

REVIEW AND APPROVALS

SANTEE NATIONAL WILDLIFE REFUGE
Summerton, South Carolina

ANNUAL NARRATIVE REPORT

Calendar Year 1990

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Refuge Manager Date

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Associate Manager Date

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Regional Office Approval Date

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K. FEEDBACK

INTRODUCTION

The Santee National Wildlife Refuge is located in Clarendon County in the upper coastal plains region of South Carolina. The refuge was established on January 1, 1942 primarily to alleviate the loss of natural waterfowl habitat caused by the construction of hydro-electric power and navigational projects on the Santee and Cooper Rivers. Except for some 4,400 acres of fee title land, the refuge is superimposed on lands and waters of the 110,000-acre Lake Marion reservoir which is administered by the South Carolina Public Service Authority (SCPSA).

The refuge is physically divided into four geographically separated management units containing 9,000 acres of open water, 1,445 acres of shallow freshwater marsh, 2,350 acres of timberland, 750 acres of agricultural lands, and 1,550 acres of early successional fields. The primary objective of Santee is to annually provide wintering habitat for some 8,000 Canada geese and 50,000 ducks. Special emphasis is placed on managing specific habitat for the wood duck. In addition, emphasis is placed on management of the red-cockaded woodpecker, an endangered species.

Included in the refuge is the 420-acre Dingle Pond Unit which is a designated Public Use Natural Area. This unit consists primarily of a Carolina Bay and as such is of local geological significance. The 163-acre Plantation Islands area and Little Pine Island are proposed for inclusion in the National Wilderness Preservation System. However, the proposal has not yet been signed by the president. Historic sites within the refuge and listed in the National Register include the Santee Indian Mound, the site of Fort Watson of Revolutionary War fame. This site is also listed in the South Carolina register of historical sites.

A fifty-year lease agreement between the USFWS and the SCPSA became effective in 1975. This lease completely altered the water boundary and changed much of the land boundary from the original lease. Provisions in the lease permitted the posting of mutually agreed upon boundaries which would become official refuge boundaries once officially surveyed. Both land and water boundary surveys were completed in 1985 and final approved maps from the SCPSA in 1986.

A. HIGHLIGHTS

The long, hot, dry summer was tough on plants and animals, only 33% of normal rainfall for June and July. (Section B.1)

Logging activities around the Indian mound became very controversial. (Section D.4)

The fall flight of Canada geese to the refuge was the lowest ever recorded. (Section G.3)

Jerry Fringeli arrived at the end of January to fill the assistant manager vacancy. (Section E.1)

Special funding was made available to cleanup after Hurricane Hugo passed through. (Section E.5)

Over 12 inches of rain in mid-October saved the expense of pumping to flood impoundments for wintering waterfowl. (Section F.2)

Major repairs on two pumps made a negative highlight. (Section I.2)

A "Partners for Waterfowl" project was completed. (Section F.15)

Refuge staff discovered a new bald eagle nest near the Pine Island Unit. (Section G.2)

Despite habitat damage done by Hurricane Hugo, the colony of red-cockaded woodpeckers raised young. (Section G.2)

Nesting by great blue herons is increasing. (Section G.4)

No deer hunting occurred in 1989, but the harvest in 1990 almost doubled that of 1988. (Section H.8)

With a quota to band 400 preseason wood ducks, the staff banded 588. (Section G.16)

For the first time, marijuana was found planted on the refuge---122 plants. (Section H.17)

B. CLIMATIC CONDITIONS

Normal climatic conditions for central South Carolina typically consist of hot humid summers and mild winters. Rainy seasons normally occur during late winter/early spring, late summer, and early fall. Annual mean temperature and precipitation based on a 30-year average is 63.5 oF and 46.36 inches, respectively.

This year precipitation totaled 43.17 inches, considerably less than last year's, 54.85 inches and occurred on 69 days. The refuge experienced a lack of rain in mid-summer and adversely affected the corn.

The summer was hot at times with temperatures breaking 100 oF during June, July, and August, and exceeding 90 oF during four other months. Refer to Table 1.

Table 1. Climatological data on Santee Refuge, 1990

Month	Precipitation (inches)				Temperatures (oF)		Average		Lake 1st of Mth
	Total	30-yr Avg	-Avg +Avg	No. Days Rain	Max o F.	Min o F.	Max o F.	Min o F.	
JAN	2.38	3.44	-1.06	3	80	26	50	34	74.25
FEB	2.42	3.67	-1.25	7	85	27	59	35	77.00
MAR	1.78	4.66	-2.88	4	89	29	67	42	76.85
APR	1.99	3.51	-1.52	4	94	40	76	51	75.40
MAY	4.20	3.35	+0.85	4	96	50	84	60	75.40
JUNE	1.65	3.82	-2.17	5	105	59	90	67	75.20
JULY	1.51	5.65	-4.14	6	105	65	92	70	74.80
AUG	9.05	5.63	+3.42	9	100	65	93	71	75.40
SEP	1.88	4.32	-2.44	5	99	46	84	64	75.20
OCT	12.66	2.58	+10.08	6	92	35	77	51	77.00
NOV	1.55	2.34	-0.79	3	84	33	67	41	74.30
DEC	2.10	3.38	-1.28	11	81	24	58	34	73.80

C. LAND ACQUISITION

2. Easement

The refuge was in the process of granting an easement to the Clarendon County Council for an existing road into an adjacent subdivision on Lake Marion, but I made the decision to drop the issue and continue maintenance of the road. The road branches off the entrance road and runs about 1/4 mile along the southern boundary of the Bluff Unit adjacent to a large subdivision 1/4 mile south of the office/VCS. The process for granting the easement was more trouble than the occasional maintenance.

3. Other

Farmers Home Administration Conservation Easements

Seven tracts were recommended by the Fish and Wildlife Enhancement office in Charleston, South Carolina for inclusion into the FHMA conservation easements program to be administered by Santee Refuge. Six tracts are located in Clarendon County and the other is located in Abbeville County, 150 miles from the refuge. All of the tracts were inspected by refuge personnel. Two of the tracts were determined to be significant enough for their biological or wetland resources to be included in the easement program. One of these was the Abbeville Tract. However, due to the distance and travel time that would be involved in putting an easement on this site, it was not recommended to be put in the program.

Since there was a disagreement between Enhancement and the refuge on placing an easement on six of the tracts, assistance of the Division of Wildlife and Habitat Management in the regional office was called upon to resolve the difference of opinion. James Burnett from Wildlife and Habitat Management, Bob Dodd from Enhancement and Asst. Mgr. Fringeli visited the sites on June 21 and 22nd. After the evaluations were completed, James Burnett recommended five of the tracts for inclusion into the program. Acreage of the five proposed easements totals approximately 364 acres depending on the final delineation of the boundaries. No additional information on the status of the tracts was received from the Division of Wildlife and Habitat Management following the June site inspection.

D. PLANNING

4. Compliance with Environmental and Cultural Resource Mandates

After Hurricane Hugo, a logging operation was brought in to salvage the most valuable of the damaged timber. On the Bluff Unit the loggers were advised to stay off the Indian Mound but could get the timber around it. However, the refuge staff was unaware of the archeological significance of the area around the mound and the logging operation damaged the area from an archeological viewpoint. The damage was done by skidders leaving deep tracks while working over moist soil. The deepest tracks were about 12 inches deep. Presently, no one knows how far out from the mound the archeological site extends.



According to archeologists these tracks left by the logging operation were very damaging to the archeological site.

(photo Fringeli)

An interagency meeting to evaluate the extent of damages to cultural resources, and to discuss mitigating actions & future management needs to the Santee Indian Mound site was held on May 4th at the refuge headquarters. Individuals present at the meeting were Pat Podriznik of the R.O., Dave Anderson - archaeologist with the National Park Service in Atlanta, Steve Smith - Deputy State Archaeologist with the S. C. Institute of Archaeology & Anthropology, Linda Stine of the S. C. State Historic Preservation Office, Chris Judge and Asst. Mgr. Fringeli. Based on an on-site inspection and ensuing discussion the following recommendations were made: 1) repair damage (tire ruts) caused by logging skidders to

prevent any further potential damages; 2) conduct a survey of the site to determine extent of any damages & locate boundaries of area containing cultural resources; 3) develop management plan for the site when boundaries have been delineated; 4) prohibit any further use of heavy equipment near the site; 5) as lead land management agency the USFWS must approve any future activities within the site, even those conducted by the lessee - the S.C. Dept. of Parks, Recreation and Tourism. These proposals were drafted by Pat Podriznik & Dave Anderson, but no money or action has come forth at year's end.



Indian mound after State Park cleanup. (JF)



Since the State Parks System leases the Indian Mound area from the Service, they contracted to have the logging debris removed.

(JF)

5. Research and Investigation

a. 43525-I-1 - Migration and Survival of Canada Geese Wintering in the Atlantic Flyway, with Special Emphasis on the Carolinas.

Emphasis was placed on neck collar observations, which were conducted weekly from geese arrival in late October to their departure in March. Observations were reported to the Cooperative Wildlife Research Unit at Cornell University with as many as 9 collar readings obtained in one observation.

In October the study by Cornell was terminated when they determined that enough data had been obtained to make management decisions. However, Patuxent Wildlife Research Center personnel wanted us to continue reading collars and to make efforts to place new and different (flexible) collars on more geese. The latter was unsuccessful because the geese could not be lured to the trap site.

b. Furbearer Census

Refuge personnel, Manager Bond, cooperated with the South Carolina Wildlife and Marine Resources Department in the annual statewide furbearer census. This ongoing study measures the frequency of occurrence of bobcat, raccoon, opossum, fox, etc. along established census routes in all 46 counties of the State. This study provides an index upon which

population figures can be based and is further used to monitor population trends statewide.

The two permanent transect lines in Clarendon County are located on the refuge, one at the Pine Island Unit and one on the Bluff Unit. These lines each used 10 prepared one meter circles over a two mile distance. These circles are prepared one day and "read" the following morning. Information recorded was sent to the State Wildlife Department.

c. Acid Rain Station

The acid rain monitoring station installed on the Bluff Unit by NOAA in 1984 is still operational but, as reported in 1989, is operated by NOAA or their contractor.

d. Evaporation Station

In cooperation with the South Carolina Department of Health and Environmental Control, the refuge provides the site and the staff reads the instruments on an evaporation station, which is one of many they have in the general area. The staff takes daily readings on four thermometers, an anemometer, rain gauge and a device to measure evaporation. Biweekly rainfall samples are collected and bottled for laboratory analysis.

E. ADMINISTRATION

1. Personnel

Gerard C. "Jerry" Fringeli came onboard January 29th to fill the GS-11 Asst. Manager's position that had been vacant since August 1989. Jerry transferred here from the Hatchie Refuge Complex in West Tennessee.

A full-time FTE was lost at the end of 1989 with the retirement of a GS-9 Asst. Manager. This FTE went to a new refuge in North Carolina. The loss of this FTE dropped our number of permanent FTE's to six.

Table 2. Five Year Staff Pattern, Santee NWR

Year	Full-Time	Part-Time	Temporary	YCC	Volunteer
1990	6	0	0	2	2
1989	6	0	0	2	2
1988	7	0	0	0	0
1987	6	0	1	0	5
1986	7	0	0	4	9



(selftimer by GB)

1 5 4 3 6 2

<u>Name/Title</u>	<u>Grade</u>	<u>EOD</u>	<u>Status</u>
1. Glen W. Bond, Jr., Refuge Manager	GS-12	08/84	PFT
2. Gerard C. Fringeli, Supervisory ROS	GS-11	01/90	PFT
3. Edward M. Stuckey, Range Technician	GS-07	06/62	PFT
4. Rufus Gaymon, Office Assistant	GS-06	08/78	PFT
5. John H. Johnson, Automotive Mechanic	WG-10	07/77	PFT
6. Bobby L. Pearson, Tractor Operator	WG-07	08/88	PFT

2. Youth Programs

Two enrolles were selected to participate in the YCC program. Quincy Johnson of Summerton and Llewlyn Walters of Elloree started their eight-week detail on June 4th. Both enrolles were brought in for one hour prior to the start of the program to familiarize them with their job duties, fill out required forms and to answer questions. Their duties included litter pickup, nature trail maintenance, boundary sign maintenance, clearing brush along roads and levees, cleaning vehicles and equipment, mowing grass, ground maintenance and assisting the refuge staff on various assignments. Both enrolles were good workers and a lot was accomplished during their eight weeks at the refuge. Quincy's detail ended on July 27. Llewlyn took off one week in the middle of the program, extending his last work day to August 3rd.



Two good YCC'ers, Quincy Johnson (L) and Lew Walters.
(GB)

4. Volunteer Program

One volunteer donated time to assist on the refuge during the year. Harold "Fuzzy" Furse, a local waterfowl hunter and enthusiast, contributed many hours from April through August checking wood duck boxes. He kept nesting data on the boxes and reported needed repairs. Fuzzy is concerned about the waterfowl resource and this attitude showed in the quality of his work. He also kept the staff informed of other wildlife activities

and sightings, and any unusual happenings on the refuge. This was helpful since most of the time he spent on the refuge was during off-duty hours. Since Fuzzy worked alone and didn't keep an accounting of the hours that he spent checking nesting boxes we estimated that he donated 110 hours during the year.

5. Funding

Initial funding allocated for FY-90 WAS \$305.3K. By the end of the year four revisions were made; 1) \$50K were added for Hurricane Hugo damages, cleanup and repairs; 2) \$10K were transferred to Carolina Sandhills NWR for new equipment; 3) \$2.5K were received for the YCC program; and 4) \$1.1K were taken out of the GSX contaminate study and transferred into a no-year fund. This brought the final funding level to \$346.7K, a 12% increase over FY 89. Without the Hurricane Hugo cleanup monies our base operations budget would have been less than last FY's funding level.

Refer to Table 3 for funding comparisons.

Table 3. Five-Year FY Funding Allocations (\$1,000's)

Sub-Activity	1990	1989	1988	1987	1986
1120		1.0	0.5		
1260				229.6	229.6
1261	203.3	204.7	163.1		
1262	93.4	88.3	112.4		
1520					5.2
6860				3.0	3.0
2821	50.0				
TOTAL:	346.7	294.00	276.0	232.6	237.8

6. Safety

Staff safety meetings were held on a monthly basis. Meetings usually consisted of a safety film followed by a discussion of the film and other relevant safety topics. A variety of topics were covered ranging from defensive driving, chain saw operations, proper lifting techniques, CPR, operating heavy equipment, identifying hazards, and personal protective equipment. YCC enrolles also attended the meetings during the summer program.

Fortunately, no accidents requiring medical attention or involving lost time off the job occurred during the year. A total of 393,421 staff hours have been worked since the last lost time accident in 1966.

F. HABITAT MANAGEMENT

1. General

Ongoing evaluation of habitat and land use was a priority item in 1990. The Moist Soil, Croplands, and Non-Forested Upland Management Plan was followed during the year and resulted in substantial habitat improvement.-

2. Wetlands

a. Pine Island Unit

This unit is unique in that greentree reservoirs, moist soil habitat, and permanent open waters are present. Moist soil areas were brought to a summer elevation of 76.2' MSL in March. Summer elevations fluctuated moderately requiring periodic pumping and dewatering to maintain desired wetland conditions. In June/July water levels were allowed to decrease to facilitate the discing and planting of about 15 acres to Japanese millet. The 15 acres were divided among three small areas that could be flooded at the full pool level of 77.4 ft. MSL. After the millet was planted in July, the water level was brought back to 76.2 ft. MSL. Two of the areas had good stands and large seed heads while the other area near Woods Pond had practically no germination. We had no clue as to the difference but it could have been soil pH.



A good stand of Japanese millet on the Pine Is. Unit. (JF)

In October, over 12 inches of rain fell and we had to release water to maintain 77.4 ft. MSL. At least we didn't have to pump to fill the impoundment for the winter's waterfowl.

b. Dingle Pond Unit

The Dingle Pond Unit is a designated Public Use Natural Area. A single access road which traverses the unit on its southern extremity is maintained solely for management and maintenance access. The only other development is a low level dike and concrete water control structure used in past years to control water levels within the 290-acre pond. In more recent years the water control structure has been filled with a permanent plug allowing the pond to revert to its natural character as a Carolina Bay. As in previous years, pool levels in 1990 were dictated by precipitation and evaporation. During the summer water level fell well below the spillway, but at year's end water was flowing over the spillway. The spillway elevation is necessary to prevent flooding a state highway.

c. Cuddo Unit

Six wetland management areas have been identified on the Cuddo Unit, and are connected to the main water source via a system of canals and water control structures. The main water source is a 48-inch reversible, high capacity pump located at Black Bottom, a part of Lake Marion. From this location all impoundments and wetland areas can be inundated and dewatered. Dewatering can also be done by gravity flow through a 36-inch screwgate on the Potato Creek side. In addition, the Cuddo Unit contains permanent water and green timber reservoirs.

In 1990 the entire unit was managed as a single unit, although there are several water control structures in the overall system. In January 1990 maximum water elevations of 76.0' MSL were maintained throughout the unit ensuring shallow inundation in green timber reservoirs and moist soil areas. With only minor fluctuation, this elevation was maintained through the winter and early spring months until drawdown was initiated during mid-March. A summer elevation of 74.5' MSL was maintained throughout the summer months until flooding was begun in mid-October by heavy rains.

Timber Island Field can be and is managed separately from the remaining Cuddo Unit wetlands system. Having its own in/out pumps, the field was flooded at least 12 inches deeper than the main system in winter and drained in summer. During the summer, attempts to plant corn were made (about 28 acres) along with 30 acres of Japanese millet. Good growths of desirable as well as undesirable moist soil plants grew in with the corn and millet as well as in other areas of the 90- acre field.

Pump No. 3, which is the supply pump for the two upper contour levels of Timber Island Field, broke down and was not repaired or functional at year's end. However with control structures closed, rainfall starting in October, was adequate to allow several thousand ducks to use the field.

d. Bluff Unit

This is primarily a farming unit where waterfowl foods are produced on un floodable lands. In addition, there are two shallow ponds, Cantey Bay and Five-Pine Ponds, along with associated wetlands which provide habitat

for wintering waterfowl. Pool elevations during January were maintained at 76' MSL. However, fluctuating lake levels necessitated periodic pumping to maintain desired pool elevations. Spring drawdown was initiated in February and continued until summer pool of 73.0' to 74.0' MSL was reached. Even at these pool levels some acreage in Cantey Bay and Five-Pine Ponds remains inundated. During the dry summer, a five-acre area of Five Pine Pond was disced and seeded to Japanese millet, but very little of it even germinated and as of October hardly any seed heads could be found. Expansive beds of Hydrilla verticillate, a submergent aquatic plant generally considered a pest species on Lake Marion, was observed in all of Cantey Bay during the year. This species has expanded its local range on the lake in recent years, but only in the past three years has it been noted on the refuge in any significant amounts. Interesting to note was the utilization of these grass beds by wintering waterfowl. From the arrival of waterfowl concentrations in late October and November the major use area was the grass beds.

Since the installation of a pumping structure on the Bluff Unit, we have realized the canal which supplies water to this pump needs to be lengthened, widened, and deepened to ensure an adequate water supply during periods of extremely low lake levels which is almost annually. With the existing setup, water supply at low lake levels cannot keep up with the pump and pumping operations are prolonged when pump rpm's are reduced.

Winter flooding of pools and wetlands was initiated mid-October and continued until an elevation of 76.4' MSL was reached. At the maximum elevation of 77.0' MSL there are some areas within the dike that cannot be flooded. Pump problems in late October allowed Five Pine Pond to drain to lake level, 74 ft. MSL. The pump was still being repaired at year's end.

Table 4. Bluff Unit, Pumping Time - Fuel Consumption

	Month	Hours	Fuel
January			
Qtr 1	February	63	220
	March		
	April		
Qtr 2	May	111	219
	June		
	July		
Qtr 3	August	49	118
	September		
	October		
Qtr 4	November		
	December	0	0
Totals		223	557

Table 5. Pine Island, Pumping Time - Fuel Consumption, 1990

	Month	Hours	Fuel
1st Qtr	January	53.5	154
	February		
	March		
2nd Qtr	April	0	0
	May		
	June		
3rd Qtr	July	49	160
	August		
	September		
4th Qtr	October	17.5	18
	November		
	December		
Totals		120	332

Table 6. Cuddo Unit, Pumping Time - Fuel Consumption 1990

		Black Bottom		Timber Island Field					
				#1	#2		#3		
Qtr	Month	Hours	Fuel	Hours	Fuel	Hours	Fuel	Hours	Fuel
1st	Jan	83	148	24	52	47.5	43	0	0
	Feb								
	Mar								
2nd	Apr	20	27	0	0	0	0	10	42
	May								
	June								
3rd	July	0	0	39.5	55	0	0	0	0
	Aug								
	Sep								
4th	Oct	38.5	66	46.5	108	0	0	0	0
	Nov								
	Dec								
Total		141.5	241	110	215	47.5	43	10	42

3. Forests

Under permit No. SNT-0-1-38641 Winfield Shecut continued salvaging pine timber after Hurricane Hugo came through in September of 1989.

Some areas of the refuge survived Hugo better than others. Much of the Bluff Unit was nearly "clearcut" as was Pine Island on the Pine Island Unit and the Plantation Islands area of the Cuddo Unit. From a waterfowl standpoint the real damage came when much of the bottomland hardwoods, water and willow oaks, turned bottoms up. This takes away mast which we could flood in winter and cavity trees for wood ducks in summer. It seems that the larger the tree the easier it fell. Contributing factors to the bottomland hardwood devastation were shallow root systems caused by a high water table, moist soil and the tree still had a full set of leaves in September.

With all the timber to be salvaged in Hugo's path, we were fortunate to even get a logger. Of course prices are rather poor - \$15/cord for pine pulpwood and \$7/ton for pine sawtimber. Mr. Shecut paid the FWS a total of \$52,938 in FY 90 for timber he took off the refuge. Of this amount \$1793.63 went to the South Carolina Public Service Authority because FWS leases land from them as part of the refuge and the lease states that they are to receive any proceeds from timber sales on the leased land. A small area on the Pine Island Unit and all that on the Dingle Pond Unit account for the leased timber sale. Prices were so low on hardwood that it was decided not to salvage any.

4. Croplands

a. Bluff Unit

In Calendar year 1990 the Bluff Unit was force account farmed to corn and wheat. In January fields 3, 4, 6, 7, 12 and 13 were in wheat from fall of 1989 totaling 91 acres. This acreage was plowed under in early March for green manure. Corn was planted in these same fields in late March-early April with good success. A fallowed area near Cante Bay was also planted to corn -- about 5 acres. Crows were kept out this year by using a product called "Germate". It worked.

A long dry, hot summer was rough on the corn, but we got enough rain to make a decent crop.

In early November the 5-acre Cante Bay field was harvested for use as bait in an attempt to band geese. The remaining corn was mowed at the end of December.



Bobby Pearson harvests cob corn to be used for baiting Canada Geese.
(JF)

Beginning in early September, fields 1, 2, 5, 11, 9, 8a, 14 and 8b totaling 65 acres were disced and then planted to wheat in early October as green browse for waterfowl. However, at year's end, 65 acres were proving to be four times the amount needed, because peak populations occur at that time and one could hardly tell where they had fed.

Field 2 was replanted in November because the wheat seed germination was very poor - old seed.

b. Pine Island Unit

Pine Island consists of 869 acres of upland interspersed with marsh and moist soil areas. About 200 acres were kept open by mowing, burning, or disking. This year, October, 10 acres of land were disced for planting wheat but the ground was so dry and hard it did little good. A rain would be needed to soften the clay soil, and rain it did -- so much we were never able to put a tractor back in the fields. Therefore, no wheat was planted on the Pine Island Unit this year.

c. Cuddo Unit

In the distant past, over 1,000 acres were farmed on this unit, both cooperatively and force account. This year the acreage was less but the cooperative and force account methods were used.

Archie Stukes was the cooperative farmer and our agreement called for the refuge to furnish seed, fertilizer, nitrogen and pesticides for the corn. Mr. Stukes announced in January that he would not be farming the refuge again because of severe weed problems such as sicklepod and Johnsongrass. However, the acres of wheat he planted in the Fall of 1989 would be his to harvest. From the harvest in June he provided the refuge with 30 bu. to use as bait for wood duck banding. In the meantime another cooperative farmer was secured, James Richburg.

Mr. Stukes planted corn for us in March in fields Q3-7 and 8 totaling 34 acres and in Timber Island Field (20 acres), but the crows got all of it as it came up and the refuge staff replanted all 54 acres. (All our corn seed was donated by Northrup King Seed Company.) By the time we had completed replanting, it was April 26 and this is late for this part of the country. With the onset of dry, hot weather in June and July the crop made very little corn.

Cooperative farmer Richburg started planting soybeans in May using the no-till method. This was done in Fields Q1-1, 2, 4, 7, 9, Q2-1, Q3-5, 6, and Q4-4 for a total of 223 acres. With the dry weather the chemicals didn't work and grass and weeds took the fields. Many of the fields were simply disced under to plant wheat in the Fall, but he was able to harvest some or at least parts of some fields.

In November the corn in fields Q3-7 and 8 was mowed while that in Timber Island Field (Q3-9) was left standing because of wet conditions.

In the Fall Mr. Richburg planted wheat in fields Q1-4, 7, Q2-1, Q4-2, 3, 4, 5, 6, and 7 for a total of 211 acres.

10. Pest Control

Staff personnel applied minor amounts of Rodeo to aquatic vegetation at the Bluff Unit banding site. In addition, small amounts of Pramitol, a soil sterilant, was applied to the banding slope in an effort to eradicate vegetation. Our major pest control effort was chemical to control such species as Johnsongrass and Bermudagrass. Roundup was sprayed at 3 qts. per acre on 51 acres on the Bluff Unit in fields 2, 5, 8a, 9 and 11 and on the Cuddo Unit on 83 acres in fields Q4-6, and 7, and Round Island.

The cooperative farmer was permitted to apply approved chemicals for the control of noxious plant species on agricultural lands. These included Canopy, Bronco, Lasso, Dual Atrex, and Evik. The refuge staff used some of these chemicals on acreage for account farmed in corn. Germate was used on all corn seed planted by the staff. As noted previously, the Germate worked well in preventing crow damage.

Other chemicals applied to crops to control sicklepod and other weeds and grasses did poorly. This was probably due to a lack of rain at critical times.

Manager Bond held a South Carolina license for pesticide application.

12. Wilderness and Special Area

The 615-acre Dingle Pond Unit is a designated Public Use Natural Area. This area, being a Carolina Bay, is of both local and State geological significance. Because of this designation development and management of this unit is minimal, although it does have a water control structure that is permanently set to allow excess rainfall to spill into Lake Marion before backing out onto a nearby state highway.

15. Private Lands

A Partners for Waterfowl project that was started in 1989 was completed in early June. The project was on lands of Bill Griffin and consisted of two water control structures in a U-shaped dike around a 14-acre corn field. Located just 200 yards from the Wateree River, his plans are to pump water from the river to flood the area. This project was very labor intensive for the acres involved and will be the last of this type.



October rains filled up the Bill Griffin "Partners" project, although pipes were laid for pumping from the Wateree River just under the cameraman.
(State Biologist Baker)

Another "Partners" project met all the approvals and plans were formulated to complete the Len Villacres project in 1991. This will be a simple straight dike of about 500 ft. feathering into high ground on either end with one water control structure.

G. WILDLIFE

2. Endangered and/or Threatened Species

a. The American Alligator

The American alligator was removed from the endangered species list in 1987 and reclassified as threatened due to similarity of appearance with other species. This reclassification permits more liberal management of the species by the South Carolina Wildlife and Marine Resources Department statewide. Under new guidelines, the American alligator can be legally removed under strict guidelines which prevents or minimizes the useless slaughter of these animals considered to be nuisance or dangerous. Under the present guidelines, alligators can be removed only by a team of authorized persons who attempt to trap and relocate those "gators" which pose a problem to residential areas. If capture cannot be accomplished the animals are dispatched.



Alligators are numerous on the Cuddo and Pine Is. Units.
(JF)

Peak populations during 1990 remained at an estimated 200 . No population census was conducted during the year. Consequently, population estimates were based on casual observations. As reported in previous years, numbers seemed to decrease during the summer months when impounded waters were pulled down leaving only shallow impoundments and canals. It is during this time that "gators", particularly the larger ones, slip across dikes and levees into deeper water and shallow coves along the shoreline of Lake Marion. These animals normally return to the refuge with the fall flooding of impoundments and canals. Probably 95% of the refuge population is found on the Pine Island and Cuddo Units.

b. Southern Bald Eagle

The endangered status of the Southern Bald Eagle remained unchanged in 1990. Observations during the year increased over 1989 with monthly reported sightings. The majority of these sightings were reported on the Bluff and Pine Island Units.

No known nesting occurred on the refuge this year, but an eagle's nest on the refuge was first observed on December 21, 1988 and from general appearance and size appeared to be a new nest. The nest, located on the Pine Island Unit, was first observed from the air while flying the waterfowl survey, and periodic inspection of the site revealed two adult eagles tending the nest. However, they did not produce any young and even egg laying could not be confirmed. When hurricane Hugo ripped through the area, the nest was blown away, but the tree remains. At the beginning 1990 there was evidence the eagles (assumed to be the same pair) were in the area, and indeed their new nest was located in February about 1.5 miles on private property from the one Hugo blew away. Neither the State eagle coordinator nor refuge staff could document eggs or young. At the end of 1990 no eagles could be found around the nest.

c. Osprey

The Osprey was observed throughout the year with a peak of ten reported during the summer.

Numerous nests occur in dead tree snags off the refuge in Lake Marion and are used annually. This year a pair nested on the platform in Cante Bay that Bond and Stuckey put up four years ago. This is the only known nest on the refuge.

The species was observed on all units of the refuge with larger numbers reported at Pine Island and the Bluff Units.

d. Peregrine Falcon

No peregrine falcons were observed at Santee during calendar year 1990, but have been observed in past years.

e. Red-cockaded Woodpecker

Continued monitoring of the red-cockaded woodpecker (RCWP) colony at Pine Island indicates that the colony was active in 1990. This was the only active colony on the refuge, but since Hugo their future is in doubt. Six of nine cavity trees were eliminated by Hugo. Of the three remaining trees, one looked very good as a possible nesting cavity and indeed the pair used one of two cavities in that tree for nesting this year. In June they were observed feeding young. The number of young produced was not determined.

3. Waterfowl

Population figures have fluctuated dramatically during the past 10 years. However, the general trend in peak waterfowl populations is downward. Swans do not occur in significant numbers so any population changes are of little concern in the overall waterfowl picture.

a. Ducks

At the beginning of the year ducks peaked at 27,820 about the first week in January. This represents an increase of nearly 9,000 ducks from the peak reported in January 1989. As in prior years, the mallard was the most numerous species with a peak of 13,740. Green-winged teal peaked at 5,200 during January to become the second most abundant species followed by American widgeon at 4,300. The black duck, a priority species, peaked at 3,270 during the same period.

A very mild January and February were recorded with the high temperatures in the 60's and 70's. Combined with this and the end of hunting season, ducks dispersed almost immediately and by mid-February only 850 remained. The geese and swans seem to stay of the refuge until they are ready to migrate north which is usually mid-February. Canada geese increased almost 100% from January 1989 to peak at 1500 in early February. Tundra swans hit a peak of 48 in early February, which is probably the most swans ever recorded on the refuge.

The Fall of '90 brought about the same number of ducks as was present the past winter -- just different species heading the "most abundant" category. The year ended with widgeon and ring-necks peaking out at 10,800 and 10,765 respectively and mallards at 6,115. Black ducks and green-winged teal were way down to peaks of 365 and 1,395 respectively at year's end. Canada geese only peaked at 785 and tundra swans at 26.

Thousands

PEAK DUCK POPULATIONS

180
174
168
162
156
150
144
138
132
126
120
114
108
102
96
90
84
78
72
66
60
54
48
42
36
30
24
18
12
6
0

Year

1966 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 1997



Though smaller in size, the Bluff Unit supported the majority of the waterfowl in 1990 a peak of 18,185 being recorded in January. Cantey Bay, served as the primary loafing and feeding area. With cold fronts, which moved through the area, concentrations of mallards, blacks, and other dabblers utilized corn fields in January while divers remained on the open waters of Cantey Bay. However, all the corn was gone by the end of January. The warming weather along with the ending of the waterfowl hunting season, resulted in dispersal of the birds. The fall migration on this Unit peaked at 11,190, in December. It was interesting to note that the majority of divers and dabblers extensively utilized grass beds in Cantey Bay. At year's end no duck had been observed in the 1990 corn crop.

The Dingle Pond Unit is a designated Public Use Natural Area. Because of its size and physical character, Dingle Pond has never contributed significantly to the overall waterfowl management program at Santee. This unit, however, provides an abundance of excellent wood duck brood habitat. A peak of 105 ducks was estimated on Dingle Pond in January. This peak included small numbers of wood ducks, black ducks, mallards and ring-necks. In past years the eastern portion of Polly Cantey Bay which was a part of the refuge has supported minor concentrations of teal, ring-necks, wood ducks, mallards, and black ducks. However, with lease boundary line changes in 1985 a boundary line hunting situation has developed which has effectively eliminated waterfowl use of this area of the Dingle Pond Unit.

Pine Island has been set aside as a wetland management area, i.e. no row-crop farming. With the capacity to manipulate and maintain water at desired elevations, the unit consists of shallow pools, expanses of open wetland areas, and flooded timber, thus, providing a diversity of habitat for both divers and dabblers. With this management regime waterfowl use of the unit has improved in recent years but in a disproportionate amount to development. Waterfowl use of the area in 1990 was concentrated along the shoreline and the open waters of The Pasture, probably because of beds of aquatic grass. Small numbers of ring-necks utilized the Pine Island Pool and minor numbers of mallards, black, wood ducks, and g. w. teal utilized shallow flooded wetlands. The majority of divers, however, were to be found in the open waters and wood ducks in general preferred the flooded timber. Peak use of the unit was reached in mid-December with 8,400 ducks, including mallards, black duck, ring-necked, g. w. teal, bufflehead, widgeon, and gadwalls reported.

At the Cuddo Unit during 1990 duck numbers peaked at 11,295 in early January with a major use area being the Nelson's Cut area. Ring-necks, widgeon and mallards composed the majority. Major concentrations of birds were observed in Black Bottom and the shoreline inlets of Potato Creek. Minor numbers of ring-necks, and wood ducks utilized Black Bottom Impoundments, Still Creek, and Cattle Guard Wetlands. Goose Pen Pond received only minor use. Shallow impoundments within Timber Island Field were used by dabblers including mallards, blacks, teal, and ring-necks. However, once natural and supplemental foods were depleted these ducks

abruptly moved to other areas. Green timber reservoirs 1 and 2 received only minor use by wood ducks and black ducks, and insignificant use was reported in winter wheat and dry land corn fields. Gator Pond was used by as many as 2,000 ring-necks in January and December.

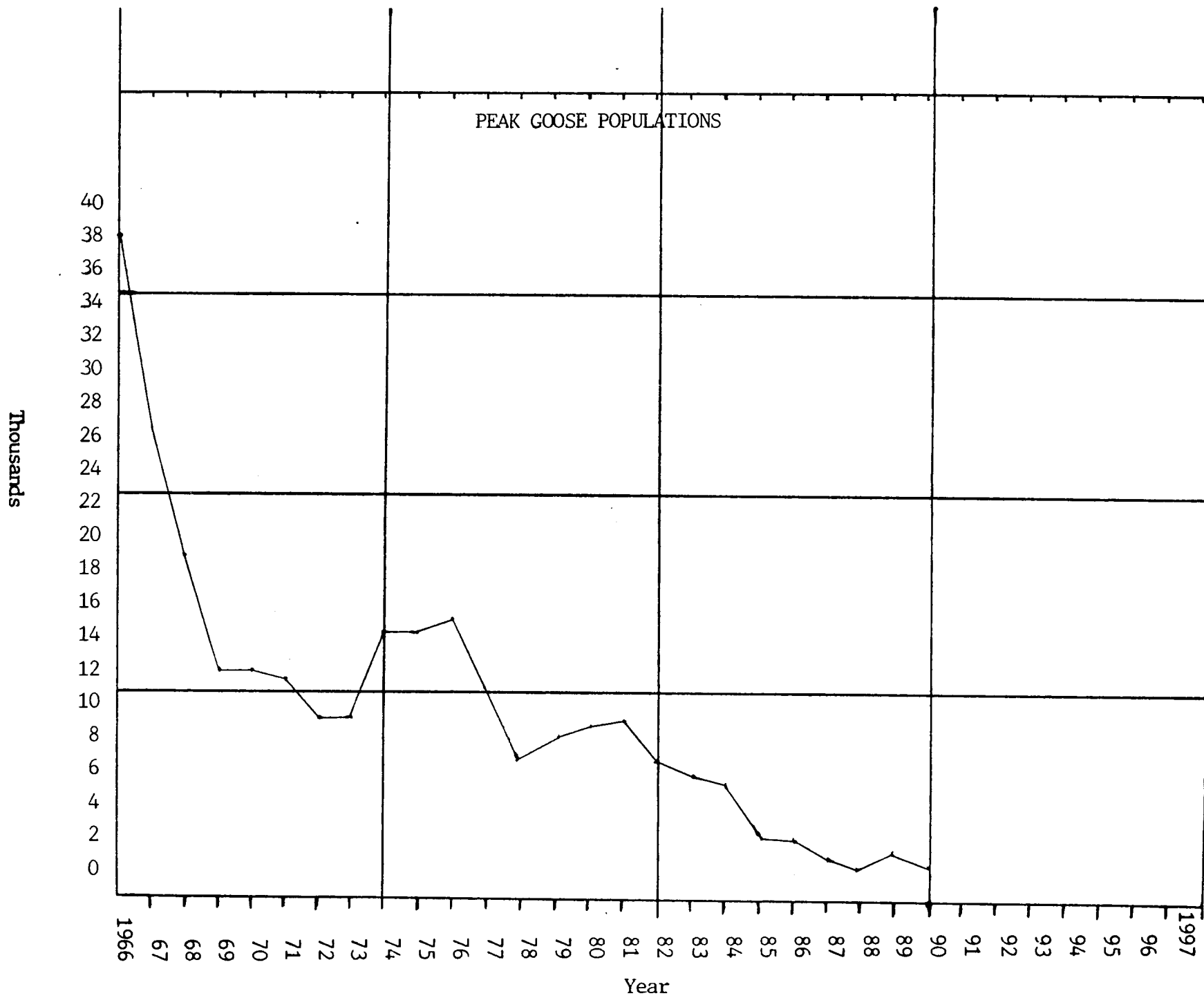
b. Geese

Canada Geese peaked at 1500 during early-February. This was nearly double from the previous year, but is still very low compared to a few years ago. Though temperatures remained in the 50's to 70's throughout much of January and February wintering concentrations did not disperse until late February. The first birds of the fall migration were observed in late September with 31 Canadas reported on the Bluff Unit. These could have been locals, but by October their number steadily increased until there were 600 on the refuge at year's end. Use by snows (blues) and white fronts is insignificant since there were less than 10 of each during the year.

Historically, the Bluff Unit has wintered the majority of geese at Santee. With the mild weather the birds preferred the shallow open waters of Cantey Bay, both loafing and feeding in grass beds. Winter wheat fields, B-2 and 11 received good use and manipulated corn fields were used considerably in January. With low lake levels, which persisted throughout the winter, exposed mud flats and shallow areas offered excellent loafing areas and seldom were birds observed off the unit. Though optimum habitat conditions existed, a combination of factors including summer-like weather, low lake levels, and the presence of the grass beds, effectively altered both feeding and loafing patterns. It should be noted that for the fourth consecutive year, geese were in Cantey Bay. When you speak of peak numbers and concentrations of geese in 1990 you are, at best, referring to rather small numbers. A peak of 1500 birds used the Bluff in February, and even this number seems large by comparison with the peak of 350 which occurred in mid-December 1988.

Only minor use of the Pine Island Unit was reported during the year, though winter browse was available. The birds preferred the open waters and mud-flats of "The Pasture". At no time were more than 260 geese observed, and that was only for a short period of time in late December when birds interchanged between the refuge units.

Up to 125 Canada geese utilized the Cuddo Unit during late November. However, only minimal use was made of green browse and corn fields, and geese preferred the shorelines of Black Bottom and Nelson's Cut. At no time during the year were the birds noted on the open waters of Lake Marion. Small numbers were observed in Timber Island Field, but when natural and supplemental foods were depleted, they retired to the shorelines and open water of Black Bottom and Nelson's Cut where they used the grass beds. Though there was an abundance of green browse and adequate corn available for fall flights, only once were the birds observed in a wheat field, field Q4-6.



c. Swans

Swans, though a curiosity, are of minor significance in the overall waterfowl picture at Santee. The species has occurred in small numbers for eight consecutive years and continue to be of interest to visiting groups. The 1990 peak of 47 occurred during February and were found on all Units except Dingle Pond. The fall flight peaked at 26 in December and they used only the Cuddo and Pine Island Units.

d. Coots

Coots peaked at 1,400 at the end of December, which is an increase over the previous year. Even though the species occurs on all units of the refuge, most were on the Bluff and Pine Island Units. Larger numbers were known to be present in the area and on occasion several thousand birds were observed rafted in the open waters of Lake Marion southwest of the Bluff Unit.

4. Marsh and Water Birds

Habitat management for this category of birds is incidental to the overall management objectives and programs at Santee, and unless significant environmental changes occur, populations of marsh and water birds will fluctuate only moderately from year to year. As a general rule these species occur on all units of the refuge. However, abundance and frequency of observation is determined primarily by availability of wetland habitat which is a factor controlled largely by lake levels and impounded waters.

Of the six species of herons known to occur at Santee, only four were observed during the year. The black-crowned, and yellow-crowned night herons were conspicuously absent from the refuge. This is the sixth and seventh years respectively that these have not been reported. All of the four heron species observed, great blue, tricolor, little blue and green backed were seen in modest numbers. A small rookery of great blue herons was observed at the head of Black Bottom Impoundment and though this rookery contains only seven nests, it may well be the beginning of a new larger rookery. Great blues also nested (4) in Gator Pond and Cattle Guard Wetlands (1). At year's end four were attending nests on Pine Island in impounded water on the east side.

The pied-billed grebe was observed on all units during cool and cold weather months.

King, Virginia, black and sora rails are present and their populations seem stable.

For the fourth consecutive year concentrations of up to 300 cormorants were observed on the refuge. The birds showed up in late October and remained on and around the several refuge units through the cold weather months. Some nesting during the summer occurs in the waters of Lake Marion, but off the refuge.

Other birds in this group were present, but only the anhinga nested (4) and they were not present in such exceptional numbers as to be noted here. Such birds other than the anhinga included white ibis, and the egrets.

5. Shorebirds, Gulls, Terns and Allied Species

As with the marsh and water birds, habitat management for this group of birds is incidental to overall refuge programs. However, it should be noted that factors directly affecting the presence or absence of these species, primarily lake levels, are controlled by the South Carolina Public Service Authority. Species diversity and numbers occurring on the refuge are normally in direct proportion to the amount of exposed shoreline and mud flats present.

Noticeably absent were the large concentrations of gulls including 600 herring, ring-billed, Bonaparte's and laughing gulls which have occurred on the refuge in the past. They were present, but only in group of 20's or thereabouts. Common snipe could be found around the flooded moist soil areas, particularly on the Pine Island Unit. A stroll through the area might jump 10-20.

6. Raptors

a. Hawks

Hawks commonly observed during the year included the northern harrier, Cooper's, red-tailed, red-shouldered, and the American kestrel. Less frequently encountered were the sharp-skinned, and broad-winged hawks. These species occurred on all units of the refuge with larger concentrations reported at Cuddo and the Bluff Units. Nesting does occur on the refuge, but no nesting or population surveys were conducted during the year. Casual observation revealed a nesting red-tailed on the Pine Unit. As in previous years, overall peak numbers occurred during the fall and winter months. Generally, populations remained stable with only minor fluctuations in numbers.

The peregrine falcon, bald eagle and osprey are addressed elsewhere.

b. Owls

The four species of owls which occur at Santee are year-round residents and include the barn, barred, great-horned and screech owl. These birds, being nocturnal, are heard more frequently than seen. However, daylight observations and the frequency of calls tend to indicate stable numbers. Screech owls (10) nested in structures intended for wood ducks, especially on the Cuddo Unit.

7. Other Migratory Birds

Mourning dove peaked in December. As in previous years, small numbers were observed on the refuge throughout the year and nesting was observed on all

units. As many as 300 birds were observed using corn fields manipulated for waterfowl during the winter months and agricultural fields were favored for feeding and loafing in the spring.

The annual dove census was conducted in May by staff personnel. The number of birds observed and calls recorded on both routes 0530 and 0601 were near those reported in 1989. Both routes are well away from the refuge.

A dove hunt was conducted on the Cuddo Unit during September. (Section H.8.a.).

8. Game Mammals

The State of South Carolina prescribes a hunting season for eleven species of mammals. Of these eleven species, ten occur on Santee. Four of the ten species which occur on the refuge, white-tailed deer, gray squirrel, raccoon, and opossum, were hunted in 1990.

The Bluff and Dingle Pond Units each supported small populations of white-tailed deer. However, the larger more diverse Cuddo and Pine Island Units supported the major concentrations. It was on the latter two units that deer hunting was allowed. Hunting is restricted to primitive weapons. Other hunting activity was restricted to the Cuddo Unit. (Section H-8.)

Other mammals for which there is a prescribed state season include rabbit, mink, muskrat, otter, skunk and fox. None of these were hunted or trapped on the refuge.

The muskrat is present, but its numbers are so small as to be insignificant.

In addition to the gray squirrel, the eastern fox squirrel is also present on the refuge. The fox squirrel, though not listed as either endangered or threatened, is of state significance and concern due to relatively small numbers statewide. This species is also far from abundant on the refuge and we are concerned that hunters might remove some fox squirrels along with grays during the September hunt. A fox squirrel was seen on the Pine Island Unit and one was seen on two occasions on the Bluff Unit this year.

The river otter was observed in small numbers on all units throughout the year. Evidence of their presence is more frequently observed than the otter themselves. A population estimate, based on observation, was placed at 25.

Both the red and gray fox occurred on the refuge and peaks of 20 and 50 respectively were estimated. The species were observed on all units of the refuge with the larger numbers found on the Cuddo Unit.

The raccoon is probably the most abundant game mammal on the refuge. An estimated 250 is the maximum present.

10. Other Resident Wildlife

Other resident wildlife include wild turkey, bobwhite quail, and bobcat. Turkeys are increasing in their range, and the population on the Cuddo Unit is thinning. Fewer birds were observed this year than last and the flocks are smaller. Turkeys were not reported this year at the Pine Island Unit.

Bobwhite quail were present on all units of the refuge. Habitat management naturally favors quail in summer by providing habitat diversity, food, water, cover, and lots of edge. But in winter a lot of their habitat is flooded.

Bobcat also occurred on all units of the refuge, and litters of three young each were observed on the Bluff and Cuddo Units. It is not uncommon to see a bobcat in daytime on the refuge.

12. Wildlife Propagation and Stocking

A total of 75 wood duck nesting boxes were located on the various Units of the the refuge. Of these, 60 boxes were used by wood ducks.

Nine new cypress boxes were placed on the Dingle Pond Unit. These were the first boxes there in over six years. Only one was used by woodies.

16. Marking and Banding

The banding quota this year was 400 preseason wood ducks.

Pre-season wood duck banding began June 1 and continued to September 20. With a good effort and cooperation by the woodies, we ended up with a total of 588. Efforts at baiting continued year round with corn and wheat and our sole capture method was use of a rocket net at one site, namely Cante Bay Pond on the Bluff Unit. The maximum banded on any one shot was 67.



Using the rocket net, we banded 588 woodies during pre-season.
(JF)

Table 7.

ANNUAL REPORT FORM
WOOD DUCK BOX PROGRAM INFORMATION
YEAR 1990

Total Boxes Up	<u>75</u>
Total Usable Boxes	<u>75</u>
Use by Wood Ducks of Usable Boxes	<u>60</u>
Number of Success- ful Boxes (Wood Ducks)	<u>51</u>
Use by Other Ducks of Usable Boxes	<u>0</u>
Period Checked (Month)	<u>April thru August</u>
Use by Other Wild- life of Usable Boxes	<u>13</u>
*Total Wood Ducks Hatched	<u>612</u>
Wood Duck Broods Produced	<u>51</u>
**Wood Ducks Surviving to Flight Stage	<u>306</u>

Plans for Next Year (Indicate Number)

<u> </u> More Boxes	<u> </u> Entrance Holes Created in Trees
<u> </u> Fewer Boxes	
<u> X </u> No Change	

Lost four hens on nest to predator (thought to be a bobcat) on Bluff Unit.
Boxes in predator area will be moved to standing water from dike edge. The
% of boxes used is fairly high because several boxes were used twice i.e.
Pine Island 3 of 6 boxes available were used twice making it appear as 100% use.

 *Unless you can actually count egg shells, just multiply successful boxes
 by 10.

**If survival rate is other than 50 percent, please explain rationale in
 remarks section.

***Be sure and document periods that boxes were checked for use and repair.

H. PUBLIC USE

1. General

Santee offers a variety of public use activities for the visiting public. The visitor contact station's dioramas, exhibits, information panels and aquarium give the visitor an excellent understanding of Santee's management goals and a glimpse of the variety of wildlife found on the refuge. The mile long Wright's Bluff nature trail provides visitors the opportunity to view wildlife, a pine land and wetland community, and interpretive signing explains the different communities, wood duck nesting boxes and the refuge farming program.

Sections of Lake Marion are included within the boundary of the refuge. Along with Lake Moultrie, Lake Marion comprises the Santee-Cooper lake system, known as one of the best sport fishing areas in the Southeast. Several of the more popular fishing areas are located in the larger bays and coves on the refuge. Fishing from boats in the lake is by far the most popular way of fishing, although bank fishing and fishing in some of the refuge ponds is common. Hunting for deer, small game and migratory birds is also available at Santee.

The close proximity to I-95 makes Santee easily accessible to travellers outside the local area. Directional signs on the interstate and secondary roads easily lead the first-time and repeat visitor to the contact station.

A total of 63,953 refuge visits were recorded this year. This is a 5% increase over 1989. Total activity hours were 138,672, indicating the average visitor spent just over 2 hours per visit.

Thirteen special use permits were issued to residents of the Cante Bay subdivision for ingress and egress through Cante Bay during the waterfowl sanctuary closure period, November through February. In order to minimize disturbance to waterfowl using the bay, all boats are required to navigate at no-wake speeds along the extreme eastern shore of the bay. In addition, a memorandum of understanding is in effect which restricts activities such as pier lights, fires, shooting and other disturbances along the shoreline during the closure period. The SUP's for boat travel are issued to the subdivision residents annually.

Six Golden Age Passports and 2 Golden Access Passports were issued during the year. This is a big decrease in Golden Age Passports issued from last year.

4. Interpretive Foot Trails

The Wright's Bluff Wildlife Trail remained closed for the first four months of the year due to damages from Hurricane Hugo. Most of the trail was totally obscured by fallen trees and two of the boardwalks were extensively damaged. Cleanup and repairs were done during slow periods between higher priority projects.



Some of our visitors to the VCS were very lively as indicated by the blurs. (JF)

After fallen trees were removed, the trail had to be leveled and the pea gravel raked back onto the path. All of this had to be done by hand. Broadwalk repairs required leveling sections that had fallen and replacing rails and planks. The trail was opened in May. Had the pea gravel not been present, we would never have found the original trail location in many areas.

Much of the scenic beauty along the trail was destroyed by the hurricane. Many of the large pines that dominated the first section of the trail were blown down, resulting in the growth of a thick understory. Many of the visitors who remembered how the area was before the hurricane commented on how different it looked and that they weren't expecting to see that much damage this far inland. Approximately 1,500 visitors walked the trail after the May reopening.

6. Interpretive Exhibits and Demonstrations

The visitor contact station (VCS) is usually the highlight for most visitors to the refuge. Many visitors to the VCS comment or note in the guest register how impressed they are with the displays in the center. No changes were made to the exhibits during the year. Normal maintenance such as changing pest strips, dusting, cleaning glass and replacing burned out lights were completed as required.

The aquarium display was replenished several times with fish netted out of Lake Marion. The problem with introducing lake fish into the aquarium is that they usually infest the other fish with ectoparasites. Several fish were received from Orangeburg National Fish Hatchery for the display. These include a largemouth bass, gar and blue catfish. They also give us smaller feeder fish, Tilapia, to keep the bigger fish happy and healthy.

Total visits to the VCS were 2,553. This is a 29% increase over last year's visits.

7. Other Interpretive Programs

Tours and programs were conducted when requested by schools and other groups. Most of the groups wanted a tour of the VCS by refuge personnel to explain the exhibits and talk about the refuge. If time permitted a tour of the nature trail and the Ft. Watson/Indian Mound site were given. Several off-refuge programs were also presented. A list of the programs presented during the year is shown in Table 8.

Table 8. Programs Presented in 1990

<u>Date</u>	<u>Group</u>	<u>Type of Program</u>	<u># In Group</u>	<u>Staff</u>
01-15-90	Methodist Men's	Slide Presentation	28	Bond
01-31-90	Sumter Bird Club	Tour of Refuge	15	Bond
02-06-90	Springhill Elem Sch			
02-26-90	Manning Middle Sch.	VCS Tour/Film	18	Gaymon
03-02-90	SC Dept. of Educ. (Teachers from throughout state)	VCS Tour	18	Fringeli
03-30-90	Holly Hill Elem School	VCS Tour/Film	100	Fringeli
05-14-90	Manning Elem. School, 2nd Grade	VCS Tour/Film	25	Fringeli
05-19-90	Orangeburg 4-h Club	VCS Tour/Film	40	Fringeli
05-25-90	First Bapt. Church Kindergarten Class	VCS Tour/Film	55	Fringeli
06-22-90	Handicapped Students from Manning	VCS Tour/Film	19	Fringeli
06-28-90	Scotts Branch H.S. Class for G/T	VCS Tour/Film	16	Fringeli
07-10-90	Kingstree Environmental Club	VCS Tour/Film	27	Gaymon
09-11-90	SC Welcome Center Coordinators	VCS Tour/Film	6	Fringeli
10-22-90	Cross Elem School 4 & 5 Grades	Refuge Slide Show at School	50	Fringeli
10-23-90	Cross Elem School 4 & 5 Grades	VCS Tour/Film	55	Fringeli
12-08-90	Boy Scout Troop Greenville, SC	VCS Tour/Film/Refuge Tour	20	Fringeli

8. Hunting

Five game species were hunted on Santee during the year. These included white-tailed deer, gray squirrel, mourning dove, raccoon and opossum. For the 5th straight year there was no waterfowl hunt on the refuge due to the state electing not to have an early duck season. All of the hunts were open with no quotas to regulate the number of hunters participating. The only requirements to hunt, aside from abiding by state and federal regulations, were to obtain, sign and possess a copy of the refuge hunt

regulation which serve as a hunt permit and to sign in and out at designated check station.

a. Raccoon and Opossum

The raccoon/opossum hunt is annually held on the last ten days of the state gun season. This year the 10-day period ran from February 20 - March 1st. Participation in the hunt was low, probable due to the effects of Hurricane Hugo. The best hunting areas were cluttered with fallen trees, making it difficult for dogs and hunters to traverse through the woods. Only five hunters, accounting for 7.5 activity hours, showed up for the hunt. No raccoon or opossum were taken.

b. Mourning Dove

Dove hunting is limited to the Cuddo Unit. Participation in this hunt has traditionally been low and this year was no exception. Two factors account for the low turnout. First, the low dove population on Cuddo and second, off-refuge sponsored hunts with better hunting opportunities in this part of the state. The hunt was held September 1st - 30th. The middle gate at Cuddo was opened at the start of the hunt to allow hunters easy access to the hunt area. Deer hunters are permitted to scout the area during the dove season, and many took advantage of the opportunity. The turnout of scouting deer hunters far outnumbered dove hunters. The final tally was 20 hunter-visits harvesting 3 doves.

c. Squirrel Hunt

Squirrel hunting is only permitted on the Cuddo Unit. The hunt was held September 15th - 30th and only gray squirrels were legal game. As far as could be determined from field patrols and the sign in/out sheets at the check station, no one participated in the squirrel hunt.

Due to the low participation in the dove and squirrel hunts, we have considered dropping both hunts. However, as stated, many deer hunters scout the area prior to the opening of the deer hunt. This is legal as our hunt regulations permit scouting during the dove & squirrel seasons. If we dropped the hunts we would need to open the area prior to the deer season to allow hunters to scout. For the time being we plan to keep the hunts. This way deer hunters can continue to scout and the opportunity is available to hunt doves and squirrels to anyone so inclined.

d. Deer Hunt

The refuge deer hunts consisted of three separate hunts held on two of the units. Due to the cancellation of all the deer hunts in 1989, because of Hurricane Hugo, a higher than normal harvest was anticipated.

The Pine Island primitive weapons hunt was held October 1-6, and included long or compound bows and muzzleloading shotguns and rifles. A total of 212 hunters accounted for 1,272 activity hours. Twenty-four deer were

harvested. All but one deer were taken with muzzleloaders. This was an increase of five deer over the 1988 total.

Two hunts were held on the Cuddo Unit. The archery only hunt ran from October 8-13 and the primitive weapons hunt was conducted October 15-20. A total of 30 deer were taken on the archery hunt. The harvest may have been higher, but 2 1/2 days of steady rain slowed down the hunting activity. A total of 471 hunters participated in the archery hunt accounting for 2,826 activity hours.

As usual, the Cuddo primitive weapons hunt was the most popular hunt of the year. The final tally was 793 hunters putting in 4,758 activity hours of hunting. The total take on the hunt was 104 deer. Several large bucks with nice racks were taken, including two that weighed over 200 lbs. The biggest buck weighed 210 lbs and had an 8-point rack. The largest rack belonged to a 185-lb. buck, 11 points.

The final tally for the three hunts was 158 deer. This is the highest total of deer harvested on Santee for a single year's hunt since the use of modern guns years ago. This year's harvest resulted in 77 more deer taken (95% increase) over the number taken during the last hunts held in 1988. The cancellation of the 1989 hunts had a definite impact on the refuge's deer population. Table 9 shows the breakdown of the deer hunt by area and hunt type.

Table 9 - Deer Hunt Data, 1990.

SANTEE NWR
1990 DEER HUNT DATA

AGE CLASSES BY SEX

(Table 9.1).....

PINE ISLAND UNIT

	1/2	1 1/2	2 1/2	3 1/2	4 1/2	5 1/2	TOTAL
Male	3	10	3				16
Female		4	2	2			8
Total	3	14	5	2			24

(Table 9.2).....

CUDDO UNIT (ARCHERY)
Oct. 8-13

	1/2	1 1/2	2 1/2	3 1/2	4 1/2	5 1/2	TOTAL
Male	1	12	5				18
Female	3	3	1	3	2		12
Total	4	15	6	3	2		30

(Table 9.3)..CUDDO UNIT (PRIMITIVE WEAPONS)

Oct. 15-20

	1/2	1 1/2	2 1/2	3 1/2	4 1/2	5 1/2	TOTAL
Male	16	20	8	10	1	1	56
Female	14	22	5	6	1		48
Total	30	42	13	16	2	1	104

9. Fishing

Fishing is by far the most popular recreational activity at Santee. Being located on a renowned fishing lake is the main cause for the high fishing activity on the refuge. Lake Marion provides excellent opportunities to catch largemouth bass, bream, crappie, catfish, white bass and striped bass. Due to the variety of fish in Lake Marion and the various types of structures in the lake, fishing is generally good year-round, except during the extremely hot or cold periods.

The majority of fishing at Santee is done in the sloughs, bays and open waters of Lake Marion where access is generally unobstructed and larger boats can navigate. Bank fishing is also popular. However, the inaccessible shoreline along most of the refuge restricts this type of fishing to the Scott's Lake section on the Bluff Unit, Log Jam Landing on the Cuddo Unit, and the perimeter levee on Pine Island. The Scott's Lake area is heavily used due to easy road access. The refuge's interior ponds, impoundments, and canals are open to fishing March through October. These areas are only accessible by walking, bicycling or dragging a boat over a dike from the lake. For these reasons the interior ponds are not heavily used. A total of 34,675 fishing visits were estimated this year. This is a 19% increase from 1989.

17. Law Enforcement

Santee has two refuge officers with law enforcement authority. Asst. Mgr. Fringeli attended the annual 40 hour law enforcement refresher training held at Lively Law Enforcement Training Center in Quincy, Florida on March 12-16. Mgr. Bond attended the second session held at the Center on March 26-30. Both officers requalified with the service revolvers on October 24 in Columbia, South Carolina. The requalification was given by Special Agents Hines and Bazemore.

In June South Carolina Conservation Officer (CO) Glen Davis received word that two men, whose boat had broken down somewhere near the vicinity of the Cuddo Unit on Lake Marion, found several marijuana plants while they were trying to locate help on shore. The stranded individuals never reported the plants to law enforcement officials, but were overheard talking about the incident while dining at a local restaurant. A search of several likely sites on Cuddo did not turn up any thing. On July 18th

CO Davis, while looking for a spot from which to observe an illegal fishing operation, found 12 marijuana plants on the west end of Round Island on the Cuddo Unit. A more thorough search of the entire island later the same day involving Mgr. Bond, Asst. Mgr. Fringeli and CO Davis revealed 102 plants ranging in size from 1-8 feet. The R.O. and Agent George Hines were notified. Agent Hines coordinated a stakeout of the area with the Governor's Drug Task Force that involved Bond, Fringeli, Agents Hines and Bazemore and members of the Task Force Team. Several personnel were positioned near the plants and two were positioned in a boat in the lake where they could observe boats approaching the area. The site was staked out on the 20th, 21st and 22nd. No activity was observed near the area. On Monday the 23rd it was decided that too much time and effort would be involved in surveillance of the area and that the best course of action would be to pull up and destroy the plants.

On the afternoon of the 23rd, Bond, Fringeli, Hines, Bazemore & Davis located and pulled up 122 marijuana plants. The plants were taken to the Clarendon County Sheriff's Dept. where they were burned by Deputy Hank Richardson.



Ass't. mgr. Fringeli inspects some marijuana growing on Round Is. of the Cuddo Unit in August. (GB)



Special Agent George Hines helped on stakeout and eventual pulling of the plants. (photo Fringeli)



L to R Agent Hines, State Wildlife Officer Glen Davis who discovered the first plants, Agent Charles Bazemore, and Bond. (JF)

Assistant Manager Fringeli assisted Special Agent Bazemore and State Conservation Officers during the first session of the state dove season. Several hunting over bait and exceeding the bag limit cases were made. All of the fields checked were off of the refuge.

Routine patrols were conducted during the waterfowl season. Since there was no waterfowl hunting on the refuge a close watch was kept on hunters close to the boundary. Special Agent Bazemore and state CO's spent a lot of time working the area during the early part of the season. In general the hunting was not very good. After the initial surge of hunting activity at the start of the season, things gradually slowed down as the season progressed.

During the Cuddo deer hunt we received several reports from hunters about baited areas. Two of the areas were located. One stand was baited with corn and a salt block and the other with a combination of wheat and corn. Both individuals were apprehended on the opening morning of the primitive weapons hunt. Both individuals denied any knowledge of the presence of the bait or how it got there. Although they were hunting in different areas on the hunt, we found out later that they were hunting partners.

Aside from the expected shooting and taking of some boundary signs, there were no instances of vandalism to refuge property. This is the first time in several years that some form of vandalism hasn't occurred. Littering along Scott's Lake and Pine Island boat ramp continued to be a hard-to-catch someone problem. Several warnings were given to swimmers along Scott's Lake.

Table 10 ,Summary of Violations

<u>Violation</u>	<u>Number</u>	<u>Disposition</u>
Removal of Gov't Property	1	Pending
Hunting Over Bait no NWR	2	\$100 each
Unsigned (unattached) Federal Duck Stamp	1	Pending
Hunting Waterfowl on Refuge during closed season	3	Pending
Unplugged Shotgun	1	Pending
No Federal Duck Stamp	1	Pending
No State Duck Stamp	1	Pending
No Hunting License	1	Pending
Disturbing Wildlife on Refuge	1	Pending
Hunting Waterfowl on Refuge during closed season (State Case)	3	Pending

I. EQUIPMENT AND FACILITIES

2. Rehabilitation

The pump for unleaded gasoline broke in June. Repairs could not be completed by the staff so a pump company in Charleston was contacted. The complete "insides" of the pump had to be replaced. The initial set of replacement vanes were too large and had to be reordered. By the time the pump was repaired, it had been inoperable for a month.

A problem with the Couch axial flow pump on the Bluff Unit developed in October. The pump is designed to be turned to the flow-in or flow-out position with the use of a bar by one or two persons. This unit could only be turned by attaching a chain to the pump and the back of a truck and pulling. When an attempt was made to close the pump after free flowing water into the impoundments the unit tilted in its housing. In this position the pump was jammed and could not be turned. Several attempts were made to reset the pump by lifting it up and setting it back down. The pump continued to set in the tilted position. We assumed that a rock or limb had gotten under the pump preventing it from setting upright. The only way to check for an obstruction would be to pull the pump completely out of its housing.



As the pump came out, with Santee Cooper's help, Mgr. Bond was prepared to jump and hold on to his cowboy hardhat. (JF)

The boom on our excavator was not long enough to remove the pump. We contacted the South Carolina Public Service Authority (Santee-Cooper) for assistance and they sent out one of their mobile crane units and crew.

After the pump was pulled out local Conservation Officer Harvin Brock, in scuba gear, inspected the bottom of the housing unit. Harvin found the pivot pin that the entire pump sits on lying on the bottom of the housing. Upon inspection of the pump it was discovered that the bearing around the pivot pin was completely worn out. After a lengthy search, the original manufacturer, Couch Pump Co., was located and a new bearing housing ordered. Repairs will be completed early in 1991.



State Wildlife Officer Harvin Brock preparing to go to the bottom of the pump housing to look for a missing support pin and anything else that might be broken or out of place. (JF)

The weather station instrument shelter by the office/vcs building was replaced and moved to the maintenance yard. The old shelter was rotting and the side slots were falling out. A used shelter was received from the National Weather Service and the useable parts from both shelters were used to make a new one. The station was moved to the maintenance yard in accordance with a suggestion from our last public use review to remove it from the highly visible VCS area.

An intense cleanup of the maintenance yard and Bluff Unit storage areas was undertaken in December. Scrap metal, old pipes and culverts, rotten lumber and other items that had been lying around for years and had no value were hauled off to a local landfill and dumped. The remaining items were stacked and arranged to improve the appearance of the sites.

A contract to replace 16 boundary pilings destroyed during Hurricane Hugo was awarded to Edisto Marine Co. of Ravenel, SC for \$9,850. The contract called for Edisto Marine to supply and drive the pilings. The pilings had to meet specified size and treatment standards. Most of the replacement pilings were put up along the Pine Island and Cuddo Units, with three being placed along the Bluff Unit boundary. Edisto's small barge and pile driver were used to do the job. Refuge boundary signs and reflectors were attached to the pilings to once again delineate the boundary and to aid in night navigation in the open water of Lake Marion.



Contractors placing one of 16 water boundary pilings taken out by Hurricane Hugo. (GB)

3. Major Maintenance

Refuge roads were regularly mowed throughout the spring, summer and fall as needed. Road grading and spot graveling were required on the frequently travelled roads, especially following heavy rains. The middle road on the Cuddo Unit almost became impassible due to use by hunters during heavy rains that made the road sloppy and deeply rutted. A second gate on the Unit had to be opened to provide easier access and reduce use on the middle road. The road had to be graded several times to get it back into shape. YCC enrollees were used to help clear roads of overhanging limbs and brush on the Cuddo and Bluff Units.

The cleanup of Hurricane Hugo debris continued throughout the early part of the year. The worst areas affected were the roads on Dingle Pond and the Cuddo Unit. Chainsaws and bulldozers were needed to clear the roads of fallen trees.

As recommended in the Public Use Review, the Bluff nature trail observation tower was renovated to improve the appearance of the structure. Plywood was attached to the inside framework to cover the exposed metal section. The entire tower was then painted.

A problem with the office/vcs and shop water distribution system pump was corrected by replacing one of the electrical relays. The pump was not maintaining the correct pressure to distribute the water, but the new relay solved the problem. A different problem with the water system occurred in June. Sand was getting into the system causing valves to stick and making the water unpleasant to drink. Even the artesian-flow birdbath and watering hole near the pumphouse began silting in. The 1,000 gallon storage tank was drained and opened to see how much silt was in the tank. Sand varying in depth from 3-10 inches had been deposited on the bottom of the tank. The sand was flushed out and the tank resealed and filled up. After completing this procedure the water was once again free of sand. We feel the sand got in the system from one of two sources. Either the well casing is coming apart or during the period when the relay was bad the pump, which was continuously running to keep up with the systems pressure, was sucking up sand.

4. Equipment Utilization and Replacement

Due to the advanced age of our vehicles a lot of time was spent on maintenance to keep them operational. Every vehicle we have required some kind of repairs other than routine maintenance. Other than a 1989 pickup truck and 1985 truck tractor all of the other vehicles are late 1970's and early 80's models.

Maintenance and repairs on other pieces of equipment include the following items:

- The John Deere 350C was taken into the shop to replace the idlers, sprockets and rock guard. The final drive also required repairs.

- The 1979 International dump truck had its engine overhauled after blowing a piston.

- The diesel motor that ran the Timber Island Field #3 pump was found to have a worn camshaft. Instead of making costly repairs we decided to rehab a used diesel motor that had been in storage for several years. The repairs on the stored motor were more than we anticipated, but it will be in place early next year. Four windows on the TD-15 damaged during Hurricane Hugo cleanup were replaced.

Several pieces of equipment were loaned to other refuges during the year.

Cape Romain NWR had used the 1980 GMC dump truck all year. They also borrowed the TD-15 dozer to help clear roads on Bull Island. Alligator River NWR picked up the hydraulic excavator in July. Carolina Sandhills NWR then picked it up from Alligator and used it until October. Savannah Coastal borrowed the JD-350C Dozer for several weeks in June. Orangeburg NFH used the International stake body truck for a couple of days to pick up supplies in Columbia.

OTHER ITEMS

1. Cooperative Programs

The following programs were conducted on a Cooperative basis during the year:

- a. Furbearer Census. (Section D-5.b)
- b. Mourning Dove Coo-Call Count. (Section G-7).
- c. Gypsy Moth Survey was conducted in conjunction with and at the request of the U. S. Forest Service. No moths were evident in the area.
- d. Evaporation station for South Carolina Department of Health and Environmental Control was continued. (Section D-5,d)

3. Items of Interest

District Biologist Otto Florschutz visited the refuge on January 10th and 11th. Otto was here on a general visit to review the waterfowl situation and discuss future management options.

Office Assistant Gaymon attended the Federal Finance System Training session in Orlando, Florida during the week of January 29 - Feb 2. Participants reviewed the policy and procedure changes of the new finance system.

Dottie Geldbaugh of the Division of Realty - Atlanta visited the refuge on January 24th and 25th. She conducted an appraisal to determine land values for tax revenue sharing purposes.

Tractor Operator Pearson spent the week of February 12th working at Cape Romain NWR as part of the burning crew on Bull Island. Bobby helped cut fire breaks & push debris with our TD-15 dozer which had been on loan to Cape Romain since January.

Mgr. Bond attended the Project Leaders meeting held in New Orleans during the week of February 12th.

Approximately 150 bushels of corn were picked up from Pee Dee Refuge on February 14th. The corn was used to bait the Bluff Unit Trap site for preseason wood duck banding.

Associate Refuge Mgr. Bill Grabill visited the refuge on April 18th and 19th. This was a familiarization visit for Bill to meet the staff and get a firsthand view of the programs at Santee.

Mgr. Bond, Asst. Mgr. Fringeli and Auto Mechanic Johnson attended the Water Control Structures Inspection & Maintenance Workshop held at the Days Inn in Savannah, Ga on May 16th.

The S. C. Forestry Commission used the headquarters auditorium on May 8th to hold a meeting for approximately 30 of their personnel.

Professor Chip Bierbaum & his biology class from the College of Charleston collected crustaceans from the ditches on the Cuddo Unit on July 5th.

Asst. Assoc. Mgr. Karen Cartlidge visited the refuge on July 6th. Karen was here to get familiar with Santee before she transferred to her new position in the R.O.

Mgr. Bond gave four members of the S. C. Waterfowl Assoc. a tour of the refuge on August 10th.

Lori Norstrom of Clemson University was given a tour of the refuge on the 16th. She was here to gather information on management activities aimed at nongame species. This is part of a program entitled "Documentary & Tracking Nongame Activities, Needs and Accomplishments on NWR's".

Mgr. Bond and Asst. Mgr. Fringeli attended a Drug Free Workplace Training session August 2nd. The training was held at the Federal Bldg. in Raleigh, N.C.

A Ford van was picked up at the Bamberg, SC Job Corps center on August 8th. The van was originally picked up for St. Catherine's Creek NWR in Ms., but we were informed that it would be used as a trade-in vehicle for Merritt Island NWR.

Mgr. Bond and Asst. Mgr. Fringeli attended the "Baiting Workshop" at Southern Pines, NC on August 14th. The workshop was conducted by Dan Searcy from the R.O.

Noxubee NWR Mgr. Jim Tisdale and Associate Mgr. Jim Matthews and Seth Mott of Lower Mississippi Joint Venture were given a tour of our completed "Partners" projects on August 16th.

Office Asst. Gaymon attended a Federal Supply purchasing seminar in Columbia on August 16th. The seminar was sponsored by GSA.

On April 24 a Refuge Revenue Sharing Payment in the amount of \$26,277 was delivered to Clarendon County Treasurer Margaret Jackson. A news release was issued to that effect.

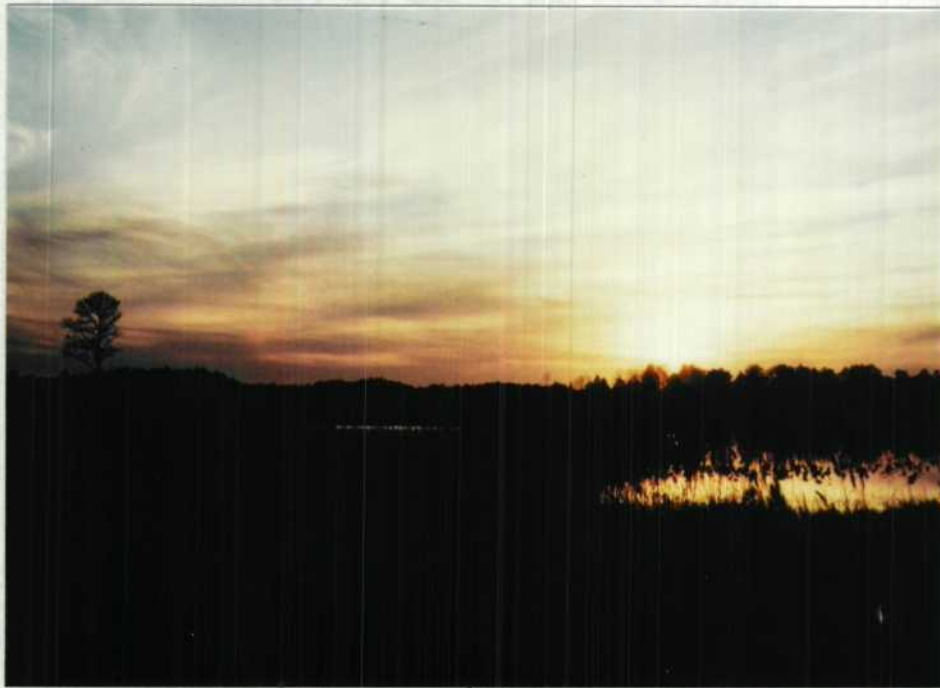
A heavy equipment training workshop was held at the refuge on July 10-13. Personnel from Santee, Cape Romain and Carolina Sandhills NWR's and McKinney Lake NFH attended the workshop conducted by Jesse Williams of Mattamuckeet NWR.



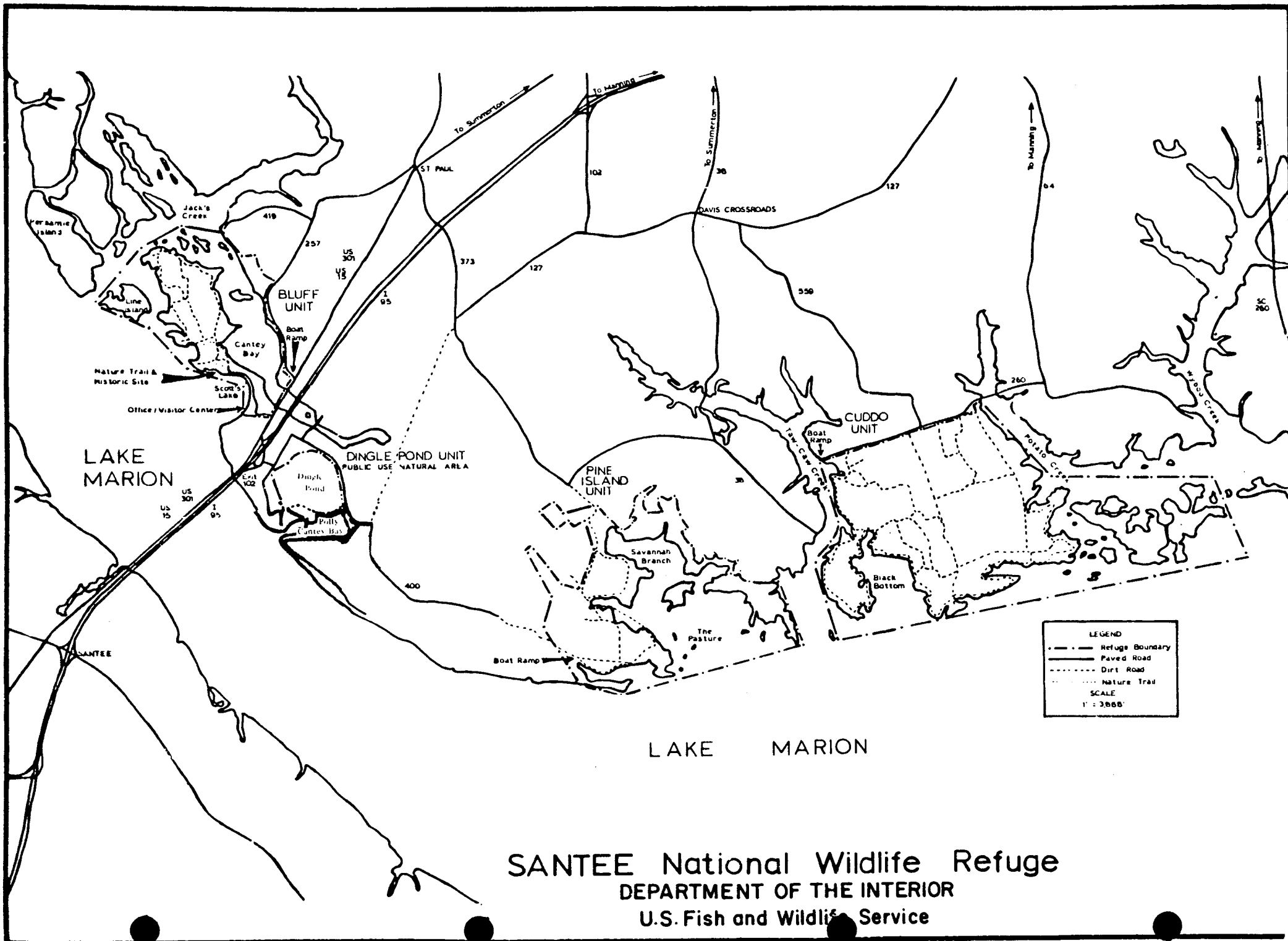
Heavy equipment training for FWS area operators was held at Santee. The fields on either side of the road were summer fallowed and planted to wheat in the Fall. Note the corn tassels in the background.
(photo Fringeli)

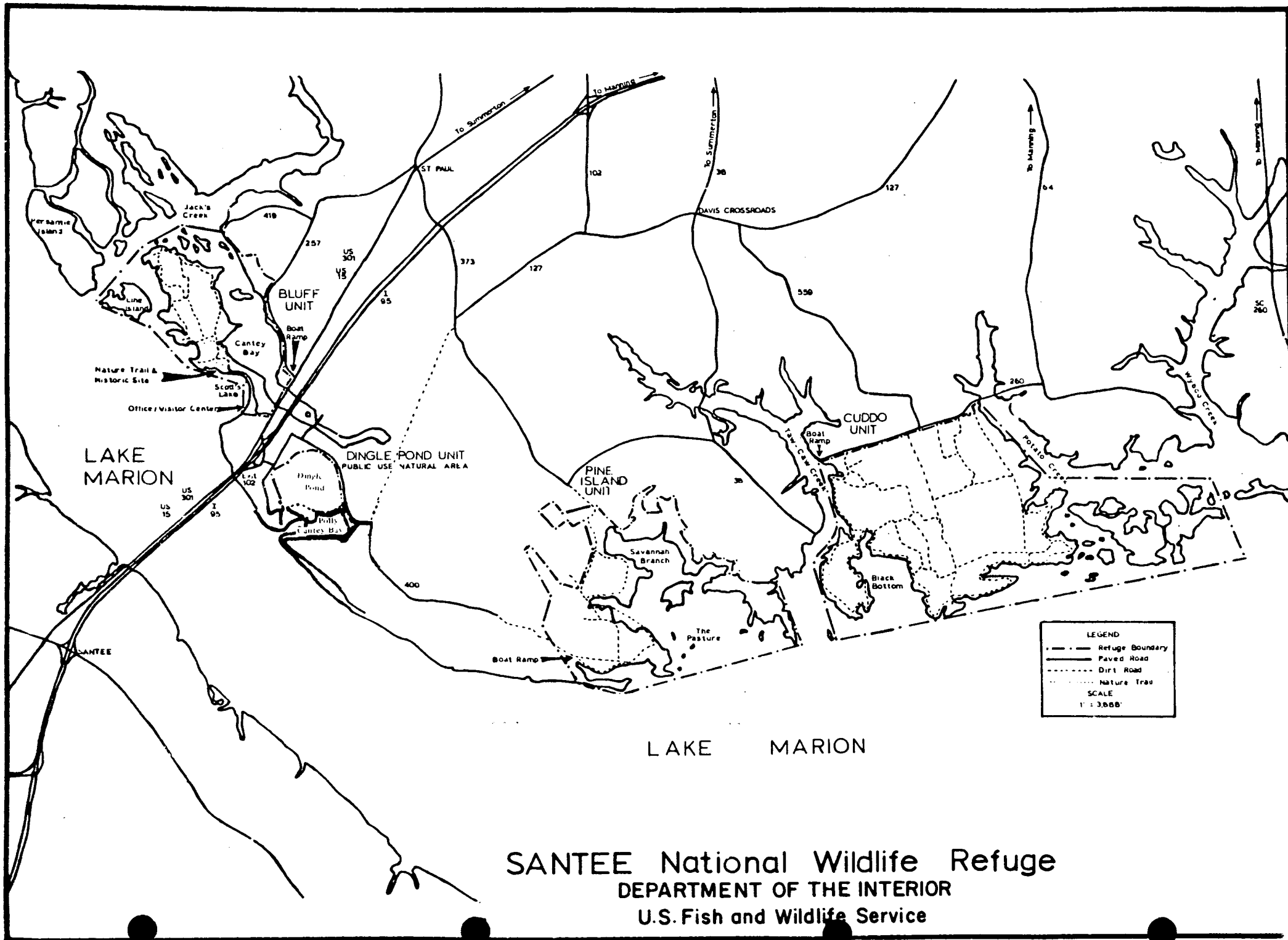
4. Credits

Bond and Fringeli wrote and Bond edited the report. Rufus Gaymon typed it. Photo credit is given under each photo.



Sunrise? We can accomplish much today! or sunset? We traded a day
of our life for what was accomplished today. Was it worth it?
(photo Vicki Grafe)





For more information contact:

Refuge Manager
Santee National Wildlife Refuge
Route 2, Box 66
Summerton, SC 29148

Phone (803) 478-2217



DEPARTMENT OF THE INTERIOR
U.S. Fish and Wildlife Service
RF-42570-1 - July 1989

SANTEE

National Wildlife Refuge



South Carolina



We Need This Refuge...

To provide food, water and shelter for approximately 8,000 Canada geese and over 50,000 ducks during the months of November through February.

To provide food, water and shelter for many other migratory and resident birds.

To provide habitat and protection for endangered and threatened species including the bald eagle, red-cockaded woodpecker and American alligator.

To provide opportunities for environmental education, interpretation and wildlife-oriented recreation for refuge visitors.

Santee National Wildlife Refuge, established in 1941, is located in Clarendon County, South Carolina. The 15,000-acre refuge lies within the Atlantic Coastal Plain and consists of mixed hardwoods and pine hardwoods, pine plantations, marsh, croplands, old fields, ponds, impoundments and open water. This tremendous diversity of habitat supports many kinds of wildlife.

The four management units of the refuge stretch over 18 miles along the northern side of Santee Cooper's Lake Marion. The office/visitor center offers many interesting displays for public viewing and is located off U.S. Highway 301/15, seven miles south of Summerton and four miles north of Santee.



Wildlife

A myriad of wildlife species inhabit the varied landscape of Santee. During the winter months the endangered bald eagle and occasionally the peregrine falcon can be seen. From November through February migrating waterfowl such as mallards, pintails, teal and wood ducks along with Canada geese are a major attraction. Throughout the year red-tailed and red-shouldered hawks can be viewed soaring overhead, as can a variety of songbirds in the trees, and wild turkey.

Birds are not the only residents of Santee. The forest provides a home for white-tailed deer and other woodland creatures such as raccoons, squirrels and bobcats. The ponds and marshes provide a home for an alligator here and there plus a number of snakes including cottonmouths.

Habitat Management

To support a large variety of wildlife species, intensive habitat management is a must. The habitat management programs at Santee range from the very basic to the complex. One of the basic programs is the wood duck nest box program, where nesting boxes are provided in areas that are lacking in available tree cavities, thus "adding to" the natural habitat. The water and marsh management program is more complex. Water levels are adjusted to provide maximum benefits for wildlife. In the impoundments and marshes different levels are used to help some types of vegetation to grow while controlling unwanted "pest plants". Periodically flooded woodlands containing nut-producing hardwoods are food-rich and very beneficial to waterfowl.

The management of forest and croplands are also critical. Private farmers are contracted who plant corn, wheat, millet and soybeans. These crops attract many species of wildlife. The farmers receive three-quarters of the crops planted while leaving one-quarter for the refuge at no cost to the government.

Habitat management is a complicated process but well worth the effort since it provides an abundant amount of food, cover and shelter for a wide range of animals.

Enjoy Your Visit...

Santee offers a variety of outdoor recreation activities for the refuge visitor. The refuge Visitor Center presents a general overview of what there is to do and see at Santee. Trails for hiking, wildlife observation and photography are available. Boating, fishing and hunting are also permitted. Portions of the refuge are closed during parts of the year. For current information on closures check with the refuge office.



VISITOR CENTER - The Santee Visitor Center is currently open Monday through Friday, 8:00 AM - 4:30 PM. It contains a number of displays describing refuge wildlife and habitats. The Center provides an excellent opportunity for the visitor to become acquainted with the refuge before venturing out, and is highly recommended, especially for the first time visitor.



WILDLIFE OBSERVATION - Foot and bicycle trails are open during March through October for wildlife observation, photography and hiking. For history buffs the Ft. Watson/Santee Indian Mound is a must. For birders, the dikes around the Dingle Pond Public Use Natural Area are excellent for viewing wading birds and shorebirds. Wintering migratory waterfowl may be observed from the observation tower along the Wright's Bluff Nature Trail, which is open year-round.



BOATING - Lake Marion is open year-round to boating, except Cantey Bay, Savannah Branch, and Black Bottom, which are closed from November 1 through the end of February. Public launches are available at Log Jam Landing and the Pine Island Unit Launch Site.



FISHING - All areas open to boating are also open to fishing, as well as the Scott's Lake Public Fishing Beach. Open year-round, these areas produce largemouth bass, catfish and bream. Remember, all Federal and State regulations are in effect.



HUNTING - Permitted on the refuge during designated seasons. Deer, small game, quail, dove and waterfowl seasons are scheduled yearly. Consult the hunt brochure for additional details.

SANTEE National

Jack's Creek

Line Island

Cantey Bay

Bluff Unit



L A K E

M A R I O N

Scott's Lake

Hwy. 301

I-95

Exit 102

Dingle Pond

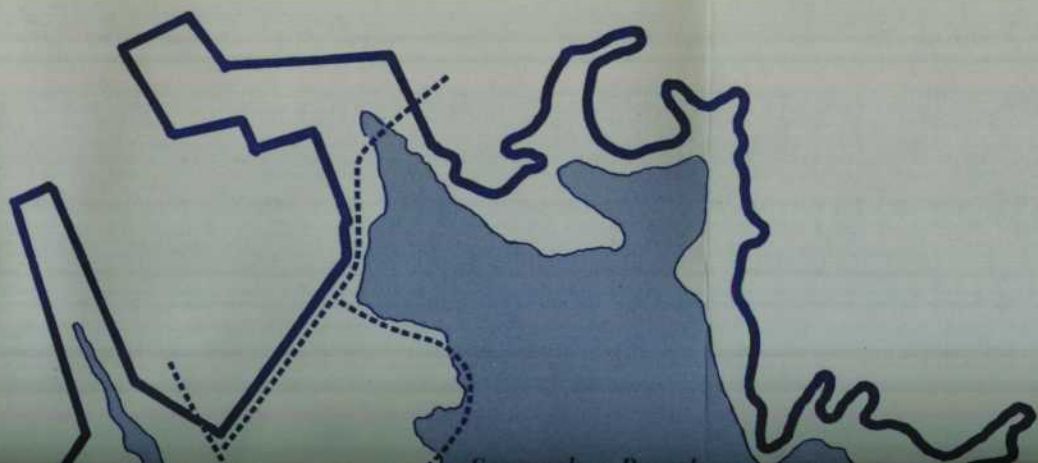
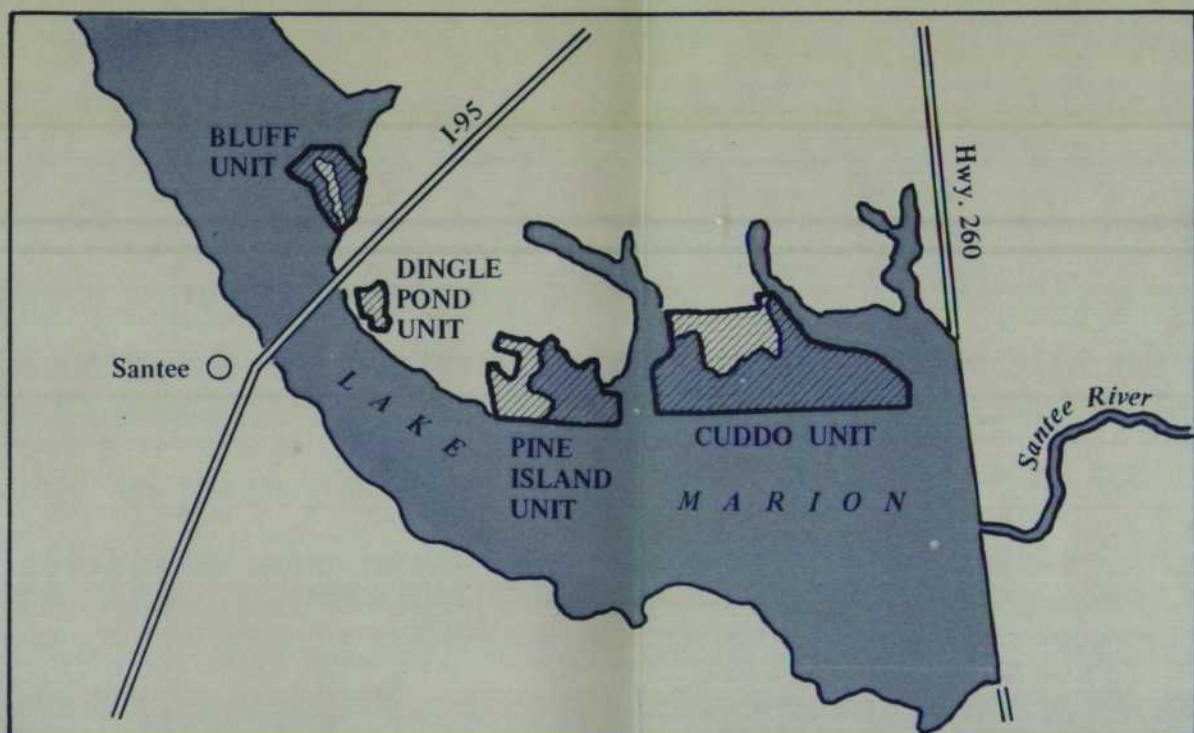


Dingle Pond Unit

0 1/2 1 Mile



Wildlife Refuge





Pine Island Unit

LEGEND:



Office/Visitor Contact Station



Public Boat Ramp



Maintenance Area



Wright's Bluff Nature Trail and Observation Tower/Wayside Exhibit



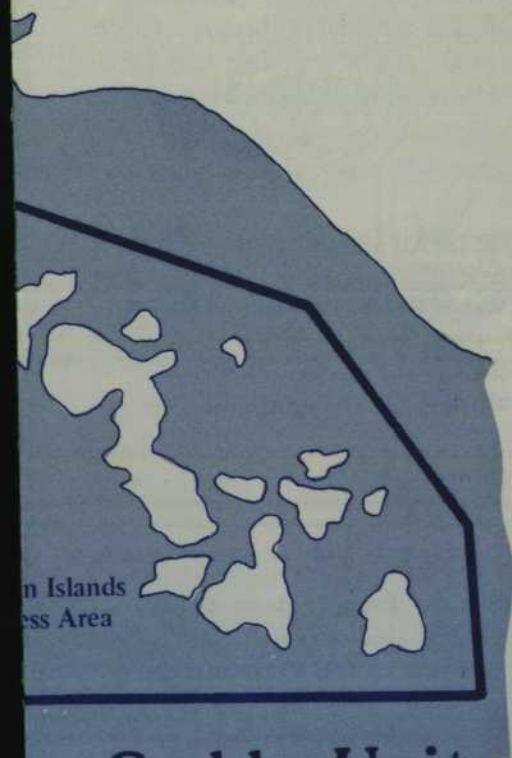
Historic Site of Ft. Watson and Santee Indian Mound



Refuge Boundary



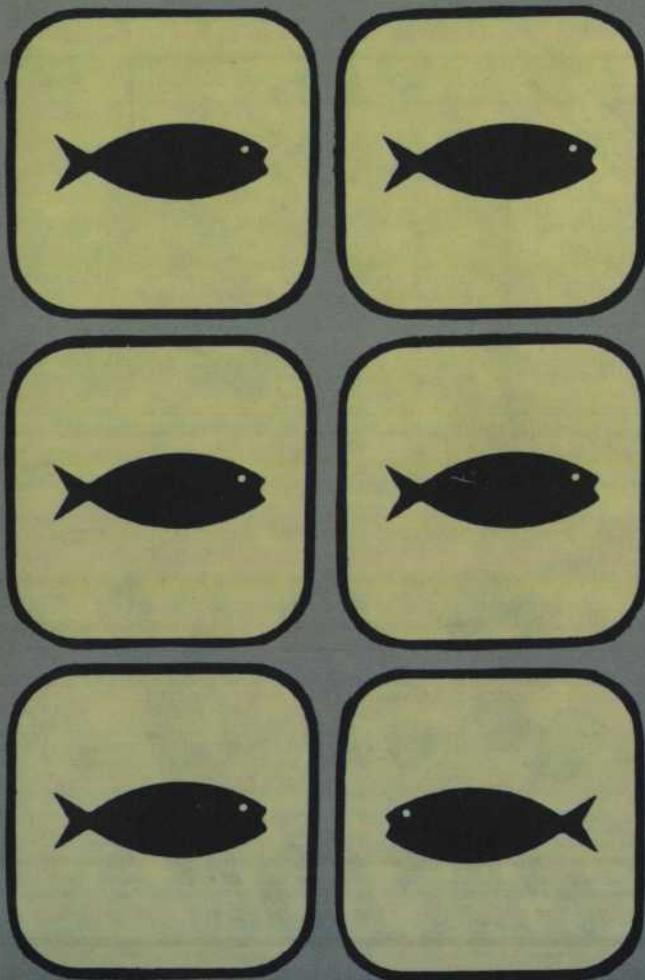
Road



Cuddo Unit

FISHING REGULATIONS

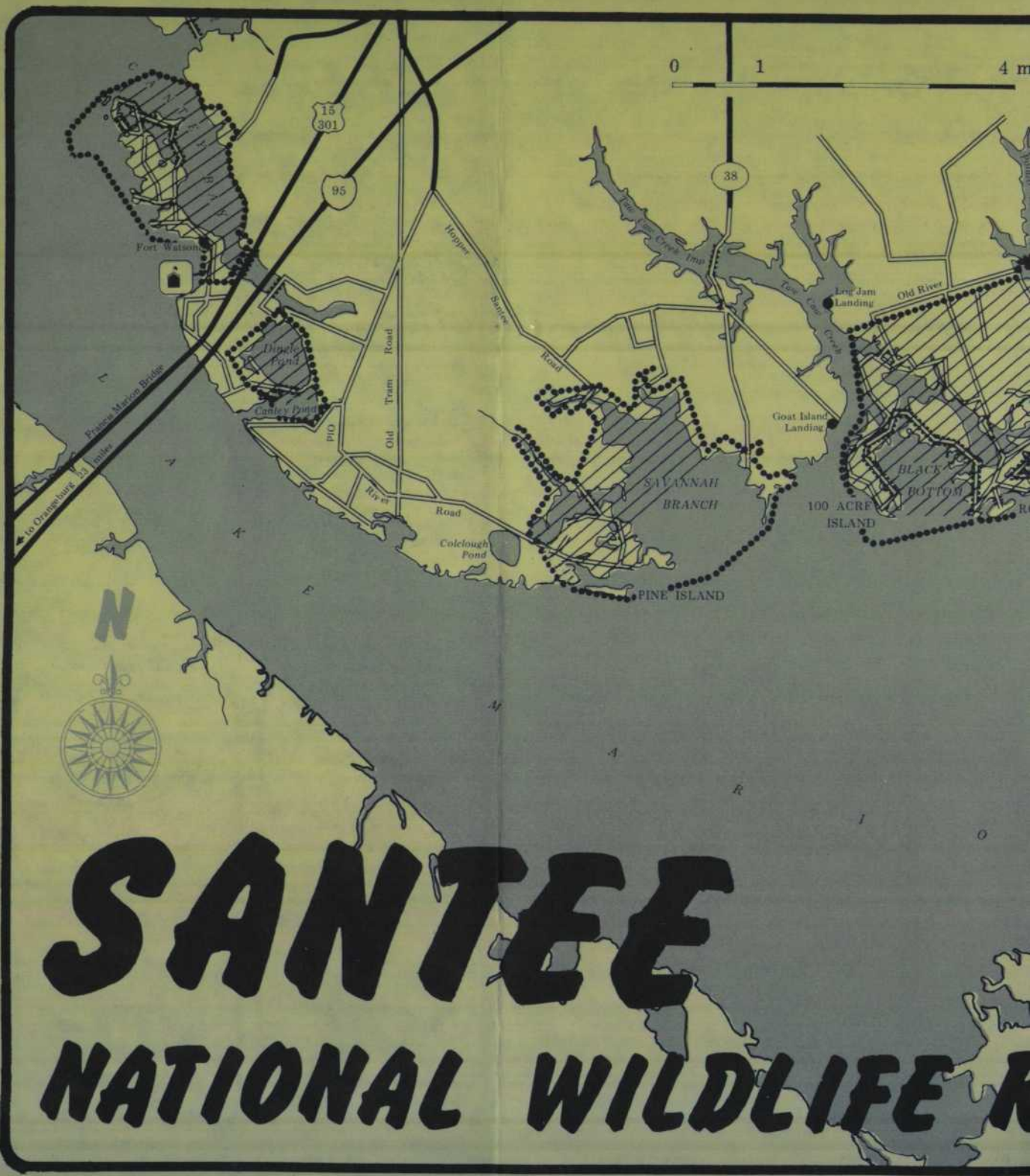
*Santee
National Wildlife Refuge*



U. S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service

RF - 42570-7

March 1985



Santee

National Wildlife Refuge

Route 2, Box 66

Summerton, S. C. 29148

Santee Refuge is one of over 400 National Wildlife Refuges. The primary objective of a National Wildlife Refuge is to provide habitat for the conservation and protection of all species of wildlife. Sport fishing is permitted at a level compatible with the environment, provides wholesome recreational activities, and permits the use of a valuable renewable resource.

The regulations listed below supplement the general regulations which govern fishing on wildlife refuge areas as set forth in Title 50 Code of Federal Regulations. Sport fishing will be in accordance with applicable State regulations.

GENERAL FISHING REGULATIONS

Public fishing on the Santee National Wildlife Refuge is permitted on approximately 16,000 acres as shown on the reverse map, except for those areas designated by signs and/or map as being closed.

Sport fishing is permitted 24 hours per day except for waters within land units which are limited to daylight use/bank fishing only.

Sport fishing is permitted year-round except that Cantey Bay, Black Bottom, Savannah Branch and waters within all land units are closed from November 1 through February 28.

A valid State fishing license is required in accordance with State regulations.

Camping, overnight mooring of boats, open fires and firearms are prohibited.

Disturbing, damaging, destroying or other molesting of wildlife, habitat, or refuge facilities is prohibited.

NOTES

Calendar of Wildlife Events



Santee
National Wildlife Refuge

CALENDAR OF WILDLIFE EVENTS

This calendar is meant to provide visitors with a general guide to seasonal wildlife events. Weather may cause variations of one to two weeks.

JANUARY. Waterfowl concentrations peak with Canada geese abundant on the wheat fields and large numbers of mallards in the impoundments and bays. "Winter" sparrows, juncos and finches are here in good numbers for the winter. Striped bass are schooling.

FEBRUARY. Waterfowl numbers begin to drop with shovelers becoming prevalent. Crappie begin to move into the creeks. Wood ducks, purple martins and bluebirds are beginning to look over the nesting boxes.

MARCH . . . Raptors are plentiful. Alligators may be seen sunning on canal and pond edges. Largemouth bass begin to move into the shallows.

APRIL Butterflies and dragonflies are everywhere. Buntings, orioles, tanagers, vireos and blue grosbeaks have returned and warblers are migrating. Productive fishing for most species.

MAY. Spring migration continues. Nesting activities are evident. Excellent fishing for all species.

JUNE Hummingbirds, titmice and chickadees are using the porch feeders while rabbits and squirrels forage below. Fish begin to seek out cooler waters. White bass begin schooling.

JULY Shorebirds begin to return from their nesting grounds and can be seen on pond and lake edges. Young of the year are out practicing their skills and learning to survive. Bass, crappie and catfish have moved to deep water.

AUGUST. . . Summer warblers begin to migrate south. Redbugs, biting flies and mosquitos are voracious. Fishing is generally poor.

SEPTEMBER. Fall songbird migration peaks. Terns are leaving as kestrels, blue-winged teal and gulls are arriving. Hummingbirds leave feeders.

OCTOBER. . Raptors, cormorants, white-throated and song sparrows, and waterfowl are arriving in numbers. Ruby-crowned kinglets and yellow-rumped warblers are prevalent. Catfishing is excellent.

NOVEMBER. Bald eagles are frequently sighted around waterfowl concentrations. Finches begin to monopolize the feeders. Striped bass are schooling.

DECEMBER. Large concentrations of waterfowl. Whistling swans may be observed on Bluff Unit. Excellent fishing for largemouth bass, striped bass and catfish.

VISITOR INFORMATION

The Santee National Wildlife Refuge Office/Visitor Center is located in North Santee on the shores of Lake Marion. The office is located off U.S. Highway 301/15, seven miles south of Summerton, S.C. and five miles north of Santee, S.C. Signs that will lead you to the office are located at the entrance to the refuge on U.S. Highway 301/15 and on Interstate 95, Exit 102. The historical site of Ft. Watson/Santee Indian Mound and the Wright's Bluff Nature Trail are located at the end of the paved entrance road and are open year round.

Public ramps for launching boats are located on the Cuddo Unit (State Highway 260 at Taw Caw Creek, open year round), on the Pine Island Unit (east end of State Highway 400, open year round), and on the Bluff Unit (State Highway 257 and U.S. Highway 301/15 intersection on Cantey Bay, open March 1 - October 31).

There are several campgrounds, restaurants, and motels within two to seven miles of the Refuge Office. Recreational camping is not permitted on the refuge. Restrooms and drinking water are available at the Refuge Office during office hours.

Foot, bicycle and boat traffic is permitted inside the land units from March 1 - October 31. Exterior Lake waters are open year round with the exception of Cantey Bay, Savannah Branch, and Black Bottom, which are closed to boating traffic from November 1 - February 28. The Dingle Pond Public Use Natural Area and the Scott's Lake and Wright's Bluff Nature Trail areas are open year round.

REMEMBER - Bring everything you need to make your visit enjoyable rain gear, comfortable walking shoes, insect repellent during warm weather, water, binoculars, etc.

WEAPONS, WATER SKIING AND SWIMMING ARE NOT PERMITTED. PETS MUST BE ON A LEASH.

For additional information on hunting, fishing, and other public uses, please write the Refuge Manager, Route 2, Box 66, Summerton, S.C. 29148 or call (803) 478-2217.

DON'T LITTER, HELP KEEP OUR WILD AREAS CLEAN

DEPARTMENT OF THE INTERIOR
U. S. Fish and Wildlife Service

—	Dickcissel	.....	T
—	Evening Grosbeak	.....	W
—	Purple Finch	.....	W
—	House Finch	.....	T
—	Pine Siskin	.....	W
—	American Goldfinch	.....	W
—	Rufous-sided Towhee	.....	P
—	Savannah Sparrow	.....	W
—	Grasshopper Sparrow	.....	W
—	Henslow's Sparrow	.....	A
—	LeConte's Sparrow	.....	W
—	Vesper Sparrow	.....	W
—	Lark Sparrow	.....	T
—	Bachman's Sparrow	.....	P
—	Dark-eyed Junco	.....	W
—	Chipping Sparrow	.....	P
—	Clay-colored Sparrow	.....	A
—	Field Sparrow	.....	P
—	White-crowned Sparrow	.....	W
—	White-throated Sparrow	.....	W
—	Fox Sparrow	.....	W
—	Lincoln's Sparrow	.....	A
—	Swamp Sparrow	.....	W
—	Song Sparrow	.....	W

NOTES

Date _____ No. Species _____

Observer(s) _____

Weather _____

Time Afield _____

DEPARTMENT OF THE INTERIOR
U.S. Fish and Wildlife Service

RF-42570-2 - May 1989

BIRDS



of the
SANTEE
National Wildlife Refuge

The Santee National Wildlife Refuge, established in 1941 as a refuge for migratory waterfowl, lies in the upper coastal plains of central South Carolina in Clarendon County, approximately seven miles south of Summerton on Highway 301.

The refuge is comprised of 15,095 acres of mixed hardwoods, mixed pine-hardwoods, pine plantations, marsh, croplands, old fields, ponds, impoundments, and open waters located in four separate management units along Lake Marion, a hydro-electric reservoir. This diversity of habitats on Santee supports a wide variety of birds.

This list of 293 species is based on records and observations by refuge personnel, state biologists, and visiting birders and on a literature search of appropriate publications. Persons having information regarding species not listed are urged to contact the Refuge Manager, Santee National Wildlife Refuge, Route 2, Box 66, Summerton, SC 29148 - phone (803) 478-2217.

Since most birds are migratory, species use of the refuge is indicated by the following codes:

P = Permanent Resident T = Transient
W = Winter Visitor A = Accidental
S = Summer Resident

LOONS:

— Common Loon T
— Red-throated Loon T

GREBES:

— Red-necked Grebe T
— Horned Grebe W
— Eared Grebe A
— Pied-billed Grebe P

PELICANS, CORMORANTS, DARTERS:

— American White Pelican A
— Double-crested Cormorant P
— Anhinga P

HERONS, BITTERNS, STORKS:

— Great Blue Heron P
— Green-backed Heron S
— Little Blue Heron P
— Cattle Egret S
— Great Egret P
— Snowy Egret P
— Tricolored Heron P
— Black-crowned Night Heron P
— Yellow-crowned Night Heron S
— Least Bittern S
— American Bittern W
— Wood Stork A

IBISES:

— Glossy Ibis S
— White Ibis P

WATERFOWL:

— Tundra Swan W
— Canada Goose W
— Barnacle Goose A
— White-fronted Goose W
— Snow Goose W
— Fulvous Whistling Duck A
— Mallard P
— American Black Duck W
— Gadwall W
— Northern Pintail W
— Green-winged Teal P
— Blue-winged Teal P
— Cinnamon Teal A
— Eurasian Wigeon A
— American Wigeon W
— Northern Shoveler W
— Wood Duck P
— Redhead W
— Ring-necked Duck W
— Canvasback W
— Greater Scaup W
— Lesser Scaup W
— Common Goldeneye W
— Bufflehead W
— White-winged Scoter A
— Ruddy Duck W
— Hooded Merganser W
— Common Merganser W
— Red-breasted Merganser W

VULTURES:

— Turkey Vulture P
— Black Vulture P

HAWKS:

— American Swallow-tailed Kite A
— Mississippi Kite S
— Sharp-shinned Hawk W
— Cooper's Hawk P
— Red-tailed Hawk P
— Red-shouldered Hawk P
— Broad-winged Hawk S
— Rough-legged Hawk A
— Golden Eagle W
— Bald Eagle P
— Northern Harrier W

OSPREYS, FALCONS:

— Osprey P
— Peregrine Falcon T
— Merlin T
— American Kestrel W

QUAIL, TURKEYS, CRANES:

— Northern Bobwhite P
— Wild Turkey P
— Sandhill Crane A

RAILS, AVOCETS:

King Rail	P
Virginia Rail	W
Sora	W
Yellow Rail	T
Black Rail	T
Purple Gallinule	S
Common Moorhen	P
American Coot	W
American Avocet	A

PLOVERS:

Semipalmated Plover	T
Wilson's Plover	T
Killdeer	P
Piping Plover	T
Lesser Golden Plover	T
Black-bellied Plover	T

SANDPIPERS:

Marbled Godwit	T
Whimbrel	T
Upland Sandpiper	T
Greater Yellowlegs	W
Lesser Yellowlegs	T
Solitary Sandpiper	T
Willet	T
Spotted Sandpiper	W
Ruddy Turnstone	T
Wilson's Phalarope	T
American Woodcock	P
Common Snipe	W
Short-billed Dowitcher	T
Long-billed Dowitcher	T
Red Knot	T
Sanderling	T
Semipalmated Sandpiper	T
Western Sandpiper	T
Least Sandpiper	T
White-rumped Sandpiper	T
Baird's Sandpiper	T
Pectoral Sandpiper	T
Dunlin	T
Stilt Sandpiper	T
Buff-breasted Sandpiper	T
Ruff	A

GULLS, TERNS, SKIMMERS:

Herring Gull	P
Ring-billed Gull	P
Laughing Gull	T
Franklin's Gull	A
Bonaparte's Gull	W
Forster's Tern	W
Common Tern	W
Little Tern	S
Royal Tern	T
Caspian Tern	T

Black Tern	T
Black Skimmer	A

PIGEONS, DOVES, CUCKOOS:

Rock Dove	P
Mourning Dove	P
Common Ground Dove	A
Yellow-billed Cuckoo	S
Black-billed Cuckoo	T

OWLS:

Common Barn-Owl	P
Eastern Screech Owl	P
Great Horned Owl	P
Barred Owl	P
Long-eared Owl	W
Short-eared Owl	W
Northern Saw-whet Owl	T

GOATSUCKERS:

Chuck-will's widow	S
Whip-poor-will	T
Common Nighthawk	S

SWIFTS, HUMMINGBIRDS, KINGFISHERS:

Chimney Swift	S
Ruby-throated Hummingbird	S
Belted Kingfisher	P

WOODPECKERS:

Northern Flicker	P
Pileated Woodpecker	P
Red-bellied Woodpecker	P
Red-headed Woodpecker	P
Yellow-bellied Sapsucker	W
Hairy Woodpecker	P
Downy Woodpecker	P
Red-cockaded Woodpecker	P

FLYCATCHERS:

Eastern Kingbird	S
Gray Kingbird	A
Western Kingbird	T
Scissor-tailed Flycatcher	A
Great Crested Flycatcher	T
Eastern Phoebe	W
Yellow-bellied Flycatcher	T
Acadian Flycatcher	S
Willow Flycatcher	T
Alder Flycatcher	T
Least Flycatcher	T
Eastern Wood-Pewee	S
Olive-sided Flycatcher	T

LARKS, SWALLOWS:

Horned Lark	W
Tree Swallow	T
Bank Swallow	T
Northern Rough-winged Swallow	S
Barn Swallow	S
Cliff Swallow	T
Purple Martin	S

JAYS, CROWS:

Blue Jay	P
American Crow	P
Fish Crow	P

TITMICE, NUTHATCHES, CREEPERS:

Carolina Chickadee	P
Tufted Titmouse	P
White-breasted Nuthatch	P
Red-breasted Nuthatch	W
Brown-headed Nuthatch	P
Brown Creeper	W

WRENS:

House Wren	W
Winter Wren	W
Bewick's Wren	A
Carolina Wren	P
Marsh Wren	W
Sedge Wren	W

MIMIC THRUSHES, THRUSHES:

Northern Mockingbird	P
Gray Catbird	P
Brown Thrasher	P
American Robin	P
Wood Thrush	S
Hermit Thrush	W
Swainson's Thrush	T
Gray-cheeked Thrush	T
Veery	T
Eastern Bluebird	P

KINGLETS:

Blue-gray Gnatcatcher	P
Golden-crowned Kinglet	W
Ruby-crowned Kinglet	W

PIPITS:

Water Pipit	W
Sprague's Pipit	A

WAXWINGS, SHRIKES, STARLINGS:

Cedar Waxwing	W
Loggerhead Shrike	P
European Starling	P

VIREOS:

White-eyed Vireo	S
Yellow-throated Vireo	S
Solitary Vireo	W
Red-eyed Vireo	S
Philadelphia Vireo	T
Warbling Vireo	T

WOOD WARBLERS:

Black-and-white Warbler	P
Prothonotary Warbler	S
Swainson's Warbler	S
Worm-eating Warbler	T
Golden-winged Warbler	T
Blue-winged Warbler	T

Tennessee Warbler	T
Orange-crowned Warbler	W
Nashville Warbler	T
Northern Parula	S
Yellow Warbler	T
Magnolia Warbler	T
Cape May Warbler	T
Black-throated Blue Warbler	T
Yellow-rumped Warbler	W
Black-throated Green Warbler	T
Cerulean Warbler	T
Blackburnian Warbler	T
Yellow-throated Warbler	P
Chestnut-sided Warbler	T
Bay-breasted Warbler	T
Blackpoll Warbler	T
Pine Warbler	P
Kirtland's Warbler	T
Prairie Warbler	S
Palm Warbler	W
Ovenbird	T
Northern Waterthrush	T
Louisiana Waterthrush	S
Kentucky Warbler	S
Connecticut Warbler	T
Mourning Warbler	T
Common Yellowthroat	P
Yellow-breasted Chat	S
Hooded Warbler	S
Wilson's Warbler	T
Canada Warbler	T
Slate-throated Redstart	S

WEAVER FINCHES, BLACKBIRDS:

House Sparrow	P
Bobolink	T
Eastern Meadowlark	P
Western Meadowlark	A
Yellow-headed Blackbird	A
Red-winged Blackbird	P
Orchard Oriole	S
Northern Oriole	W
Rusty Blackbird	W
Brewer's Blackbird	A
Boat-tailed Grackle	A
Common Grackle	P
Brown-headed Cowbird	P

TANAGERS:

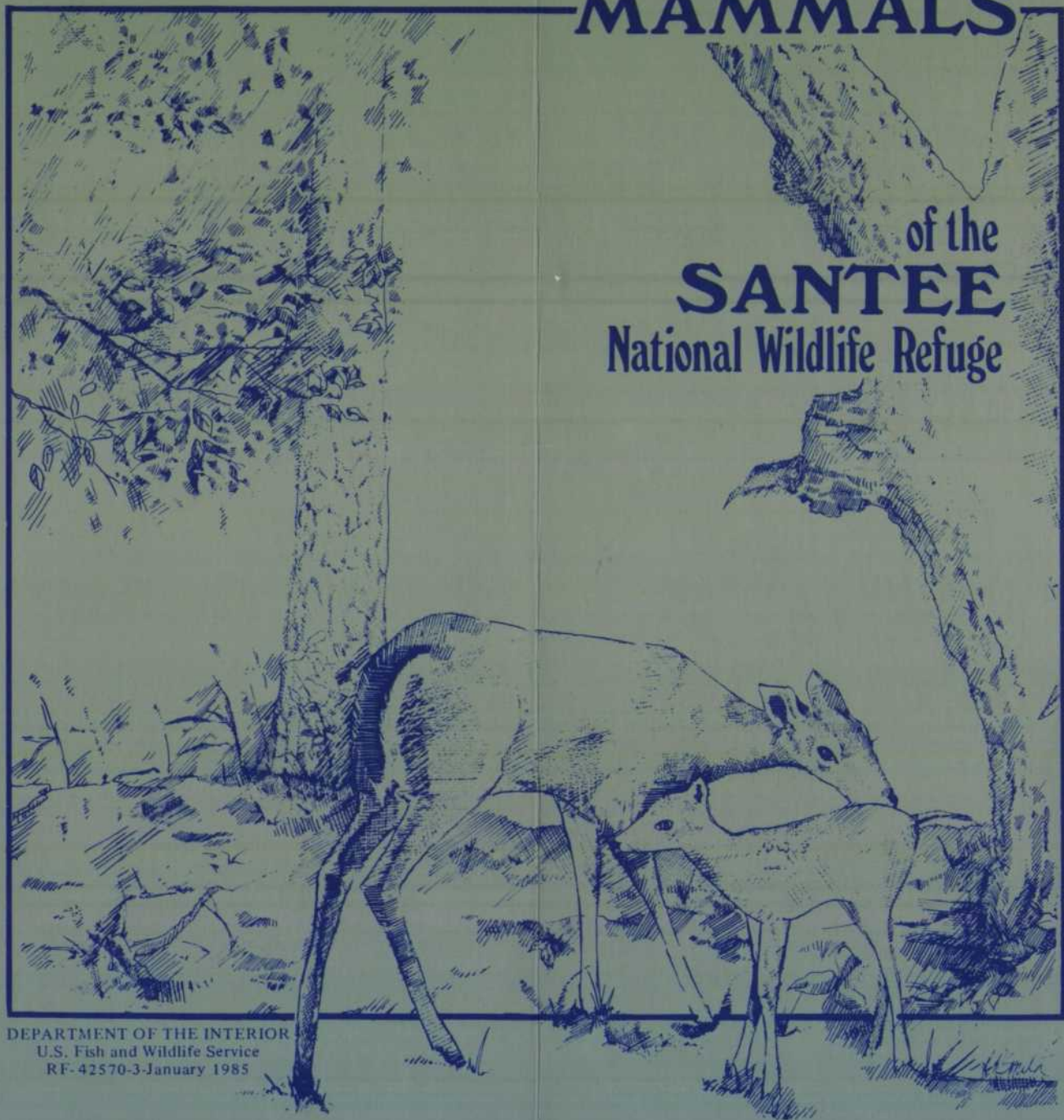
Western Tanager	T
Scarlet Tanager	T
Summer Tanager	S

FINCHES:

Northern Cardinal	P
Rose-breasted Grosbeak	T
Blue Grosbeak	S
Indigo Bunting	S
Painted Bunting	S

MAMMALS

of the SANTEE National Wildlife Refuge



DEPARTMENT OF THE INTERIOR
U.S. Fish and Wildlife Service
RF-42570-3-January 1985

The Santee National Wildlife Refuge, established in 1941 as a refuge for migratory waterfowl, lies in the upper coastal plains of central South Carolina in Clarendon county, approximately seven miles south of Summerton on Highway 301.

The refuge is comprised of 15,095 acres of mixed hardwoods, mixed pine-hardwoods, pine plantations, marsh, croplands, old fields, ponds, impoundments and open waters located in four separate management units along Lake Marion, a hydro-electric reservoir. This diversity of habitat on the refuge supports a wide variety of mammals.

This list of 45 species is based on records and observations by refuge personnel, state biologists and local citizens and on a literature search of appropriate publications. Persons having information regarding species not listed are urged to contact the Refuge Manager, Santee National Wildlife Refuge, Route 2, Box 66, Summerton, South Carolina 29148, or telephone (803) 478-2217.

MARSUPIALS

These are mammals that bear very undeveloped young and carry them in a pouch on the belly.

VIRGINIA OPOSSUM (*Didelphis virginiana*). This nocturnal mammal is common on the refuge.

INSECTIVORES

Shrews and moles are small mammals with short thick fur, tiny eyes and ears and five clawed toes on their feet.

SOUTHEASTERN SHREW (*Sorex longirostris*). This long-tailed mammal is brownish above and buff below and can be found burrowing in mossy areas, fields, brushy areas and woods.

SOUTHERN SHORT-TAILED SHREW (*Blarina carolinensis*). This shrew is gray all over with a short tail and is common under hedges and in woodlands.

LEAST SHREW (*Cryptotis parva*). The least shrew is short-tailed and grayish-brown or brown with a paler belly and prefers fields, marshes and wet woods.

EASTERN MOLE (*Scalopus aquaticus*). A long, naked snout, outturned palms, webbed toes and a short, naked tail identify this resident of fields and waste areas.

STAR-NOSED MOLE (*Condylura cristata*). A long, hairy tail and 22 fleshy projections on the nose make this mole unmistakable in its usually wet habitat.

BATS

Bats are the only mammals that truly fly. These mammals are best seen flying about at dusk searching for insects.

LITTLE BROWN MYOTIS (*Myotis lucifugus*). This bat is glossy brown above and buff below and is seen occasionally during warm weather.

SILVER-HAIRED BAT (*Lasiurus noctivagus*). The silver-haired bat is nearly black with silver frosted hairs on the back and is found in protected areas of trees.

EASTERN PIPISTRELLE (*Pipistrellus subflavus*). This species of bat can be found during the daytime hanging in vegetation. The eastern pipistrelle is our smallest bat and has reddish to light brown, tricolored hair.

BIG BROWN BAT (*Eptesicus fuscus*). This large brown bat is found in buildings and hollow trees.

RED BAT (*Lasiurus borealis*). Varying shades of red with white frosting on back and breast and a whitish patch on each shoulder distinguish this bat which is found in summer in trees and hedgerows.

SEMINOLE BAT (*Lasiurus seminolus*). This silver-frosted, mahogany brown bat is found during daytime hanging in clumps of Spanish moss.

HOARY BAT (*Lasiurus cinereus*). Light brown with dense white frosting and a buff throat, our largest but rarely seen bat can be found hanging from evergreen branches.

NORTHERN YELLOW BAT (*Lasiurus intermedius*). Large with long, silky, yellowish-brown fur touched with black above, this tree-loving bat can rarely be seen by day, hanging in clumps of Spanish moss.

EVENING BAT (*Nycticeius humeralis*). The evening bat is reddish-brown above and tawny below and is found in summer in buildings and hollow trees.

RAFINESQUE'S BIG-EARED BAT (*Plecotus rafinesquii*). Large ears distinguish this brown bat with white frosting below.

BRAZILIAN FREE-TAILED BAT (*Tadarida brasiliensis*). The naked tail extending beyond the interfemoral membrane separates this bat from the others.

RODENTS

These gnawing mammals have two pairs of incisor teeth. Although common, some species are seldom seen and difficult to identify unless in hand.

MARSH RABBIT (*Sylvilagus palustris*). Dark brown with a small grayish-brown tail, this rabbit is common on the refuge around the lake edges, swamps and bottomlands.

EASTERN COTTONTAIL (*Sylvilagus floridanus*). Grayish-brown above with white below the short tail, this common resident inhabits brushy areas, old fields, woods and cultivated areas.

GRAY SQUIRREL (*Sciurus carolinensis*). Gray, silver-tipped hair and a flat, bushy tail characterize this common forest resident.

FOX SQUIRREL (*Sciurus niger*). This, our largest tree squirrel is usually black and white, but can vary. A large bushy tail with yellow-tipped hairs can be seen on this occasional forest resident.

SOUTHERN FLYING SQUIRREL (*Glaucomys volans*). This is our only flying squirrel and our smallest squirrel, and although very common on the refuge, is seldom seen since it is nocturnal.

BEAVER (*Castor canadensis*). This large, dark brown rodent has a paddle-shaped, flat, black, scaly tail. Although not yet positively identified on the refuge, this mammal is known to occur within three miles of the refuge on Lake Marion and is possibly using the refuge lands and waters.

MARSH RICE RAT (*Oryzomys palustris*). It is a common resident of marshes, canals and impoundments.

EASTERN HARVEST MOUSE (*Reithrodontomys humulis*). They are common in refuge old fields and field edges.

OLDFIELD MOUSE (*Peromyscus polionotus*). This animal is common in timbered lowlands and old fields.

COTTON MOUSE (*Peromyscus gossypinus*). It is common in timbered lowlands, brushy areas and swamps.

GOLDEN MOUSE (*Ochrotomys nuttalli*). These mammals are common in thickets, brushy areas and swamps.

HISPID COTTON RAT (*Sigmodon hispidus*). It is common in grassy areas, brush piles and forest edges.

EASTERN WOODRAT (*Neotoma floridana*). They are common in woodlands and hedgerows.

WOODLAND OR PINE VOLE (*Microtus pinetorum*). These animals are noted for their tunnels in woodlands.

MUSKRAT (*Ondatra zibethicus*). It is common around water.

BLACK RAT (*Rattus rattus*). This is a non-native animal that may occur around buildings.

NORWAY RAT (*Rattus norvegicus*). Also introduced, the animal may occur around buildings, grain bins and cultivated fields.

HOUSE MOUSE (*Mus musculus*). An introduced species, it is common around buildings and fields.

CARNIVORES

These mammals are predators that live mainly on freshly killed prey, although some are omnivorous, and eat a lot of vegetative material.

RED FOX (*Vulpes vulpes*). A small, red, doglike mammal with a long, white-tipped, bushy tail, it is common throughout the refuge, especially in cropland areas.

GRAY FOX (*Urocyon cinereoargenteus*). Small and doglike and colored grayish above and reddish below with a long, black-tipped, bushy tail, this mammal is common in woody and brushy areas.

RACCOON (*Procyon lotor*). Easily identified by its black and brownish-gray ringed tail and black mask, this mammal is common throughout the refuge.

LONG-TAILED WEASEL (*Mustela frenata*). Brown above and white below with a black-tipped, brown tail, this nocturnal mammal prefers to hunt in areas near water.

MINK (*Mustela vison*). Dark brown or black with white spots on the chin and throat, this nocturnal mammal hunts along the lake edge and around the refuge canals, impoundments and marshes.

STRIPED SKUNK (*Mephitis mephitis*). Black with two white stripes on its back, this mammal is rarely seen in the area.

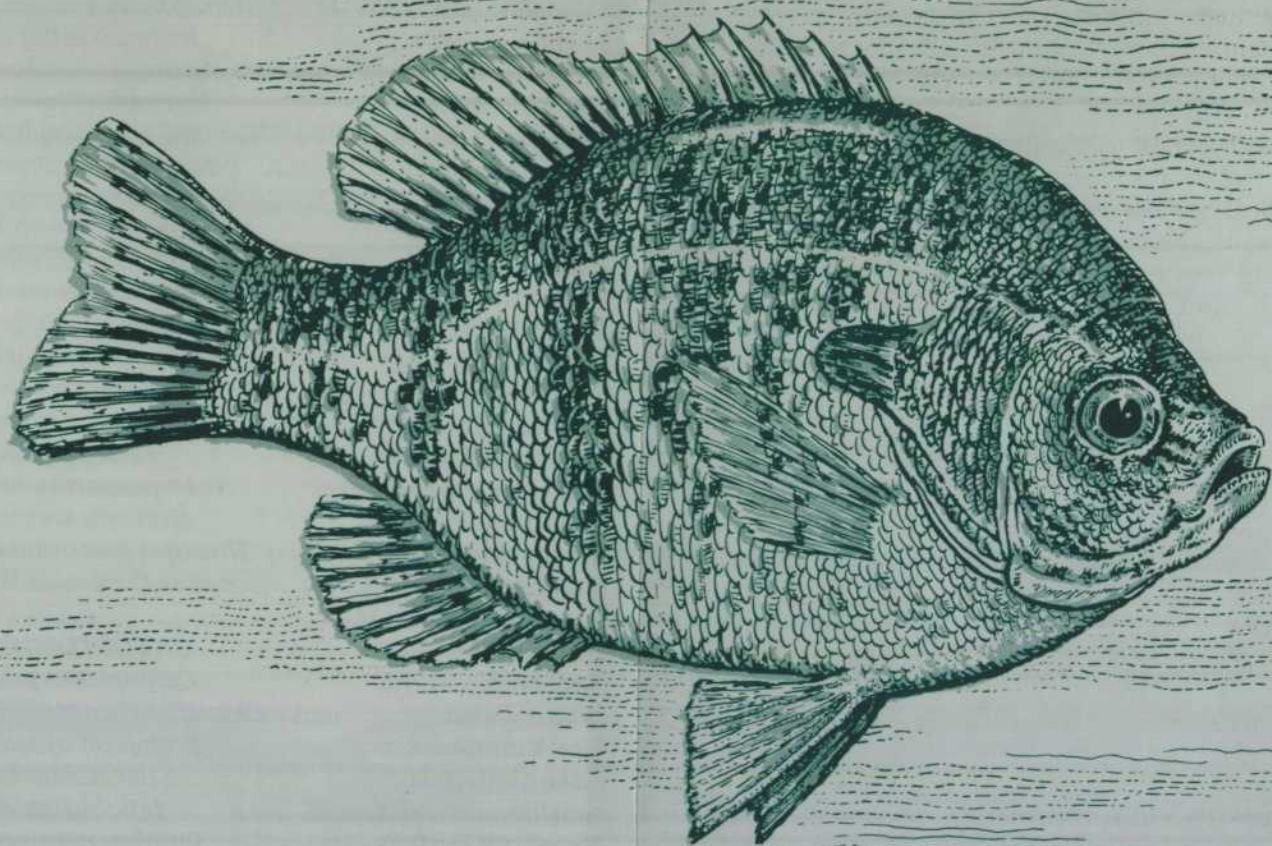
RIVER OTTER (*Lutra canadensis*). Dark brown with a paler belly and throat, prominent whiskers, a long tapering tail and webbed feet, this mammal is common in refuge waters but submerges quickly and quietly when disturbed by humans.

BOBCAT (*Felis rufus*). Grayish with black spots and a short tail, this mammal is common but only seen occasionally.

HOOFED MAMMALS

WHITE-TAILED DEER (*Odocoileus virginianus*). Santee's only hoofed mammal is easily identified by its long slender legs and "white-flag" tail. Common but difficult to observe, this mammal is tan or reddish-brown above in summer and grayish-brown in winter with white below. Bucks have antlers which they shed yearly and fawns are reddish colored with white spots.

FISHES



DEPARTMENT OF THE INTERIOR
U. S. Fish and Wildlife Service

of the
SANTEE
National Wildlife Refuge

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Although minimal fish management is conducted at Santee, the waters of the lake and refuge provide optimum habitat for a variety of game and non-game fish species. Lake Marion is one of the foremost recreational fishing spots in the nation. Following is a species list derived from records and collections by refuge personnel and visiting ichthyologists. More exhaustive collecting would doubtlessly reveal additional species. Persons having information regarding species not listed herein are urged to contact the Refuge Manager, Santee National Wildlife Refuge, Route 2, Box 66, Summerton, South Carolina 29148.

STURGEONS

Atlantic sturgeon
Shortnose sturgeon

ACIPENSERIDAE

Acipenser oxyrhynchus
Acipenser brevirostrum

GARS

Longnose gar

LEPISOSTEIDAE

Lepisosteus osseus

BOWFINS

Bowfin

AMIIDAE

Amia calva

FRESHWATER EELS

American eel

ANGUILLIDAE

Anguilla rostrata

HERRINGS

Blueback herring
Hickory shad
American shad
Gizzard shad
Threadfin shad

CLUPEIDAE

Alosa aestivalis
Alosa mediocris
Alosa sapidissima
Dorosoma cepedianum
Dorosoma petenense

MUDMINNONS

Eastern mudminnow

UMBRIDAE

Umbra pygmaea

PIKES

Redfin pickerel
Chain pickerel

ESOCIDAE

Esox a. americanus
Esox niger

MINNOWS and CARPS

Goldfish
Common carp
Mississippi silvery minnow
Highback chub
Thicklip chub
Bluehead chub
Golden shiner
Highfin shiner
Ironcolor shiner
Greenfin shiner
Greenhead shiner
Warpaint shiner
Dusky shiner
Whitetail shiner
Spottail shiner
Sailfin shiner
Yellowfin shiner
Taillight shiner
Whitefin shiner
Coastal shiner
Swallowtail shiner
Fieryblack shiner
Sandbar shiner
Mirror shiner
Creek chub

CYPRINIDAE

Carassius auratus
Cyprinus carpio
Hybognathus nuchalis
Hybopsis hypsinotus
Hybopsis labrosa
Nocomis leptcephalus
Notemigonus crysoleucas
Notropis altipinnis
Notropis chalybaeus
Notropis chloristius
Notropis chlorocephalus
Notropis coccogenis
Notropis cummingsae
Notropis galacturus
Notropis hudsonius
Notropis hypselopterus
Notropis lutipinnis
Notropis maculatus
Notropis niveus
Notropis petersoni
Notropis procne
Notropis pyrrhomelas
Notropis scepticus
Notropis spectrunculus
Semotilus atromaculatus

SUCKERS

Quillback
White sucker
Creek chubsucker
Lake chubsucker
Smallmouth buffalo
Bigmouth buffalo
Spotted sucker
Silver redhorse
Shorthead redhorse
Suckermouth redhorse
Smallfin redhorse

CATOSTOMIDAE

Carpoides cyprinus
Catostomus commersoni
Erimyzon oblongus
Erimyzon sucetta
Ictiobus bubalus
Ictiobus cyprinellus
Minytrema melanops
Moxostoma anisurum
Moxostoma macrolepidotum
Moxostoma pappilosum
Moxostoma robustum

FRESHWATER CATFISHES

Snail bullhead
White catfish
Blue catfish

ICTALURIDAE

Ictalurus brunneus
Ictalurus catus
Ictalurus furcatus

Yellow bullhead	<i>Ictalurus natalis</i>
Brown bullhead	<i>Ictalurus nebulosus</i>
Flat bullhead	<i>Ictalurus platycephalus</i>
Channel catfish	<i>Ictalurus punctatus</i>
Tadpole madtom	<i>Noturus gyrinus</i>
Margined madtom	<i>Noturus insignis</i>
Flathead catfish	<i>Pylodictis olivaris</i>

CAVEFISHES

Swampfish

AMBLYOPSIDAE

Chologaster cornuta

PIRATE PERCHES

Pirate Perch

APHREDODERIDAE

Aphredoderus sayanus

NEEDLEFISHES

Atlantic needlefish

BELONIDAE

Strongylura marina

KILLIFISHES

Golden topminnow

Lined topminnow

CYPRINODONTIDAE

Fundulus chrysotus

Fundulus lineolatus

LIVEBEARERS

Mosquitofish

Least killifish

POECILIIDAE

Gambusia affinis

Heterandria formosa

SILVERSIDES

Brook silverside

Tidewater silverside

ATHERINIDAE

Labidesthes sicculus

Menidia beryllina

TEMPERATE BASSES

White perch

White bass

Striped bass

Hybrid striped bass x white bass

PERCICHTHYIDAE

Morone americana

Morone chrysops

Morone saxatilis

Morone sp.

SUNFISHES

Mud sunfish

Flier

Banded pygmy sunfish

Blackbanded sunfish

Bluespotted sunfish

Banded sunfish

Redbreast sunfish

Green sunfish

Pumpkinseed

Warmouth

Orangespotted sunfish

Bluegill

CENTRARCHIDAE

Acantharchus pomotis

Centrarchus macropterus

Elassoma zonatum

Enneacanthus chaetodon

Enneacanthus gloriosus

Ennaecanthus obesus

Lepomis auritus

Lepomis cyanellus

Lepomis gibbosus

Lepomis gulosus

Lepomis humilis

Lepomis macrochirus

Dollar sunfish
Longear sunfish
Redear sunfish
Spotted sunfish
Largemouth bass
White crappie
Black crappie

PERCHES

Carolina darter
Fantail darter
Swamp darter
Johnny darter
Tessellated darter
Saluda darter
Sawcheek darter
Seagreen darter
Yellow perch
Piedmont darter
Shield darter

MULLETS

Striped mullet

SOLES

Hogchoker

Lepomis marginatus
Lepomis megalotis
Lepomis microlophus
Lepomis punctatus
Micropterus salmoides
Pomoxis annularis
Pomoxis nigromaculatus

PERCIDAE

Etheostoma collettei
Etheostoma flabellare
Etheostoma fusiforme
Etheostoma nigrum
Etheostoma olmstedtii
Etheostoma saludaense
Etheostoma serriferum
Etheostoma thalassinum
Perca flavescens
Percina crassirostris
Percina peltata

MUGILIDAE

Mugil cephalus

SOLEIDAE

Trinectes maculatus



Raccoon and Opossum - Last ten days of State gun season.

MIGRATORY BIRDS CUDDO UNIT ONLY

Mourning Dove - Opens with State season and ends September 30.

Waterfowl - Opens for October season, hunting is allowed until noon.

Decoys and non-native blind materials must be removed at end of each days hunt. Permanent blinds are not permitted.

SCOUTING

No special scouting season for white-tailed deer or waterfowl has been designated for the Cuddo Unit. Scouting is permitted during the dove and squirrel hunts.

The scouting period of the Pine Island Unit will be the last Friday and Saturday before the hunt - vehicles permitted. Hunters may scout anytime prior to this date on foot or bicycle.

**SANTEE NATIONAL WILDLIFE REFUGE
HUNT PERMIT VALID FOR:
BIG GAME, UPLAND GAME & MIGRATORY BIRDS**

NAME _____

ADDRESS _____

I have read and understand the regulations governing hunting on Santee NWR.

SIGNATURE

This permit is valid only when signed by the hunter listed above.

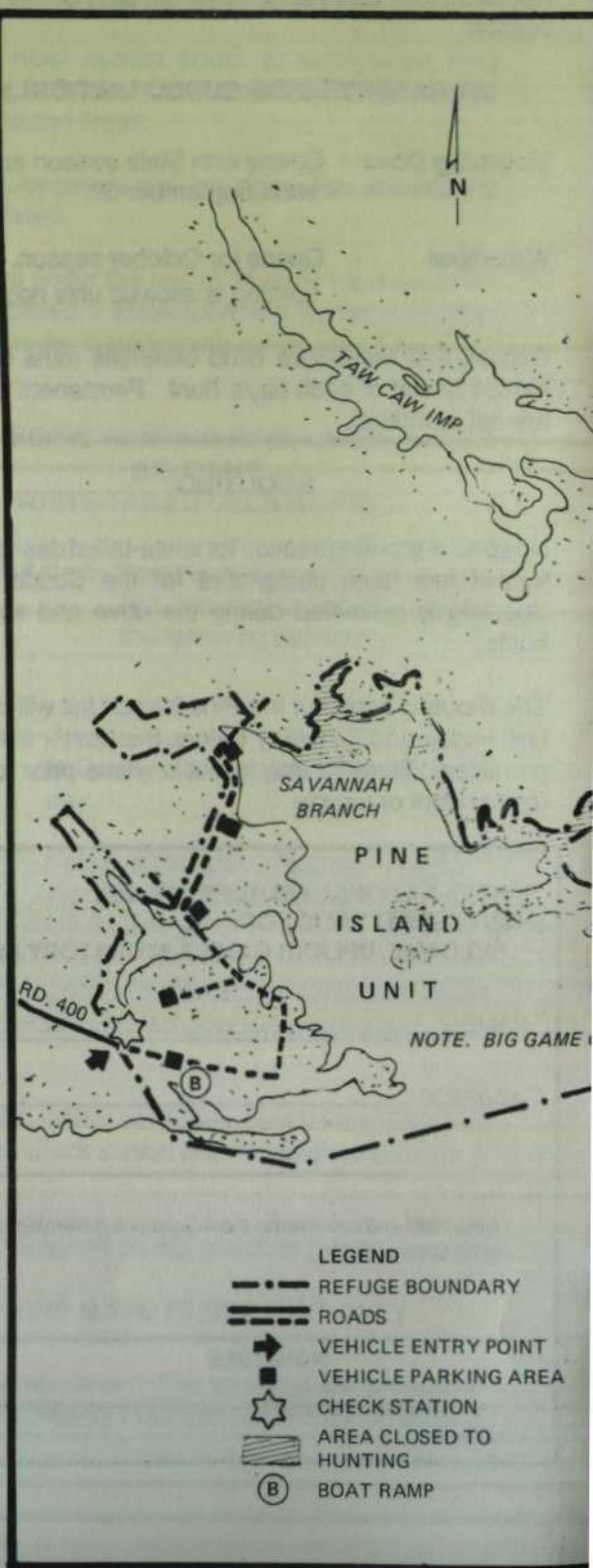
SANTEE NATIONAL WILDLIFE REFUGE

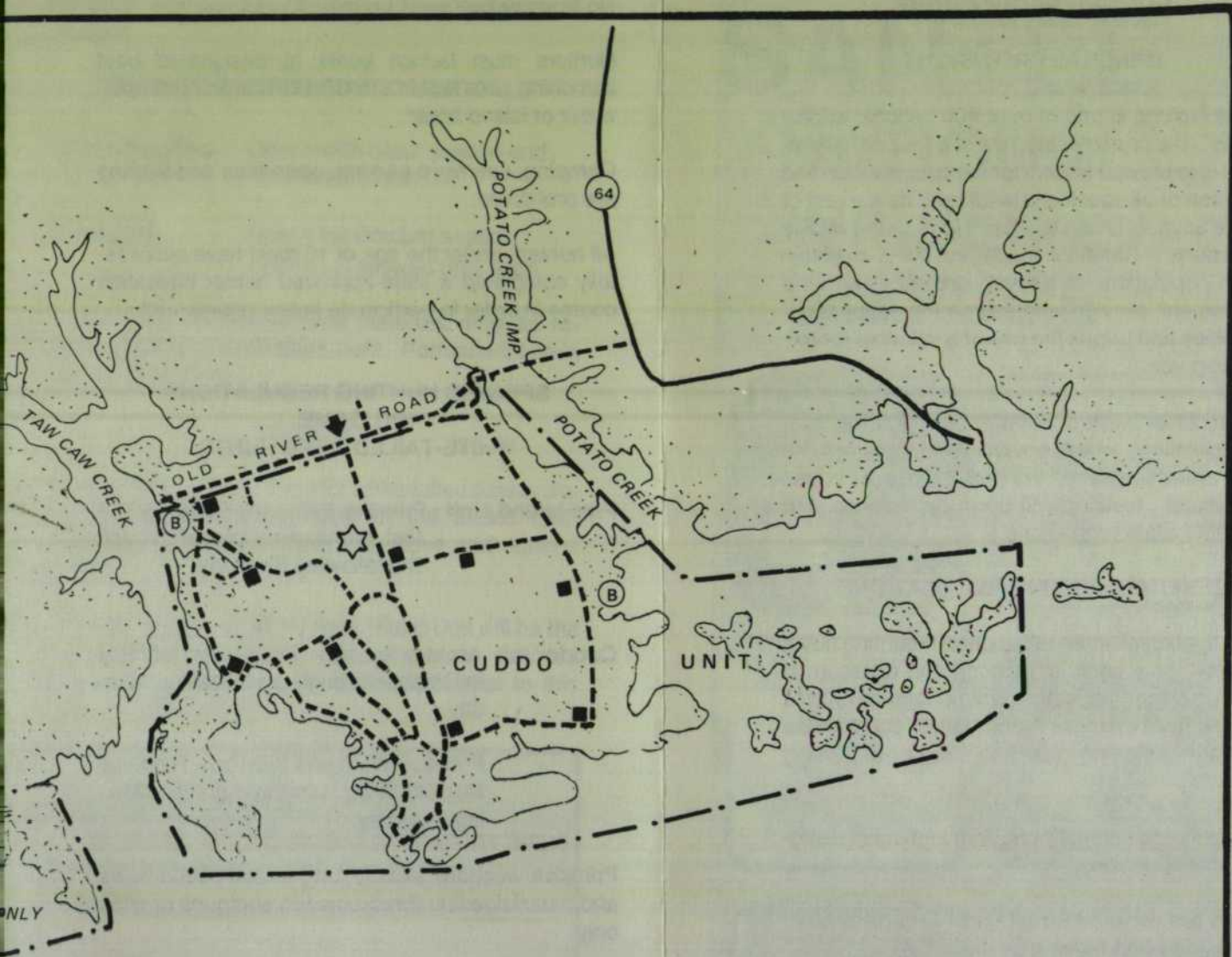


HUNTING REGULATIONS

SANTEE NATIONAL WILDLIFE REFUGE

SOUTH CAROLINA





LAKE

MARION

SANTEE NATIONAL WILDLIFE REFUGE

ROUTE 2, BOX 370

SUMMERTON, S.C. 29148

PHONE: (803) 478-2217

PINE ISLAND AND CUDDO UNITS

A PORTION OF SANTEE NATIONAL WILDLIFE REFUGE

0 1 MILE

HUNTING REGULATIONS

GENERAL PROVISIONS

Santee Refuge is one of over 400 national wildlife refuges. The primary objective of a national wildlife refuge is to provide habitat for the conservation and protection of all species of wildlife. The harvest of surplus animals is one tool used to manage wildlife populations. Carefully managed hunts maintain wildlife populations at a level compatible with the environment, provide wholesome recreational opportunities and permit the use of a valuable renewable resource.

The regulations listed below supplement the general regulations which govern hunting on wildlife refuge areas as set forth in Title 50, Code of Federal Regulations. Hunting will be in accordance with applicable State regulations.

GENERAL HUNTING REGULATIONS

Public hunting of white-tailed deer, mourning dove, waterfowl, gray squirrel, raccoon and opossum is permitted on portions of the Santee National Wildlife Refuge other than those areas marked or otherwise designated as being closed to entry or to hunting (see reverse map).

Hunters must personally check in and out of designated check stations.

Permits are required for all hunts and must be in possession when hunting on the refuge.

Upland game and migratory bird hunters are requested to use hunter check stations identified on reverse map.

Dogs may be used only for dove, waterfowl, opossum and raccoon hunting.

All vehicles must remain on established refuge roads identified by signs and/or gates.

All firearms must be unloaded and dismantled or encased while being transported in a vehicle.

No Sunday hunting is permitted.

Hunters must launch boats at designated boat launching sites within the Cuddo Unit to hunt open water or island areas.

Camping, overnight parking, open fires and littering are prohibited.

All hunters under the age of 16 must have successfully completed a state-approved hunter education course in order to participate in any refuge hunt.

SPECIFIC HUNTING REGULATIONS

BIG GAME

WHITE-TAILED DEER HUNTS

Pine Island Unit— Primitive Weapons Season - The first Monday in October through the following Saturday.

Cuddo Unit— Archery Season - The second Monday in October through the following Saturday.

Primitive Weapons Season - The third Monday in October through the following Saturday.

Primitive weapons include long or compound bows and muzzleloading (blackpowder) shotguns or rifles only.

No bag limit - either sex (does must be tagged at the designated check station prior to leaving the refuge).

An outer garment of daylight fluorescent orange material is required during gun deer hunts.

UPLAND GAME CUDDO UNIT ONLY

Gray Squirrel Only - Fox squirrels are protected. Opens with State season and closed September 30.