can be found in Appendix Table 9; and the locations of the islands in Figures 5 and 9.

The first island was preferred by *Double-crested Cormorants, *Anhingas, *Great Blue Herons, Great Egrets, Snowy Egrets, Louisiana Herons, *Green Herons, *Cattle Egrets, Wood Storks, White Ibis, and Glossy Ibis. The same species, except for *Green Herons and Anhingas, were noted in 1977. In 1978 only White Ibis used the island.

The second island, which is the largest and has the greatest species diversity, was found to have Double-crested Cormorants, *Anhingas, Great Blue Herons, Great Egrets, Snowy Egrets, Louisiana Herons, *Cattle Egrets, Black-crowned Night Herons, White Ibis, and Glossy Ibis. All these species were present in 1977, 1978, and 1979.

The third and fourth islands were used by *Double-crested Cormorants, *Anhingas, and *Great Blue Herons. These birds were noted on the islands in all three of the study years.

In an impoundment (A of Figure 9) on the eastern edge of Moore Creek between islands two and three, *Cormorants, *Anhingas, *Great Blue Herons, Great Egrets, Snowy Egrets, Louisiana Herons, Little Blue Herons, *Green herons, *Cattle Egrets, Least Bitterns, White Ibis, and Glossy Ibis were noted in 1978. The composition of this heronry in 1977 and 1979 is unknown.

Bird Island (Crane Island) is a 5-hectare mangrove island located about 1 1/2 miles north of the Volusia-Brevard County line on the eastern edge of Mosquito Lagoon (Figure 5). This island is predominantly used by Brown Pelicans, although several other species also nest on it. Additional species found on the island were *Double-crested Cormorants, *Great Blue Herons, Great Egrets, and *Cattle Egrets, Black-crowned Night Herons, and Wood Storks. The initiation of nesting by the Great Blue Herons and the cormorants generally began in February, the Great Egrets and Wood Storks in April, and the Cattle Egrets in May. Population estimates for Bird Island in 1978 can be found in Appendix Table 9. With the exception of the storks, the avian populations nesting on the island were relatively stable in 1977, 1978, and 1979.

In addition to the aforementioned major colonies, several small colonies were located. A small colony of *Great Blue Herons and Great Egrets was located on several islands in Peacocks Pocket west of Banana River in 1978, and the birds again used the islands in 1979. A small mangrove island in the impoundment between Picnic Island and the Saturn Causeway (Figure 5) was found to contain *Double-crested Cormorants, *Great Blue Herons, Great Egrets, Snowy Egrets, Louisiana Herons, and *Cattle Egrets. The population was basically the same in 1978 and 1979. Another small heronry was located about halfway between LC 39-A and 39-B, but did not contain any species under study. *Double-crested Cormorants, *Great Blue Herons, and *Green Herons were found there. The locations of these colonies can be found in Figure 5, and population estimates in Appendix Table 9.

*Species not under consideration in this study, but included for completeness.

North American Wood Stork

The North American Wood Stork (*Mycteria americana*) has been declining in numbers for the last 50 years. In the 1930's there were an estimated 75,000-100,000 birds in Florida, but this number had declined to 12,000 adults by 1975 (Ogden, 1978a). Most of the failure in nesting attempts have occurred since 1960, and Ogden (1978b) estimated the population reduction to be at least 50 per cent from the 60's to the 70's. The population decline is due to changes in the hydrologic regime of Florida caused by development, drainage, and flood control systems. Colonies are apparently most successful in years of high water levels during the summer and low levels in the winter. These conditions result in heavy concentrations of small fish in ditches and small ponds, and provide the food resources necessary for the initiation of breeding and maintenance of the young (Clark, 1978). If the conditions are not suitable, the storks will not attempt to breed or, if they do, they may abandon the nesting effort (Kahl, 1964). Since the stork is a non-visual myotactile forager which feeds by a method known as groping, it is extremely sensitive to environmental changes. Because of this sensitivity, the bird has been used as an indicator species in several south Florida studies (Kushlan et al., 1975; Browder, 1976).

Historically, the Wood Storks were found in east-central Florida; however, breeding was limited to the inland areas especially near the St. Johns River system. In the mid 1800's Henry Bryant (1859) noted several colonies along the St. Johns, and one colony of 1,000 nests at Lake Ashby in central Volusia County. Bent (1904) found the stork to be abundant all along the Indian River during the winter, but "as the breeding season approaches the Wood Ibises disappear from their winter feeding ground and resort to the cypress swamps in the interior to breed". Bent found several small breeding colonies a few miles back from the coast along the Indian River in Brevard County and "in the big cypress swamps in the upper St. Johns region". Reports of colonies on the St. Johns River continue up to the 30's (Howell, 1932), then there is a lapse in the reports until the 60's. The Wood Storks were not reported using the mangrove coastal islands until 1957 when a stork was noted breeding at Halls Island west of Cocoa Beach, Brevard County (Cruickshank, pers. comm.), and two pairs were noted on Pelican Island in Indian River County in 1958 (Ogden and Nesbit, in press).

Storks were first noted breeding on NASA lands in 1972 when approximately 35 pairs were observed on a 1-hectare white mangrove (*Laguncularia racemosa*) island located at the northern end of Moore Creek, and impounded section of Banana Creek which is west of the VAB (Figure 5 and 9). The population of storks breeding at Moore Creek has expanded since 1972 and now utilizes the original island and one 4-hectare island immediately to the south. Reproduction data on this colony can be found in Table 4.

Table 4
Reproductive data on the Wood Storks using the Moore Creek Colony

Year	Number of nests	Clutch size	Young per nest attempt	Young per successful nest	Island used (Fig. 9)	Source
1972	35	-	-	-	1	Ohlendorf, pers. comm.
1973	50	-	-	-	1	Ohlendorf, pers. comm.
1974	250	-	-	0	1	Ogden, pers. comm.
1975	150	2.9	-	1.4	1	Girard, 1976
1976	225	-	-	1.9	1	Ogden, pers. comm.
1977	325	3.0	-	2.5	1,2	Clark, 1978
1978	150	2.9	1.1	1.7	1,2	Clark, 1978
1979	275	3.2	1.7	1.9	2	This study

Although storks were noted loafing on Bird Island (Figure 5) in 1977 and 1978, no breeding was observed until 1979. In this year 11 pairs of birds nested. Reproductive data for this colony can be found in Table 5.

Table 5
Reproductive data on the Wood Storks using the Bird Island Colony

Year	Number of nests	Clutch size	Young per successful nest	Source
1979	11	3.2	1.9	This study

During the 1977 breeding season the storks were found feeding frequently in the lower Puzzle Lake area of the St. Johns, Cabbage Slough, and the East Chain or Salt Lakes (Loughman, Salt, Clar, Ellis, and Buck Lakes) in northern Brevard and Southern Volusia Counties. The birds were also noted along the St. Johns River in central Brevard County as well as in the mosquito control impoundments on Merritt island, but they were not found as extensively as they were in the northern areas of the St. Johns. In 1978 the most heavily used feeding area was the upper Puzzle Lake region from S. R. 50 south to S. R. 520. The birds were also found in the Sykes Creek and Onion Farm areas of Merritt Island, but in fewer numbers than on the St. Johns. Late in the breeding season disked spoil ponds on the western edge of Banana River were heavily used by the storks. Because of an ongoing dredging operation in the Banana River, spoil was being deposited in the ponds and large numbers of stunned or killed gaffsail catfish (Bagre marina) readily available, and up to 300

birds were found foraging (scavenging may be a more appropriate word) in the ponds. During the 1979 season the birds fed primarily on the St. Johns River in the lower Puzzle Lake region in a similar pattern to 1978's population.

The success of the Moore Creek Wood Stork colony can be attributed to the seasonal oscillations of rainfall in east-central Florida. Work by Kahl (1964), Kushlan et al. (1975), and Browder (1976) in south Florida indicated initiation and success of breeding was dependent on declining water levels during the dry season which resulted in an increase in the ecological density (number/m³) of fish and other prey items. A complete discussion of factors affecting the initiation and success of nesting at the Moore Creek colony is given in Clark (1978) and is summarized below.

Summary

The initiation and success of nesting by Wood Storks in the Moore Creek colony is related to the seasonal fluctuations in the water levels of the St. Johns River wetland system. The number of breeding adults appears to be related to the number of storks successfully breeding in south Florida and the hydrologic conditions of the St. Johns. The time of breeding ranges from February to April and is dependent on the water level, rate of water level decline, and the change in water level from the previous wet season. The storks begin nesting as the water levels are declining so that the period of maximum food demand (preflight nestling stage) coincides with the minimal water levels. The number of young produced per nest is correlated with the spring drying rate. Total production of young from the colony is also dependent on water levels with a greater number of young produced in years when extensive dry down begins in the early fall and accelerates through the breeding season. In years when dry down is delayed and/or summer rains are early and heavy, production is reduced. The survival of chicks after reaching independence appears to be related to water levels, especially during the summer.

The feeding areas of the storks during the 1977-1979 breeding seasons are mapped in Figures 11, 12, and 13. The critical area on the maps are those in which the large numbers of birds fed throughout most of the breeding season and which appeared to have the most dependable food resources. Primary areas were those in which small groups of birds were regularly noted. Secondary areas are not shown, but include the many small ponds and ditches located throughout the county which the birds used in small numbers, particularly when poor weather conditions precluded movements to the St. Johns system.

The Puzzle Lake region of the St. Johns is characterized by numerous meandering and frequently isolated channels, ponds, and sloughs during low water periods, but it is low-lying enough to be covered with a sheet of water during high water periods. The East chain or Salt Lakes are contiguous with the St. Johns during periods of high water, but are isolated in low water conditions. These large shallow lakes are heavily choked with aquatic vegetation, and are surrounded by extensive marsh which recedes into the lakes during the dry season. The section of the St.

Johns from Lake Harney south to Lake Poinsett is somewhat unique in that it does not have the well-defined channels and permanent lakes which characterize the river north or south of this area.

It is apparent the storks rely heavily on the St. Johns River system during the breeding season, especially when there are young in the nest. Ogden, et al. (1976) in a south Florida study, found Wood Storks preferred certain species of fish and selected the relatively larger fish of that species. This may explain why the stork expends the energy to fly or to soar 25 to 30 miles to forage on the St. Johns. The fish available and utilized by the storks in the mosquito control impoundments are quite small and consist primarily of mollies (Poecilia), mosquito fish (Gambusia), and sheepshead minnows (Cyprinodon) and several other cyprinodonts. The fish on the St. Johns were much larger and made up of several species of bullheads (Ictalurus), sunfish (Lepomis), and several other larger freshwater fish. Also the concentration effect on the St. Johns is much greater as the water levels may vary up to 6 times that of the mosquito control impoundments.

In a cooperative effort with John Ogden of the National Audubon Society, young storks about a month old were tagged with numbered, red patagial tags to determine juvenile dispersal. In 1977, 100 storks were banded at Pelican Island and 200 at Moore Creek; and in 1978, 138 were banded at Pelican Island and 112 at Moore Creek. With two exceptions reported sightings of these birds have all occurred in Florida. One bird was seen on Cumberland Island, Georgia, and another in the Okefenokee Swamp, Georgia. The locations of various sightings of the tagged Wood Storks are mapped in Figure 14.

The graphs of the census data (Figure 4) indicate that the largest number of storks found on Merritt Island occurs during the late fall and early winter. This increase is due to birds returning to central and south Florida from the northward dispersal in summer. It also appears that feeding conditions are better on Merritt Island at this time of year than they are inland. This may partially account for the increase. It is suspected that the number of storks found on Merritt Island is affected to a large degree by the hydrologic conditions throughout the state. There has been a noticeable shift of the storks to the St. Johns during the mid to late winter when foraging conditions are generally better inland.

Roseate Spoonbill

The Roseate Spoonbill (Ajaia ajaja) is found along the coastal area of Texas, Louisiana, and Florida. The Spoonbill population in the U. S. is gradually recovering from a low of 20 to 25 breeding pairs between 1890 and 1919 (Allen, 1942). The present breeding population is estimated to be about 3,000 pairs of which 2,000 are in Texas, 200 in Louisiana, and 800 in Florida (Ogden, 1978b). The turn-of-the-century decline in the birds was largely due to plume hunting.

The Florida population of spoonbills began to decline in the 1880's and the number of birds remained low (about 25 pair) until the early 1950's. The number since then has gradually increased. The present breeding population is about 800 pairs and the total population is about

2,500 birds (Ogden, 1978b). The birds are now expanding their range along the west coast and in 1975 15 pairs of birds were found nesting in Tampa Bay (Dunstan, 1976).

Roseate Spoonbills have been reported from the Merritt Island area for more than a century. Birds were reported in the area in 1917 (Howell, 1932)(Butler, 1930), and in 1923 (Nicholson, 1929). Spoonbills were found breeding at Lake Poinsett and Seventeen Mile Swamp in Brevard County in 1884 (Jencks, 1884); however, they soon disappeared. There are no confirmed reports of Spoonbills breeding on Merritt Island, although several trappers thought the bird nested near the Haulover Canal in the mid-1920's (Nicholson, 1929).

The number of Spoonbills noted on the census route increased during the spring and declined in the fall (Figure 4). Few birds were noted during December, January, and February. The birds were noticeably absent during the cold winter of 1977. The number of birds observed on the census route has remained relatively stable despite extensive nesting failure in south Florida (Ogden, pers. comm.).

The number of spoonbills observed on Merritt Island has gradually been increasing, and there is no reason to expect this trend to stop. It is possible that breeding will eventually begin here as non-breeding birds have been observed in the Moore Creek colonies and a large roost of 100 or more birds is located about 1/2 km north of Bird (Crane) Island. The Spoonbill historically nested at Pelican Island near Sebastian Inlet (Allen, 1942), and this island and Bird Island are almost identical in vegetation and surrounding environments.

Cooper's Hawk

Cooper's Hawk (Accipiter cooperii) is a medium sized raptor which is found throughout much of the U. S. and breeds in many states, including Florida. The decline in this species, like most birds of prey, appears to be due to indiscriminate shooting, pesticide contamination, loss of habitat, and illegal harvest for falconry (Snyder, 1978).

Although the Hawk breeds south to Lake Okeechobee in Florida, it is not found on Merritt Island during the breeding season because its habitat preference is a mixture of woods and open country near fresh water. The bird was not noted on the census routes, but may occasionally be seen during the fall migrations as it moves to the wintering areas which extend to Central Florida.

Southern Bald Eagle

The Southern Bald Eagle (Haliaeetus leucocephalus leucocephalus) population in the United States has declined dramatically in the last 50 years. This change has apparently been due to the loss of habitat, indiscriminate shooting, and the use of persistent pesticides, especially DDT. The original Southern Bald Eagle breeding population in the United States is unknown, but was at least several thousand. By the mid-1970's the number of nesting eagles had declined to 350-375 pairs. With the exception of about 50 pairs, all breeding is restricted to Florida (Robertson, 1978).

The original population of eagles in Florida probably exceeded 1,000 breeding pairs with the largest concentration in the middle Gulf and Atlantic coasts (Robertson, 1978), and by the late 1940's the number of breeding birds was estimated to be 450 (Broley, 1950). The present estimate is about 300 breeding pairs (Robertson, 1978).

The breeding population of Bald Eagles on Merritt Island was one of the most concentrated of any in Florida. In 1886-1888 Dr. W. L. Ralph estimated 100 occupied nests (Howell, 1932). In 1935, J. C. Howell examined 24 Bald Eagle nests on Merritt Island and he continued to monitor the nest sites about every 5 years until 1971 (Howell, 1937, 1941, 1949, 1954, 1958, 1962, 1967, 1968, 1973). Of these 24 nest sites 15 are on NASA controlled areas. During this period, the number of breeding eagles declined 83 percent, and the only ones that were successful in recent years were on NASA properties. The status of the eagle nests under observation by Howell can be found in Table 6. Since 1972, the eagle nests have been monitored by the staff of the Merritt Island National Wildlife Refuge, and the status of the nests from this time on can be found in Table 7, and the nest locations found in Figure 7. A summary of the reproductive data from 1972-1979 is given in Table 8.

The eagles move to the nest sites in October or November, egg laying begins in November or December, and the young fledge from February to April. During the breeding season it appears the eagles on Merritt Island feed to a large extent on the Coot (Fulica americana), although they have been observed stealing fish from Ospreys (Pandion haliaetus) and feeding on road kills.

Bald Eagles migrate into Florida during the late summer, and leave in the late spring. The number of eagles noted in the census is shown graphically in Figure 4. The earliest arrival of an eagle was in the first week in September, and the latest sighting was during the last week of April. The adult birds generally leave the area before the young. Both the adults and juveniles migrate out of the state, but the juveniles wander greater distances and have been found as far north as Canada (Broley, 1947). During the winter both sub-adults and adult eagles were observed on Merritt Island. Data from the Christmas Bird Counts since 1972 indicates an average of 8.0 adults to 2.2 immature birds. The total breeding and non-breeding population on the NASA lands is about 15 birds.

Osprey

Although the status of the Osprey (Pandion haliaetus carolinensis) in the United States is undetermined, a decline in the population was noted as early as the nineteenth century (Bent, 1937). It was not until the late 1950's, however, that a drastic decline was noted, especially in the northeastern states. The primary cause of this decrease is the accumulation of DDT and its metabolites in fish which are eaten by the birds. In Florida, the most serious problem is the loss of habitat due to development, especially around the coastal waters and lakes.

Ospreys are common throughout the year, but a decline begins in October as some of the birds presumably migrate southward. The birds return in June. The number of Osprey fluctuates in waves, and this is

Table 6
 State of occupancy of 24 nest sites during certain years
 from 1935 to 1971 (Howell, 1937-1973).

Site Numbers	1935	1940	1946	1951	1956	1961	1966 ^a	1971 ^a
1	0	0	U	U	U	U	U (E)	E
2	0	0	0	0	0	U	U (E)	E
3	0	A	0	0	A	U	U (N)	Q
4	0	0	U	U	A	U	U (Q)	N
5	0	A	A	A	U	U	U (N)	N
6	0	U	A	A	U	U	U (Q)	Q
7	0	0	0	0	U	U	U (Q)	Q
8	0	0	U	0	0	0	0 (0)	0
9	A	A	0	0	U	U	U (N)	N
10	U	0	U	0	U	U	U (Q)	Q
11	0	U	U	U	U	U	U (E)	E
12	0	A	U	U	U	U	U (N)	Q
13	0	U	0	0	U	U	U (N)	Q
14	U	U	0	0	U	A	0 (0)	Q
15	0	A	0	0	0	U	0 (0)	0
16	0	0	0	0	A	0	0 (0)	0
17	0	0	0	0	0	U	U (Q)	Q
18	0	0	U	0	0	0	0 (0)	N
19	0	0	0	0	U	U	U (Q)	Q
20	A	U	U	0	0	U	U (Q)	Q
21	0	U	U	U	U	U	U (E)	E
22	0	A	0	0	U	U	U (Q)	Q
23	0	0	0	0	0	0	U (N)	0
24	0	U	0	U	0	0	0 (0)	0
Percent of sites occupied	83	46	54	67	33	21	25 (25)	17

- A - Nest site with an adult present, but no eggs or young.
 E - Extinct site that is no longer ecologically suitable for breeding.
 N - Site with a remnant nest.
 O - Occupied nest site thought to contain eggs or young.
 Q - Ecologically suitable site which contains no nest remnants.
 U - Unoccupied site in which no adult was present.
 a - Howell (1968, 197) began a more detailed classification.
 * - Sites on NASA/KSC controlled area.

Table 7
 Status of the occupied and active Bald Eagle nests on NASA/
 KSC controlled areas from 1971-1978. Numbering system is
 that utilized by the Merritt Island National Wildlife Refuge.

Nest Number	Year							
	1972	1973	1974	1975	1976	1977	1978	1979
2	S (1)	I	I	-	-	I	I	I
4	S (1)	U	U			I	I	I
10	S (1)	S (1)	S (2)	S (2)	-	I	I	I
11								
12	I	S (1)	U	-	-	-	-	-
17		I	I	-	U	U	U	U
19		U	U	U	-	U	S (2)	S (2)
20			U	U	S (2)	S (2)	S (2)	S (2)
21							U	U

S = Successful
 U = Unsuccessful
 I = Inactive
 - = Data missing

Table 8
 The productivity and production of Bald Eagles on NASA controlled
 areas from 1972-1979.

	Year							
	1972	1973	1974	1975	1976	1977	1978	1979
Number of nests attempts	3	4	5	3	2	3	4	5
Number of successful nests	3	2	1	1	1	1	2	3
Number of young	3	2	1	2	2	2	4	6
Young/nest attempt	1.0	0.5	0.2	0.7	1.0	0.7	1.0	1.2
Young/successful nest	1.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0

probably due to the migration of birds from the northern areas of North America (Henny and Van Velzen, 1972). There is a small number of resident birds which remain on the island all year long. The number of birds noted on the census route is found in Figure 4. The location of summer Osprey territories along the census route is found in Figure 17.

A small breeding population is also present on Merritt Island, with the largest and most successful colony in the Shilo area north of the Indian River. This colony consists of three nests, and reproduction begins here in February and terminates in May. During the last three years, several individual nests have been located: one in an old Bald Eagle nest just north of the Brevard-Volusia County Line (1977), one on a spoil island on the Intracoastal Waterway (1978), one on a survey tower in Black Point (1978, 1979), and one on a piling in the Banana River Barge Canal (1977, 1978). The eagle nest, spoil island, and survey tower nests were failures. The nest on the piling in the Banana River Barge Canal near Peterson Point was apparently successful until 1978 when dredging of the canal required the transfer of the nest to an artificial nest site nearby. Information on the move, which was carried out by the Merritt Island National Wildlife Refuge, was published (Leenhouts, 1979) in the Florida Field Naturalist.

About 80 percent of the nesting attempts result in the production of young. The location of the nesting sites can be found in Figure 7.

Peregrine Falcon

The Peregrine Falcon (Falco peregrinus) population has been declining in the U. S. since the late 1940's. The primary cause of the decline has been DDT and its metabolites in the birds' tissues, and this resulted in reproductive failures due to eggshell thinning. The sub-species found breeding in the U. S. is F. p. anatum; however, the sub-species migrating through Florida during the spring and fall is F. p. tundris.

On Merritt Island the peregrine falcons were noted during October and November (Figure 4) along the beach strand and the western edge of Mosquito Lagoon as they migrated along the eastern coast line to their southern wintering ground as far south as Argentina (Enderson, 1965). One falcon was sighted in December and may be one of a few birds which goes no further south and overwinters in Florida. Since Christmas Bird Counts were resumed on Merritt Island in 1970, at least one falcon has been noted every year. This certainly suggests that a few of the falcons linger or overwinter here. Peregrine Falcons have not been observed migrating through Merritt Island during the spring, although they have been seen on the St. Johns River. This suggests they use some alternate route to return north.

Merlin

The Merlin (Falco columbarius) is a falcon which occurs over much of the northern areas of North America, and winters throughout the southern parts of the U. S. and south to South America. In recent years the number of Merlins migrating through Florida has decreased and the cause may be pesticide contamination affecting productivity (Wiley, 1978).

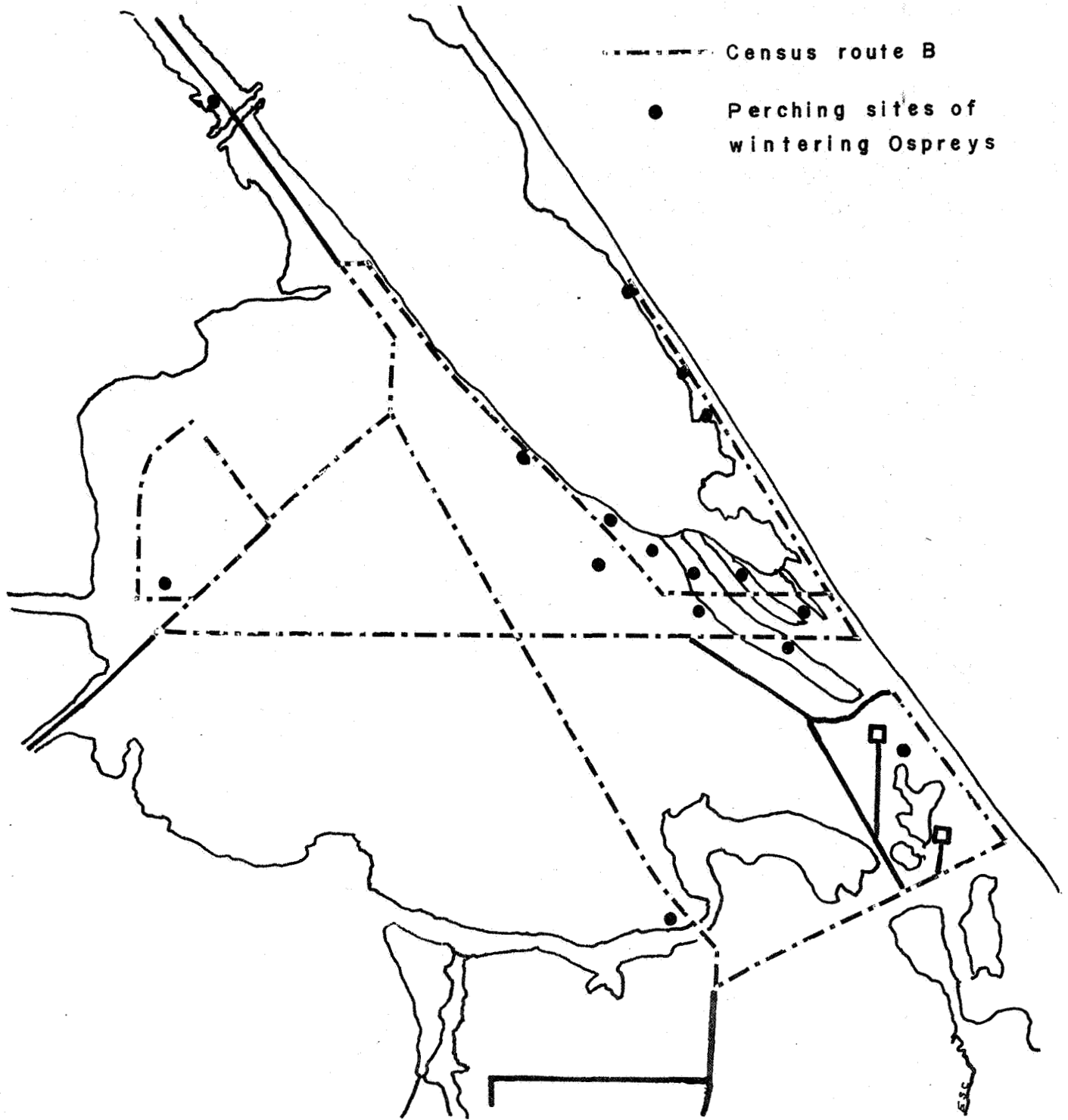


Figure 17. Perching sites of wintering Ospreys.

Merlins were noted on Merritt Island as they migrated to the southern wintering grounds in October. Although Merritt Island is within the birds' wintering area, no wintering birds were noted in this study.

Florida Sandhill Crane

The Florida Sandhill Crane (Grus canadensis pratensis), a resident of Florida, is a sub-species of the Sandhill Crane. The current population is estimated to be about 4,000 birds of which 25 percent are non-breeding sub-adults (Williams, 1978).

No Sandhill Cranes have been noted on Merritt Island during this study; however, the birds have been reported during Christmas Bird Counts. It is unknown if the Sandhill Cranes reported were the Florida sub-species or if they were the migratory Greater Sandhill Crane (G. c. tabida). There are no records of Cranes breeding on Merritt Island, and the birds noted were probably from the St. Johns River system.

Black Rail

The Black Rail (Laterallus jamaicensis) is a highly secretive nocturnal bird which inhabits the tidal salt and brackish marshes. The present status of the bird in Florida is unknown although it is locally common in some areas. Large areas of the birds' habitats have been destroyed by development, dredging, and diking of salt and brackish marshes.

In July of 1926, D. Nicholson discovered a Black Rail nest with 6 eggs in a Salicornia marsh on western Merritt Island in a Dusky Seaside sparrow colony (Bent, 1926). No Black Rails were noted in this study, although H. Kale located a bird in the Black Point area of the island by using taped calls (Kale, 1977). Recent breeding records exist for the Black Rail on Merritt Island (Kale, 1978).

American Oystercatcher

The American Oystercatcher (Hiaematopus pulliatus) is rare in most of Florida and very localized in distribution. The decline in this species is due primarily to the destruction of breeding and feeding grounds because of development and utilization of areas for human recreation. The total population in Florida is unknown, but an estimated 10-12 pairs were reported breeding along the Intracoastal Waterway in Brevard and Indian River counties (DeGrange, 1978). One pair was found nesting on a spoil island in the Banana River in 1976 (Bennett, 1976) and another in 1979 (L. Salata, pers. comm.). No oystercatchers were noted breeding nor were any observed on the census route; however, occasional individuals have been noted on NASA/KSC areas and they are frequently noted on Christmas Bird Counts.

Piping Plover

The Piping Plover (Charadrius melodus) is a small shorebird which overwinters along much of the coastline of Florida. Apparently not more than several hundred plovers winter in Florida, and the state may be one of the more heavily utilized wintering areas. Development and public use of beaches, especially around inlets, has resulted in a loss of habitat for these birds. In this study no data were gathered on the Piping Plover, although the birds are occasionally noted on Christmas Bird Counts.

American Avocet

The American Avocet (Recurvirostra americana) is a large shorebird which is found throughout much of the United States, and overwinters in the southern portions of the U.S. south to Guatemala. The birds are found in Florida primarily during the winter, and there is an estimated population of 500 at four locations - one of which is NASA/KSC (DeGrange,1978).

The avocet requires shallow water, fine-grained mud flats and favors protected areas. On the KSC the birds are most often seen in a mud flat impoundment east of LC 39-B. Unfortunately, the water in this impoundment fluctuates considerably and the flats are often covered with water. The maximum number of birds noted has been 62, and they have been observed irregularly during every month of the year (Figure 4). Courtship and copulation have been reported for Merritt Island, but no nests or eggs have been located (DeGrange,1978).

Least Tern

The sub-species of Least Tern (Sterna albifrons antillarum) found in Florida breeds from Louisiana along the Gulf and Atlantic coasts northward to Cape Cod. The tern was common all along the coast, but by 1900 the population was greatly reduced by eggers and plume hunters. The birds are now threatened by human population pressures as the result of the development of beaches and the use of offshore islands for recreation. In response to these pressures, only 20 per cent of the Least Terns nesting are nesting on natural areas (Fisk,1978). There are no estimates of the Least Tern population in the U.S. or Florida.

Least Terns are present on Merritt Island only during the summer breeding season. They arrive in late April and early May and remain into August. The number of birds noted on the census routes is shown graphically in Figure 4. There is variation in the number observed each year, and this is due to changes in breeding sites, closer to or away from, the census route.

Least Terns nesting on Merritt Island generally begin courtship in late April or May, start laying eggs in late May or June, and abandon the colonies in July or August. Personnel of the Merritt Island National Wildlife Refuge have encouraged the birds to nest on Merritt Island away from NASA's activities by disking several plots of land to provide the coarse shell and sand habitat necessary for the birds to nest successfully.

Since terns are very opportunistic and will nest in any flat open areas with coarse gravel, rock, or shell, it frequently prefers man-made nesting sites such as parking lots, road shoulders, runways, etc. The location of nesting Least Terns in the last 3 years are given in Figure 6. Many of the breeding attempts on Merritt Island are in disturbed areas and often end up in failure due to man's activities. It appears that the number of birds attempting to breed ranges from 100 to 120 pairs; however, the nest success may vary considerably. In response to the destruction of ideal nesting habitat, terns have begun to rest on the roof tops of buildings. One such colony has been located in Titusville,

and this may be a response to disturbances on Merritt Island and in the surrounding area. The number of colonies and total nesting success are found in Table 9.

Table 9

The nest success of the Least Tern on NASA/KSC controlled areas from 1977-1979.

Year	Number of Colonies		Total Nests	
	Unsuccessful	Successful	Unsuccessful	Successful
1977	2	3	35	95
1978	2	1	85	30
1979	5	0*	58	0*

* An additional colony of at least six nests was located, but not revisited to determine success (unpublished FWS report).

Florida Scrub Jay

The Florida Scrub Jay (*Aphelocoma coerulescens coerulescens*) is a disjunct sub-species of the scrub jay which is restricted to the scrubby flatwoods of Florida and separated from the nearest population by over 1,000 miles. Their decline is primarily a consequence of habitat destruction resulting from development and the expansion of agricultural lands.

On Merritt Island the birds are found only in the scrubby flatwoods in the interior of the island, and prefer an edge where an open area is adjacent to a shrub layer. Since the jays are very territorial and occur in family groups, one would expect consistent survey numbers; however, the data do not reflect this permanence as the birds are extremely sensitive to weather conditions. Few birds are seen during windy, foggy, or rainy days. The number of jays noted on the census route is given in Figure 4.

The scrub jay breeds in small family groups throughout the dry scrub areas during the spring and early summer. Since the nests are scattered in dense scrub and difficult to locate, no reproductive data has been gathered. The U. S. Fish and Wildlife Service is currently conducting a study of the scrub jay on Merritt Island. Results should be available within a year.

Royal Tern

The Royal Tern (*Sterna maxima*), Sandwhich Tern (*Sterna sandvicensis*), and the Caspian Tern (*Sterna caspia*) are locally common terns found along the Atlantic and Gulf coasts of the U. S. In recent years the populations of these birds has declined as a result of the development and public use of nesting sites and the loss of bays and estuaries used for feeding.

Many of the Royal Tern nesting sites in Florida, especially along the Gulf Coast, were extirpated years ago; however, they are gradually being reestablished. Royal Terns were first noted nesting in 1969 (Ogden, 1970). The Caspian Tern did not begin breeding in Florida until 1962 (Woolfenden and Meyerriechs, 1963), and the Sandwich Tern did not begin breeding until 1974 (Ogden, 1974). The number of these terns found breeding is gradually expanding.

Royal and Caspian Terns were first reported breeding on spoil islands in the KSC controlled areas in 1973 (Ogden, 1973; Ogden, 1974). The 1973 record for the Caspian Tern was the first reported nesting attempt on the east coast of Florida.

In this study the terns were found nesting on a series of spoil islands in an area about 1 mile north and 1 mile south of the NASA Causeway in the Banana River. Breeding generally begins in late April or early May, and continues through the end of July. The estimated number of nesting terns during the 1974-1979 breeding seasons can be found in Table 10. The location of the spoil islands and the number of birds on each can be found in Figures 6 and 10 and Table 10.

Table 10

The number of pairs of Royal and Caspian Terns breeding in the NASA/KSC controlled area of the Banana River from 1975-1979.

Bird	Year					
	1974 ^a	1975 ^b	1976 ^b	1977 ^c	1978 ^d	1979 ^e
Royal Tern	2,000	2,000	3,350	4,500	1,325	2,000
Caspian Tern	2	31	0	1	2	0

^aOgden 1974.

^bBennett, K. 1976. Unpublished.

^cEllis, L. 1977.

^dUnpublished MINWR records.

^eL. Salata (pers. comm.)

During the years 1975, 1976, and 1977 young Royal Terns were banded by members of the Indian River Audubon Society (IRAS). Banding data and returns are being gathered by Lon Ellis of the IRAS, but have not been released.

Mortality on these spoil island colonies is high and is probably due to heavy rains, high winds, predation, and human disturbance. However, the terns are very responsive to management practices. Since the birds prefer open sandy beaches with scattered vegetation for shade, the removal of brush every few years is necessary, and is currently being done by the staff of the Merritt Island National Wildlife Refuge. The increase in breeding Royal Terns from 2,000 pair in 1975 to 4,500 in 1977 was attributed to the removal of vegetation (Ellis, 1977).

The census data (Figure 4) show that the largest number of Royal and Caspian Terns occurs during the fall when the birds are migrating to the winter grounds. The fewest sightings occur during the late spring and summer months when the birds are either on nesting areas or have migrated back to the north. The birds are most frequently noted loafing on mud flats in an impoundment east of LC 39-B, and in the north end of the Banana River.

Black Skimmer

The Black Skimmer (*Rynchops niger*) is a locally common bird found in coastal bays and estuaries, and is often observed roosting/loafing in compact flocks on sand bars, beaches, and spoil areas. The bird is found throughout much of the coastal U. S., and breeds along the Atlantic, Gulf, and Pacific coasts. The skimmer is a species of special concern because of the rapid development and public use of sandy beaches.

As early as 1969 there were reports of skimmers breeding in the Banana River area; however, it was not until 1972 or 1973 that the population had become established (Bennett, 1977). Skimmers were reported on the Indian River spoil islands in the 1950's. Skimmers generally were observed breeding in two areas: the spoil islands around the NASA Causeway over the Banana River, and a spoil island (II-71 of Schreiber, 1978) north of the NASA railroad bridge over the Indian River. Although the latter colony is not on NASA/KSC controlled areas, the birds from this colony feed on Merritt Island. Breeding generally begins in May and continues through July. Since the skimmers nest on bare sand flats just above the high water mark they are subject to being washed out during periods of high water storms when water levels increase. In 1978 a colony of 200 pairs in the Banana River and 100 pairs in the Indian River was destroyed during heavy wind and rain. The Indian River colony successfully re-nested. In 1978 the Indian River colony was examined and the nests were found to have a clutch size of 3.0 (N=33) in mid-June, and a clutch size of 2.9 (N=51) the last of June. The number of birds found breeding on Merritt Island and the surrounding area is found in Table 10. The location of each colony and the number of birds in each can be found in Figure 7 and 10 and Appendix Table 9, summarized in Table 11.

Table 11

The nesting Black Skimmer populations (pairs) found on or near NASA/KSC controlled areas.

	1974 ^a	1975 ^b	1976 ^b	1977	1978	1979
Banana River	279	300	? ^c	200	210	150
Intracoastal Waterway	?	?	?	100	100	50
^a Ogden, 1974	^b Bennett, K., 1977		^c Colony destroyed by storm			

Although the skimmer is migratory and spends the winter in Florida (Barbour, 1978) no such pattern was evident in the census route data (Figure 4). The fluctuation in skimmer populations appears to be due to the birds' preference for loafing on ephemeral sand bars, generally found in mosquito control impoundments.

Florida Burrowing Owl

The Florida Burrowing Owl (*Athene cunicularia floridana*) is a bird which is primarily restricted to Florida although an occasional individual may disperse considerable distances (Barbour, 1943) (Ogden, 1972). The Burrowing Owl population size in Florida is unknown; however, it is without a doubt declining due to the massive development of natural prairies and sandhills. The large colonies of the 1800's are no longer present (Bent and Copeland, 1926).

On 5 August, 1976, a Burrowing Owl was noted along the outer dune at Playalinda Beach and remained there until 10 October. This is only one of a few sightings of the bird on Merritt Island (Matchett, 1973) and the only sighting on NASA/KSC areas. Although the owl was in a rather typical habitat, several other records of this bird occurring on a narrow beach strand of the mainland exist (Able, 1969; Matchett, 1973).

Southern Hairy Woodpecker

The Southern Hairy Woodpecker (*Picoides villosus audubonia*) has apparently always been "rather uncommon" (Howell, 1932) in Florida, and only one other woodpecker, the Red-cockaded (*Picoides bouvealis*), is more rare (Owre, 1978). The present population size is unknown and whether a decline has occurred or not is not known.

During this study no Hairy Woodpecker were observed; however, they are occasionally observed on Christmas Bird Counts and by bird watchers. No attempts to breed on Merritt Island are known, although the habitat appears suitable for nesting.

Red-cockaded Woodpecker

The Red-cockaded Woodpecker (*Dendrocopos borealis*) is a small, specialized bird of the open pine forests which is designated endangered on both state and federal lists. The bird has been declining for many years as a result of lumbering, clearing, and urbanization. This decline is due to the woodpecker's utilization of living pine trees infected with heartwood fungus for nest cavities. Unfortunately, most of these mature (80+ years), diseased trees have been culled out as a result of present day management practices.

Although the Red-cockaded Woodpecker was not observed in this study, it has been reported at KSC by members of the Indian River Audubon Society. The species has also been reported as a breeding bird on Merritt Island (Jackson, 1971).

Florida Prairie Warbler

The Florida Prairie Warbler (*Dendroica discolor paludicola*) is a small warbler which is restricted to mangrove habitats, although it may inhabit strands of coastal live oaks. The bird is reported to breed from

the Florida Keys northward along the coast to Volusia County (Stevenson, 1978). The cause for concern in this species is the extensive decimation of mangroves in coastal areas caused by development.

No Florida Prairie Warblers were noted in this study; however, they are frequently reported during Christmas Bird Counts. Large areas of suitable habitat occur on Merritt Island, and there is good reason to expect that the birds do nest here.

American Redstart

The American Redstart (Setopaga ruticilla) is a common warbler throughout much of the United States; however, it is placed on the Florida list because of its limited breeding range, which is restricted to the drainage systems of the upper Escambia and Yellow Rivers (Stevenson, 1978). The bird is migratory and overwinters in southern Florida southward to northern Brazil.

Redstarts were observed only once on the census route. Five immature individuals were observed in the Australian Pines of the Canaveral National Seashore picnic area the last week of September 1976. These trees died during the cold winter of 1977 and have since been removed.

Dusky Seaside Sparrow

The Dusky Seaside Sparrow (Ammospiza maritima nigrescens) is clearly an endangered species, and certainly the one species for which Merritt Island is known. Although they were relatively abundant until recent years, the range of this bird has always been restricted to the salt marsh of Merritt Island and the flood plain of the St. Johns River system in central and northern Brevard County. The sparrow was supposedly discovered by Charles Maynard in 1872 on the Salt Lake area of the St. Johns, and it was formally described a year later by Ridgeway (1873) from a specimen collected at Dummitts Creek on Merritt Island.

Apparently the dusky population on Merritt Island remained relatively stable until the 1940's, and Sharp (1970) estimated the original population to be about 2,000 birds. From 1942 to 1953, Donald Nicholson noted a 70 percent decline in the sparrow population, and in the early 1960's C. M. Trost examined the Merritt Island population and only found four widely spread colonies which totaled about 70 pairs (Kale, 1977). Work by Sharp (1970) revealed a remnant population of 33-34 males in 1968 and this represented a decline of about 50 percent in 5 years. The last reported duskies on Merritt Island were two males which were sighted by Merritt Island National Wildlife Refuge personnel in 1977. A few birds remain on the St. Johns. The number of Dusky Seaside Sparrows found on Merritt Island from 1900-1979 is given in Table 12.

Table 12
The number of Dusky Seaside Sparrows on Merritt Island from 1900-1979.

Year	Number	Source
1900	2,000	Sharp (1970)
1953	700	Nicholson (In Kale, 1977)
1960	70	Trost (In Kale, 1977)
1968	34	Sharp (1970)
1974	6	MINWR records
1975	6	MINWR records
1976	2	MINWR records
1977	2	MINWR records
1978	0	MINWR records
1979	0	MINWR records

Nicholson (1928) described the original habitat as "covered with dense patches of Salicornia ... close to the water extending back many yards and beyond this in the dryer parts were patches of switchgrass, a rush-like species of Juncus, and here and there in spots the thick luxuriant salt grass grew. This sort of country stretched for miles, as far as the eye could reach along the river, and through this ran sloughs, creeks, and bayous." Sharp (1968) estimated there were about 6,000 acres of suitable habitat for the sparrow originally.

The decline in the Dusky Sparrow population on Merritt Island is due primarily to man's manipulation of the ecosystem which the bird requires for reproduction. The early reduction in the bird's population in the 1940's and early 1950's coincides with the spraying of salt marshes with DDT to control mosquitos. However, the largest declines occurred after the marshes were impounded in 1956.

The present condition of the dusky on Merritt Island is very bleak. Despite the breaching of impoundment T-10K and management of T-10-J, the population failed to respond, and it appears that the restoration project was not begun until the population fell below the critical level. A captive breeding program may be started soon, and if it is successful, birds may be reintroduced into this area.

Launch Complex 39-B Study Impoundment

One area of importance to several avian species is an impoundment due east of LC 39-B (Figure 9). The area is unique for two reasons: it contains a number of fine-grained mud flats which provide excellent loafing sites for many species, and the extensive shallow waters are very suitable foraging ground for a few species not commonly found elsewhere on the island.

This area is important to Brown Pelicans, Least Terns, Royal Terns, and Black Skimmers as a loafing area, and to Reddish Egrets, American Avocets, and Least Terns for foraging. It is also used occasionally by Wood Storks, Ospreys, Roseate Spoonbills, Little Blue Herons, Louisiana Herons, Great Egrets, Snowy Egrets, White Ibis, and Sandwich Terns.

Since census route B was established in October 1976, a large percentage of the sightings of several species were in this impoundment. For example, American Avocets - 100 percent, Royal Terns - 45 percent, Black Skimmers - 38 percent, and Brown Pelicans - 19 percent. The number of birds, exclusive of long-legged waders, for the first year, on the Inventory of Rare and Endangered Biota of Florida sighted in the impoundment from October, 1976, are listed in Appendix Table 10.

This area is especially important to the American Avocet. DeGrange (1976) lists four important wintering locations for them, one of which is the Kennedy Space Center - Merritt Island National Wildlife Refuge. Most of the avocets found on the space center are in this impoundment with flocks of up to 75 wintering individuals noted. Courtship and copulation have also been reported on the Merritt island National Wildlife Refuge, but no nests were located.

The effects of launches from LC 39-B are unknown, and should be monitored. Most avian species readily become habituated to man's activities such as movement and noise. Of special concern at the present time is the possible effect of acidic wash-down water flowing into the impoundment after a launch. Fortunately, the impoundment does not have a direct connection to a drainage canal from the pad, and it is isolated from Max Hoek Creek except during high water. It is suggested that some sort of mechanism be installed to restrict acidic back flow into the impoundment from Max Hoek Creek during a launch if further examination reveals there is a potential for contamination.

Although water levels of the LC 39-B impoundment study were not available, levels of a similar uncontrolled impoundment at Camera Pad 10 were. General observations of the study area indicated the minimum number of birds occurred when water levels were very high or low. This was apparently due to the presence of fine grained mud flat islands only during periods of normal water. In low water or dry periods the island were non-existent, and during times of high water they were covered.

An analysis of the distribution of the five most commonly observed species (Brown Pelican, American Avocet, Least Tern, Royal Tern, Black Skimmer) was performed to quantify the relationship to water levels. Regression analysis of water levels and number of birds sighted was conducted, but, as suspected, no significant correlation was found. The mean, standard deviation, and range of the number of each species observed is given in Appendix Table 9. Graphs of the above data (Figure 15), show that the relationship between water levels and the number of each species is generally bell shaped. These results indicate that the greatest number of birds occur during normal water when large numbers of mud flat islands are exposed. The number of each species noted per month is also found in Figure 15.

Conclusions

- 1) Information developed by other investigators and agencies was compiled and included in accounts of the present status of 31 imperiled species at KSC.
- 2) Biweekly ground censuses and periodic aerial censuses were conducted and provided information that can contribute to a monitoring baseline.
- 3) Thirty-one imperiled avian species were found breeding at KSC.
- 4) The impoundment east of Complex 39-B was found to be unique for two reasons: it contains a number of fine-grained mud flats which provide excellent loafing sites for many bird species; and the extensive shallow waters are very suitable foraging grounds for a few species not commonly found elsewhere on the island.

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OTHER THREATENED AND ENDANGERED FORMS

Introduction

Objective

To serve as a clearing house through which information now being gathered by other agencies will be processed, synthesized, and succinctly reported to NASA/KSC.

Endangered Species Account: West Indian Manatee

General

The manatee is a large, thick-skinned, nearly hairless marine mammal. The body is fusiform, the forelimbs are modified as paddles and the hind limbs are lacking. The tail is spatulate and is not notched. The upper lip is deeply cleft and bears bristles. The overall color is dark grey to nearly black (Anderson and Jones, 1967).

In the U. S. this species is found almost exclusively in peninsular Florida (Hartman, 1978). They inhabit shallow, brackish, and salt-water lagoons, estuaries and bays on the Gulf and Atlantic coasts of Florida. The area between New Smyrna Beach (Volusia County) and the St. Lucie River (Martin County), including KSC, is the focus of their distribution on the east coast (ibid.).

Current Status

Estimates of total manatee abundance range from 600 to 1000. It is believed that exploitation in the first three centuries of settlement of Florida reduced the number from several thousands to the present level (Hartman, 1974). The primary factors that now threaten the manatee are: 1. propellers of power boats, 2. poaching and vandalism, and 3. habitat alteration. They are protected by the Endangered Species Act of 1973 and the Marine Mammals Act of 1972.

Status at Kennedy Space Center

There are probably about 150 manatees in the waters surrounding KSC (Shane, 1978). They are common within the security area at the northern extreme of the Banana River (Irvine, Scott, and Shane, 1978). Only in the coldest part of the year, January and February, do sightings taper off. Another area of concentration is at Haulover Canal in the northern part of KSC.

Ongoing Research

Marine mammalogists of the National Fish and Wildlife Laboratory at Gainesville, Florida, are continuing investigations of manatee use of sanctuaries and unprotected environments, causes of mortality, tagging and tracking technology, ecosystem relationships, basic reproduction and behavior, and the influence of warm water effluents on distribution. Much of this work is carried out in the KSC area.

Additionally, the Florida Audubon Society is currently under contract to Florida Power and Light Company to study the relative abundance and distribution of manatees (Trichechus manatus) in and around several power plant effluents, through weekly aerial surveys.

Recent Literature

In addition to those works already cited, recent contributions to our knowledge of manatee ecology and conservation include Brownell, Ralls, and Reeves (1978) and Applied Biology, Inc. (1976). Also, Irvine and Campbell (1978) and Rose (1978) have used aerial census techniques to determine numbers and distribution of manatees.

Threatened Species Accounts

Nerodia fasciata taeniata (Salt Marsh Snake)

General

The Atlantic salt marsh snake Nerodia fasciata taeniata is a medium sized snake (38-76 cm) whose range extends from just north of Jacksonville, to just south of Merritt Island (Conant, 1975). The species is completely confined to coastal salt marshes, and correspondingly, to salt or brackish water. Due to its secretive nature, and dubious taxonomic status, virtually nothing is known concerning this species' ecology.

Current Status

The Atlantic salt marsh snake was declared a federally threatened sub-species in 1977 and considered an endangered sub-species by the state of Florida, although few data on its actual status were available. In fact, a recent study has cast doubt on its subspecific status (see below). At this time, however, the major concern of most herpetologists is that N. f. taeniata is becoming swamped by hybridization with its fresh water conspecific, N. f. pictiventris. This hybridization is believed to be caused by human interference with coastal habitats, allowing the two races to interbreed. Since N. f. pictiventris is apparently far more common than N. f. taeniata, the former race is virtually swamping the salt marsh snake out of existence.

Status at Kennedy Space Center

As is true throughout the species range, nothing is known concerning the population status of N. f. taeniata at KSC. However, the construction of the mosquito control dikes, and the constant pumping of water in and out of the impoundments, probably means that the natural barriers separating N. f. taeniata from pictiventris have been broken, and that the two populations are interbreeding. An informal examination of water snakes at KSC indicates that this is indeed the case since only one specimen of what could possibly be termed a pure taeniata has ever been found at KSC. Numerous specimens, however, do indicate that the two races are hybridizing, with individuals resembling pictiventris far outnumbering those resembling taeniata.

Ongoing Research

Due to its secretive nature and low population densities, little research has been conducted on N. f. taeniata. Dr. James Hebrard of UCF is preparing to conduct a three month survey of Merritt Island - KSC, in order to determine where (if at all) N. f. taeniata occurs at KSC.

Recent Literature

Dunson (1979) reported on the morphological variation in a population of N. f. compressicauda in Collier Co., Florida, and questioned the sub-specific designation of N. f. taeniata. He suggests, however, that although modification of the taxonomic status of taeniata would relieve some of the concern for the survival of salt water snakes in Florida, that "populations of compressicauda along the east coast especially deserve protection". Limited available coastal habitat and apparent low population levels necessitate the protection of compressicauda throughout its entire range.

Summary

Until additional sampling is done on KSC populations of water snakes, it will not be known if N. f. taeniata, whether as a separate sub-species or as a phenotype of compressicauda actually occurs at KSC. Until this is done and until something is known concerning salt marsh snake life history, it will be difficult to determine what steps are necessary to protect N. f. taeniata at KSC. However, at the very least, potential habitat, especially those areas which have little or no fresh water influence, should be located and preserved so that whatever populations remain at KSC will have an opportunity to return to normal levels.

Drymarchon corais (Indigo Snake)

General

The eastern indigo snake, Drymarchon corais is the largest snake in North America, reaching a maximum size of 213 cm (Conant, 1975). It inhabits large, uninhabited areas, and seems to prefer more xeric areas. Food consists of small mammals, birds, and other snakes.

Current Status

The indigo snake was declared a federal threatened species in 1978. A recent summary of Drymarchon status (Lawler, 1977) gave the following reasons for the decline in this species numbers: 1. habitat destruction: Drymarchon prefers large, open areas of xeric habitats; such areas are rapidly being developed for housing, and road construction. 2. Commercial exploitation: the indigo is an extremely attractive snake with a docile nature, and as its numbers decrease the value of the snake rapidly increases with specimens bringing prices as high as \$250 in northern markets. 3. Recent data (Lawler, 1977) indicates that residual pesticides in some areas are causing increased mortality in some populations. As a result of these factors, Drymarchon has all but eliminated from South Carolina and Alabama (Mount, 1975). Populations in Florida appear to be in the best condition, but as habitat destruction and commercial collection continue it appears these populations will also decline.

Status at Kennedy Space Center

Few quantitative data on KSC populations of Drymarchon are available, but informal observations by UCF personnel indicate that the populations on KSC are in reasonably good condition, with several large, healthy individuals on record. Drymarchon at KSC appear to be restricted to the central scrub belt, along the area east of Rt. 3. The only threat to KSC populations appears to come from road kills since Drymarchon are rather large and conspicuous and are thus easily noticed by motorists, who may intentionally run over them. At least six individuals were killed this way since June, 1978.

Recent Literature

The best review of Drymarchon biology and status is Lawler, 1977.

Summary

Populations of indigos at KSC are protected from the two major causes of Drymarchon decline, habitat destruction, and commercial collection. As long as xeric habitats (i.e., the central scrub belt along Rt. 3) are relatively undisturbed, there appears to be no reason for undue concern for KSC populations. An intensive survey of these populations to determine exact population size and structure would be a wise investment in future management of indigos at KSC.

Gopherus polyphemus (Gopher Tortoise)

General

The gopher tortoise, Gopherus polyphemus is a large (15-37 cm) turtle, which ranges from Georgia to extreme eastern Louisiana. It is unique in its habit of constructing large, complex burrows in which to live. The gopher tortoise lives in sandy, xeric areas, in soils which are suitable for burrow construction (Ernst and Barbour, 1972).

Current Status

The gopher tortoise has no current status under the Endangered Species Act, but is considered to be threatened in every state in which it occurs. The prime reason for the decline of this species is habitat destruction. The xeric areas that this animal inhabits are rapidly being utilized for housing and road construction, resulting in the destruction of many burrows. Many gopher tortoises are also killed during rattlesnake roundups, when gasoline is poured down the burrow to force any snakes hiding in it to come to the surface.

Status at Kennedy Space Center

Since Gopherus populations at KSC are protected from habitat destruction, the outlook for populations there is fairly good. A recent survey (Logan, 1978) estimated that the KSC area supports about 14,000 gophers, at an average density of 1.14 tortoises/hectare. Most of these turtles live in the central scrub area around Rt. 3 and along the beach dunes.

Ongoing Research

W. Auffenburg and J. Douglass are most active in investigating Gopherus ecology in Florida.

Recent Literature

Douglass (1977, 1978) has provided the best recent data on Florida populations of Gopherus.

Summary

The outlook for KSC populations of Gopherus appears to be bright. However, protection of the xeric habitat along the coastal beach strand and of the central scrub area along Rt. 3 is essential for continued survival of gopher tortoises at KSC. More detailed surveys of Gopherus populations at regular intervals should be conducted to trace the population levels of this threatened species.

Alligator mississippiensis (American Alligator)

General

The American alligator, Alligator mississippiensis, a large (adults commonly attaining 3 m and more) reptile that commonly inhabits wetland habitats, which include the margins of large lakes, ponds, rivers, swamps, and fresh water marshes. It ranges throughout the state of Florida, with its greatest numbers in the peninsula. Outside Florida, it occurs below the fall line throughout the southeastern states. Extensive studies on all aspects of the alligator ecology (i.e. reproductive biology, movements, feeding habits, etc.) have been conducted throughout its range (Hines et al., 1968; Joanen, 1969; Joanen and McNease, 1971; Chabreck, 1972; Bara, 1972).

Current Status

This species was almost entirely decimated by the late 1960's due to hunting. It proved, however, to be an extremely resilient species. With the protection granted them under federal endangered status, alligator populations bounced back, and indeed, are booming in the late 1970's (Hines and Woodward, 1978). The increase has been such that nuisance alligators have become a severe problem in several parts of its range (Hines and Keenlyne, 1976; Hines and Woodward, 1978). Consequently, populations in several parishes in Louisiana have been removed from the Federal Endangered Species List and the species has now been reduced to threatened status in coastal South Carolina, Georgia, and throughout Florida and eastern half of coastal Texas. The Fish and Wildlife Service in the October 2, 1978, Federal Register proposed a similar series of changes in the classification and special rules pertaining to the alligator in Louisiana. These include "reclassifying the American alligator to threatened [similarity of appearance] in nine parishes of Louisiana, simplifying buyers, tanners, and fabricators licenses, and allowing the sale of alligator meat from legally taken alligators" (Anon, 1979). A comment period on these proposals opened May 10 and lasted until June 5.

In Florida, the alligator is considered a species of special concern (that is, a species that, although relatively abundant throughout the state, is vulnerable to certain types of exploitation and has experienced severe population declines) and is fully protected under Florida statute. Recently, the Florida Game and Fish Commission has proposed to the state legislature to allow the controlled private harvesting of nuisance alligators and to legalize the production and sale of alligator products.

Status at Kennedy Space Center

As in other parts of its range, the alligator is doing extremely well at the Kennedy Space Center. Merritt Island Refuge personnel conduct an annual two night survey of alligators. They report last year's population size estimate to be between 4,000 and 7,000 animals (R. Lee, per. comm.).

The mosquito impoundments, large dikes and extensive marsh in KSC and the Merritt Island Wildlife Refuge are ideal habitat. In addition, there is little possibility of the people-gator confrontations that plague the more urbanized, populated areas of Florida. Thus, the preservation and isolation of the necessary wetland habitat by KSC presents a haven for this species.

Ongoing Research

In Florida, the Department of Natural Resources and Game and Freshwater Fish Commission personnel (especially Tom Hines) are the major researchers on this potentially economically valuable species. At the Merritt Island Refuge, Rob Lee will be conducting a revised censusing method to estimate population numbers in August of this year.

Recent Literature

A general review of the biology and status of the alligator in Florida was prepared by Fogerty, 1978.

Peromyscus floridanus (Florida mouse)

General

The Florida mouse is similar to other deer mice in external form. It is brown or brownish-gray above as an adult and gray above as a juvenile. Both stages are white on the venter. It is restricted to scrub and sandhill habitats of peninsular Florida and does not occur outside of the state. It is primarily a ground-dweller and typically nests in burrows constructed by other animals. Gopher tortoise burrows are most commonly used.

Current Status

The Florida mouse is the only species of mammal that occurs exclusively within Florida. It is threatened by widespread destruction and alteration of its habitat. The well-drained, sand soils on which it occurs are excellent for real estate development and enormous acreages of habitat have been converted to pastures and citrus groves. As a result, the species is designated as threatened by FCREPA (Layne, 1978).

Status at Kennedy Space Center

Ehrhart (1976) reported work with the KSC P. floridanus population. The species exists primarily in the scrub and scrubby flatwoods areas in the southeastern quadrant of Merritt Island and in the interior of the Cape Canaveral Air Force Station.

Outgoing Research

Dr. I. J. Stout has been conducting research that involves the population dynamics and community relations of this species at KSC for the past three years. See the part of this overall report dealing with small mammal population dynamics. Elsewhere the principal authority and leading researcher involved with the species is J. N. Layne of the Archbold Biological Station, Lake Placid, Florida. Population trends are continuously monitored at that station.

Recent Literature

Ehrhart's (1976) report summarized 3 years of trapping studies at KSC. Fertig and Layne (1963) studied water relationships in the species. Johnson and Layne (1961) and Layne (1963) studied P. floridanus parasites and included many ecological and zoogeographic considerations in their works.

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APPENDIX TABLES

Table 1. Total avian species noted from 24 September - 9 December, 1976 on census route A.

	ROUTE A				
	Oct. 13	28	Nov. 11	25	Dec. 9
<u>Endangered</u>	1				
Wood Stork	6	14	2	6	17
Peregrine Falcon	0	0	0	0	0
<u>Threatened</u>					
Brown Pelican	0	0	7	7	13
Southern Bald Eagle	2	4	5	0	1
Osprey	4	6	1	5	1
Florida Scrub Jay	20	0	12	20	3
<u>Rare</u>					
Reddish Egret	0	0	0	0	0
Roseate Spoonbill	53	0	6	15	0
American Redstart	0	0	0	0	0
<u>Special Concern</u>					
Little Blue Heron	9	3	7	8	25
Great Egret	34	12	10	19	19
Snowy Egret	11	3	13	22	13
Louisiana Heron	20	23	15	14	38
Black-crowned Night Heron	0	0	0	0	0
White Ibis	205	137	120	29	110
Royal Tern	0	0	2	4	0
Sandwich Tern	0	0	0	0	0
Caspian Tern	0	4	0	0	0
Black Skimmer	44	0	0	0	1
<u>Undetermined</u>					
Merlin	0	0	0	0	0
Florida Burrowing Owl	0	0	0	0	0

Table 1. Total avian species noted from 5 January - May, 1977 on census route A.

	Jan. 5 19	Feb. 3 16	Mar. 2 17 31	Apr. 13 27	May 11 25
<u>Endangered</u>					
Wood Stork	6 10	22 2	6 5 6	2 22	1 7
<u>Threatened</u>					
Brown Pelican	10 4	0 2	3 0 0	1 3	2 0
Southern Bald Eagle	3 3	3 1	2 4 3	3 4	0 0
Osprey	0 0	0 0	1 2 1	1 3	1 1
Least Tern	0 0	0 0	0 0 0	1 0	3 23
Florida Scrub Jay	10 0	23 10	14 10 17	15 12	0 16
<u>Special Concern</u>					
Little Blue Heron	2 0	0 6	0 2 0	1 0	0 1
Great Egret	15 23	26 10	19 8 20	28 6	38 10
Snowy Egret	13 19	20 14	22 1 32	17 4	39 31
Louisiana Heron	29 12	11 7	16 8 13	14 7	50 7
White Ibis	33 40	49 42	30 36 25	36 20 ¹	30 45
Royal Tern	1 0	0 0	0 0 0	0 2	0 0
Caspian Tern	0 7	2 0	0 1 1	2 0	0 0
Black Skimmer	8 0	23 16	85 31 0	4 0	5 0

Table 1. Total avian species noted from 1 June - December, 1977 on census route A.

	June		July		August		September		October		November		December	
	9	23	5	19	2	16	31	13	29	13	26	10	23	6
<u>Endangered</u>														
Wood Stork	3	1	6	37	7	7	0	11	32	3	31	35	79	39
Peregrine Falcon	0	0	0	0	0	0	0	0	0	0	1	0	0	0
<u>Threatened</u>														
Brown Pelican	1	1	0	0	8	0	4	3	8	1	7	14	14	13
Southern Bald Eagle	0	0	0	0	0	0	0	0	0	1	1	0	2	1
Osprey	1	1	2	0	5	4	4	2	1	1	0	0	0	0
Least Tern	10	0	0	3	176	100	2	2	0	0	0	0	0	0
Florida Scrub Jay	13	13	4	17	10	0	8	13	8	16	16	0	10	16
<u>Rare</u>														
Roseate Spoonbill	2	7	5	13	0	21	4	0	20	3	6	0	0	0
<u>Special Concern</u>														
Little Blue Heron	1	5	0	12	0	0	0	30	2	10	2	3	0	6
Great Egret	15	100	107	142	12	3	7	86	9	9	115	158	64	6
Snowy Egret	61	128	502	469	10	20	2	204	2	6	112	206	340	34
Louisiana Heron	18	9	5	58	4	12	5	51	9	21	31	15	25	13
Black-crowned Night Heron	0	0	0	0	0	0	1	0	0	0	0	0	0	0
White Ibis	108	85	11	95	0	24	0	125	2	17	60	35	205	88
Royal Tern	0	27	0	0	0	0	0	0	0	0	0	0	2	0
Caspian Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	9
Black Skimmer	43	3	0	0	0	0	12	1	0	0	0	0	150	35

Table 1. Total avian species noted from 20 December, 1977 - April, 1978 on census route A.

	Dec. 20	Jan. 3 17 31	Feb. 14 28	Mar. 14 28	Apr. 11 25
<u>Endangered</u>					
Wood Stork	10	19 8 3	28 18	16 5	1 0
<u>Threatened</u>					
Brown Pelican	7	17 12 7	3 2	1 0	0 0
Southern Bald Eagle	4	2 1 3	2 3	2 5	1 2
Osprey	2	0 0 0	1 1	0 1	1 0
Florida Scrub Jay	9	3 6 6	2 9	11 6	1 6
<u>Special Concern</u>					
Little Blue Heron	18	32 0 1	6 4	2 0	0 0
Great Egret	106	17 23 14	46 25	9 8	5 7
Snowy Egret	108	9 7 9	106 19	17 54	6 14
Louisiana Heron	39	4 3 7	33 8	8 8	3 2
White Ibis	32	87 26 45	142 48	49 66	26 12
Caspian Tern	4	2 2 17	0 0	0 0	0 0
Black Skimmer	75	21 88 45	0 0	0 3	0 0

Table 1. Total avian species noted from 9 May - 11 November, 1978, on census route A.

	May		June		July		Aug.		Sept.		Oct.		Nov.	
	9	23	6	22	5	19	27	14	29	8	21	13	31	11
<u>Endangered</u>														
Wood Stork	0	0	1	0	0	0	0	0	1	9	10	20	29	0
Peregrine Falcon	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Threatened</u>														
Brown Pelican	0	0	0	0	0	0	0	0	0	7	2	0	6	3
Southern Bald Eagle	0	0	0	0	0	0	0	0	0	1	0	1	3	1
Osprey	0	0	1	1	0	0	0	4	2	3	3	0	0	0
Least Tern	0	0	0	0	0	40	0	20	0	0	0	0	0	0
Florida Scrub Jay	14	8	4	6	0	10	10	20	15	16	0	7	10	2
<u>Rare</u>														
Reddish Egret	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Roseate Spoonbill	0	0	0	0	0	0	0	5	32	1	75	0	0	0
American Redstart	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Special Concern</u>														
Little Blue Heron	0	0	1	0	0	0	0	2	1	0	0	11	1	4
Great Egret	7	57	29	14	5	3	5	52	59	26	76	20	39	29
Snowy Egret	4	200	213	44	2	17	1	101	202	52	106	212	19	113
Louisiana Heron	0	19	7	5	0	1	2	58	302	8	24	33	20	37
Black-crowned Night Heron	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White Ibis	4	2	46	8	0	0	50	536	18	10	0	544	40	54
Cooper's Hawk	0	0	0	0	0	0	0	0	0	0	0	0	0	0
American Avocet	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Royal Tern	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Sandwich Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caspian Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black Skimmer	0	0	0	0	0	0	1	0	1	0	30	0	0	0

Table 1. Total avian species noted from 22 November, 1978 - 2 February, 1979 on census route A.

	Nov. 22	Dec. 6	Dec. 20	Jan. 2	Jan. 10	Feb. 2
<u>Endangered</u>						
Wood Stork	6	15	0	2	7	8
<u>Threatened</u>						
Brown Pelican	0	0	7	8	7	5
Southern Bald Eagle	0	0	2	2	3	1
Osprey	0	0	1	1	0	
Florida Scrub Jay	4	4	0	0	17	2
<u>Rare</u>						
Reddish Egret	0	0	0	1	0	7
<u>Special Concern</u>						
Little Blue Heron	4	0	0	12	0	2
Great Egret	32	44	100	8	7	7
Snowy Egret	36	21	202	29	30	23
Louisiana Heron	13	7	32	23	6	0
White Ibis	202	90	335	41	32	58
Caspian Tern	0	0	0	0	12	1
Black Skimmer	0	0	0	0	21	0

Table 2. Total avian species noted from 24 September - 9 December, 1976 on census route B.

	ROUTE B					
	Sept. 24	7	Oct. 21	4	Nov. 18	Dec. 2
<u>Endangered</u>						
Wood Stork	8	4	1	17	13	15
Peregrine Falcon	0	3	3	0	0	0
<u>Threatened</u>						
Brown Pelican	14	7	46	17	132	96
Southern Bald Eagle	0	0	0	1	0	0
Osprey	15	17	7	3	1	9
Florida Scrub Jay	0	22	3	10	6	2
<u>Rare</u>						
Reddish Egret	0	0	0	0	0	2
Roseate Spoonbill	94	4	10	0	3	0
American Redstart	5	0	0	0	0	0
<u>Special Concern</u>						
Little Blue Heron	7	7	7	30	46	73
Great Egret	19	19	32	51	25	39
Snowy Egret	130	23	16	50	10	89
Louisiana Heron	49	32	38	43	21	48
Black-crowned Night Heron	0	0	1	0	0	0
White Ibis	253	197	248	386	145	183
Royal Tern	28	18	249	324	224	36
Sandwich Tern	0	0	0	3	0	0
Caspian Tern	0	0	10	23	4	42
Black Skimmer	148	0	0	2	0	0
<u>Undetermined</u>						
Merlin	0	0	0	1	1	0
Florida Burrowing Owl	1	0	0	0	0	0

Table 2. Total avian species noted from 14 December - May, 1977 on census route B.

	Dec. 14 30	Jan. 12 25	Feb. 10 23	Mar. 9 23	Apr. 6 20	May 4 18
<u>Endangered</u>						
Wood Stork	10 13	18 34	25 8	10 10	5 3	17 0
<u>Threatened</u>						
Brown Pelican	29 25	30 33	34 20	37 84	81 35	44 49
* 30 min. counts	9 0	16 23	26 17	21 55	53 8	29 41
Southern Bald Eagle	1 1	2 0	1 2	0 0	2 0	1 0
Osprey	6 3	5 6	0 1	2 0	0 0	0 0
Least Tern	0 0	0 0	0 0	0 0	0 0	21 6
Florida Scrub Jay	4 8	4 3	5 9	7 7	7 0	4 4
<u>Rare</u>						
Reddish Egret	0 1	0 0	0 0	0 0	0 0	0 0
Roseate Spoonbill	0 0	0 0	0 0	1 45	2 8	1 1
<u>Special Concern</u>						
Little Blue Heron	18 12	9 7	1 8	33 9	1 4	0 0
Great Egret	48 20	17 50	68 28	75 20	21 21	47 24
Snowy Egret	129 22	19 16	72 30	239 93	271 147	206 247
Louisiana Heron	32 21	22 11	15 14	36 25	18 37	77 33
Black-crowned Night Heron	0 0	0 0	0 0	0 0	1 1	2 1
White Ibis	140 57	42 78	132 57	243 53	141 89	118 204
American Avocet						
Royal Tern	112 14	33 30	3 12	113 0	287 67	65 2
Caspian Tern	1 8	7 37	4 0	9 1	4 0	0 0
Black Skimmer	7 0	7 22	60 24	7 0	0 181	80 6

* The total number of Brown Pelican counted crossing an imaginary line east from Camera Pad 10 for a 30 minute period.

Table 2. Total avian species noted from 1 June - December, 1977 on census route A.

	June		July		August		September		October		November		December		
	1	15	28	12	26	9	23	6	16	6	20	3	17	29	15
<u>Endangered</u>															
Wood Stork	9	28	16	15	9	7	8	11	9	13	51	38	21	42	36
Peregrine Falcon	0	0	0	0	0	0	0	0	0	2	0	1	0	0	1
<u>Threatened</u>															
*Brown Pelican	6	20	6	14	5	5	23	106	45	121	106	68	38	34	84
30 min.	0	15	4	8	1	4	16	57	26	43	59	29	9	6	36
Southern Bald Eagle	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2
Osprey	2	2	1	1	3	6	13	7	12	13	16	5	4	4	8
Least Tern	59	0	2	6	0	2	100	0	0	0	0	0	0	0	0
Florida Scrub Jay	2	9	6	0	18	17	11	3	8	8	0	0	12	10	10
<u>Rare</u>															
Reddish Egret	1	1	0	0	1	0	0	0	0	0	0	0	0	0	1
Roseate Spoonbill	37	22	44	4	3	20	1	12	29	0	1	0	0	0	0
<u>Special Concern</u>															
Little Blue Heron	2	5	2	4	2	9	10	14	33	2	1	1	5	2	11
Great Egret	133	31	56	77	33	118	35	16	74	32	704	205	19	117	121
Snowy Egret	221	136	131	301	68	224	113	94	388	208	537	365	114	305	221
Louisiana Heron	50	13	58	68	30	21	26	26	38	62	53	66	15	19	22
Black-crowned Night Heron	0	2	0	0	3	0	3	0	2	0	8	1	0	2	0
White Ibis	35	31	43	9	40	21	18	17	21	41	211	146	58	300	137
American Avocet	0	6	0	0	0	0	0	0	2	0	0	0	0	0	0
Royal Tern	5	5	2	0	2	77	97	128	250	14	35	33	118	40	29
Caspian Tern	0	0	0	0	0	0	0	0	0	2	14	0	0	8	9
Black Skimmer	40	0	1	0	0	0	0	158	0	0	0	0	0	125	150
<u>Undetermined</u>															
Merlin	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0

* Brown Pelicans noted in 30 minute time period at Playalinda Beach

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Table 2. Total avian species noted from 20 December, 1977 - 2 May, 1978 on census route B.

	Dec.		Jan.		Feb.		Mar.		Apr.		May
	27	10	24	7	21	7	21	4	18	2	
<u>Endangered</u>											
Wood Stork	42	18	29	38	61	12	28	22	5	2	
<u>Threatened</u>											
*Brown Pelican	6	18	13	14	13	11	16	0	0	101	
30 minutes	0	17	6	6	10	25	22	31	3	28	
Southern Bald Eagle	1	1	1	2	1	1	1	1	0	0	
Osprey	3	9	2	1	2	1	1	2	0	1	
Least Tern	0	0	0	0	0	0	0	0	15	10	
Florida Scrub Jay	2	3	0	0	21	29	5	8	0	5	
<u>Rare</u>											
Roseate Spoonbill	0	0	0	0	0	0	13	0	61	62	
<u>Special Concern</u>											
Little Blue Heron	63	8	3	5	20	3	8	0	4	0	
Great Egret	50	62	23	39	65	21	92	8	4	26	
Snowy Egret	17	35	16	61	199	55	194	31	6	68	
Louisiana Heron	9	31	17	15	47	11	15	9	19	22	
Black-crowned Night Heron	0	0	0	0	1	1	0	2	0	0	
White Ibis	218	232	47	230	257	51	57	24	79	95	
Cooper's Hawk	0	0	0	1	0	0	0	0	0	0	
American Avocet	6	0	5	0	10	0	1	0	0	0	
Royal Tern	34	44	4	42	15	0	0	50	200	103	
Caspian Tern	7	25	9	0	1	1	0	0	1	0	
Black Skimmer	110	125	73	0	5	0	23	0	12	105	

*Brown Pelicans noted in 30 minute time period at Playalinda Beach.

Table 2. Total avian species noted from 16 May - 15 November, 1978, on census route B.

	May		June		July		Aug.		Sept.		Oct.		Nov.	
	16	30	19	28	12	26	9	23	6	20	4	18	1	15
<u>Endangered</u>														
Wood Stork	31	6	0	68	12	3	2	0	11	30	16	13	9	5
Peregrine Falcon	0	0	0	0	0	0	0	0	0	0	1	0	0	0
<u>Threatened</u>														
*Brown Pelican 30 minutes	4	2	16	2	16	18	8	106	82	32	31	119	71	23
Southern Bald Eagle	9	54	15	18	3	10	3	91	43	10	8	22	22	1
Osprey	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Least Tern	0	2	3	1	2	3	8	7	15	8	13	10	9	11
Florida Scrub Jay	0	5	25	0	20	50	0	0	0	0	0	0	0	0
	8	14	3	7	6	10	9	6	24	10	12	6	2	4
<u>Rare</u>														
Reddish Egret	0	2	0	0	1	1	1	1	1	1	1	2	7	3
Roseate Spoonbill	33	10	25	33	5	20	7	19	59	33	96	1	0	0
American Redstart	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Special Concern</u>														
Little Blue Heron	0	0	0	0	0	2	3	7	3	10	2	2	16	2
Great Egret	37	8	10	39	13	16	33	34	56	130	185	32	66	18
Snowy Egret	188	9	7	140	31	17	82	97	103	367	153	56	232	21
Louisiana Heron	40	15	6	13	19	20	154	51	53	91	74	33	17	13
Black-crowned Night Heron	0	0	0	0	1	0	0	0	0	0	0	0	0	0
White Ibis	116	7	2	80	60	28	134	84	167	391	112	226	0	74
Cooper's Hawk	0	0	0	0	0	0	0	0	0	0	0	0	0	0
American Avocet	0	12	0	1	0	0	0	0	15	21	0	62	0	0
Royal Tern	55	19	69	100	126	61	300	129	505	312	180	258	215	204
Sandwich Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caspian Tern	0	0	0	0	0	0	0	5	3	5	0	2	16	0
Black Skimmer	79	54	78	75	15	14	10	27	0	17	5	8	0	0
<u>Undetermined</u>														
Merlin	0	0	0	0	0	0	0	0	0	0	0	0	0	1

*Brown Pelicans noted in 30 minute time period at Playalinda Beach.

Table 2. Total avian species noted from 28 November, 1978 - 24 April, 1979 on census route B.

	Nov. 28	Dec. 15	Dec. 27	Jan. 12	Jan. 26	Feb. 8	Mar. 2	Mar. 19	Apr. 6	Apr. 24
<u>Endangered</u>										
Wood Stork	2	12	17	4	6	33	5	4	6	0
<u>Threatened</u>										
*Brown Pelican 30 minutes	63	63	95	26	23	10	3	7	4	25
Southern Bald Eagle	14	55	22	0	8	10	41	6	43	24
Osprey	0	0	1	1	0	0	1	1	0	0
Least Tern	8	5	2	0	0	0	1	0	0	0
Florida Scrub Jay	0	0	0	0	0	0	0	0	0	2
	0	4	0	0	4	2	15	8	4	6
<u>Rare</u>										
Reddish Egret	2	0	0	0	0	0	0	0	1	1
Roseate Spoonbill	0	0	0	0	0	0	0	0	7	0
<u>Special Concern</u>										
Little Blue Heron	5	1	1	0	3	6	4	3	1	0
Great Egret	9	38	28	13	16	45	23	13	25	59
Snowy Egret	32	134	70	24	8	8	38	12	201	61
Louisiana Heron	22	64	11	10	7	4	28	6	10	18
White Ibis	82	415	84	43	100	119	101	16	35	68
American Avocet	105	24	14	0	0	0	0	0	0	0
Royal Tern	120	300	28	70	60	2	38	65	250	200
Caspian Tern	5	0	0	0	3	7	0	0	0	0
Black Skimmer	0	0	0	75	0	7	0	15	0	42

*Brown Pelicans noted in 30 minute time period at Playalinda Beach.

Table 3a. Avian species noted on route A, in area 1.

	AREA 1				
	Oct. 13	28	Nov. 11	25	Dec. 9
<u>Endangered</u>					
Wood Stork	6	4	0	0	0
Peregrine Falcon	0	0	0	0	0
<u>Threatened</u>					
Brown Pelican	0	0	7	2	8
Southern Bald Eagle	1	0	1	0	0
Osprey	0	1	0	0	0
Florida Scrub Jay	2	0	7	18	0
<u>Rare</u>					
Reddish Egret	0	0	0	0	0
Roseate Spoonbill	0	0	0	0	0
American Redstart	0	0	0	0	0
<u>Special Concern</u>					
Little Blue Heron	0	0	0	0	0
Great Egret	0	0	0	0	0
Snowy Egret	0	0	0	0	0
Louisiana Heron	0	0	0	0	0
Black-crowned Night Heron	0	0	0	0	0
White Ibis	0	0	1	0	0
Royal Tern	0	0	0	0	0
Sandwich Tern	0	0	0	0	0
Caspian Tern	0	0	0	0	0
Black Skimmer	0	0	0	0	0
<u>Undetermined</u>					
Merlin	0	0	0	0	0
Florida Burrowing Owl	0	0	0	0	0

Table 3a. Species noted on route A, in area 1.

	Jan. 5 19	Feb. 3 16	Mar. 2 17 31	Apr. 13 27	May 11 25
<u>Endangered</u>					
Wood Stork	0	0	0	0	1
<u>Threatened</u>					
Brown Pelican	2	0	0	0	1
Southern Bald Eagle	0	0	0	0	0
Osprey	0	0	2	1	1
Least Tern	0	0	0	0	0
Florida Scrub Jay	8	0	2	12	2
					6
<u>Special Concern</u>					
Little Blue Heron	0	0	0	0	0
Great Egret	1	0	0	0	4
Snowy Egret	0	0	0	0	0
Louisiana Heron	0	0	0	0	2
White Ibis	0	0	0	0	0
Royal Tern	0	0	0	0	0
Caspian Tern	0	0	0	0	0
Black Skimmer	0	0	0	0	0

Table 3a. Avian species noted on Route A, area 1.

	June		July		August		September		October		November		December	
	9	23	5	19	2	16	13	29	13	26	10	23	6	6
<u>Endangered</u>														
Wood Stork	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peregrine Falcon	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Threatened</u>														
Brown Pelican	0	0	0	0	2	0	3	0	1	0	14	0	0	2
Southern Bald Eagle	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Osprey	1	1	2	0	2	4	0	0	0	0	0	0	0	0
Least Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Florida Scrub Jay	13	4	4	4	6	0	4	8	9	8	9	5	7	7
<u>Rare</u>														
Reddish Egret	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Special Concern</u>														
Little Blue Heron	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Great Egret	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Snowy Egret	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Louisiana Heron	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White Ibis	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Royal Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caspian Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black Skimmer	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 3a. Species noted on route A, in area 1.

	Dec. 20	Jan. 3 17 31	Feb. 14 28	Mar. 14 28	Apr. 11 25
<u>Endangered</u>					
Wood Stork	0	0 0 0	0	0	0
<u>Threatened</u>					
Brown Pelican	3	2 0 0	2	0	0
Southern Bald Eagle	0	0 0 0	0	0	0
Osprey	0	0 0 0	0	0	1
Florida Scrub Jay	9	3 0 6	2	1	1
<u>Special Concern</u>					
Little Blue Heron	0	0 0 0	0	0	0
Great Egret	0	0 0 0	1	0	0
Snowy Egret	0	0 0 0	0	0	0
Louisiana Heron	0	0 0 0	0	0	0
White Ibis	0	0 0 0	0	0	0
Caspian Tern	0	0 0 0	0	0	0
Black Skimmer	0	0 0 0	0	0	0

Table 3-1. Avian species noted on route A, in area 1.

	May		June		July		Aug.		Sept.		Oct.		Nov.	
	9	23	6	22	5	19	27	14	29	8	21	13	31	11
<u>Endangered</u>														
Wood Stork	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peregrine Falcon	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Threatened</u>														
Brown Pelican	0	0	0	0	0	0	0	0	0	7	2	0	1	2
Southern Bald Eagle	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Osprey	0	0	0	1	2	0	0	1	1	0	0	0	0	0
Least Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Florida Scrub Jay	14	8	4	6	4	4	0	11	2	9	0	8	0	0
<u>Rare</u>														
Reddish Egret	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Roseate Spoonbill	0	0	0	0	0	0	0	0	0	0	0	0	0	0
American Redstart	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Special Concern</u>														
Little Blue Heron	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Great Egret	0	1	2	0	0	0	0	0	0	0	0	0	0	0
Snowy Egret	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Louisiana Heron	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-crowned Night Heron	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White Ibis	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cooper's Hawk	0	0	0	0	0	0	0	0	0	0	0	0	0	0
American Avocet	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Royal Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sandwich Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caspian Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black Skimmer	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 3a. Avian species noted from 22 November, 1978 - 2 February, 1979 on census route A, area 1.

	Nov. 22	Dec. 6	Dec. 20	Jan. 2	Jan. 10	Feb. 2
<u>Endangered</u>						
Wood Stork	0	0	0	0	0	0
<u>Threatened</u>						
Brown Pelican	3	0	6	2	0	2
Southern Bald Eagle	0	0	0	0	0	0
Osprey	0	0	0	1	0	0
Florida Scrub Jay	0	0	0	0	0	0
<u>Rare</u>						
Reddish Egret	0	0	0	0	0	0
<u>Special Concern</u>						
Little Blue Heron	0	0	0	0	0	0
Great Egret	0	0	0	0	0	0
Snowy Egret	0	0	0	0	0	0
Louisiana Heron	0	0	0	0	0	0
White Ibis	0	0	0	0	0	0
Caspian Tern	0	0	0	0	0	0
Black Skimmer	0	0	0	0	0	0

Table 3b. Avian species noted on route A in area 2.

AREA 2					
	Oct.		Nov.		Dec.
	13	28	11	25	9
<u>Endangered</u>					
Wood Stork	0	10	2	6	16
Peregrine Falcon	0	0	0	0	0
<u>Threatened</u>					
Brown Pelican	0	0	0	5	5
Southern Bald Eagle	0	2	2	0	0
Osprey	1	3	1	4	1
Florida Scrub Jay	4	0	2	2	0
<u>Rare</u>					
Reddish Egret	0	0	0	0	0
Roseate Spoonbill	53	0	6	15	0
American Redstart	0	0	0	0	0
<u>Special Concern</u>					
Little Blue Heron	8	2	4	7	25
Great Egret	26	10	10	19	16
Snowy Egret	11	3	11	21	11
Louisiana Heron	20	23	13	14	38
Black-crowned Night Heron	0	0	0	0	0
White Ibis	205	137	119	29	110
Royal Tern	0	0	2	4	0
Sandwich Tern	0	0	0	0	0
Caspian Tern	0	4	0	0	0
Black Skimmer	44	0	0	0	1
<u>Undetermined</u>					
Merlin	0	0	0	0	0
Florida Burrowing Owl	0	0	0	0	0

Table 3b. Species noted on route A, in area 2.

	Jan. 5 19	Feb. 3 16	Mar. 2 17 31	Apr. 13 27	May 11 25
<u>Endangered</u>					
Wood Stork	6 8	15 1	0 1 0	0 0 0	0 0 5
<u>Threatened</u>					
Brown Pelican	8 1	0 2	3 0 0	1 0 0	1 0 0
Southern Bald Eagle	2 1	1 1	1 1 1	0 1 1	0 0 0
Osprey	0 0	0 0	1 0 0	0 0 0	
Least Tern	0 0	0 0	0 0 0	1 0 0	1 22 0
Florida Scrub Jay	0 0	2 0	12 0 1	0 1 1	0 0 0
<u>Special Concern</u>					
Little Blue Heron	2 0	0 6	0 2 0	1 0 0	0 1 1
Great Egret	8 22	25 10	14 3 17	28 3 36	4 4 36
Snowy Egret	10 18	17 14	8 0 30	17 0 39	30 30 39
Louisiana Heron	25 8	11 7	11 8 13	14 6 6	5 5 50
White Ibis	30 40	24 42	30 36 19	36 3 36	28 30 28
Royal Tern	1 0	0 0	0 0 0	0 0 0	0 0 0
Caspian Tern	0 7	2 0	0 1 1	2 0 0	0 0 0
Black Skimmer	8 0	23 16	44 0 0	4 0 4	5 0 5

Table 3b. Avian species noted on Route A, area 2.

	June		July		August			September		October		November		December	
	9	23	5	19	2	16	31	13	29	13	26	10	23	6	6
<u>Endangered</u>															
Wood Stork	2	1	6	37	3	6	0	11	32	3	31	30	68	39	
Peregrine Falcon	0	0	0	0	0	0	0	0	0	0	1	0	0	0	
<u>Threatened</u>															
Brown Pelican	1	1	0	0	6	0	1	0	8	0	7	0	14	11	
Southern Bald Eagle	0	0	0	0	0	0	0	0	0	1	1	0	0	0	
Osprey	0	0	0	0	1	0	0	1	1	1	0	0	0	0	
Least Tern	10	0	0	3	176	100	2	2	0	0	0	0	0	0	
Florida Scrub Jay	0	0	0	0	0	0	2	0	0	0	0	0	0	0	
<u>Rare</u>															
Roseate Spoonbill	2	7	5	13	0	21	0	0	20	3	6	0	0	0	
<u>Special Concern</u>															
Little Blue Heron	1	5	0	12	0	0	0	20	2	9	0	2	0	5	
Great Egret	5	94	100	142	10	3	4	81	9	7	108	156	62	14	
Snowy Egret	21	110	500	549	10	20	1	104	2	5	109	205	330	13	
Louisiana Heron	16	8	5	56	5	12	4	51	9	21	31	15	24	11	
Black-crowned Night Heron	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
White Ibis	90	82	11	95	0	24	0	125	2	10	60	27	204	85	
Royal Tern	0	27	0	0	0	0	0	0	0	0	0	0	2	0	
Caspian Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	9	
Black Skimmer	43	3	0	0	0	12	1	0	0	0	0	0	150	35	

Table 3b. Species noted on route A, in area 2.

	Dec.		Jan.		Feb.		Mar.		Apr.	
	20	31	3	17	14	28	14	28	11	25
<u>Endangered</u>										
Wood Stork	4	1	5	7	17	9	2	0	1	0
<u>Threatened</u>										
Brown Pelican	4	6	15	12	1	2	1	0	0	0
Southern Bald Eagle	3	2	1	1	1	1	1	1	1	0
Osprey	1	0	0	0	0	0	0	0	0	0
Florida Scrub Jay	0	0	0	0	0	1	0	0	0	1
<u>Special Concern</u>										
Little Blue Heron	18	0	7	0	0	3	2	0	0	0
Great Egret	101	13	8	22	35	19	5	3	2	3
Snowy Egret	103	8	6	5	83	16	16	14	3	11
Louisiana Heron	34	7	1	2	30	5	8	6	3	1
White Ibis	12	18	87	26	141	44	49	39	26	11
Caspian Tern	4	11	2	2	0	0	0	0	0	0
Black Skimmer	75	45	21	78	0	0	0	0	0	0

Table 3-2. Avian species noted on route A, in area 2.

	May		June		July		Aug.		Sept.		Oct.		Nov.	
	9	23	6	22	5	19	27	14	29	8	21	13	31	11
<u>Endangered</u>														
Wood Stork	0	0	0	0	0	0	0	0	1	9	10	20	29	0
Peregrine Falcon	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Threatened</u>														
Brown Pelican	0	0	0	0	0	0	0	0	0	0	0	0	5	1
Southern Bald Eagle	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Osprey	0	0	0	0	0	0	2	1	2	2	3	4	1	1
Least Tern	0	0	0	0	0	40	0	20	0	0	0	0	0	0
Florida Scrub Jay	0	0	0	0	0	6	5	0	0	0	0	0	2	0
<u>Rare</u>														
Reddish Egret	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Roseate Spoonbill	0	0	0	0	0	0	5	24	1	75	150	0	0	0
American Redstart	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Special Concern</u>														
Little Blue Heron	0	0	0	0	0	0	2	1	0	0	0	10	1	4
Great Egret	0	50	9	6	2	0	1	50	58	26	76	201	37	28
Snowy Egret	2	200	111	36	2	1	1	101	202	52	106	212	19	113
Louisiana Heron	0	18	4	3	0	0	1	58	302	8	24	33	20	37
Black-crowned Night Heron	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White Ibis	0	4	1	0	0	0	1	50	536	17	10	544	40	54
Cooper's Hawk	0	0	0	0	0	0	0	0	0	0	0	0	0	0
American Avocet	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Royal Tern	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Sandwich Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caspian Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black Skimmer	0	0	0	0	0	0	0	0	1	0	30	0	0	0

Table 3b. Avian species noted from 22 November, 1978 - 2 February, 1979 on census route A, area 2.

	Nov. 22	Dec. 6	Dec. 20	Jan. 2	Jan. 10	Feb. 2
<u>Endangered</u>						
Wood Stork	6	16	0	2	6	8
<u>Threatened</u>						
Brown Pelican	0	0	1	6	7	2
Southern Bald Eagle	0	0	0	1	0	1
Osprey	0	0	0	0	0	0
Florida Scrub Jay	2	4	0	0	5	2
<u>Rare</u>						
Reddish Egret	2	0	0	1	0	0
<u>Special Concern</u>						
Little Blue Heron	4	0	0	12	0	1
Great Egret	31	44	100	7	3	4
Snowy Egret	34	21	202	29	23	23
Louisiana Heron	12	7	31	23	5	0
White Ibis	185	90	334	41	30	38
Caspian Tern	0	0	0	0	12	1
Black Skimmer	0	0	0	0	21	1

Table 3c. Avian species noted on route A, in area 3.

AREA 3

	Oct.		Nov.		Dec.
	13	28	11	25	
<u>Endangered</u>					
Wood Stork	0	0	0	0	1
Peregrine Falcon	0	0	0	0	0
<u>Threatened</u>					
Brown Pelican	0	0	0	0	0
Southern Bald Eagle	0	2	2	0	1
Osprey	1	2	0	1	0
Florida Scrub Jay	4	0	3	0	3
<u>Rare</u>					
Reddish Egret	0	0	0	0	0
Roseate Spoonbill	0	0	0	0	0
American Redstart	0	0	0	0	0
<u>Special Concern</u>					
Little Blue Heron	0	1	3	1	0
Great Egret	0	2	0	0	3
Snowy Egret	0	0	2	1	2
Louisiana Heron	0	0	2	0	0
Black-crowned Night Heron	0	0	0	0	0
White Ibis	0	0	0	0	0
Royal Tern	0	0	0	0	0
Sandwich Tern	0	0	0	0	0
Caspian Tern	0	0	0	0	0
Black Skimmer	0	0	0	0	0
<u>Undetermined</u>					
Merlin	0	0	0	0	0
Florida Burrowing Owl	0	0	0	0	0

Table 3c. Species noted on route A, in area 3.

	Jan. 5 19	Feb. 3 16	Mar. 2 17 31	Apr. 13 27	May 11 25
<u>Endangered</u>					
Wood Stork	0 2	7 1	6 4 6	2 22	1 1 1
<u>Threatened</u>					
Brown Pelican	0 0	0 0	0 0 0	0 1	0 0 0
Southern Bald Eagle	1 2	2 0	1 3 3	3 3	0 0 0
Osprey	0 0	0 0	0 0 0	0 1	0 0 0
Least Tern	0 0	0 0	0 0 0	0 0	0 0 0
Florida Scrub Jay	2 0	21 10	0 6 8	3 5	0 0 10
<u>Special Concern</u>					
Little Blue Heron	0 0	0 0	0 0 0	0 0	0 0 0
Great Egret	6 1	1 0	5 5 3	0 3	2 2 2
Snowy Egret	3 1	3 0	14 1 2	0 4	0 0 1
Louisiana Heron	4 4	0 0	5 0 0	0 0	0 0 0
White Ibis	3 0	25 0	0 0 6	0 18	2 15
Royal Tern	0 0	0 0	0 0 0	0 2	0 0 0
Caspian Tern	0 0	0 0	0 0 0	0 0	0 0 0
Black Skimmer	0 0	0 0	41 31 0	0 0	0 0 0

Table 3c. Avian species noted on Route A, area 3.

	June		July		August		September		October		November		December	
	9	23	5	19	2	16	31	13	29	13	26	10	23	6
<u>Endangered</u>														
Wood Stork	1	0	0	0	4	1	0	0	0	0	0	5	11	0
Peregrine Falcon	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Threatened</u>														
Brown Pelican	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Southern Bald Eagle	0	0	0	0	0	0	0	0	0	0	0	0	2	1
Osprey	0	0	0	0	2	0	4	1	0	0	0	2	0	0
Florida Scrub Jay	0	7	0	13	4	4	0	9	0	7	8	8	5	9
<u>Rare</u>														
Roseate Spoonbill	0	0	0	0	0	0	4	0	0	0	0	0	0	0
<u>Special Concern</u>														
Little Blue Heron	0	0	0	0	0	0	0	10	0	1	1	1	0	1
Great Egret	10	6	7	0	2	0	3	5	0	2	7	2	2	6
Snowy Egret	40	18	2	10	0	0	1	100	0	1	3	1	10	21
Louisiana Heron	2	1	0	2	0	0	1	0	0	0	0	0	2	2
White Ibis	18	3	0	0	0	0	0	0	0	5	0	8	1	3
Royal Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caspian Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black Skimmer	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 3c. Species noted on route A, in area 3.

	Dec.		Jan.		Feb.		Mar.		Apr.	
	20	3	17	31	14	28	14	28	11	25
<u>Endangered</u>										
Wood Stork	6	14	1	2	11	9	14	5	0	0
<u>Threatened</u>										
Brown Pelican	0	0	0	1	0	0	0	0	0	0
Southern Bald Eagle	1	1	0	1	1	2	1	4	0	2
Osprey	1	0	0	0	1	1	0	1	0	0
Florida Scrub Jay	0	0	6	0	0	2	10	3	0	0
<u>Special Concern</u>										
Little Blue Heron	0	25	0	1	6	1	0	0	0	0
Great Egret	5	9	1	1	10	6	4	5	3	4
Snowy Egret	5	3	2	1	23	3	1	40	3	3
Louisiana Heron	5	3	1	0	3	3	0	2	0	1
White Ibis	20	0	0	27	1	4	0	27	0	1
Caspian Tern	0	0	0	6	0	0	0	0	0	0
Black Skimmer	0	0	10	0	0	0	0	3	0	0

Table 3-3. Avian species noted on route A, in area 3.

	May		June		July		Aug.		Sept.		Oct.		Nov.	
	9	23	6	22	5	19	27	14	29	8	21	13	31	11
<u>Endangered</u>														
Wood Stork	0	0	1	0	0	30	0	0	0	0	0	0	0	0
Peregrine Falcon	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Threatened</u>														
Brown Pelican	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Southern Bald Eagle	0	0	0	0	0	0	0	0	0	1	0	1	1	1
Osprey	0	0	1	0	0	0	0	1	0	1	0	0	1	1
Least Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Florida Scrub Jay	0	0	0	0	0	0	5	9	13	7	0	5	10	2
<u>Rare</u>														
Reddish Egret	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Roseate Spoonbill	0	0	0	0	0	0	0	0	8	0	0	0	0	0
American Redstart	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Special Concern</u>														
Little Blue Heron	0	0	1	0	0	0	0	0	0	0	0	1	0	0
Great Egret	7	6	18	8	3	4	2	1	0	0	0	0	2	1
Snowy Egret	2	0	102	8	0	16	0	0	0	0	0	0	0	0
Louisiana Heron	0	1	3	2	0	1	1	0	0	0	0	0	0	0
Black-crowned Night Heron	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White Ibis	4	1	45	8	0	0	0	0	1	0	0	0	0	0
Cooper's Hawk	0	0	0	0	0	0	0	0	0	0	0	0	0	0
American Avocet	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Royal Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sandwich Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caspian Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black Skimmer	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 3c. Avian species noted from 22 November, 1978 - 2 February, 1979 on census route A, area 3.

	Nov. 22	Dec. 6	Dec. 20	Jan. 2	Jan. 10	Feb. 2
<u>Endangered</u>						
Wood Stork	0	0	0	0	1	0
<u>Threatened</u>						
Brown Pelican	0	0	0	0	0	1
Southern Bald Eagle	0	0	2	1	2	0
Osprey	0	0	1	0	0	0
Florida Scrub Jay	2	0	0	0	12	0
<u>Rare</u>						
Reddish Egret	0	0	0	0	0	7
<u>Special Concern</u>						
Little Blue Heron	0	0	0	0	0	1
Great Egret	1	0	0	1	4	3
Snowy Egret	2	0	0	0	7	0
Louisiana Heron	1	0	1	0	1	0
White Ibis	17	0	1	0	2	20
Caspian Tern	0	0	0	0	0	0
Black Skimmer	0	0	0	0	0	0

Table 4a. Avian species noted on route B in area 1.

	AREA 1					
	Sept. 24	7	Oct. 21	4	Nov. 18	Dec. 2
<u>Endangered</u>						
Wood Stork	6	4	1	11	10	8
Peregrine Falcon	9	3	3	0	0	0
<u>Threatened</u>						
Brown Pelican	11	7	22	1	93	72
Southern Bald Eagle	0	0	0	1	0	0
Osprey	14	15	6	1	1	5
Florida Scrub Jay	0	21	3	10	6	1
<u>Rare</u>						
Reddish Egret	0	0	0	0	0	0
Roseate Spoonbill	3	4	10	0	3	3
American Redstart	5	0	0	0	0	0
<u>Special Concern</u>						
Little Blue Heron	7	7	6	17	4	29
Great Egret	9	13	5	29	16	20
Snowy Egret	120	21	6	28	6	61
Louisiana Heron	31	25	29	30	16	24
Black-crowned Night Heron	0	0	1	0	0	0
White Ibis	137	42	38	185	83	221
Royal Tern	27	18	14	15	27	3
Sandwich Tern	0	0	0	0	0	0
Caspian Tern	0	0	0	0	0	0
Black Skimmer	0	0	0	0	0	0
<u>Undetermined</u>						
Merlin	0	0	0	1	1	0
Florida Burrowing Owl	1	0	0	0	0	0

Table 4a. Species noted on route B in area 1.

	Dec.	Jan.	Feb.	Mar.	Apr.	May
	14 30	12 25	10 23	9 23	6 20	4 18
<u>Endangered</u>						
Wood Stork	7 5	1 12	22 2	6 10	4 3	17 0
<u>Threatened</u>						
Brown Pelican	26 3	36 46	60 34	58 84	58 25	33 47
Southern Bald Eagle	0 0	0 0	0 0	0 0	0 0	0 0
Osprey	5 3	5 6	0 1	2 0	0 0	0 0
Least Tern	0 0	0 0	0 0	0 0	0 0	0 0
Florida Scrub Jay	1 5	2 0	5 0	7 0	0 4	3 4
<u>Rare</u>						
Reddish Egret	0 0	0 0	0 0	0 0	0 0	0 0
Roseate Spoonbill	0 0	0 0	0 0	1 45	2 8	0 1
<u>Special Concern</u>						
Little Blue Heron	12 7	5 7	1 7	33 8	1 0	0 0
Great Egret	39 12	7 40	10 16	75 18	19 13	18 5
Snowy Egret	111 7	5 9	8 13	236 90	269 119	58 25
Louisiana Heron	17 9	9 6	5 6	31 22	14 37	39 15
Black-crowned Night Heron	0 0	0 0	0 0	0 0	1 1	2 0
White Ibis	57 28	24 66	71 44	239 46	96 51	34 3
American Avocet	0 0	0 0	0 0	0 0	0 0	0 0
Royal Tern	55 12	12 30	3 12	13 0	0 1	0 2
Caspian Tern	0 2	0 17	2 0	9 0	2 0	0 0
Black Skimmer	0 0	0 0	0 0	0 0	0 0	0 1

Table 4a. Avian species noted on Route B, area 1.

	June		July		August		September		October		November		December				
	1	15	28	12	26	9	23	6	16	6	20	3	17	29	6	20	15
<u>Endangered</u>																	
Wood Stork	8	6	16	9	9	7	8	10	6	8	1	3	0	10	12		
Peregrine Falcon	0	0	0	0	0	0	0	0	0	2	0	1	0	0	1		
<u>Threatened</u>																	
Brown Pelican	4	18	5	12	3	5	22	60	31	60	60	29	16	11	44		
Southern Bald Eagle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Osprey	1	2	1	1	3	5	11	5	11	12	16	5	3	4	5		
Least Tern	15	0	2	6	0	0	0	0	0	0	0	0	0	0	0		
Florida Scrub Jay	2	0	0	0	9	8	11	3	8	6	0	0	3	5	1		
<u>Rare</u>																	
Reddish Egret	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0		
Roseate Spoonbill	37	17	44	4	3	20	1	12	27	0	1	0	0	0	0		
<u>Special Concern</u>																	
Little Blue Heron	2	0	1	3	2	7	10	3	2	2	1	1	0	2	4		
Great Blue Heron	82	13	54	11	20	105	33	14	45	3	4	5	2	59	6		
Snowy Egret	75	37	224	148	55	209	106	22	102	17	5	9	156	83	13		
Louisiana Heron	18	7	40	56	18	17	17	17	11	11	13	11	2	9	30		
Black-crowned Night Heron	0	2	0	0	3	0	3	0	0	0	0	1	0	2	0		
White Ibis	19	17	11	4	27	20	6	17	21	12	24	41	8	74	62		
American Avocet	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0		
Royal Tern	5	5	2	0	2	11	4	5	0	14	23	33	18	40	27		
Caspian Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Black Skimmer	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0		
<u>Undetermined</u>																	
Merlin	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0		

Table 4a. Species noted on route B, in area 1

	Dec. 27	Jan. 10 24	Feb. 7 21	Mar. 7 21	Apr. 4 18	May 2
<u>Endangered</u>						
Wood Stork	30	14 17	29 13	9 19	6 4	2
<u>Threatened</u>						
Brown Pelican	1	2 6	4 7	9 13	0 0	6
Southern Bald Eagle	0	0 0	0 0	0 0	0 0	0
Osprey	2	9 2	1 2	1 1	2 0	1
Least Tern	0	0 0	0 0	0 0	0 0	0
Florida Scrub Jay	0	0 0	0 21	21 5	8 0	2
<u>Rare</u>						
Roseate Spoonbill	0	0 0	0 0	0 13	0 61	62
<u>Special Concern</u>						
Little Blue Heron	4	7 3	5 15	3 6	0 4	0
Great Egret	22	27 12	28 12	17 85	3 4	24
Snowy Egret	14	18 8	44 40	44 179	16 5	53
Louisiana Heron	9	26 11	11 17	5 10	9 16	18
Black-crowned Night Heron	0	0 0	0 1	1 0	2 0	0
White Ibis	162	197 47	180 90	33 56	14 71	92
Cooper's Hawk	0	0 0	1 0	0 0	0 0	0
American Avocet	0	0 0	0 0	0 0	0 0	0
Royal Tern	14	4 1	1 15	0 0	2 0	3
Caspian Tern	0	0 0	0 0	0 0	0 0	0
Black Skimmer	0	0 12	0 3	0 0	0 0	41

Table 4-1. Avian species noted on route B, in area 1.

	May		June		July		Aug.		Sept.		Oct.		Nov.	
	16	30	19	28	12	26	9	23	6	20	4	18	1	15
<u>Endangered</u>														
Wood Stork	31	6	0	5	5	2	2	0	4	0	9	0	2	1
Peregrine Falcon	0	0	0	0	0	0	0	0	0	0	1	0	0	0
<u>Threatened</u>														
*Brown Pelican 30 minutes	4	1	2	2	4	0	0	12	10	19	12	10	17	3
Southern Bald Eagle	9	54	15	18	3	10	3	91	43	10	8	22	22	1
Osprey	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Least Tern	0	2	2	1	2	1	7	7	11	8	12	9	8	11
Florida Scrub Jay	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	6	3	3	6	7	9	6	18	7	6	6	2	0
<u>Rare</u>														
Reddish Egret	0	2	0	0	0	0	0	0	0	1	0	0	1	0
Roseate Spoonbill	33	10	25	28	5	20	4	19	59	33	12	0	0	0
American Redstart	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Special Concern</u>														
Little Blue Heron	1	0	3	0	1	2	0	7	3	5	1	2	8	0
Great Egret	33	6	8	18	10	14	3	10	23	79	150	22	65	9
Snowy Egret	185	2	3	28	18	15	27	35	45	167	52	54	216	10
Louisiana Heron	37	7	6	12	19	14	91	27	31	37	40	3	10	7
Black-crowned Night Heron	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White Ibis	112	7	1	42	33	28	79	79	147	91	27	12	304	16
Cooper's Hawk	0	0	0	0	0	0	0	0	0	0	0	0	0	0
American Avocet	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Royal Tern	0	4	1	0	1	0	0	4	5	12	5	8	3	4
Sandwich Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caspian Tern	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Black Skimmer	3	0	0	0	0	0	2	2	0	0	0	0	0	0
<u>Undetermined</u>														
Merlin	0	0	0	0	0	0	0	0	0	0	0	0	0	1

*Brown Pelicans noted in 30 minute time period at Playalinda Beach.

Table 4a. Avian species noted from 28 November, 1978 - 24 April, 1979 on census route B, area 1.

	Nov. 28	Dec. 15	Dec. 27	Jan. 12	Jan. 26	Feb. 8	Mar. 2	Mar. 19	Apr. 6	Apr. 24
<u>Endangered</u>										
Wood Stork	0	1	2	0	1	16	4	2	6	0
<u>Threatened</u>										
*Brown Pelican	5	8	21	0	4	0	2	1	4	10
30 minutes	14	55	22	0	8	10	41	6	43	24
Southern Bald Eagle	0	0	0	0	0	0	0	0	0	0
Osprey	8	4	2	1	3	5	1	0	0	0
Least Tern	0	0	0	0	0	0	0	0	0	0
Florida Scrub Jay	0	0	0	0	2	0	3	4	4	6
<u>Rare</u>										
Reddish Egret	1	0	0	0	0	0	0	0	1	1
Roseate Spoonbill	0	0	0	0	0	0	0	0	7	0
<u>Special Concern</u>										
Little Blue Heron	3	1	1	0	2	3	4	3	1	0
Great Egret	5	11	23	3	9	37	4	2	14	42
Snowy Egret	29	33	65	3	4	7	15	4	200	25
Louisiana Heron	12	53	7	0	5	0	24	5	8	15
White Ibis	76	375	9	0	86	98	46	8	10	22
American Avocet	0	0	0	0	0	0	0	0	0	0
Royal Tern	0	0	0	0	60	2	18	0	0	0
Caspian Tern	0	0	0	0	2	0	0	0	0	0
Black Skimmer	0	0	0	0	0	0	0	0	0	0

*Brown Pelicans noted in 30 minute time period at Playalinda Beach.

Table 4b. Avian species noted on route B, in area 2.

AREA 2						
	Sept. 24	7	Oct. 21	4	Nov. 18	Dec. 2
<u>Endangered</u>						
Wood Stork	2	0	0	6	3	4
Peregrine Falcon	0	0	0	0	0	0
<u>Threatened</u>						
Brown Pelican	3	0	8	2	0	13
Southern Bald Eagle	0	0	0	0	0	0
Osprey	1	2	1	0	0	4
Florida Scrub Jay	0	1	0	0	0	0
<u>Rare</u>						
Reddish Egret	0	0	0	0	0	0
Roseate Spoonbill	91	0	0	0	0	0
American Redstart	0	0	0	0	0	0
<u>Special Concern</u>						
Little Blue Heron	0	0	1	13	40	42
Great Egret	10	6	23	18	7	13
Snowy Egret	10	2	9	18	4	21
Louisiana Heron	18	7	9	12	5	21
Black-crowned Night Heron	0	0	0	0	0	0
White Ibis	116	155	206	170	62	59
Royal Tern	1	0	0	0	0	12
Sandwich Tern	0	0	0	0	0	0
Caspian Tern	0	0	0	1	0	1
Black Skimmer	148	0	0	0	0	0
<u>Undetermined</u>						
Merlin	0	0	0	0	0	0
Florida Burrowing Owl	0	0	0	0	0	0

Table 4b. Total species noted on route B in area 2.

	Dec.		Jan.		Feb.		Mar.		Apr.		May	
	14	30	12	25	10	23	9	23	6	20	4	18
<u>Endangered</u>												
Wood Stork	1	2	17	19	0	0	3	0	1	0	0	0
<u>Threatened</u>												
Brown Pelican	8	3	1	6	0	2	0	0	0	0	6	0
Southern Bald Eagle	1	1	2	0	1	2	0	0	2	0	1	0
Osprey	0	0	0	0	0	0	0	0	0	0	0	0
Least Tern	0	0	0	0	0	0	0	0	0	0	1	0
Florida Scrub Jay	0	0	0	0	0	0	0	0	0	0	0	0
<u>Rare</u>												
Reddish Egret	0	0	0	0	0	0	0	0	0	0	0	0
Roseate Spoonbill	0	0	0	0	0	0	0	0	0	0	0	0
<u>Special Concern</u>												
Little Blue Heron	4	4	2	0	0	0	0	0	0	4	0	0
Great Egret	5	7	7	9	58	7	0	1	0	6	29	3
Snowy Egret	16	10	10	6	62	8	3	0	0	25	146	22
Louisiana Heron	15	12	12	5	9	8	5	2	4	0	37	10
Black-crowned Night Heron	0	0	0	0	0	0	0	0	0	0	0	1
White Ibis	35	14	13	11	61	5	4	0	44	35	84	1
American Avocet	0	0	0	0	0	0	0	0	0	0	4	0
Royal Tern	0	2	0	0	0	0	0	0	0	0	4	0
Caspian Tern	1	4	7	20	2	0	0	1	0	0	0	0
Black Skimmer	7	0	7	22	0	37	0	0	0	0	0	0

Table 4b. Avian species noted on Route B, area 2.

	June		July		August		September		October		November		December		
	1	15	28	12	26	9	23	6	16	6	20	3	17	29	15
<u>Endangered</u>															
Wood Stork	6	22	0	6	0	0	0	1	3	5	50	35	11	29	15
Peregrine Falcon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Threatened</u>															
Brown Pelican	0	0	1	0	0	0	0	0	0	0	26	0	0	7	4
Southern Bald Eagle	0	0	0	0	0	0	0	0	1	1	0	0	1	0	2
Osprey	0	0	0	0	0	0	0	0	0	1	1	0	3	0	0
Least Tern	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Florida Scrub Jay	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0
<u>Rare</u>															
Roseate Spoonbill	0	5	0	0	0	0	0	0	30	36	20	0	0	0	0
<u>Special Concern</u>															
Little Blue Heron	0	4	1	0	0	2	0	11	31	0	0	0	3	0	5
Great Egret	51	17	2	51	12	11	2	28	28	29	700	200	14	56	112
Snowy Egret	130	85	6	146	13	14	5	57	92	87	531	302	54	219	203
Louisiana Heron	16	4	7	12	5	3	9	5	2	51	38	53	7	9	4
Black-crowned Night Heron	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0
White Ibis	16	14	32	5	13	1	12	0	0	29	177	80	50	223	70
American Avocet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Royal Tern	0	0	0	0	0	0	0	13	0	0	0	0	0	0	2
Caspian Tern	0	0	0	0	0	0	0	0	0	0	2	0	0	8	2
Black Skimmer	40	0	0	0	0	0	0	150	0	0	0	0	0	125	150

Table 4b. Species noted on route B, in area 2

	Dec. 27	Jan. 10 24	Feb. 7 21	Mar. 7 21	Apr. 4 18	May 2
<u>Endangered</u>						
Wood Stork	12	1 1	5 42	0 0	0 0	0 0
<u>Threatened</u>						
Brown Pelican	4	7 4	3 0	2 0	0 0	2 2
Southern Bald Eagle	1	1 1	2 1	1 1	1 0	0 0
Osprey	1	0 0	0 0	0 0	0 0	0 0
Least Tern	0	0 0	0 0	0 0	0 0	0 0
Florida Scrub Jay	0	0 0	0 0	0 0	0 0	0 0
<u>Rare</u>						
Roseate Spoonbill	0	0 0	0 0	0 0	0 0	0 0
<u>Special Concern</u>						
Little Blue Heron	59	1 0	0 4	0 0	0 0	0 0
Great Egret	27	34 4	7 50	4 4	5 0	1 1
Snowy Egret	3	12 2	16 158	10 13	15 0	0 0
Louisiana Heron	0	4 3	4 30	6 3	0 3	2 2
Black-crowned Night Heron	0	0 0	0 0	0 0	0 0	0 0
White Ibis	54	27 0	50 163	16 0	10 8	2 2
Cooper's Hawk	0	0 0	0 0	0 0	0 0	0 0
American Avocet	0	0 0	0 0	0 0	0 0	0 0
Royal Tern	0	0 0	15 0	0 0	0 0	0 0
Caspian Tern	7	25 9	0 1	1 0	0 0	0 0
Black Skimmer	110	105 61	0 2	0 0	0 0	1 1

Table 4-2. Avian species noted on route B, area 2.

	May		June		July		Aug.		Sept.		Oct.		Nov.	
	16	30	19	28	12	26	9	23	6	20	4	18	1	15
<u>Endangered</u>														
Wood Stork	0	0	0	0	7	0	0	0	7	30	7	12	7	0
Peregrine Falcon	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Threatened</u>														
Brown Pelican	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Southern Bald Eagle	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Osprey	0	0	0	0	0	0	0	0	2	0	1	1	1	0
Least Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Florida Scrub Jay	2	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Rare</u>														
Reddish Egret	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Roseate Spoonbill	0	0	0	0	0	0	0	0	0	0	84	1	0	0
American Redstart	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Special Concern</u>														
Little Blue Heron	0	0	0	0	0	0	3	0	0	4	0	0	8	1
Great Egret	3	2	1	1	2	0	27	23	23	51	34	8	1	6
Snowy Egret	1	1	2	2	13	1	53	62	56	200	96	2	16	8
Louisiana Heron	1	5	0	1	0	1	59	29	22	50	33	27	7	5
Black-crowned Night Heron	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White Ibis	3	0	1	0	27	0	51	5	20	300	85	214	10	22
Cooper's Hawk	0	0	0	0	0	0	0	0	0	0	0	0	0	0
American Avocet	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Royal Tern	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Sandwich Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caspian Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black Skimmer	0	0	0	0	0	0	3	25	0	0	0	0	0	0
<u>Undetermined</u>														
Merlin	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4b. Avian species noted from 28 November, 1978 - 24 April, 1979 on census route B, area 2.

	Nov. 28	Dec. 15	Dec. 27	Jan. 12	Jan. 26	Feb. 8	Mar. 2	Mar. 19	Apr. 6	Apr. 24
<u>Endangered</u>										
Wood Stork	2	11	13	2	0	6	0	0	0	0
<u>Threatened</u>										
Brown Pelican	0	0	4	4	12	5	1	0	0	0
Southern Bald Eagle	0	0	1	0	0	0	1	0	0	0
Osprey	0	0	0	0	0	0	0	0	0	0
Least Tern	0	0	0	0	0	0	0	0	0	0
Florida Scrub Jay	0	0	0	0	2	0	0	0	0	0
<u>Rare</u>										
Reddish Egret	0	0	0	0	0	0	0	0	0	0
Roseate Spoonbill	0	0	0	0	0	0	0	0	0	0
<u>Special Concern</u>										
Little Blue Heron	0	0	0	0	0	0	0	0	0	0
Great Egret	2	27	2	9	1	2	6	8	10	13
Snowy Egret	1	101	3	21	0	1	19	4	1	28
Louisiana Heron	7	11	4	10	0	4	3	0	1	3
White Ibis	3	40	75	43	14	1	51	8	25	39
American Avocet	0	0	0	0	0	0	0	0	0	0
Royal Tern	0	0	3	0	0	0	0	0	0	0
Caspian Tern	0	0	0	0	0	0	0	0	0	0
Black Skimmer	0	0	75	75	0	0	0	0	0	0

Table 4c. Avian species noted on route B, in area 3.

AREA 3

	Sept. 24	7	Oct. 21	4	Nov. 18	Dec. 2
<u>Endangered</u>						
Wood Stork	0	0	0	0	0	3
Peregrine Falcon	0	0	0	0	0	0
<u>Threatened</u>						
Brown Pelican	16	14	39	11	0	0
Southern Bald Eagle	0	0	0	0	0	0
Osprey	0	2	0	0	0	0
Florida Scrub Jay	0	0	0	0	0	1
<u>Rare</u>						
Reddish Egret	0	0	0	0	0	2
Roseate Spoonbill	0	0	0	0	0	0
American Redstart	0	0	0	0	0	0
<u>Special Concern</u>						
Little Blue Heron	0	0	2	2	2	6
Great Egret	4	4	0	0	0	7
Snowy Egret	1	4	0	0	0	3
Louisiana Heron	0	1	0	0	0	0
Black-crowned Night Heron	0	0	0	0	0	0
White Ibis	4	21	0	0	0	3
Royal Tern	235	309	197	21	0	0
Sandwich Tern	0	3	0	0	0	0
Caspian Tern	10	22	4	41	0	0
Black Skimmer	0	2	0	0	0	0
<u>Undetermined</u>						
Merlin	0	0	0	0	0	0
Florida Burrowing Owl	0	0	0	0	0	0

Table 4c. Total species noted on route B in area 3.

	Dec.		Jan.		Feb.		Mar.		Apr.		May	
	14	30	12	25	10	23	9	23	6	20	4	18
<u>Endangered</u>												
Wood Stork	2	6	0	3	3	6	1	0	0	0	0	0
<u>Threatened</u>												
Brown Pelican	4	19	9	4	0	1	0	0	23	10	5	2
Southern Bald Eagle	0	0	0	0	0	0	0	0	0	0	0	0
Osprey	1	0	0	0	0	0	0	0	0	0	0	0
Least Tern	0	0	0	0	0	0	0	0	0	0	20	6
Florida Scrub Jay	3	3	2	3	0	9	0	7	7	3	1	0
<u>Rare</u>												
Reddish Egret	0	1	0	0	0	0	0	0	0	0	0	0
Roseate Spoonbill	0	0	0	0	0	0	0	0	0	0	0	0
<u>Special Concern</u>												
Little Blue Heron	2	1	2	0	0	1	0	1	0	0	0	0
Great Egret	4	1	3	1	0	5	0	1	2	2	0	16
Snowy Egret	2	5	4	1	2	9	0	3	2	3	2	200
Louisiana Heron	0	0	1	0	1	0	0	1	0	0	1	8
Black-crowned Night Heron	0	0	0	0	0	0	0	0	0	0	0	0
White Ibis	48	15	5	0	0	8	0	7	1	3	0	200
American Avocet	0	0	0	0	0	0	0	0	0	0	0	16
Royal Tern	57	0	21	0	0	0	100	0	287	66	61	0
Caspian Tern	0	2	0	0	0	0	0	0	2	0	0	0
Black Skimmer	0	0	0	0	0	23	24	7	0	181	80	5

Table 4c. Avian species noted on Route B, area 3.

	June		July		August		September		October			November			December			
	1	15	28	12	26	9	23	6	6	20	3	17	29	3	17	29	15	
<u>Endangered</u>																		
Wood Stork	0	0	0	0	0	0	0	0	1	0	0	0	0	5	10	3	9	
Peregrine Falcon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
<u>Threatened</u>																		
Brown Pelican	2	2	0	2	2	0	1	46	14	61	46	39	22	16	16	36		
Southern Bald Eagle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Osprey	1	0	0	0	0	1	2	2	1	1	0	0	1	0	0	1		
Least Tern	11	0	0	0	0	2	100	0	0	0	0	0	0	0	0	0		
Florida Scrub Jay	0	9	6	0	0	9	0	0	0	2	0	0	9	5	9			
<u>Rare</u>																		
Reddish Egret	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
Roseate Spoonbill	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	
<u>Special Concern</u>																		
Little Blue Heron	0	1	1	0	0	0	0	0	0	0	0	0	2	0	0	2		
Great Egret	0	1	0	5	1	2	0	2	1	0	1	30	3	2	2	3		
Snowy Egret	16	14	1	7	0	1	2	15	0	0	1	55	4	3	5	5		
Louisiana Heron	0	2	1	0	0	1	0	4	25	0	2	2	6	1	2			
Black-crowned Night Heron	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0		
White Ibis	0	0	0	0	0	0	0	0	0	0	10	25	0	3	5	0		
American Avocet	0	4	0	0	0	0	0	0	2	0	0	0	0	0	0	0		
Royal Tern	0	0	0	0	0	66	93	110	250	0	3	0	100	0	130			
Caspian Tern	0	0	0	0	0	0	0	1	0	0	12	0	0	0	7			
Black Skimmer	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0		

Table 4c. Species noted on route B, in area 3

	Dec. 27	Jan. 10 24	Feb. 7 21	Mar. 7 21	Apr. 4 18	May 2
<u>Endangered</u>						
Wood Stork	0	3 11	4 6	3 9	16 1	0
<u>Threatened</u>						
Brown Pelican	1	9 3	7 6	0 3	0 0	93
Southern Bald Eagle	0	0 0	0 0	0 0	0 0	0
Osprey	0	0 0	0 0	0 0	0 0	0
Least Tern	0	0 0	0 0	0 0	15 10	10
Florida Scrub Jay	2	3 0	0 0	8 0	0 0	3
<u>Rare</u>						
Roseate Spoonbill	0	0 0	0 0	0 0	0 0	0
<u>Special Concern</u>						
Little Blue Heron	0	0 0	0 1	0 1	0 0	0
Great Egret	1	1 7	4 3	0 3	0 0	1
Snowy Egret	0	5 6	1 1	2 2	1 15	15
Louisiana Heron	0	1 3	0 0	2 2	0 0	2
Black-crowned Night Heron	0	0 0	0 0	0 0	0 0	0
White Ibis	2	8 0	0 4	2 1	0 0	1
Cooper's Hawk	0	0 0	0 0	0 0	0 0	0
American Avocet	6	0 5	0 10	0 1	0 0	0
Royal Tern	20	40 3	26 0	0 0	48 200	100
Caspian Tern	0	0 0	0 0	0 0	0 0	0
Black Skimmer	0	20 0	0 0	0 23	0 12	63

Table 4-3. Avian species noted on route B, in area 3.

	May		June		July		Aug.		Sept.		Oct.		Nov.	
	16	30	19	28	12	26	9	23	6	20	4	18	1	15
<u>Endangered</u>														
Wood Stork	0	0	0	63	0	1	0	0	0	0	0	1	0	3
Peregrine Falcon	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Threatened</u>														
Brown Pelican	0	1	14	0	12	18	8	94	72	23	19	109	51	20
Southern Bald Eagle	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Osprey	0	0	1	0	0	2	1	0	2	0	0	1	0	0
Least Tern	0	5	25	0	20	50	0	0	0	0	0	0	0	0
Florida Scrub Jay	3	8	0	4	0	3	0	0	6	3	6	0	0	4
<u>Rare</u>														
Reddish Egret	0	0	0	0	1	1	1	1	1	1	1	1	6	3
Roseate Spoonbill	0	0	0	5	0	0	3	0	0	0	0	0	0	0
American Redstart	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<u>Special Concern</u>														
Little Blue Heron	0	0	0	0	0	0	1	0	0	1	1	0	0	1
Great Egret	1	0	1	20	1	2	3	1	10	0	1	2	0	3
Snowy Egret	2	6	2	100	0	1	2	0	2	0	5	0	0	3
Louisiana Heron	2	3	0	0	0	5	4	3	0	4	1	3	0	1
Black-crowned Heron	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White Ibis	1	1	0	38	0	0	4	0	0	0	0	0	0	0
Cooper's Hawk	0	0	0	0	0	0	0	0	0	0	0	0	0	0
American Avocet	0	12	0	1	0	0	0	0	15	21	0	62	0	74
Royal Tern	55	15	68	100	125	61	300	125	500	300	175	250	210	500
Sandwich Tern	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caspian Tern	0	0	0	0	0	0	0	5	3	5	0	2	15	0
Black Skimmer	76	54	78	75	15	14	5	0	0	5	0	0	0	0
<u>Undetermined</u>														
Merlin	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4c. Avian species noted from 28 November, 1978 - 24 April, 1979 on census route B, area 3.

	Nov. 28	Dec. 15	Dec. 27	Jan. 12	Jan. 26	Feb. 8	Mar. 2	Mar. 19	Apr. 6	Apr. 24
<u>Endangered</u>										
Wood Stork	0	0	2	2	3	1	1	2	0	0
<u>Threatened</u>										
Brown Pelican	58	55	74	26	7	4	0	6	0	15
Southern Bald Eagle	0	0	0	0	0	0	0	0	0	0
Osprey	0	1	1	0	0	0	1	1	0	0
Least Tern	0	0	0	0	0	0	0	0	0	2
Florida Scrub Jay	0	4	0	0	0	2	0	4	0	0
<u>Rare</u>										
Reddish Egret	1	0	0	0	0	0	0	0	0	0
Roseate Spoonbill	0	0	0	0	0	0	0	0	0	0
<u>Special Concern</u>										
Little Blue Heron	2	0	0	0	1	3	0	0	0	0
Great Egret	2	0	3	1	6	6	13	3	1	4
Snowy Egret	2	0	2	0	4	0	23	4	0	8
Louisiana Heron	3	0	0	0	3	0	1	1	1	0
White Ibis	1	0	0	0	0	20	4	0	0	7
American Avocet	105	24	14	0	0	0	0	0	0	0
Royal Tern	120	300	25	70	0	0	20	65	250	200
Caspian Tern	5	0	0	0	1	0	0	0	0	0
Black Skimmer	0	0	0	0	0	0	0	15	0	42

Table 5. The mean, standard deviation, range, and coefficient of variation for birds noted on census route A.

<u>Bird</u>	<u>Mean</u>	<u>Standard Deviation</u>	<u>Range</u>	<u>Coefficient of Variation</u>
Brown Pelican	4.2	5.1	0 - 22.0	121.8
Great Egret	34.1	36.6	3.0-158.0	107.4
Snowy Egret	75.7	108.3	1.0-502.0	143.1
Reddish Egret	0.1	.9	0 - 7.0	611.6
Louisiana Heron	21.3	40.0	0 -302.0	187.4
Little Blue Heron	3.8	7.0	0 - 32.0	180.7
Black-crowned Night Heron	.02	.1	0 - 1.0	761.6
Wood Stork	11.2	14.0	0 - 79.0	125.4
White Ibis	74.6	106.9	0 -544.0	143.3
Roseate Spoonbill	4.5	12.8	0 - 75.0	287.0
Southern Bald Eagle	1.2	1.5	0 - 5.0	114.5
Osprey	1.2	1.5	0 - 6.0	123.7
Peregrine Falcon	.02	.1	0 - 1.0	744.6
Least Tern	6.3	26.4	0 -176.0	416.2
Royal Tern	.7	3.5	0 - 27.0	516.5
Caspian Tern	1.1	3.0	0 - 17.0	267.8
Black Skimmer	12.2	27.5	0 -150.0	226.5
Florida Scrub Jay	8.9	6.3	0 - 23.0	71.3

Table 6. The mean, standard deviation, range, and coefficient of variation for birds noted on census route B.

<u>Bird</u>	<u>Mean</u>	<u>Standard Deviation</u>	<u>Range</u>	<u>Coefficient of Variation</u>
Brown Pelican	38.3	35.4	2.0-132.0	92.3
Great Egret	55.0	89.5	3.0-704.0	162.7
Snowy Egret	119.3	113.0	7.0-537.0	94.7
Reddish Egret	0.5	1.0	0 - 7.0	223.6
Louisiana Heron	30.6	24.9	0 -154.0	81.6
Little Blue Heron	8.3	13.6	0 - 73.0	164.7
Black-crowned Night Heron	0.4	1.2	0 - 8.0	292.3
Wood Stork	16.1	14.4	0 - 68.0	89.4
White Ibis	114.3	97.4	0 -415.0	85.2
Roseate Spoonbill	12.1	21.7	0 - 96.0	178.9
Coopers Hawk	0.01	0.1	0 - 1.0	824.6
Southern Bald Eagle	0.4	0.6	0 - 2.0	147.8
Osprey	4.5	4.7	0 - 17.0	103.8
Peregrine Falcon	0.1	0.6	0 - 3.0	394.3
Merlin	0.8	5.3	0 - 40.0	665.0
American Avocet	4.2	15.2	0 -105.0	365.2
Least Tern	4.7	15.6	0 -100.0	328.8
Royal Tern	96.5	107.9	0 -505.0	111.8
Sandwich Tern	0.04	0.4	0 - 3.0	824.6
Caspian Tern	4.1	8.1	0 - 42.0	196.4
Black Skimmer	29.2	46.9	0 -181.0	160.5
Florida Burrowing Owl	0.01	0.1	0 - 1.0	824.6
Florida Scrub Jay	6.9	6.5	0 - 29.0	93.6
American Redstart	0.07	0.6	0 - 5.0	818.5

Table 7-1. Species and number of birds found in the Haulover Colony.

Haulover Colony

Island #62

Great Blue Heron	10	Snowy Egret	200
*Green Heron	1	Louisiana Heron	300
Little Blue Heron	2	Black-crowned Night Heron	5
*Cattle Egret	1000	Glossy Ibis	30
Reddish Egret	1	White Ibis	500
Great Egret	10		

Island #63

No Birds

No Birds

Island #65

*Cattle Egret	175	*Green Heron	1
Louisiana Heron	15	Snowy Egret	10

Island #66

*Cattle Egret	1500	Louisiana Heron	350
Great Egret	30	Little Blue Heron	1

*Species not under study, but included for completeness.

Table 7-2. Species and number of birds found in the Moore Creek Colony

Moore Creek Colony

First Island

*Great Blue Heron	1	Wood Storks	135
Great Egret	20	Glossy Ibis	5
Snowy Egret	300	White Ibis	20
Louisiana Heron	300		

Second Island

*Double-crested Cormorants	75	Louisiana Heron	1000
*Anhinga	100	Black-crowned Night Heron	15
*Great Blue Heron	3	Wood Storks	1
Great Egret	20	Glossy Ibis	20
*Cattle Egret	1500	White Ibis	500
Snowy Egret	15		

Fourth Island

*Double-crested Cormorants	125	Great Blue Heron	13
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East Side of Moore Creek

*Anhinga	125	Snowy Egret	125
*Great Blue Heron	1	Louisiana Heron	150
*Green Heron	2	Glossy Ibis	5
Little Blue Heron	1	White Ibis	900
*Cattle Egret	5	*Least Bitten	10
Great Egret	15		

*Species not under study, but included for completeness.

Table 7-3. Species and number of birds found in the Banana River Colony

<u>Banana River Colony</u>			
<u>Island #3</u>			
*Florida Duck	2		
<u>Island #5</u>			
Least Tern	30		
<u>Island #6</u>			
*Laughing Gull	80	Black Skimmer	150
<u>Island #7</u>			
Caspian Tern	1	Black Skimmer	30
<u>Island #8</u>			
*Laughing Gull	75		
<u>Island #9</u>			
*Laughing Gull	30	Black Skimmer	10
<u>Island #10</u>			
*Laughing Gull	10		
<u>Island #11</u>			
*Florida Duck	2	Black Skimmer	5
<u>Island #13</u>			
Royal Tern	625		
<u>Island #14</u>			
Royal Tern	400		
<u>Island #15</u>			
*Florida Duck	1	Caspian Tern	1
*Gull-billed Tern	20	Black Skimmer	10

*Species not under study, but included for completeness.

Table 7-3. Species and number of birds found in the Banana River Colony.

(Continued).

Banana River Colony

Island #17

*Laughing Gull 50

Island #18

*Laughing Gull	100	*	Royal Tern	300
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Island #19

*Laughing Gull 2

Island #28

Osprey 1

*Species not under study, but included for completeness.

Table 7-4. Species and number of birds found on Bird Island.

<u>Bird (Crane) Island</u>			
Brown Pelican	400	*Cattle Egret	10
*Double-crested Cormorants	100	Great Egret	100
Great Blue Heron	40		

*Species not under study, but included for completeness.

Table 7-5. Species and number of birds found in Peacock Pocket's Heronry.

<u>Peacock Pocket's Heronry</u>			
*Great Blue Heron	10	Great Egret	15

*Species not under study, but included for completeness.

Table 7-6. Species and number of birds found in Picnic Island Heronry.

<u>Picnic Island Heronry</u>			
*Double-crested Cormorants	10	Great Egret	10
*Anhinga	15	Louisiana Heron	20
*Great Blue Heron	3	White Ibis	5
Snowy Egret	75		

*Species not under study, but included for completeness.

Table 7-7. Species and number of birds found in the colony between L.C. 39A & B.

*Double-crested Cormorants	50	*Green Heron	53
*Great Blue Heron	2		

*Species not under study, but included for completeness.

Table 8. Birds observed at the L.C. 39B study site.

Date	Wood Stork		Brown Pelican		Osprey		Least Tern		Reddish Egret		Roseate Spoonbill		Little Blue Heron			Great Egret			Snowy La. Heron		Black-crowned Night Heron		White Ibis		American Avocet		Royal Tern		Caspian Tern		Black Skimmer	
21 Oct. 76			1																							200	10					
4 Nov.			4																						309	22				2		
18 Nov.			5																						197	4						
2 Dec.			1																						21							
14 Dec.			0																						57							
30 Dec.			1																						0							
12 Jan. 77			9																						0							
25 Jan.			0																						0							
10 Feb.			0																						0							
23 Feb.			1																						0							
9 Mar.			0																						100					24		
27 Mar.			0																						0					7		
6 Apr.			0																						287	2				159		
20 Apr.			6																						86							
4 May			3																						4							
17 May			2																						16						5	
1 June			2																						0							
15 June			0																						0							
28 June			0																						0							
12 July			0																						0							
26 July			0																						0							
9 Aug.			0																						66							
23 Aug.			1																						93							
6 Sept.			27																						110	1				8		
16 Sept.			14										1												2							
6 Oct.			61																						3					12		
20 Oct.			6																						10							
3 Nov.			39																													
17 Nov.			7																													
29 Nov.			15																													
13 Dec.			1																							130					7	
27 Dec.			1																							6					20	

Data Not Available until 12 July 78.

Table 8 . Birds observed at the L.C. 39B study site. (Continued).

	Wood	Brown	Least	Reddish	Roseate	Little	Great	Snowy	La.	Black-	American	Royal	Caspian	Black
	Stork	Pelican	Tern	Egret	Spoonbill	Blue	Egret	Egret	Heron	La.	Black-	Tern	Tern	Skimmer
	Stork	Pelican	Tern	Egret	Spoonbill	Blue	Egret	Egret	Heron	La.	Black-	Tern	Tern	Skimmer
10 Jan. 78														
24 Jan.		3										3		
7 Feb.	0													
21 Feb.	3										10			
7 Mar.	0													
21 Mar.											1			0
4 Apr.												48		
18 Apr.		10										200		12
2 May		18	10									100		63
16 May												55		76
30 May		1	5								12	15		54
14 June		14	25									68		78
28 June	63				5						1	100		75
12 July		6	0	1			1					125		15
26 July		4	50	1				1	5			61		14
9 Aug.		5		1	3			1	2			300		5
23 Aug.		72		1								125		5
6 Sept.		49		1							15	500		3
20 Sept.		7		1		1			3		21	300	5	5
4 Oct.				1		1								
18 Oct.		39	1	1			2		3		62	200	2	
1 Nov.				6								200		15
15 Nov.	1	9		2		1	3	3	1		74	500		
28 Nov.		28		1		2	2	1	3		105	120	5	
15 Dec.		30									24	250		
27 Dec.		24						2			14	25		
12 Jan. 79		0					1					70		
26 Jan.		0				2	0	0	0		0	0		
8 Feb.							1					0		
2 Mar.							1					20		
19 Mar.		6					1							65
6 Apr.							1					150		
24 Apr.		3	2				2		1			100		12

Data Not Available until 12 July 78.

Table 9 . The mean, standard deviation, and range of the number of birds noted at the L.C. 39B study site.

Name	Mean	Standard Deviation (±)	Range
Wood Stork	1.9	9.3	0-63
Brown Pelican	8.2	15.1	0-61
Osprey	2.1	9.7	0-1
Least Tern	6.4	17.4	0-100
Reddish Egret	0.3	0.8	0-6
Roseate Spoonbill	0.1	0.7	0-5
Little Blue Heron	0.4	0.7	0-2
Great Egret	0.9	1.0	0-3
Snowy Egret	0.6	1.0	0-3
Louisiana Heron	0.9	1.5	0-5
White Ibis	0.3	1.1	0-5
American Avocet	5.8	17.8	0-105
Royal Tern	85.8	117.6	0-500
Caspian Tern	2.5	12.7	0-22
Black Skimmer	10.8	27.4	0-159