

CAROLINA SANDHILLS NATIONAL WILDLIFE REFUGE

McBee, South Carolina

ANNUAL NARRATIVE REPORT

Calendar Year 1987

U. S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

REVIEW AND APPROVALS

CAROLINA SANDHILLS NATIONAL WILDLIFE REFUGE

McBee, South Carolina

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Calendar Year 1987

<u>Ronald C Snider</u>	<u>3-22-88</u>	<u>James H. McDaniel</u>	<u>4-11-88</u>
Refuge Manager	Date	Refuge Supervisor Review	Date
<u>Harold W. Benson</u>		<u>5/26/88</u>	
Regional Office Approval		Date	

INTRODUCTION

Carolina Sandhills National Wildlife Refuge overlies a portion of the Fall Line region of South Carolina which forms the transition zone between the Atlantic Coastal Plain and the Piedmont Plateau. In prehistoric times the coastal plain was covered by an ancient ocean into which drained rivers from adjacent mountainous regions. Silt and sand deposited along the coastline from these streams eventually was formed into a band of sand dunes which are today known as the Sandhills Region of North and South Carolina.

Human habitation of the Sandhills has probably existed for over 10,000 years. Before the arrival of European man, the region was sparsely populated by scattered indian tribes which came to be known as the Catawba Nation. Little information is available concerning the early history of European man in this area. Not until the 16th century was the area visited by explorers and for the next 150 years, the only people to visit the region on a regular basis were trappers and traders in search of furs and hides. Not until the mid-1700's did Europeans begin to establish permanent settlements in inland South Carolina.

Vast longleaf pine forests dominated the landscape of the sandhills when man first settled in this area. These supported major lumber and naval stores industries by the late 1800's. However, by the early 1900's these forests had been completely destroyed and farming became the predominant lifestyle in this region. Poor agricultural practices and deep infertile soils combined to spell the doom of this industry. The region was badly eroded and essentially a biological desert when acquisition for the refuge began in 1934.

The refuge was established by Executive Order Number 8067 dated March 17, 1939 under authority of the 1933 National Industrial Recovery Act and the Emergency Relief Appropriation of 1935. The United States Department of the Interior owns a total of 92,000 acres of which 45,601.9 acres is managed by the U. S. Fish and Wildlife Service as the Carolina Sandhills National Wildlife Refuge. The remaining area comprises the Carolina Sandhills Wildlife Management Area and is leased to the South Carolina Forestry Commission who manages it as the Sand Hills State Forest.

Elevations on the refuge range from 250 to 500 feet above mean sea level. The topography is characterized by gently rolling hills comprised of deep sandy soils with occasional outcroppings of red and kaolin clays. Uniquely, much of the flora and fauna found in the east side of the refuge is characteristic of those forms generally associated with the Coastal Plain while those of the west side could be expected to be associated with the Piedmont Plateau. The dominant forest type is longleaf pine with a scattered understory of turkey oak. Where clay outcroppings occur, longleaf is replaced by loblolly pine and bluejack oak is the most common understory species.

The eastern portion of the refuge drains into Black Creek and its tributaries. Water in these streams is clear but stained black due to the presence of organic acids. The larger creeks have steep banks, deep channels, and moderate stream flows. Flood plain swamps occur along some of the large streams. Tributaries are similar except they are shallower and swifter. The western portion of the refuge drains into Lynches River and its tributaries. The tributaries of Lynches River are similar to those of Black Creek except that they are deeper and swifter. The mainstream of Lynches River originates in the Piedmont

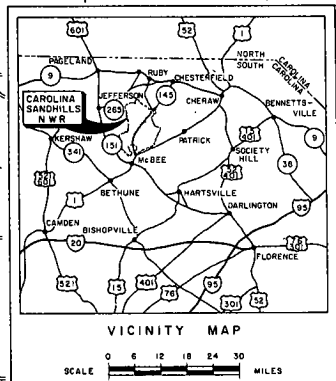
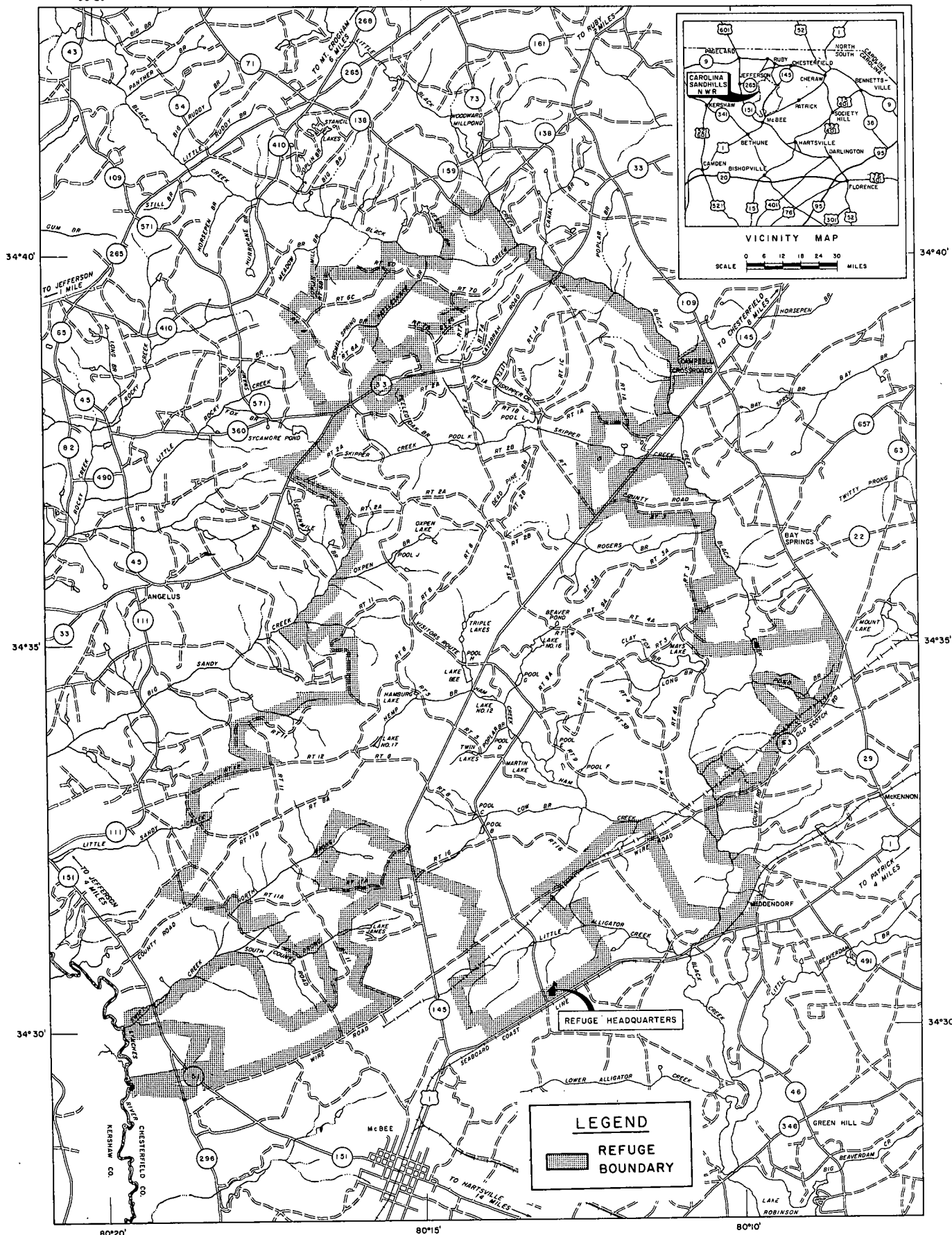
Plateau and in the vicinity of the refuge is characterized by slightly stained and turbid water and predominantly clay banks. Pocosin ecotones, swamp hardwood forests, and dense stands of evergreen shrubs border these streams producing some of the best wildlife habitat found on the refuge. Thirty small impoundments having dark, clear water have been constructed on these tributaries; most of these have been stocked with bass and bream. Edge and diversity have been added by the creation of many small fields scattered throughout the refuge.

CAROLINA SANDHILLS NATIONAL WILDLIFE REFUGE

CHESTERFIELD COUNTY, SOUTH CAROLINA

UNITED STATES
DEPARTMENT OF THE INTERIOR
80°20'

UNITED STATES
FISH AND WILDLIFE SERVICE
80°10'



LEGEND
REFUGE
BOUNDARY

COMPILED IN THE DIVISION OF REALTY FROM
SURVEYS BY U.S.G.S.

ATLANTA, GEORGIA
REVISED: 12/86

JUNE, 1974

Scale 0 1320 2640 5280 10560 15840 21120 FEET
0 1 2 3 4 MILES

TRUE NORTH
MEAN
DECLINATION
1974

4R-SC-275-404

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A. HIGHLIGHTS

Two staff members receive length of service awards. (Sec. E.1).

Martins Lake aerielly sceded with Japanese millet. (Sec. F.2).

Timber harvesting operations resume under Service administration. (Sec. F.3).

Wintering waterfowl populations reach all time low. (Sec. G.3).

Off road vehicle problems increase. (Sec. H. 15).

Refuge personnel assist local law enforcement officials with large marijuana haul; two arrests made. (Sec. H. 17).

Equipment operator Jack Oliver assists with wetlands restoration project. (Sec. I.3).

Radio communications system upgraded. (Sec. I.5).

B. CLIMATIC CONDITIONS

Generally speaking the year was wet with reasonably normal temperature extremes. The first quarter received 17.94 inches of precipitation which was 6.97 inches above normal for the period. An ice and sleet storm which occurred on February 16 produced some local power outages but little in the way of real damage. The months of April and May received less than normal rainfall but the quarter wound up with a 2.69 inch surplus due to the reception of 10.05 inches in June. The period was generally warm and humid. July and August were typically hot and humid but September was atypically cool and mild. Precipitation for this period was near normal with 16.25 inches recorded; a surplus of only 1.02 inches.

During the first three quarters of 1986 this area suffered through the worst drought on record. During that period only 24.44 inches of precipitation had been recorded, more than half of which was received in August alone. This represented a deficit of 13.05 inches. The comparable period for 1987 received 48.17 inches of rainfall; a surplus of 10.68 inches.

Winter arrived early in the Sandhills in 1987. Average temperatures for the month of October were six degrees below normal and the first frost occurred on October 9. While several frosts did occur in November, the month was mild overall. December began on a cool note but had warmed to above normal temperatures by month's end. This final quarter of the year was the only one which did not receive normal or above normal rainfall; only November received above normal amounts. Even at that the deficit was only 1.51 inches. Overall, the year received a surplus of 9.17 inches of precipitation.

Table 1. 1987 Temperature Data By Month

	<u>Average</u>		<u>Maximum</u>	<u>Minimum</u>
	<u>High</u>	<u>Low</u>		
January	53.1	33.7	70	21
February	55.3	36.6	72	22
March	66.4	41.7	79	28
April	73.3	48.0	88	29
May	85.7	61.4	93	46
June	88.5	71.0	94	60
July	94.5	71.1	100	63
August	93.2	71.8	100	64
September	85.2	65.2	92	53
October	72.0	44.4	80	30
November	69.7	44.6	80	24
December	59.0	64.3	75	22
Averages			85.25	38.5

Table 2. Monthly Distribution of Precipitation In Inches (1987)

<u>Month</u>	<u>1987</u>	<u>Normal</u>	<u>Deviation</u>
January	7.88	3.36	+ 4.52
February	6.08	3.47	+ 2.61
March	3.98	4.14	- 0.16
April	1.25	3.84	- 2.59
May	2.68	3.36	- 0.68
June	10.05	4.09	+ 5.96
July	7.82	5.62	+ 2.20
August	3.65	5.35	- 1.70
September	4.78	4.26	+ 0.52
October	2.64	2.68	- 0.04
November	3.39	2.80	+ 0.59
December	1.40	3.46	- 2.06
Totals	55.60	46.43	+ 9.17
Averages	4.63	3.87	+ 0.76

Table 3. Five Year Distribution Of Rainfall In Inches

<u>Year</u>	<u>Recorded</u>	<u>Deviation</u>
1983	58.40	+ 11.97
1984	48.32	+ 1.89
1985	51.18	+ 4.75
1986	36.21	- 10.22
1987	55.60	+ 9.17

Five Year Average - 49.94 Inches

Five Year Average Deviation - + 3.51 Inches

C. LAND ACQUISITION

In our 1986 narrative report we reported that a longstanding dispute between the U. S. Fish and Wildlife Service and Boise Cascade Timber Company concerning the rightful ownership of a 27 acre parcel of land in Compartment One had been resolved when both parties agreed to split the land 50-50. In 1987, Steve Anderson, a surveyor from the regional office of the Fish and Wildlife Service, and Assistant Manager Hoffmann re-established and remarked the boundary in this area to reflect the terms of the agreement. However, by the end of the year we had received word from the regional office that Boise Cascade had reneged on their commitment. The dispute continues.

This station was informed by the regional office that money might be forthcoming for the purchase of inholdings needed to complete our boundaries. We were instructed to contact the owners of such lands to see if they would be willing to sell to the government. A total of 44 owners of 13 proposed acquisition parcels were researched out of county records. We contacted 25 of those owners and only 12 were willing to sell their land.

E. ADMINISTRATION

1. Personnel



LEFT TO RIGHT: Robinson, Hoffmann, Sweeney, Tate, Oliver, McCutcheon, Eller, and Snider.

1. Ronald C. Snider, Refuge Manager, GS-485-12, PFT
2. John S. Hoffmann, Assistant Refuge Manager, GS-485-9, PFT
3. David H. Robinson, Forester, GS-460-11, PFT
4. Andrew C. Eller, Jr., Forestry Technician, GS-462-4, PFT
5. Kay W. McCutcheon, Secretary, GS-318-5, PFT
6. T. Jack Oliver, Engineering Equipment Operator, WG-5716-11, PFT
7. Louis Tate, Maintenance Mechanic, WG-4749-9, PFT
8. Ellice L. Sweeney, Tractor Operator, WG-5705-6, PFT

Refuge Manager Ronald Snider's position was reclassified at the GS-12 level in June to reflect additional duties and responsibilities obtained with the complexing of Pee Dee Refuge with our station.

At the request of Refuge Supervisor McDaniel, Tractor Operator Ellice Sweeney's position was re-described and documents were submitted to Personnel for classification, series, and grade determination. This resulted in Ellice's promotion from the GS-3 level to the GS-6 level.

Forestry Technician Andrew C. Eller's temporary appointment expired on January 3rd. However, Mr. Eller was picked up as a GS-5 in the same series under a permanent appointment on February 1. Mr. Eller has since been informed that he has been selected to fill a vacancy within the division of Realty in Atlanta. His reporting date is February 14, 1988.

Two members of the maintenance staff received length of service awards during the year. Maintenance man Louis Tate received recognition for 20 years of service while Engineering Equipment Operator Oliver received a 10 year award.



Employees Louis Tate and Jack Oliver display their 20 year and 10 year length of service awards.

Table 4. Five Year Comparison of Staffing Patterns

	Permanent		Temporary
	Full Time	Part Time	
FY 87	8	0	1*
FY 86	7	0	1
FY 85	8**	0	1
FY 84	8	1***	1
FY 83	6	0	4

*This position converted to PFT in February, 1987.

**One position abolished with transfer of refuge manager trainee 12/85.

***This position converted to PFT in March, 1984.

2. Youth Programs

With the exception of a year's hiatus this station has hosted a YCC camp every year since 1976. The 1987 camp was comprised of two enrollees, one male and one female, both of whom were from neighboring Hartsville, S. C.

The program got underway on June 8 and both enrollees were hard conscientious workers who did their assigned tasks well. All projects were accomplished in an efficient, timely and acceptable manner. Projects accomplished included the following:

1. Picked up litter from roads and trails on and adjacent to the refuge (an annual affair).
2. Assisted Forester Robinson with remarking of several miles of exterior boundary in Compartments 9 and 10.
3. Assisted Forestry Technician Eller in marking, tagging, and clearing brush from underneath all red-cockaded woodpecker cavity trees in Compartments 9 and 10.
4. Patched and repaired cracks and potholes in the paved wildlife drive.
5. Constructed a 500 foot split rail fence along the visitor's access route to the refuge office and around the parking area.
6. Forty-two wood duck boxes were assembled and made ready for erection throughout the refuge.
7. Replaced a foot bridge which had been damaged during a prescribed burning operation.
8. Cleared encroaching trees and tree limbs from approximately 100 miles of refuge roads and trails.
9. Cleared accumulated trash and junk from behind the equipment storage shed.
10. Cleaned and treated old wooden grain storage building.
11. Cleaned, treated, and patched the concrete block seed storage building.
12. Timber and brush was cleared from the dam at Pool F to prevent deterioration by root systems.



YCC enrollee marking red-cockaded woodpecker cavity tree.

5. Funding

Base funding for this station gave little hope for accomplishing little more than the bare minimum in operations and maintenance. Funding included \$202,000 in activity 1260 (three thousand dollars of which was for wood duck box maintenance); \$35,000 in activity 6860 (expenses for sale); and \$8,917 in activity 8610 (quarters maintenance). Base funding totaled \$245,917.

As the year progressed, our funding situation looked much brighter. An addition of \$8,000 in fire equipment funds was made in March to 1260 monies for purchase of a pickup truck. Authorization was received in April to expend \$5,000 in 2850 funds for repairs to the Lake 16 dam. Further additions to our 1260 funding allocation in April included an increase of O & M by \$5,000; funding of \$5,000 for a timber inventory; and \$20,000 for gravel purchases for road rehabilitation. Funds totaling \$2,500 for operation of our YCC program in activity 1520 were also added in April. Funds totaling \$1,100 were added to 1260 in September to cover added costs of our gravel contract.

Monies distributed at year end by the regional office to this station included \$8,500 for purchase of a new vehicle and \$4,000 which was used to purchase fertilizer, agricultural lime, and seeds. Funds available for the year totaled \$305,017. This compares to the \$356,426 available for our use in FY 86. As in FY 1986, the regional office also administered payment of \$53,083 in 1240 funds to the S. C. Forestry Commission in our behalf for fire protection and prescribed burning. In FY 1986, the S. C. Forestry Commission was paid \$54,227 for these services by the regional office out of 1510 monies.

Our FY 88 budget allocation totals \$461,112 (\$418,000 - 1260; \$35,000 - 6860; and \$8,112 - 8610). This funding is a combined allocation for Carolina Sandhills and Pee Dee Refuges. Pee Dee's total allocation for FY 87 was \$181,800;

adding that to the \$305,017 allocated to Carolina Sandhills for FY 87 brings the combined total to \$486,817. We expect to expend approximately \$360,000 for salaries of both stations, leaving around \$100,000 for fixed expenses and operations and maintenance. Table 5 provides a comparison of funding allocations for the past five years.

Table 5. Five Year Funding Summary
Carolina Sandhills NWR

<u>FY</u>	<u>1240</u>	<u>1260</u>	<u>8610</u>	<u>6860</u>	<u>1480</u>	<u>2850</u>	<u>1520</u>	<u>1510</u>	<u>Totals</u>
1984		181,000	4,000	73,000***	15,000				273,100
1985		208,000	5,600	30,000	5,000	18,500	6,250	34,960	308,310
1986		306,800	7,950	35,000			6,500	63,239**	356,462
1987	53,083*	235,600	8,917	35,000		5,000	2,500		358,100
1988		418,000	8,112	35,000					461,112

*Paid by the regional office to S. C. Forestry Commission for fire protection and prescribed burning.

**Paid by the regional office to S. C. Forestry Commission for fire protection and prescribed burning - \$54,227; \$9,012 expended for emergency fire suppression.

***Included \$43,000 paid directly to S. C. Forestry Commission for fire suppression and other timber management practices.

6. Safety

No member of the refuge staff sustained any lost time accident during the year. One member of the YCC crew did require medical attention when she cut her hand on a piece of broken glass while picking up litter.

Safety films relating to our work environment were viewed by the entire staff at our regular monthly staff and safety meetings. Comments concerning these films were solicited by all in attendance and safety hazards which had been noticed while performing our regular operations were discussed.

7. Technical Assistance

A cooperative agreement between the South Carolina Forestry Commission and the U. S. Fish and Wildlife Service gives the refuge the responsibility for providing technical assistance on wildlife matters to the staff of Sand Hills State Forest. Details of the cooperative program between the two agencies can be found in Section J.1.

F. HABITAT MANAGEMENT

1. General

When purchased by the U. S. Fish and Wildlife Service in 1939 the refuge was essentially a biological desert. Protection, reforestation, and proper land use has restored much of the original vitality to the area.

Ninety-two percent of the refuge is dominated by pine forests. Longleaf pine-turkey oak communities comprise most of the area. Where clay outcroppings occur the prevalent community is one of loblolly pine and bluejack oak. Early attempts to establish slash pine on the refuge were not successful and most of these plantations have been replaced with either longleaf or loblolly pine. Pond pine is found in wet areas and drains while pocosin habitat is comprised chiefly of gallberry, fetterbush, and sweetbay. Approximately 1,200 acres has been set aside in open fields and clearings and there are 350 acres in man-made lakes.

2. Wetlands

The numerous creeks and streams which transect the refuge have been dammed off to provide thirty lakes and ponds. Most are spring fed and provide ample water supply even during drought years.

As has been the case in prior years, the water level in Pools D, G, H, K, L, Martins Lake, Honker Lake, and Holdover Pond was lowered in the spring and early summer so that their bottoms and slopes could be partially exposed. This was done to allow them to revegetate. All produced good crops especially Holdover Pond and Martins Lake which developed excellent stands of smartweed, spike rushes, and panic grasses. The crops were gradually reflooded beginning in October. Unfortunately waterfowl use of the refuge was at an all time low.

Reflooding of Upper Triple Lake, and Pools F and G began in March. These had been drained in 1986 in an effort to reduce levels of accumulated muck and to control aquatic vegetation. These objectives were at least partially met. These ponds were restocked with bream in December.

In order to reduce levels of muck and to control aquatic vegetation, both Lake 12 and Lower Triple Lake were drained beginning in October. The draining of Pool 12 also permitted needed repairs to the emergency spillway.

At some point during the summer months someone opened the water control gate at Honker Lake. Before this could be detected the lake had drained completely and all fish stock had been lost. The gate was subsequently modified so that it could not be operated by unauthorized persons. The pond was restocked with bream in November.

Approximately twenty acres in the upper end of Martins Lake was aerially seeded to Japanese millet at a cost of \$490.00 by Jack Ross Flying Service of Dovesville, S. C. on July 22. An early examination of the seeded area revealed that the seed had germinated well around the periphery of the lake but very poorly elsewhere. Overall, a very poor stand developed. This was probably due to competition from dense, established stands of spikerushes, smartweeds, and panic grass. Also, there was still standing water in much of the area.



Aerial seeding of Japanese millet in Martins Lake.

In our 1986 narrative report, we stated that wintering waterfowl populations had reached an "all time low". That statement can truthfully be reported concerning the 1987-88 waterfowl population. Wood duck use of the refuge was the only bright spot. Nesting by this species occurred throughout the refuge and nearly all of the impoundments were utilized by them at one time or another. Canada geese used Martins Lake almost exclusively but made occasional use of Pool D, Honker Lake, Oxpen Lake, and Lake 16. Most other waterfowl species restricted their activities to Martins Lake. Populations peaked in February at 250 geese and 790 ducks, 600 of which were wood ducks.

3. Forests

Since the establishment of the refuge in 1939, the South Carolina Forestry Commission under a cooperative agreement has been responsible for timber management activities (timber sales, tree planting, etc.) on the refuge. As reported in last year's narrative (1986) Regional Director Pulliam authorized the refuge manager to undertake all forest management activities on the refuge. The refuge staff assumed these management responsibilities on the refuge this year. A forestry technician was hired to assist the refuge forester in handling timber management activities on the refuge.

Woodland habitat management prescriptions for timber compartments 9 and 10 were prepared and submitted to the regional office and were approved.

Four pulpwood sales and three sawtimber sales were marked and sold during the year as prescribed in our compartment prescriptions (See Table 6 for volume and revenues). In addition approximately 941,220 board feet of pine sawtimber was marked for a timber exchange sale. The government gave up 410.20 acres of land having an appraised value of \$433,251.00 in exchange for 420.72 acres of state land (S. C. Wildlife and Marine Resources Department) having an appraised

value of \$291,080. The Fish and Wildlife Service retained approximately 948,000 board feet of sawtimber having an appraised value of \$142,171 in order to arrive at an equal value exchange. The exchange sale was sold to Canal Wood Corporation of Chester, S. C.

A refuge salvage and miscellaneous sale was conducted on the refuge during the year. This sale was advertised and sold to E. J. Dixon of D. J. Creed, Inc. for \$9.00 per cord (mill tally). Trees which had died due to fire and insect damage and other natural causes (lightning, wind, etc.) located next to roads were marked for removal. A large amount of our salvage wood continued to come from a wildfire area where mortality was high.



Pulpwood salvage operations were conducted throughout the year by local pulpwooder E. J. Dixon.

Miscellaneous cutting included removal of trees in the spillways of Lakes 12 and 16. Trees were cut and removed from an area in front of an observation tower at Ox Pen. This will afford visitors utilizing the tower a better view of Honkers Lake which often winters ducks and geese.

Approximately forty (40) acres in the Ox Pen area was planted to longleaf pine by refuge personnel. Trees and equipment were furnished by the Sand Hills State Forest. This planting was accomplished in an effort to control an erosion problem. Approximately four (4) acres were hand planted in longleaf pine in a field above Pool D (Compartment 6) to control erosion.

A small planter was purchased for the purpose of planting acorns on Pee Dee Refuge. In order to test the effectiveness of the planter, water and bluejack acorns were collected from Carolina Sandhills and were planted in a refuge field and food strips. The planter worked well but it remains to be seen what kind of germination will result.

Approximately 150 acres of pine scruboak stands in Compartment 9 were roller chopped using a crawler tractor and roller chopper. These mixed pine scruboak stands were roller chopped in order to open up the dense turkey oak stands thereby promoting crown development and better mast production. The sprouts from the downed turkey oaks provided favorable browse for deer. Longleaf pine regeneration was also visible in these areas. The roller chopper was also used in red-cockaded woodpecker colony areas to knock down turkey oaks growing up around existing and potential cavity trees.

Prescribed burning continues to be a very important management tool used on the refuge for the purpose of wildlife habitat improvement, hardwood control, and wildfire suppression. All upland pine stands are proposed for burning on a five (5) year burning cycle. During the 1987 burning season, approximately 5,377 acres of woodlands and 178 acres of fields were prescribed burned in seven (7) compartments.

Table 6. Timber Removal - 1987
Carolina Sandhills NWR

Permittee	Comp't #	Volume Removed		Acres	Revenue	Type Cut
		Pulpwood (cords)	Sawtimber (BF)			
Ratliff Woodyard	4	165		45	\$3,310.00	Thinning
Mock-Bunting Forest Products	4	52	238,245 211	106	35,439.00 231.00	Improvement Cut Damages
Canal Wood Corp. of Dillon	4	75	115,844 4,000	75	15,712.50 1,000.00	Improvement Cut Damages
D. J. Creed, Inc.	5	310		86	4,976.00	Thinning
Canal Wood Corp. of Chester			941,220	115	142,171.00	Timber Exchange
D. J. Creed, Inc.	10	310		64	4,957.65	Thinning
D. J. Creed, Inc.	10	405		70	5,550.00	Thinning
Mock-Bunting Forest Products	10	123	152,324	135	23,346.00	Improvement Cut
E. J. Dixon	2,3,5, 6 & 9	444		200	3,994.02	Salvage & Misc.
Totals		1,884	1,451,844	896	\$240,687.17	

4. Croplands

Cultivated fields and forest openings comprise approximately 1,112 acres of the refuge. The cultivated acreage has largely been planted to such soil building crops as sericea, bicolor, and japonica lespedeza (approximately 900 acres). Approximately 104 additional acres was planted to winter wheat, vetch, browntop millet, and milo.

Mr. A. C. McLeod was responsible for maintaining 264.3 acres of established sericea lespedeza and planting 20.4 acres of corn and 53 acres of bicolor lespedeza under a cooperative agreement with the refuge. Under the terms of his contract, five percent of the sericea crop is due the government. In 1987 this amounted to 750 pounds. Some of this was given back to Mr. McLeod in exchange for the corn he planted at Martins Lake. All of the bicolor seed planted was furnished by the government and the refuge share of the crop will be twenty-five percent. All seed was dried, cleaned, scarified, bagged, and delivered to the refuge by March 10.

Our remaining cooperative farming agreement was with Mr. George R. Catoe who maintained 18.4 acres of japonica lespedeza and 20.3 acres of bicolor lespedeza. The government retained 30% of his crop which was harvested, dried, cleaned, bagged, and delivered to the refuge by March 10. Mr. Catoe performed no other farming operations on the refuge.

Table 7. Cooperative Farming - 1987

<u>Crop</u>	<u>Acres</u>	<u>Cooperator's Share</u>	<u>Government Share</u>
<u>Mr. A. C. McLeod</u>			
Sericea lespedeza	264.3	95%	5%
Corn	20.4	0%	100%
Bicolor lespedeza*	53.0	75%	25%
*Bicolor lespedeza was not well enough established to be harvested in 1987.			
<u>Mr. George R. Catoe</u>			
Japonica lespedeza	18.4	70%	30%
Bicolor lespedeza	20.3	70%	30%

Thirty five acres were force account planted to winter wheat and vetch to provide green browse for waterfowl in the Martins Lake and Oxpen areas. Also force account planted in the Oxpen area was 7.7 acres of corn. An additional 15.9 acres of wheat and vetch was planted in several small fields along the wildlife drive in order to attract wildlife into the open for visitors to see.

A mixture of browntop millet and milo was planted to 12.3 acres in three small fields at Martins Lake, and along the wildlife drive. This was done to provide seeds and bugging areas for turkey, quail, and dove.

Fields totaling 158 acres and 40 acres were burned in the Oxpen and Martins Lake farm units respectively. This was done to set back succession and to stimulate new growth. Strips were plowed in fields along the wildlife drive and at Mays Lake and planted to bicolor and japonica lespedeza; germination was good but overall growth was poor.

9. Fire Management

An annual prescribed burning plan for Carolina Sandhills Refuge was submitted to the regional office and approved prior to burning season.

During the 1987 burning season, approximately 5,377 acres of woodlands and 178 acres of fields in compartments 2, 3, 4, 5, 6, 9, and 10 were prescribe burned. A total of 5,178 acres were prescribe burned using aerial ignition. This was the fifth year in which aerial burning had been used on the refuge. We consider it a very efficient burning method because large blocks can be burned faster than conventional burning; plowed firebreaks can be eliminated; areas which normally could not be burned due to poor accessibility can be burned; and fire intensities can be better regulated by the distance between strips and flight lines. Aerial ignition burning was accomplished under contract with the South Carolina Commission of Forestry at a cost of \$3.50 per acre.

The S. C. Commission of Forestry is responsible for wildfire suppression on the refuge. Under the terms of a contract agreement, the Commission is paid \$0.76 per acre for wildfire detection and suppression. When needed, refuge personnel serve as a back-up force with a John Deere 450-C tractor unit with a Mathis plow.



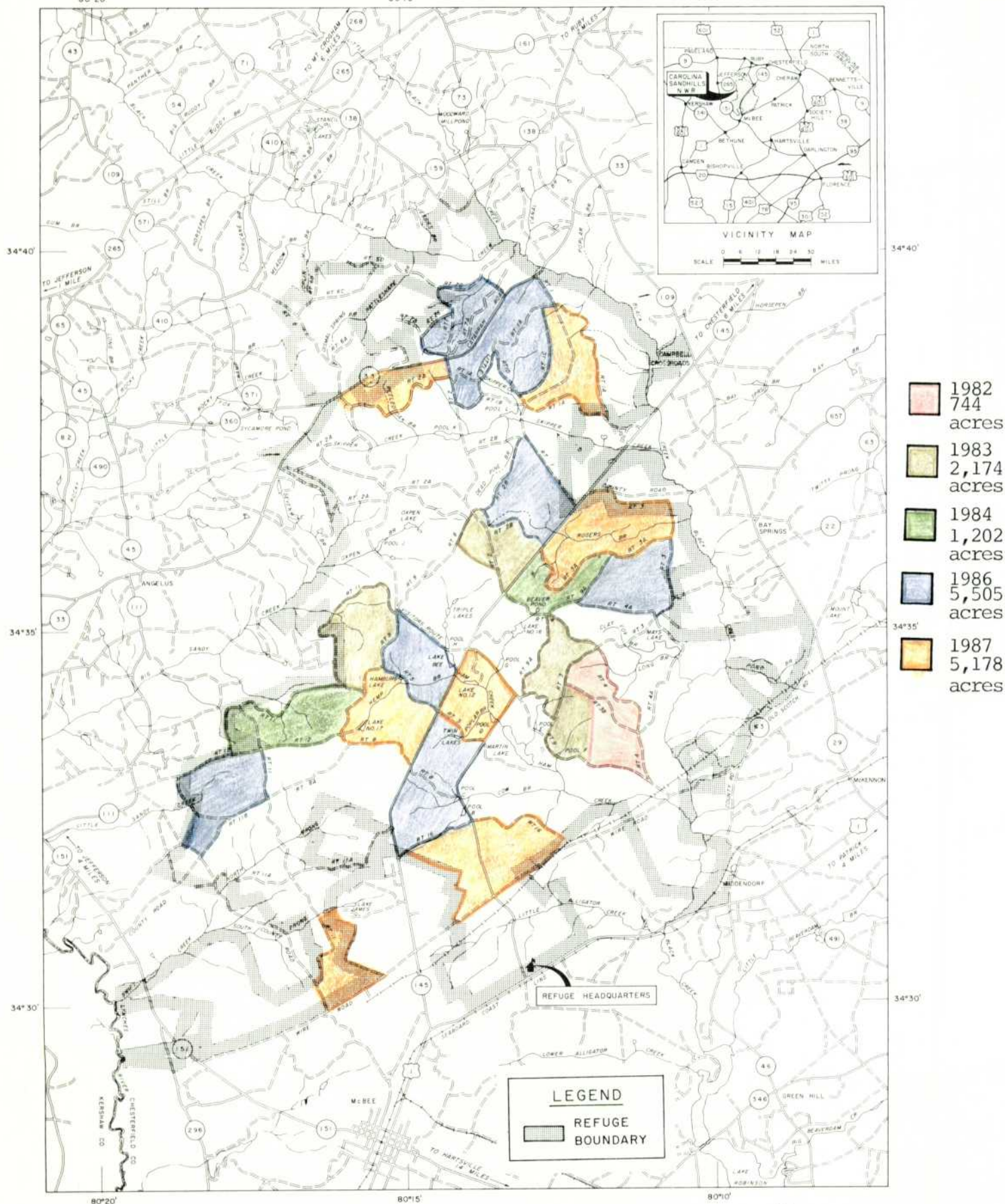
Prescribed burning by aerial ignition.

During the year, three wildfires occurred on the refuge burning a total of 26.6 acres. Two wildfires were started by trains passing through the refuge and one fire started from a lightning strike. No damages occurred as a result of these fires. The S. C. Forestry Commission suppressed all three wildfires.

All firebreaks which were cut to suppress wildfires and to aid prescribed burning operations as well as logging decks were replowed with a recovery plow, fertilized, and seeded with a mixture of bahiagrass, lovegrass, and sericea seed to help prevent erosion and provide habitat diversity.

CAROLINA SANDHILLS NATIONAL WILDLIFE REFUGE

CHESTERFIELD COUNTY, SOUTH CAROLINA

UNITED STATES
DEPARTMENT OF THE INTERIORUNITED STATES
FISH AND WILDLIFE SERVICECOMPILED IN THE DIVISION OF REALTY FROM
SURVEYS BY U.S.G.S.ATLANTA, GEORGIA
REVISED: 12/86

JUNE, 1974

Scale 0 1320 2640 5280 10560 15840 21120 FEET
0 1/2 1 2 3 4 MILESMEAN
DECLINATION
1974

4R-SC-275-404



Logging decks areas were planted in a mixture of bahiagrass, lovegrass, and sericea to alleviate soil erosion and increase habitat diversity.

10. Pest Control

For the fifth consecutive year in conjunction with the U. S. Forest Service, gypsy moth traps were placed on the refuge and checked periodically for the presence of gypsy moths. No gypsy moths were detected.

Scattered incidences of black turpentine, ips, and ambrosia beetle attacks were found on the refuge during the year with heavier concentrations being found in a wildfire area in Compartment 6. Beetle infestations were mainly confined to trees severely scorched and damaged by fire and to lightning struck trees. Beetle infested trees located in the wildfire areas and those trees located next to roads were marked and cut as salvage timber. No pesticides were used for control.

12. Wilderness and Special Areas

There is a 554 acre longleaf pine-scruboak research natural area located on the refuge. Protection was the only management activity relating to this area that was undertaken in 1987.

Numerous areas found on the refuge are unique to the sandhills region. Included among these are archaeological sites, Atlantic white cedar bogs, rock outcroppings, temporary pools for amphibians and unique plant communities, etc. Many of these have been plotted on compartment maps and were afforded special management consideration and protection.

G. WILDLIFE

1. Wildlife Diversity

Carolina Sandhills Refuge is superimposed over a ridge of sandhills that extend from the North Carolina border near Cheraw in Chesterfield County to the Georgia border near North Augusta in Aiken County. Situated as it is between the Piedmont Plateau and the Atlantic Coastal Plain, the refuge has a good blend of habitat types and species of plants and animals which are characteristic of both of these physiographic regions. Also present are many intergrades which are unique to the fall line.

The expanding wildlife population found on the refuge is supported by the many open fields, wetlands, and forest communities present on the refuge. In 1987, management practices were designed to meet the needs of a broad spectrum of plants and animals.

Approximately 190 species of birds, 42 species of reptiles, and 25 species of amphibians utilize the refuge. Many, such as sundews, pitcher plants, Well's pixie moss, and white wicky, are unique species.

2. Endangered and/or Threatened Species

Several endangered plants and animals were either known or thought to be present on the refuge during the report period. These were the red-cockaded woodpecker, eastern cougar, pine barrens treefrog, Southern bald eagle, and golden eagle. Plants included white wicky, Well's pixie moss, and sweet pitcher plants. Each is discussed below.

a. Red-cockaded Woodpecker

Carolina Sandhills NWR supports approximately one-hundred and twenty-two (122) red-cockaded woodpecker (Picoides borealis) colonies. This is the largest number of colonies found on any Region 4 refuge and is based on a special survey conducted in 1984. All cavity trees are located and mapped annually in a systematic manner using the compartment management schedule. Each tree is marked with a white band for easy identification and tagged with a pre-numbered aluminum tag for record keeping purposes. One of the specific objectives of Carolina Sandhills Refuge is to provide habitat and protection for this endangered species.

On August 4th, N. C. State University Biologist Jay Carter and Ft. Bragg Forester Craig Lantz visited the refuge along with a group of graduate students and Ft. Bragg Wildlife Department personnel. The day was spent examining refuge red-cockaded woodpecker colonies and discussing management practices.

Over 40,000 acres of forested land provide nesting and foraging habitat for the woodpecker. Forest management and a three-pronged method of habitat improvement are used to maintain optimal conditions. See Section F.3 for details on forest management. With the help of the YOC enrollees, brush is removed from the base of cavity trees thereby providing open access to the cavity entrance. Roller chopping and prescribed burning are used in tandem to create and maintain the open forest condition required by the bird.

As part of the continuing refuge survey and habitat improvement program for the red-cockaded woodpecker all live pine trees containing cavities and cavity starts in Compartments 9 and 10 were located and mapped. A total of 128 cavity trees and one start tree were located. All cavity trees were tagged and marked as outlined above. The scruboaks and brush were cleared from around each tree to prevent cavity blockage and possible desertion.

Compartments 9 and 10 were previously surveyed in 1977 and 1982. Table 8 presents a comparison between the three surveys.

Table 8. 1987 Red-cockaded Woodpecker Cavity Tree Survey
Carolina Sandhills National Wildlife Refuge

Comp't #	# Cavity Trees Available 1977	# Cavity Trees Available 1982	# Cavity Trees Died 1982-87	# New Cavity Trees 1982-87	# Cavity Trees Available 1987	% Change 1982-87
9	57	64	16*	22	70 (26 active; 44 inactive)	+ 9.4
10	60	57	10*	11	58 (18 active; 40 inactive)	+ 1.7

*The majority of dead trees are victims of the March 28, 1984 tornado.

b. Pine Barrens Treefrog

Ninety percent of the known colonies of this State listed species are found in Chesterfield and Marlboro counties. Ten colonies are known to exist on the refuge, the second largest concentration of colonies in the state. Since plant succession is the greatest threat to the continued existence of this species, prescribed fire is an excellent management tool. All known "frog-bogs" on the refuge were burned in 1987.

c. Eastern Cougar

No cougar sightings were made during the year. In spite of this we still feel that at least one of these elusive cats made at least partial use of the refuge during the year.

d. Plants

Species which have been under review for addition to the federal list for endangered plants include white wicky and Well's pixie moss. Sweet pitcher plant is considered to be a threatened species by the State of South Carolina. All of these are found on the refuge and all respond favorably to fire. Loss of habitat through natural succession and human disturbance is the greatest threat to their continued existence. An active and aggressive prescribed burning program has helped to promote these species.

e. Other Endangered/Threatened Species

Bald and golden eagles are infrequent refuge visitors. This year Assistant Manager Hoffmann observed an immature southern bald eagle flying over Pool G on June 15, the only sighting of the year. Although eagle sightings were down, compared to 1986, osprey sightings increased.

3. Waterfowl

Refuge waterfowl populations peaked during the winter of 1976-77. There has been a steady decline in waterfowl use of the refuge since that time. The Canada goose population for 1986-87 peaked at 250 birds in February; a 25 bird increase over the winter of 1985-86 but still considerably less than the 2,000 bird population of 1976-77. Goose use days were 23,895, an increase of 4,517 over last year. Duck use increased over last year by 54,277 use days to 199,878. However, most of this was attributable to our resident wood duck populations. Tables 10 and 11 tell the whole story.

The wintering population was composed primarily of widgeon, green-winged teal, and Canada geese. Mallards were conspicuous by their near absence. Concentrations were on Martins and Honker Lakes. Wood ducks, present throughout the year, were fairly evenly distributed throughout the wetlands of the refuge.

Two goslings were sighted on Martins Lake in mid-May by Project Leader Snider. No additional goslings were ever sighted. It is not known whether or not the two which were seen survived. The resident goose population appeared to be down by one bird, i.e., 29 birds in 1987 as opposed to 30 in 1986.

Table 10. Peak Populations: Common Wintering Waterfowl

<u>Species</u>	<u>1976-77</u>	<u>82-83</u>	<u>83-84</u>	<u>84-85</u>	<u>85-86</u>	<u>86-87</u>
Canada geese	2,000	455	500	350	225	250
Mallard	5,500	400	350	275	200	70
Black duck	600	75	75	70	75	12
G. W. teal	500	40	35	30	25	50
A. widgeon	2,500	150	150	100	100	102
Wood duck	3,500	600	550	600	650	600
H. merganser	150	12	10	12	5	20

Table 11. Five Year Summary: Wintering Waterfowl Use Days
September through March

<u>Season</u>	<u>Canada Geese</u>	<u>Other Geese</u>	<u>Ducks</u>	<u>Coots</u>	<u>Total</u>
1982-83	29,416	0	181,104	61	210,520
1983-84	29,655	682	163,539	490	198,876
1984-85	16,289	40	164,451	367	181,147
1985-86	19,378	0	145,601	0	164,979
1986-87	23,895	0	199,878	30	223,803

4. Marsh and Water Birds

Carolina Sandhills Refuge does not provide much in the way of suitable habitat for marsh and water birds. As such, concentrations of these species is a

Table 12. ANNUAL NARRATIVE REPORT FORM
WOOD DUCK BOX PROGRAM INFORMATION

REFUGE: Carolina Sandhills

NESTING YEAR: 1987

	<u>NUMBER</u>	<u>PERCENT</u>
Total Usable Boxes	<u>108</u>	
Estimated Boxes Used By Wood Ducks	<u>54</u>	<u>50</u>
Estimated Boxes Used By Other Ducks	<u>0</u>	<u>0</u>
Estimated Boxes Used By Other Wildlife	<u> </u>	<u>11</u>
Estimated Wood Duck Broods Produced	<u>45</u>	
Estimated Total Wood Ducks Hatched	<u>202</u>	
Estimated Wood Ducks Surviving To Flight Stage*	<u>101</u>	<u>50</u>

Plans for next year (indicate number):

 x more boxes (See remarks)

 fewer boxes

 no change

Remarks: All paper and wooden boxes no longer serviceable were replaced with
Tom Tubbs fiberblasse boxes (42 in all).

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

rarity on this station. However, as was previously mentioned in this report, Honker Lake was completely drained during the year by an act of vandalism. During this time the lake was used extensively by colonial birds who fed extensively on the fishes, frogs, and other creatures which were left stranded by the receding waters. Observed were great blue herons, white ibis, common (great) egrets, little blue herons, and cattle egrets. The presence of these birds plus an additional population of vultures probably prevented an outright fish kill.



Water bird use of Honker Lake during unplanned drainage.

5. Shorebirds, Gulls, Terns, and Allied Species

Species in this category which have been found on the refuge are snipe, yellowlegs, sandpipers, woodcock, and killdeer. Habitat for these species is practically non-existent. Few sightings were reported in 1987.

6. Raptors

Species known to nest on the refuge are red-tailed hawks, red-shouldered hawks, American kestrels, turkey vultures, barn owls, screech owls, great horned owls, and barred owls. It is believed that sharp-shinned and Cooper's hawks also nest on the refuge but no nest has ever been found. Northern harriers winter on the refuge and are commonly seen feeding and hunting in the many fields found scattered throughout the refuge. In early March an adult osprey was observed twice fishing from a snag in Pool H. Sightings were made repeatedly in various pools around the refuge during the months of April and May. On two occasions during this period a pair of adult birds were seen feeding. All refuge ponds were surveyed at this time by Forestry Technician Eller but no nest was found. No osprey were seen again until October when Forester Robinson spotted one perched on a snag in Pool K feeding on fresh fish.

7. Other Migratory Birds

Mr. Bill Hilton out of Rock Hill, S. C. conducted the 9th consecutive Audubon Christmas Bird Count on the refuge on December 27. Mr. Hilton had not provided us with his data in time for this report.

8. Game Mammals

The deer which were checked through the check station during our managed hunts implied that our deer herd is in good general condition and that it is well within the carrying capacity of the habitat. These conclusions were born out by a deer herd health survey conducted on the refuge in 1986 by the Southeastern Wildlife Disease Study.



Weight, age, and sex data is gathered at the hunter check station; general health condition is also monitored.

10. Other Resident Wildlife

Wild turkey and their signs were commonly seen throughout the refuge. While adult birds were frequently seen, no poult sightings were ever recorded. Thirteen "young birds" were observed in January indicating that some reproduction had taken place the preceding year.

11. Fisheries Resources

Little fish culture work is accomplished at this station. Pool G, Upper Triple Lake, and Honker Lake were all restocked with bream in December (they

had been completely dewatered earlier in the year). All fish stock was supplied by the Cheraw State Fish Hatchery at no cost to the refuge. Efforts have been made to have our "Fisheries Resources" personnel in Charleston do some sampling and make recommendations, but we are yet to see any positive response.



Bream restocking; fish provided by Cheraw State Fish Hatchery.

14. Scientific Collection

Fisheries biologists from Carolina Power and Light Company collected a small sample of fin-fish from Lake Bee in November. These were used to obtain background radiation levels which were used for comparison with fish collected from Lake Robinson where Carolina Power & Light operates a nuclear power plant.

16. Marking and Banding

Our post season banding quota was set at 150 mallards. With only a dozen mallards ever utilizing Martins Lake at the time of banding (our total refuge population was not much greater than this), this proved to be an impossible task. We did not make our quota. Pre-season wood duck banding was considerably more successful however. We came to within one bird of meeting our quota of 100 birds.

H. PUBLIC USE

1. General

Carolina Sandhills Refuge received 77,021 activity hours of public use in eight different programs by 2,705 visitors during the 1987 calendar year.

This amounted to an average of 1,725.4 visits and 6,418.4 activity hours per month; each visitor spent an estimated 3.72 hours on the refuge. The public hunting and fishing programs received the greatest amount of use. Table 13 summarizes these programs.

Table 13. Summary of Public Use - 1987

<u>Activity</u>	<u>Visits</u>	<u>Activity Hours</u>	<u>Avg. Visits Per Month</u>	<u>Avg. Hours Per Month</u>	<u>Activity Hrs. Per Visit</u>
Conducted Tours	203	642	16.9	53.5	3.16
Interpretive Exhibits	2,078	522	173.2	43.5	0.25
Deer Hunting*	6,904	37,454	3,452.0	18,727.0	5.42
Other Hunting**	1,254	5,574	624.0	2,787.0	4.44
Fishing	4,561	18,244	380.1	1,520.3	4.00
Picnicking	2,827	8,648	235.6	720.7	3.06
WL/WL Observation	2,737	3,112	228.1	259.3	1.14
Photography	141	2,875	11.8	23.5	2.00
Totals/Averages	20,705	77,021	1,725.4	6,418.4	3.72

*Deer hunting is conducted in October and November only.

**Other hunting held in November, December, and March.

2. Outdoor Classrooms - Students

Refuge Manager Snider met with five students and the faculty advisor of the McBee High School science club on March 24. He spoke to this group about the role of forest management practices in refuge management, and in particular, their role at this station. The students planted several trees in a vacant field adjacent to the refuge office.

Twenty six students from the University of North Carolina at Charlotte botany class visited the refuge on a teaching field trip on May 18. An additional 14 botany students from the institution visited the refuge on June 22. Both of these groups were studying sandhills vegetation.

Secretary Kay McCutcheon conducted a tour of the refuge for 38 fifth and sixth grade students from Sumter Christian School on May 15. Four adults were also in attendance. Mrs. McCutcheon had previously conducted a similar tour for two first grade classes from the Petersburg Elementary School in Pageland, S. C.

6. Interpretive Exhibits/Demonstrations

Interpretive panels and exhibits are located in the headquarters building and in two kiosks located along the wildlife drive. These received continuous use by visitors, particularly on weekends and holidays.

7. Other Interpretive Programs

Assistant Manager Hoffmann presented a program to the Hartsville Lion's Club on March 19. The subject of his program was the National Wildlife Refuge System and the role Carolina Sandhills Refuge plays in that system. Mr. Hoffmann

presented this same program to a group of Carolina Power and Light Company employees at the H. B. Robinson Nuclear Power Plant on June 24. Both of these presentations were well received.

Refuge Manager Snider participated in the Cheraw Natural History Seminar sponsored by the Cheraw State Park on March 8. He led a group from this seminar on a tour of the refuge.

Approximately 45 students from the McBee Elementary School held an end of year picnic at Lake Bee on May 14. This is an annual affair.

Manager Snider conducted a tour of the refuge for Mr. Glen Oeland on May 28. Mr. Oeland, a free lance writer, was collecting information about the refuge which was to be used in preparing an article about "natural areas" of the state which will appear in the January, 1988 issue of South Carolina Wildlife.

Forestry Technician Andrew C. Eller toured the refuge with Mr. John Culverwell on May 21. Mr. Culverwell was visiting southeastern refuges and national forests in order to collect information about the red-cockaded woodpecker. This information was to be used in preparing a series of articles for the British Ornithological Society.

Ted Borg, chief photographer for the South Carolina Wildlife magazine, visited the refuge in June for the purpose of obtaining photographs of the red-cockaded woodpecker, as well as endangered plants, for use in the January, 1988 issue of South Carolina Wildlife. These are to be used to illustrate the article on unique and natural areas of the state.

A team from the South Carolina Educational Television System visited the refuge to tape geographical features which are unique to the sandhills region of the Carolinas. This information was to be used in planned production concerning the sandhills.

8. Hunting

Approximately 43,000 acres of the refuge was open to the public for the taking of white-tailed deer, quail, mourning dove, raccoon, opossum, and rabbit.

More people participated in our white-tailed deer hunting program than in all of the others combined. There were three (3) deer seasons totaling 14 days divided as follows: Archery (six days), primitive weapons (five days), and modern firearms (three days). The bag limit for each of our hunts is set at one antlerless deer and an unlimited number of antlered deer. Archery and primitive weapons hunting took place in October; only antlerless deer were checked as these deer must be tagged before they can be removed from the station. Modern weapons hunting took place on November 18, 19, and 20. An estimated 3,970 hunters bagged a total of 188 deer, an increase over 1986 of 60 deer.

A five year history of our deer hunting program is depicted in Tables 15 and 16.



One of our more successful deer hunters.

Table 15. Five Year History: Archery Either Sex Deer Hunting
1983-1987

<u>Year</u>	<u>Hunter</u>		<u>Harvest</u>			<u>HD/ Deer</u>	<u>HH/ Deer</u>	<u>HH/ Day</u>	<u>Days/ Hunt</u>
	<u>Days</u>	<u>Hours</u>	<u>Bucks</u>	<u>Does</u>	<u>Total</u>				
1983	575	4,600	5	5	10	58	460	8.0	6
1984	542	4,336	9	7	16	34	271	8.0	6
1985	490	3,920	3	1	4	123	980	8.0	6
1986	629	5,031	3	4	7	89.8	718.8	8.0	6
1987	734	5,868	6	4	10	73.4	586.8	8.0	6
Totals	2,970	23,755	26	21	47	63.2	505.4	-	-
Averages	594	4,751	5.2	4.2	9.4	-	-	8.0	6

Table 16. Five Year History: Primitive Weapons Either Sex Deer Hunting 1983-1987

<u>Year</u>	<u>Hunter</u>		<u>Harvest</u>			<u>HD/ Deer</u>	<u>HH/ Deer</u>	<u>HH/ Day</u>	<u>Days/ Hunt</u>
	<u>Days</u>	<u>Hours</u>	<u>Bucks</u>	<u>Does</u>	<u>Total</u>				
1983	1,200	9,600	3	40	43	28.0	223	8.0	5
1984	1,028	8,224	11	7	18	57.0	457	8.0	5
1985	983	7,864	10	13	23	43.0	342	8.0	5
1986	944	7,552	9	14	23	41.0	328	8.0	5
1987	1,467	11,736	7	29	36	40.75	326	8.0	5
Totals	5,662	44,976	40	103	143	39.31	314.52	-	-
Averages	1,124.4	8,995.2	8	20.6	28.6	-	-	8.0	5

Hunting for quail, mourning dove, and rabbit opened on Thanksgiving Day and closed on December 31. Mourning dove could only be taken when the open season for that species coincided with the quail season. No effort was made to keep track with the number of hunters participating in this hunt or with their success. It did appear, however, that participation was good.

The first ten evenings in March were open for the taking of raccoons and opossum. Permits were required but there was no quota. One hundred and fourteen permits were issued and participation was good; approximately 50 percent. An estimated 100 'coons were bagged.

12. Other Wildlife Oriented Recreation

A few serious photographers visit the refuge each year. These individuals are given our fullest cooperation in exchange for which we often obtain top quality photographs. Two such individuals are C. W. Grant and Todd Steen of Hartsville. Todd is a former YCC enrollee.

14. Picnicking

Hunting, fishing, and wildlife observation opportunities attracted many visitors to the refuge during the year. Many of these utilized the picnicking facilities at the Lake Bee Recreation Area while on the station. These facilities are also frequently utilized by local church groups and for family reunions.

15. Off-Road Vehicling

We began having problems with people operating ATC vehicles on the refuge during the year. Several individuals were apprehended with these machines on the station but could only be charged with operating unlicensed vehicles (they were on roads that were otherwise open to vehicular traffic). However, one such person almost lost her license due to this infraction.

17. Law Enforcement

Aside from the problems with off road vehicles which we began experiencing in 1987, our chief law enforcement problem continued to be that of unrestrained

deer hunting dogs. Owners of these dogs were charged a \$10.00 impoundment fee each time we picked up their animals and were issued a citation for animal trespass when they were impounded three or more times in a given year. All hunters were provided with a verbal warning after the second infraction. One individual, who had seven of his dogs impounded on the opening day of the deer season, was fined \$300 plus court costs. His dogs had been impounded on seven prior occasions since 1985 and he had been issued three prior citations.

A locked gate was erected across the road to the navigation tower to aid in a law enforcement access problem and to provide security for the FAA facilities located there.



Erection of a gate across the navigation tower road.

The case of a hunter who had been apprehended while attempting to take deer from the refuge during a closed season in November, 1986 was heard in magistrate's court in January, 1987. This individual was the unfortunate victim of an article which had appeared in the November issue of Fins and Feathers. This article stated, in no uncertain terms, that the refuge would be open to deer hunting for three days beginning on Thanksgiving Day. This was false information. The individual was fined \$150 plus \$25 court costs.

Forester Robinson and Forestry Technician Eller located three small patches of marijuana near the Lynches River area of the refuge in June. These were reported to the Chesterfield County Sheriff's Department, who notified SLED, and to the Fish and Wildlife Service law enforcement authorities. After keeping these plots under surveillance for nearly a month, Special Agent Hines, Forester Robinson, Forestry Technician Eller, and Sheriff's Deputies Blackwell and Turner cleared these plots of approximately 31 plants. These were turned over to the Chesterfield County Sheriff's Department for disposal.



Marijuana plants found near Lynches River in June.

On the 28th of September, Assistant Manager Hoffmann and Refuge Manager Snider assisted Chesterfield County Sheriff's Department and SLED agents in the location and removal of marijuana from the refuge. Two arrests were made in connection with this incident.



Approximately 200 marijuana plants with an estimated value in excess of \$60,000 were removed from the refuge by SLED and sheriff's deputies.

Refuge Officers Hoffmann and Robinson apprehended three individuals attempting to take pine straw from a refuge longleaf pine plantation. The individuals twice failed to appear in court on these charges and one has died. The case is still pending.

On the evening of Wednesday, September 23, Refuge Officer Hoffmann located an automobile parked half on - half off of Highway 145 at approximately 8:45 p.m. No one was in or near the car but several articles of women's clothing were located in the car and the engine was still hot. A check of the highway revealed no other automobile traffic or pedestrians. The South Carolina Highway Patrol was notified and they discovered that the license plates were not registered to the car they were on and that they were supposed to have been withdrawn from use. The car, it turned out, belonged to a local used car dealer. The patrol surmised that the dealer and/or his family were operating an uninsured vehicle and were switching license plates around as needed. The plates were apprehended and the vehicle was impounded.

Refuge Officer Hoffmann attended a meeting of all area law enforcement agencies at the Chesterfield County Sheriff's office in December. The objective of this meeting was to organize a drug enforcement task force for the county and to provide input for a \$50,000 grant proposal the Sheriff's Department was trying to obtain. If successful, these monies will be utilized to hire a drug enforcement coordinator for the department and to purchase needed equipment. This equipment will be available for use by all law enforcement agencies within the county (including the refuge). Hoffmann was asked to be a part of the task force.

As in the past, we received excellent cooperation and assistance from the S. C. Wildlife and Marine Resources Department enforcement personnel during our managed hunts.

Table 17. Violations - CY 1987

<u>Violation</u>	<u>No. Cases</u>	<u>Disposition</u>
Hunting out of season	3	Pending (3)
No license/big game permit	16	Pending (2); Fined \$35.00 each in State Court (14)
Man driving deer	4	Pending (4)
No orange vest (big game gun hunt)	2	Pending (2)
Transporting loaded weapon (big game gun hunt)	2	Pending (2)
Vehicular trespass	3	Pending (1); Forfeiture of collateral of \$50.00 each (2)
Hunting in closed area	2	Pending (2)
Unlicensed vehicle	8	Forfeiture of collateral of \$25.00 each (8)
Animal trespass	2	Fined \$300.00 + court costs (1); Forfeiture of collateral of \$50.00 (1)
Taking pine straw from refuge	3	Pending (3)

I. EQUIPMENT AND FACILITIES

2. Rehabilitation

Renovation of the shop-maintenance facility continued during the year. Specifically, an office and a restroom which consumed badly needed maintenance space were removed and a 12,000 pound vehicle lift was installed. Extensive rewiring was accomplished and badly needed equipment was purchased, i. e. tire changer and air compressor.

It was mentioned in the 1986 narrative report for this station that a seepage problem was thought to exist in the Lake 16 dam and that the problem was being investigated. This problem was resolved through the installation of a stone filled toe drain extending from the area of seepage to a nearby creek. This was a force account project.

The emergency spillways of the dams of Lake 12, 16, and 17 were cleared of all trees, stumps, excess vegetation, and debris during the year.

An old house with outbuildings which was located on the State Forest but belonged to the Fish and Wildlife Service was advertised and sold for \$588.88. The house was relocated by the purchaser to a site not far from the refuge headquarters and has been renovated extensively. The outbuildings were destroyed.

The exterior trim of Quarters 212 was repainted during the year. This work was done by a local contractor.

The Department of Environmental Systems Engineering at Clemson University conducted a screening program to determine where, or if, any radon problems existed within the State. As part of this screening, a radon monitor was placed in Quarters 212 for eight days in November. This facility measured only 0.8 pico Curie/liter. The EPA has determined that a concentration of less than 4 p. Curie/liter does not pose a significant health risk.

3. Major Maintenance

Engineering equipment operator Jack Oliver participated in a wetlands restoration project which was conducted at the Triple C Farms, Inc., in Cumberland County, North Carolina. This was a joint venture between the Farmer's Home Administration and the Fish and Wildlife Service under the authority of a Memorandum of Understanding between the two agencies as provided for by the Farm Bill. This project involved placing 1,500 cubic yards of fill material in a 200 foot plug in a drainage canal at an estimated cost of \$1,700.

Our 1977 GMC flat bed truck required major repairs when one of the cylinders developed a crack in a cylinder wall. The cylinder had to be bored out and a sleeve installed. All bearings, bushings, seals, and gaskets were inspected and replaced as needed during this operation.

4. Equipment Utilization and Replacement

Major purchases made during the year included:

1. A 1988 Dodge Dakota was received in December. This vehicle was purchased with FY 86 funds and was used to replace the 1980

Plymouth Arrow utilized primarily by the assistant manager.

2. In order to upgrade our compressed air system so that it would meet our needs a new Curtis two stage air compressor was purchased.
3. A pneumatic tire changer was purchased and installed. This will enable us to do our own tire changing and servicing.
4. A new set of aerial photographs was purchased to aid in the development of a new timber management plan.
5. New radio equipment purchased during the year included a low band mobile and two high band portables.
6. Ninety Carsonite "No Vehicle" signs were purchased to aid with closing of logging roads and trails.
7. Forty new fiberglass "Tom Tubbs" wood duck nesting boxes were purchased to replace old deteriorated paper and wooden boxes.
8. A timber inventory computer program was purchased to aid in our timber management work.
9. A "Mariner" electric outboard motor was purchased during the year. This increased the efficiency with which wood duck boxes can be checked and serviced.

5. Communications Systems

A new high band/low band duplex radio repeating system was installed during the year. Located at the Ruby Fire Tower, where the antenna is 540 feet above mean sea level, this system vastly improved communications at this station especially when working in the field away from vehicles. Included with this system were six new handheld, programmable, high band portable transceivers, three standard charging units, and one vehicular charging unit. The handheld portables also permit radio contact with the S. C. Forestry Commission and provide 24 hour/day weather information. They will also be programmed to the new S. C. Wildlife and Marine Resources Department frequencies as they become operable in 1988.

J. OTHER ITEMS

1. Cooperative Programs

A memorandum of agreement between the U. S. Fish and Wildlife Service and the S. C. Commission of Forestry was used to facilitate the reimbursement of expenses incurred by the State for fire protection (46,000 acres) and prescribed burning by aerial ignition on the refuge for fiscal year 1987. The total itemized invoice for the State for these activities was as follows:

a. Fire Protection	
(46,000 acres @ \$0.76 per acre)	\$34,960.00
b. Prescribed Burning (aerial ignition)	
(5,178 acres @ \$3.50 per acre)	<u>\$18,123.00</u>
Total	\$53,083.00

Under a lease agreement between the U. S. Fish and Wildlife Service and the S. C. Forestry Commission executed in 1939, approximately 46,000 acres of Interior-owned land adjacent to the refuge is leased to the S. C. Forestry Commission. This land known as the Sand Hills State Forest is managed as a multiple use area. The S. C. Forestry Commission has been allowed to utilize all timber receipts on the state forest in carrying out their management activities. The refuge forester monitors management activities on the state forest such as reviewing proposed annual work plans to insure compliance with the lease agreement, assisting with the preparation of compartment prescriptions and providing information and management assistance for the management of the red-cockaded woodpecker.

This year Refuge Forester Robinson met with Forest Director Murphy and discussed red-cockaded woodpecker management on the Sand Hills State Forest. Director Murphy was directed to include specific goals on red-cockaded woodpecker habitat maintenance in this year's operating plan. The annual work plan and compartment prescriptions for Sand Hills State Forest were received and reviewed by the refuge manager and forester but did not include specific goals for red-cockaded woodpecker management. The operating plan and prescriptions were returned to the Commission for revision since they did not include specific goals. The Commission revised the plan to include specific goals such as roller chopping in red-cockaded woodpecker colony areas and prescribed burning. The annual work plan and prescriptions were approved by the Service at the joint annual meeting between the Service and the S. C. Forestry Commission held at Commission headquarters in Columbia, S. C. Refuge Supervisor Travis McDaniel, Refuge Manager Snider, and Refuge Forester Robinson represented the Service at this meeting.

For the fourth consecutive year this station cooperated with the South Carolina Wildlife and Marine Resources Department in their state-wide survey of terrestrial furbearers. Two, 1.8 mile lines having ten scent stations located 0.2 miles apart were established along unimproved dirt roads and were checked for the presence of furbearer tracks after an overnight period. Gray fox and bobcat tracks were observed.

3. Items of Interest

Regional Forester Howard Poitevint visited the refuge on February 11 and reviewed our timber management program.

Assistant Manager Hoffmann participated in the career opportunity day program held at Chesterfield High School on February 13.

Assistant Manager Hoffmann assisted Steve Anderson, a surveyor from the regional office, in establishing a new boundary line across a 27 acre parcel of land in Compartment One.

Project Leader Snider and Assistant Manager Hoffmann attended the Project Leaders/Waterfowl Management Conference in Savannah, Georgia held from March 30 through April 3, 1987.

Forester Robinson and Forestry Technician Eller visited the Sandhills Wildlife Management Area and Fort Bragg (both located at Pinehurst, N. C.) on August 25th and 26th. There they studied the innovative practices which permit commercial development of the forest lands while also benefitting the red-cockaded woodpecker.

Assistant Manager Hoffmann, Forester Robinson, and Engineering Equipment Operator Oliver attended the 40 hour in-service law enforcement refresher training course held at the Lively Law Enforcement Training Center, Quincy, Florida during the week of April 6-10, 1987.

Pete Beck and Terry Clayton of the Denver Engineering Center arrived on station on the 15th of April to conduct inspections of several of our dams. Of particular interest to them were the proposals for correcting the seepage problems in the Lake 16 dam. No serious problems were detected during their inspection.

An environmental assessment, FONSI, Section 7, etc., were prepared for the widening of South Carolina Highway 151 through portions of the refuge. This work is to be accomplished by the South Carolina Highway Department. No significant impact was found.

Secretary Kay McCutcheon attended a retirement system decision advisor workshop in Atlanta on July 14 and 15. McCutcheon, Hoffmann, Tate, Robinson, and Oliver all attended a one day FERS/CRS workshop in Raleigh, NC on Friday, July 24.

Staffing Specialist Billy Turnage visited the refuge on August 3 and 4 to conduct a personnel review. He interviewed all station personnel to determine adequacy of position descriptions and other personnel related functions.

Tim Ivey and Reggie Paxton of the South Carolina Wildlife and Marine Resources Department researched our files on September 8. This was done to obtain information needed for a proposal the Department was preparing in an effort to take over management activities on the refuge.

Forestry Technician Eller attended a regional orientation for new employees in Atlanta on November 5 and 6.

Forestry Technician Eller was notified in December that he had been selected to fill a vacancy in the Division of Realty in Atlanta. His reporting date will be February 14, 1988.

4. Credits

Sections F.3 (Forests), F.9 (Fire Management), and J.1 (Cooperative Programs) were written by David Robinson. Section G.2a (Endangered Species - Red-cockaded Woodpecker) was written by Andrew C. Eller. Section E.5 (Funding) was written by Kay McCutcheon. The balance of the report was written by John S. Hoffmann.

Editing was done by Ronald C. Snider. Kay McCutcheon provided the final scrutiny of the text and was responsible for typing and assembly of this report.