

**CAROLINA SANDHILLS NATIONAL
WILDLIFE REFUGE**

McBee, South Carolina

ANNUAL NARRATIVE REPORT

Calendar Year 1988

U.S. Department of the Interior
Fish & Wildlife Service
National Wildlife Refuge System

REVIEW AND APPROVALS

CAROLINA SANDHILLS NATIONAL WILDLIFE REFUGE

McBee, South Carolina

ANNUAL NARRATIVE REPORT

Calendar Year 1988

<u>Ronald C. Souda</u>	<u>3-8-89</u>	<u>[Signature]</u>	<u>3/25/89</u>
Refuge Manager	Date	Refuge Supervisor Review	Date
<u>[Signature]</u>		<u>3/27/89</u>	
Regional Office Approval		Date	

TABLE OF CONTENTS

	<u>Page</u>
<u>INTRODUCTION</u>	i
A. <u>HIGHLIGHTS</u>	1
B. <u>CLIMATIC CONDITIONS</u>	2
C. <u>LAND ACQUISITION</u>	
1. Fee Title.....	4
2. Easements.....	Nothing to Report
3. Other.....	Nothing to Report
D. <u>PLANNING</u>	
1. Master Plan.....	Nothing to Report
2. Management Plan.....	4
3. Public Participation.....	Nothing to Report
4. Compliance w/ Envirnmntal & Cultural Resources Mandates...NTR	
5. Research and Investigations.....	Nothing to Report
6. Other.....	Nothing to Report
E. <u>ADMINISTRATION</u>	
1. Personnel.....	5
2. Youth Programs.....	8
3. Other Manpower Programs.....	10
4. Volunteer Programs.....	Nothing to Report
5. Funding.....	10
6. Safety.....	12
7. Technical Assistance.....	12
8. Other.....	Nothing to Report
F. <u>HABITAT MANAGEMENT</u>	
1. General.....	12
2. Wetlands.....	12
3. Forests.....	18
4. Croplands.....	21
5. Grasslands.....	Nothing to Report
6. Other Habitats - Fields.....	22
7. Grazing.....	Nothing to Report
8. Haying.....	Nothing to Report
9. Fire Management.....	24
10. Pest Control.....	26
11. Water Rights.....	Nothing to Report
12. Wilderness and Special Areas.....	26
13. WPA Easement Monitoring.....	Nothing to Report

TABLE OF CONTENTS - Cont'd

Page

G. WILDLIFE

1. Wildlife Diversity.....	28
2. Endangered and/or Threatened Species.....	28
3. Waterfowl.....	31
4. Marsh and Water Birds.....	33
5. Shorebirds, Gulls, Terns, and Allied Species.....	33
6. Raptors.....	33
7. Other Migratory Birds.....	36
8. Game Mammals.....	36
9. Marine Mammals.....	Nothing to Report
10. Other Resident Wildlife.....	36
11. Fisheries Resources.....	37
12. Wildlife Propagation and Stocking.....	38
13. Surplus Animal Disposal.....	Nothing to Report
14. Scientific Collections.....	Nothing to Report
15. Animal Control.....	38
16. Marking and Banding.....	38
17. Disease Prevention and Control.....	Nothing to Report

H. PUBLIC USE

1. General.....	39
2. Outdoor Classrooms - Students.....	41
3. Outdoor Classrooms - Teachers.....	Nothing to Report
4. Interpretive Foot Trails.....	Nothing to Report
5. Interpretive Tour Routes.....	Nothing to Report
6. Interpretive Exhibits/Demonstrations.....	41
7. Other Interpretive Programs.....	42
8. Hunting.....	43
9. Fishing.....	45
10. Trapping.....	Nothing to Report
11. Wildlife Observation.....	Nothing to Report
12. Other Wildlife Oriented Recreation.....	45
13. Camping.....	Nothing to Report
14. Picnicking.....	46
15. Off-Road Vehicling.....	Nothing to Report
16. Other Non-Wildlife-Oriented Recreation.....	Nothing to Report
17. Law Enforcement.....	46
18. Cooperating Associations.....	Nothing to Report
19. Concessions.....	Nothing to Report

I. EQUIPMENT AND FACILITIES

1. New Construction.....	Nothing to Report
2. Rehabilitation.....	48
3. Major Maintenance.....	56
4. Equipment Utilization and Replacement.....	57
5. Communications Systems.....	58
6. Computer Systems.....	59

TABLE OF CONTENTS - Cont'd

Page

I. EQUIPMENT AND FACILITIES

- 7. Energy Conservation.....59
- 8. Other.....Nothing to Report

J. OTHER ITEMS

- 1. Cooperative Programs.....59
- 2. Other Economic Uses.....60
- 3. Items of Interest.....60
- 4. Credits.....64

K. FEEDBACK.....65

L. INFORMATION PACKET (inside back cover)



(Ellice L. Sweeney - 10/27/16 - 5/23/88)
Tractor Operator Ellice Sweeney doing what he did
best - making tools work for him instead of vice
versa.

This year's annual narrative report is dedicated to former employee Ellice L. Sweeney who passed away on May 23, 1988. A testament to the kind of steady, dependable employee that he was, Mr. Sweeney died of an apparent heart attack while on duty. Mr. Sweeney was a very unique individual who had a real knack for rigging up all sorts of contraptions to make his work and the work of others easier and/or more efficient. I have heard a few past managers bemoan the fact that Mr. Sweeney never threw anything away, but I have also heard those same managers asking Mr. Sweeney, "Can you find me something that will work here?" Most of the time, he could come up with just the right piece of wire, tubing, or just plain junk to make things work right.

Besides his most obvious attributes, Mr. Sweeney was a good friend and companion to all of us at Sandhills and he will be missed around here for a long time to come.

(For the staff - Kay W. McCutcheon)

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 45,586 acres are 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.

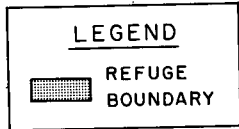
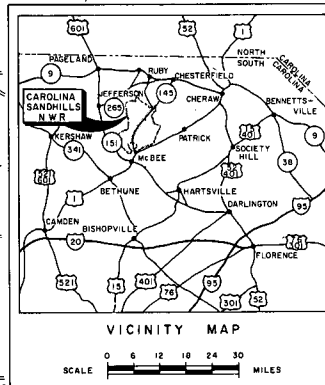
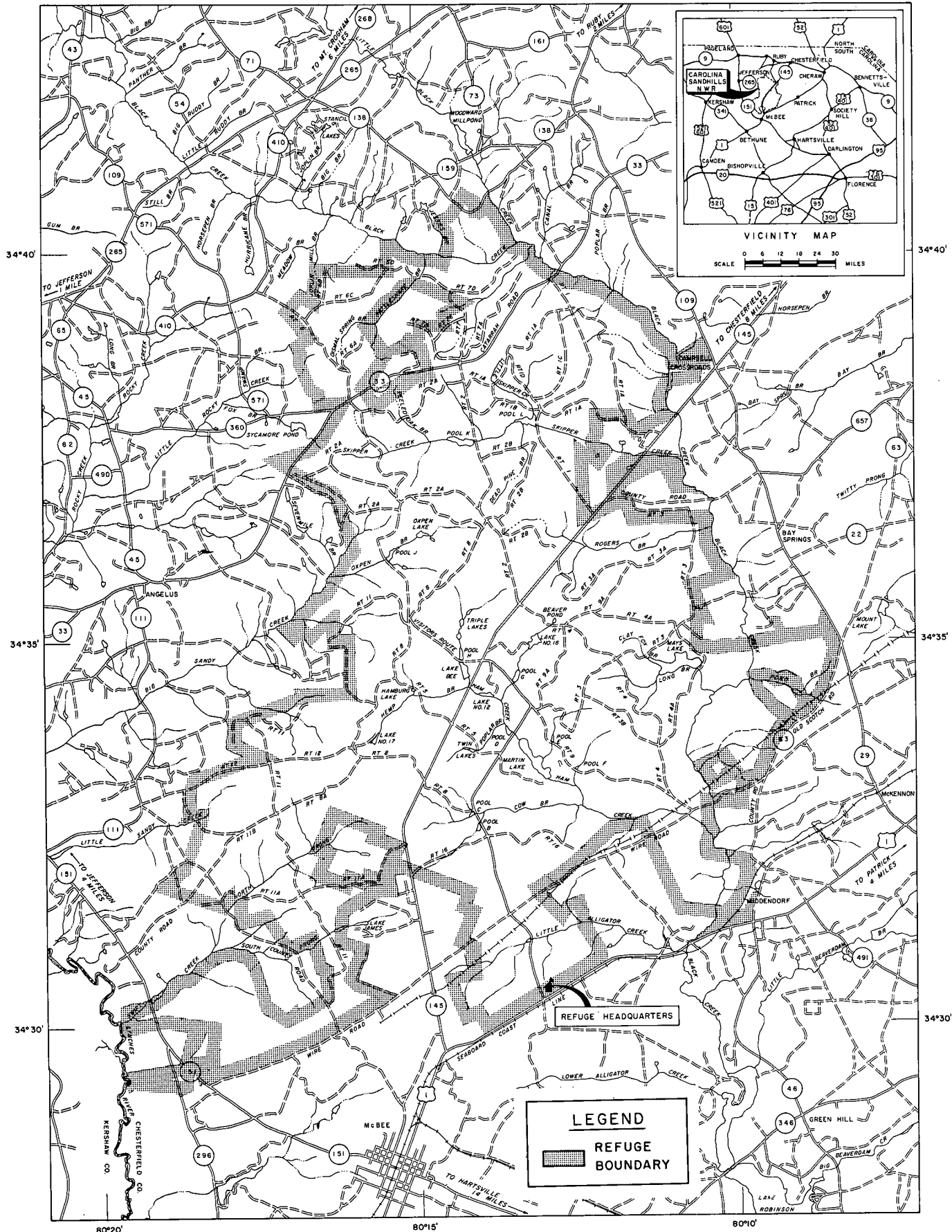
The eastern portion of the refuge drains into Black Creek and its tributaries. Water in these streams is clear but stained black due to the presence of organic acids. Flood plain swamps occur along some of the larger streams. Tributaries are similar except they are shallower and swifter. The western 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

UNITED STATES
DEPARTMENT OF THE INTERIOR
80°20'

CHESTERFIELD COUNTY, SOUTH CAROLINA

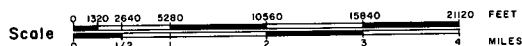
UNITED STATES
FISH AND WILDLIFE SERVICE
80°10'



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

ATLANTA, GEORGIA
REVISED: 12/86

JUNE, 1974



TRUE NORTH
MAGNETIC
DECLINATION
1974

MEAN
DECLINATION
1974

4R-SC-275-404

A. HIGHLIGHTS

Employee Ellice Sweeney passed away on May 23 from an apparent heart attack. Mr. Sweeney had worked at the refuge since 1970 and was 71 years old. (Sec. E.1).

The first collared goose arrived on the refuge on October 14. (Sec. G.16).

We were computerized! (Sec. I.6).

Six inches of snow on the ground for six days in January brought the area to a standstill. (Sec. B.).



Black Creek with four and one half inches of snow. An unusual site in this part of the country. (88NR-1, 1-88, McCutcheon)

B. CLIMATIC CONDITIONS

The high point of the weather for this region of South Carolina in 1988 was a 4.5 inch snowfall which occurred on January 6 and 7. The temperatures at the time were cold enough to permit the snow to accumulate and to remain in place for nearly eleven (11) days. This snowfall combined with additional precipitation during the month and carryover moisture from 1987 resulted in excellent ground moisture conditions.

Conversely, February began what was to become one of the toughest drought periods on record. A deficit of 5.23 inches was recorded for the six month period spanning February through July.

The spring (March-May) was exceptionally warm and precipitation was below normal. Average high temperatures fell in the mid 70 degree range with the overnight lows averaging 50 degrees. Total recorded precipitation for the period was 9.42 inches; nearly 2.00 inches below normal. The summer (June-August) was relatively mild and dry. The average daily high temperature for this period was 91 degrees while the average overnight low was 68 degrees. Total accumulated rainfall was 14.23 inches, nearly one inch below normal. The fall (September-November) was warm and wet. It was the only season of the year for which an excess in rainfall was recorded. The total accumulation was 12.07 inches which was 2.33 inches above normal. The average daily high temperature was 74 degrees, while the average overnight low was 52 degrees. These averages would have been higher had it not been for a brief period in October when we experienced an early cold snap.

As can be deduced from the data on relative humidity presented in the table below, air in the Sandhills is always wet. This high humidity greatly magnifies the way one experiences the weather. The summers are hot and muggy and you feel as if you are constantly in a sauna. Conversely, during the winter, it is difficult to prevent the cold from penetrating your clothing.

Table 1. 1988 Temperature and Relative Humidity Data

Month	Temperature Data				Relative Humidity			
	Average				Average %			
	High	Low	Max.	Min.	High	Low	Max.	Min.
January	49	30	68	16	99%	49%	100%	28%
February	59	35	76	16	98%	40%	100%	12%
March	68	44	81	24	96%	35%	100%	18%
April	76	49	92	35	98%	35%	100%	18%
May	82	57	93	45	99%	35%	100%	22%
June	90	64	98	49	100%	38%	100%	26%
July	91	70	102	56	100%	52%	100%	32%
August	93	72	105	64	100%	51%	100%	24%
September	84	65	93	54	100%	57%	100%	37%
October	71	46	85	31	100%	35%	100%	24%
November	68	45	80	30	100%	40%	100%	26%
December	58	34	75	17	96%	38%	100%	16%

Table 2. Monthly Distribution of Precipitation In Inches
Calendar Year 1988

	<u>Amount</u>	<u>Normal</u>	<u>Deviation</u>
January	3.73*	3.36	+ 0.37
February	1.69	3.47	- 1.78
March	3.32	4.14	- 0.82
April	3.17	3.84	- 0.67
May	2.93	3.36	- 0.43
June	4.13	4.09	+ 0.04
July	4.05	5.62	- 1.57
August	6.05	5.35	+ 0.70
September	5.47	4.26	+ 1.21
October	3.12	2.68	+ 0.44
November	3.48	2.80	+ 0.68
December	0.19	3.46	- 3.27
Totals	41.33	46.43	- 5.10

*Includes a 4.5 inch snowfall (1.08" as water)

Table 3. Five Year Distribution of Rainfall In Inches

<u>Year</u>	<u>Recorded</u>	<u>Deviation</u>
1984	48.32	+ 1.89
1985	51.18	+ 4.75
1986	36.21	- 10.22
1987	55.60	+ 9.17
1988	41.33	- 5.10

Five Year Average - 46.53 Inches

Five Year Average Deviation - + 0.49 Inches

C. LAND ACQUISITION

1. Fee Title

Negotiations proceeded this year for the exchange of a 92 acre parcel of refuge lands along our southwestern boundary for a 143 acre parcel of a inholding known as the Rowe Tract located in the refuge's lower midsection. This inholding has been our number one acquisition priority since the 1940's. A neighboring peach farmer, Campbell McLeod, purchased the Rowe Tract property with the express intention of trading it to the refuge for a refuge boundary parcel which adjoins his orchards. To date we have signed a lease agreement which allows us to manage the property as refuge until the transfer. The exchange proposal is now awaiting Washington Office approval. We hope to be able to obtain the remaining four parcels of this inholding in the near future.

We were also able to purchase a four acre tract of inholding property along the Catarrah Road which belonged to the county school board. Deed preparation and recording are all that remain on this deal.

We have been working with our Ecological Services office and the Farmers Home Administration toward the acquisition of a 125 acre parcel of land along the Pee Dee River near Cheraw. If things go as planned we should be able to take over active management of this property early next year.

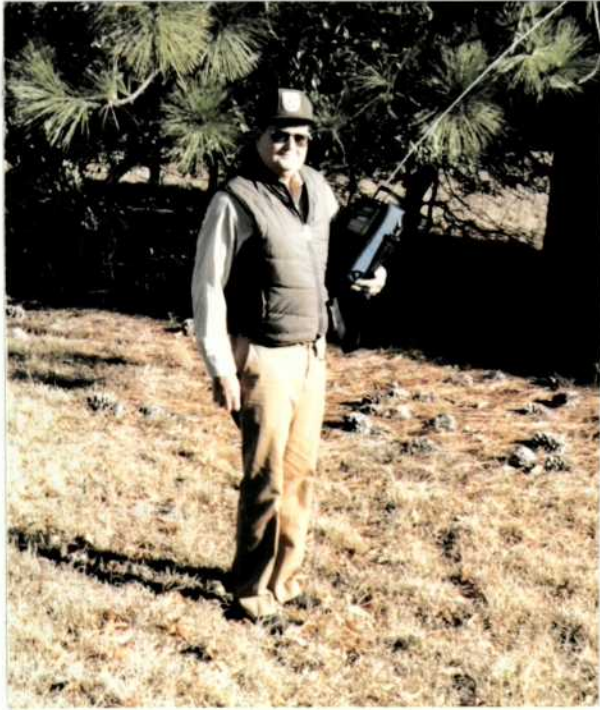
D. PLANNING

2. Management Plan

A combined Law Enforcement Plan was written and approved for Carolina Sandhills and Pee Dee Refuges. Pocket size copies of the plan were made and given to each law enforcement officer.

E. ADMINISTRATION

1. Personnel



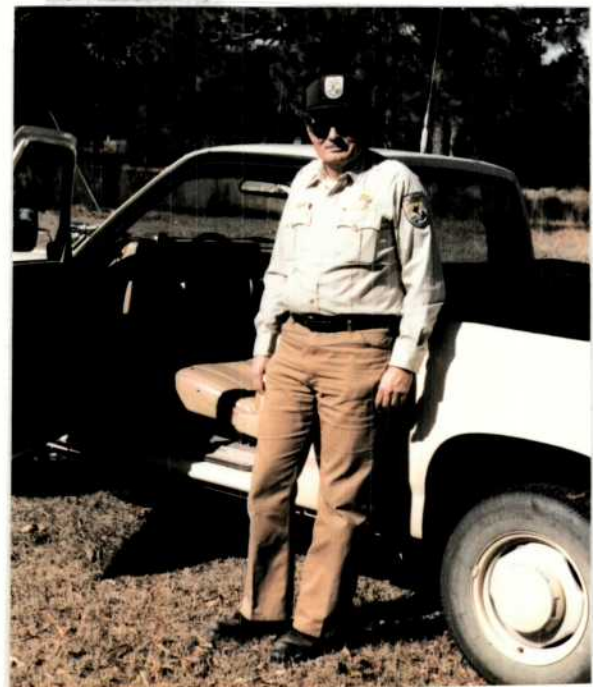
Snider



Cartlidge, McCutcheon



Lay, Robinson



Hoffmann



Oliver, Loflin, Tate



Taylor

The staffing pattern and incumbents occupying these positions for Carolina Sandhills Refuge is as listed below:

Ronald C. Snider, Refuge Manager, GS-485-12, PFT
Karen S. Cartlidge, Asst. Refuge Manager, GS-485-11, PFT
John S. Hoffmann, Asst. Refuge Manager, GS-485-9, PFT
David H. Robinson, Forester, GS-460-11, PFT
Steven D. Lay, Forester, GS-460-11, PFT
Kay W. McCutcheon, Office Asst., GS-303-6, PFT
T. Jack Oliver, Engineering Equip. Operator, WG-5716-11, PFT
Louis Tate, Maintenance Mechanic, WG-4749-9, PFT
Julius R. Loflin, Range Technician, GS-7, PFT
William E. Taylor, Jr., Biological Tech., GS-404-5, INT
Henry R. Sansing, Forestry Coop Student, GS-499-4, TFT

Calendar year 1988 was a busy year for personnel actions. It seemed that every few months someone was either coming or going. Our first addition of the year occurred on January 17 with the arrival of Karen Cartlidge from Quivira NWR in Kansas to fill the newly created position of assistant project leader for both Pee Dee and Carolina Sandhills Refuges.

Our first loss of the year occurred on February 14 when Forestry Technician Andrew Eller accepted a job as an appraisal forester and transferred to the Division of Realty in the Atlanta Regional Office.

After several months of fact-finding and evaluation, Region 4 decided to reclassify all secretarial positions in the region. Secretary Kay McCutcheon's position was upgraded to a GS-6 Office Assistant in May.

Recruiting efforts were made and Steven D. Lay was hired to fill the vacant Forester, GS-460-5 position. This position had been converted from the forestry technician (GS-462) series after the transfer of Mr. Eller to Realty. Steve came on board on May 23, 1988.

Also beginning a tour of duty on May 23, 1988 was Forestry Cooperative Student Henry R. Sansing. Henry worked through mid-August before returning to school at Mississippi State.

Sadly, the refuge staff suffered a tremendous personal loss in May. Tractor Operator Ellice L. Sweeney passed away on the afternoon of May 23, 1988. Mr. Sweeney died on the job of an apparent heart attack. This was not the kind of "welcome aboard" new employees Steve Lay and Henry Sansing had anticipated.

After discussion between Refuge Supervisor McDaniel, Cape Romain NWR Manager Garris, and Carolina Sandhills Manager Snider, a decision was made to fill the vacancy created by Mr. Sweeney's death via a transfer. Cape Romain Biological Technician Julius R. Loflin was given the opportunity to transfer to Carolina Sandhills Refuge. Julius's family had been living in Cheraw (25 miles north of our refuge office) while he was stationed at Cape Romain and living on Bulls Island. He had been making biweekly trips from Awendaw to Cheraw to spend time with his family. Julius was more than happy to accept our offer. His position was renamed "Range Technician" by the Personnel Office. We have been very pleased with Julius's abilities and initiative.

The reporting date established for Julius Loflin was set for August 14. A temporary laborer was hired on June 13 to tide us over until Mr. Loflin's arrival. William F. Johnson worked intermittently until his resignation on July 21 to accept a

Calendar year 1988 was a busy year for personnel actions. It seemed that every few months someone was either coming or going. Our first addition of the year occurred on January 17 with the arrival of Karen Cartlidge from Quivira NWR in Kansas to fill the newly created position of assistant project leader for both Pee Dee and Carolina Sandhills Refuges.

Our first loss of the year occurred on February 14 when Forestry Technician Andrew Eller accepted a job as an appraisal forester and transferred to the Division of Realty in the Atlanta Regional Office.

After several months of fact-finding and evaluation, Region 4 decided to reclassify all secretarial positions in the region. Secretary Kay McCutcheon's position was upgraded to a GS-6 Office Assistant in May.

Recruiting efforts were made and Steven D. Lay was hired to fill the vacant Forester, GS-460-5 position. This position had been converted from the forestry technician (GS-462) series after the transfer of Mr. Eller to Realty. Steve came on board on May 23, 1988.

Also beginning a tour of duty on May 23, 1988 was Forestry Cooperative Student Henry R. Sansing. Henry worked through mid-August before returning to school at Mississippi State.

Sadly, the refuge staff suffered a tremendous personal loss in May. Tractor Operator Ellice L. Sweeney passed away on the afternoon of May 23, 1988. Mr. Sweeney died on the job of an apparent heart attack. This was not the kind of "welcome aboard" new employees Steve Lay and Henry Sansing had anticipated.

After discussion between Refuge Supervisor McDaniel, Cape Romain NWR Manager Garris, and Carolina Sandhills Manager Snider, a decision was made to fill the vacancy created by Mr. Sweeney's death via a transfer. Cape Romain Biological Technician Julius R. Loflin was given the opportunity to transfer to Carolina Sandhills Refuge. Julius's family had been living in Cheraw (25 miles north of our refuge office) while he was stationed at Cape Romain and living on Bulls Island. He had been making biweekly trips from Awendaw to Cheraw to spend time with his family. Julius was more than happy to accept our offer. His position was renamed "Range Technician" by the Personnel Office. We have been very pleased with Julius's abilities and initiative.

The reporting date established for Julius Loflin was set for August 14. A temporary laborer was hired on June 13 to tide us over until Mr. Loflin's arrival. William F. Johnson worked intermittently until his resignation on July 21 to accept a

permanent job. If Bill harbors any ill feelings toward the Fish and Wildlife Service, he certainly has good reasons. This poor soul worked for six weeks before he was ever paid. He still had not received a paycheck upon his resignation. The payroll/personnel office was totally responsible for his nonpayment and was totally unresponsive to our efforts to correct this problem.

William Edward (Eddie) Taylor, Jr. was hired as a Biological Technician on a temporary appointment to conduct Canada goose collar observation surveys and to head up efforts to band and collar geese. Eddie canvasses both Carolina Sandhills and Pee Dee Refuges as well as several local areas with known prior use by waterfowl.

2. Youth Programs



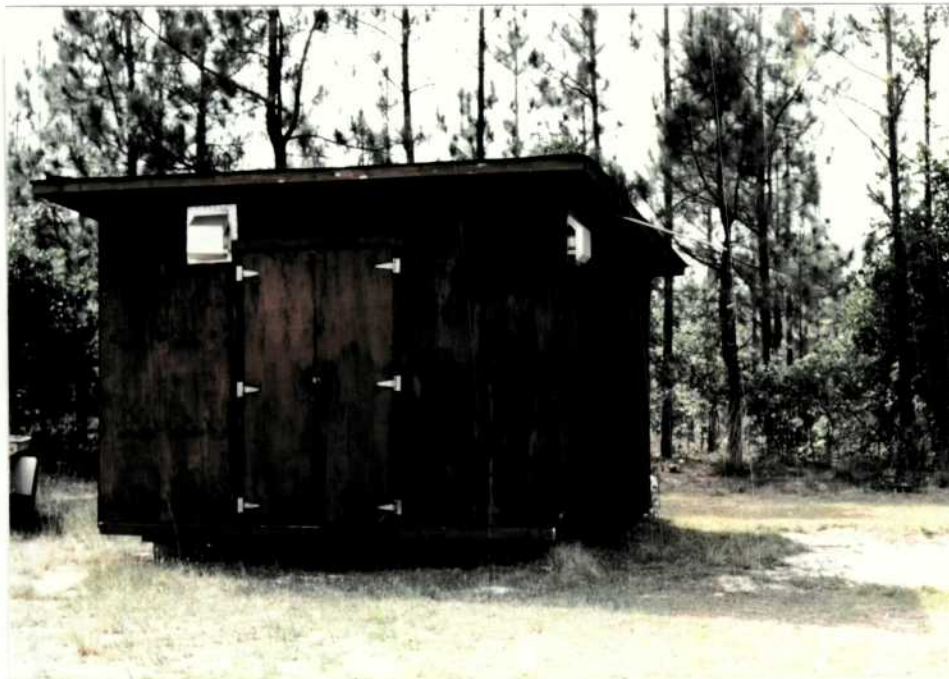
YCC Enrollees - Johnson, Faille

The refuge YCC program had two enrollees. Both William Johnson and Andrea Faille are students at McBee High School. They were excellent workers and took a real interest in the projects they were working on. Supervision of the enrollees was divided between the permanent staff depending on the project to be accomplished.

Projects accomplished were:

1. Remarking 35 miles of boundary by painting marks on trees.
2. Removing understory from around all red-cockaded woodpecker cavity trees in Compartments 6 and 8 for a total of 112 acres. All the cavity trees were marked with a band of white paint.
3. Brush was removed from dams and spillways at ten water impoundments.
4. Enrollees painted trim, windows, and doors on four buildings and painted a small storage shed.
5. Enrollees picked up litter along major roads going through the refuge for a total of 30 miles of roadway.
6. Potholes and cracks in the wildlife drive were repaired. A total of seven tons of asphalt was used to make the repairs.
7. Brush and overhanging limbs were removed from six miles of foot trails.

In addition enrollees did other small projects around the shop and headquarters buildings. The appraised value of the YCC program was \$6,823.00.



Equipment storage shed before painting. (88NR-9, 6-88, Cartlidge)



After painting by YCC enrollees. (88NR-10, 7-88, Cartlidge)

3. Other Manpower Programs

William Long began working off a 300 hour Community Service sentence, but failed to show up after two weeks. Although his probation officer was notified, Mr. Long never showed up again.

5. Funding

Beginning with FY 1988, no separate funding allocation was made for Pee Dee Refuge. Their funding needs were covered by allocations made to the Carolina Sandhills Refuge budget. A summary of funds allocated to Carolina Sandhills Refuge for FY's 1988 and 1989 is shown in Table 4. Since it would not be an equitable comparison, funding levels for years prior to the complexing of Pee Dee and Carolina Sandhills Refuges are not shown.

Table 4. Funding Summary
 Carolina Sandhills and Pee Dee Refuges
 FY's 88 and 89

FY	YCC						Totals
	1261	1262	6860	8610	1120	1210	
88	303,200*	143,200**	35,000	8,112	5,000	2,400	496,912
89	365,900•	151,800	35,000	6,215	6,000	N/A••	564,915

*Total includes add-ons to base funding of 13,000 for O&M; 3,400 for salary of forestry cooperative student; and 7,000 for a slip-on pumper at Pee Dee.

**Total includes add-ons to base funding of 18,000 for maintenance O&M; and 1,000 for added costs for a vehicle.

•Total includes add-ons to base funding of 2,200 for contaminant study at Pee Dee; fire equipment needs totaling 40,700; and 4,000 for hiring of temporary to conduct goose collar observations.

••Funding level for FY 89 has not been formally set; it is assumed to be at the same level as for FY 88.

To put these figures into proper perspective, consider that for FY 88, a total of \$496,912 was available for refuge operations. Of this, approximately \$350,000 was utilized for salaries and \$23,512 was set aside for specific projects or purchases (vehicle, YCC, quarters, farm bill activities). The remaining balance (\$123,400) was available for payment of fixed expenses and conduct of operations and maintenance activities.

Looking at FY 89, the amount of funds available for discretionary purchases is comparable to that available in FY 88. Total funding of \$564,915 will cover salaries projected at approximately \$402,000; set asides totaling \$55,115 (contaminants, fire equipment, quarters, and farm bill activities); the amount remaining for fixed expenses and operations and maintenance projects is projected to be approximately \$107,800.

The figures listed above for FY 88 do not include \$56,472 paid by the regional office to the S. C. Forestry Commission for fire protection and for prescribed burning by aerial ignition. A like amount will also be expended for these activities during FY 89.

6. Safety

Carolina Sandhills held regular safety meetings, two of which were combined with Pee Dee Refuge. Topics covered a variety of subjects concerning work and personal safety.

There was one lost time accident as a result of a bumblebee sting. The employee had an allergic reaction and missed one day of work.

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

The land comprising the Carolina Sandhills National Wildlife Refuge and the Sand Hills State Forest was purchased by the U. S. Fish and Wildlife Service in 1939 and was, at that time, a biological desert. Much of this land has been restored to a vital, productive, organically rich condition through protection, reforestation, and wise land use management.

Most of the 45,586 acres comprising the refuge is characterized by pine forests of one species or another. Longleaf pine and turkey oak communities are the most prevalent while loblolly pine and bluejack oak dominate those areas where clay outcroppings occur. The pocosins, wet areas, and drains of the refuge are dominated by pond pine, gallberry, fetterbush, and sweetbay. Open fields and clearings make up approximately 1,200 acres while man made lakes and ponds comprise an additional 350 acres.

2. Wetlands

Most of the numerous creeks and streams which flow through the refuge have been dammed off at various points creating 30 man-made lakes and ponds. In addition to stream flow, they are

spring-fed and have an ample water supply even during periods of drought.

In order to achieve management objectives the water levels of several impoundments were raised and/or lowered as needed. Water levels in Pools D, G, H, K, and L were lowered in March in order to remove standing water from green timber along their shorelines. These were subsequently reflooded in November. Honker Lake was drained to about one-third its capacity in May in order to permit moist soil species to grow on its exposed shoreline. Reflooding of this area began in November and was still underway at the close of the year. Plans are to let this area remain at full pool level throughout 1989 in order to control a wool grass problem which has developed in the shallow, upper reaches of the pool over the past few years.

The small, five acre Holdover Pond, has historically been one of our prime moist soils areas. It was completely dewatered in April and was disked and planted to Japanese millet in early July. Not only did a good stand of millet develop, but there was a good response from three species of smartweeds, biden, crabgrass, fall panicum, and three species of cyperus. The unit was shallowly reflooded in late August. However, due to our poor wintering population, very little waterfowl use of this areas occurred.



Holdover pond was drained in April to dry out the bottom. (88NR-11, 4-88, Cartlidge)



The bottom was disked and planted to Japanese millet in June. (88NR-12, 6-88, Cartlidge)



Not only did we get a fairly good crop of Jap millet, we got an excellent crop of moist soil plants. (88NR-13, 9-88, Cartlidge)

An effort to establish a stand of Japanese millet in Martins Lake was once again attempted. In order to eliminate competition by non-beneficial moist soils species, we held off draining the lake until July. Twenty acres in the upper end of the lake were aerially seeded by Jack Ross Flying Service of Dovesville, S. C. Early on it appeared as if this procedure was going to pay off. It appeared a good stand of millet was developing. By the end of September, however, it was determined that much of what we thought was developing millet, was, in fact, a mixed stand of grasses and sedges. Very little millet ever developed. We finally decided that perhaps we did not get the lake bed dry enough. We also suspect that the resident geese ate a lot of the young plants. We will re-evaluate this effort based on its cost vs. benefit.



The aerial seeding of Jap millet in Martins Lake was unsuccessful possibly due to too much standing water at the time of germination. We did get a good crop of *Eleocharis* which failed to head out before frost. (88NR-14, 9-88, Cartlidge)

Lake 12 and Lower Triple Lake were completely dewatered beginning in October, 1987 in order to consolidate their bottoms and to control aquatic vegetation. Because of the need to utilize the banding site at Lower Triple Lake for preseason wood duck banding, a prolonged drawdown of this pool was not possible. Reflooding began in March. Thus, the management objectives for this impoundment were not fully realized.

Lake 12 appeared to offer potential as a moist soils unit and because there was no compelling reason to reflood it, this pond was permitted to remain dry for an extended period. This decision proved to be fruitful when, in July, wild millet, eleocharis, juncus, smartweeds, and other good waterfowl food plants began to appear. The pool was reflooded to an average depth of four to six inches on August 24. Flooding continued gradually throughout the remainder of the year and the lake was approximately one-third full by years end. Even with the abundance of natural foods, no waterfowl were observed utilizing this area.



Lake 12 was drained in October, 1987 and remained dry through August 1988. (88NR-15, 4-88, Cartlidge)



The drawdown produced an abundance of moist soil plants.
(88NR-16, 8-88, Cartlidge)



Although the food supply was excellent in Lake 12, no waterfowl were ever observed using it. (88NR-17, 8-88, Cartlidge)

Both Pool E and Middle Triple Lake were completely dewatered beginning in October. Pool E was drained in order that the water control structure and culvert could be cleared of an

accumulation of beaver debris and to permit needed repairs. Middle Triple Lake was drained in order to permit oxidation and consolidation of lake bottoms and to make needed repairs to the dam. Both units will remain down through the 1989 growing season as they are potentially good moist soils areas.

3. Forest

A forestry technician position was established last year to assist the refuge forester in handling timber management activities on the refuge. This position was reclassified as a forester position this year. In May, a forestry co-op student was assigned to Carolina Sandhills for the summer to assist the forestry staff.

Preparations were made, and work begun on the revision of our timber management plan. The refuge was originally comprised of ten timber compartments. It was divided into twenty smaller compartments this year. New timber type and compartment maps were prepared. Timber type and compartment acreage was recomputed. Approximately 43,160 acres or 94.7% of the total 45,586 acres on the refuge is categorized as woodlands.

An Omnitalk microcomputer program (Comprehensive Inventory Processor System for Tally Data) was purchased to assist the forestry staff with the computation of field data for our revised timber management plan. A new Husky Hunter field computer with Omnitalk software was also purchased to give greater productivity and accuracy to our forestry inventory system.

Woodland habitat management prescriptions for timber compartments 6 and 8 were prepared and submitted to the regional office and were approved. All timber management activities on the refuge were prescribed in accordance with these prescriptions and the previous years prescriptions (Compartments 9 and 10).

Three pulpwood sales and one sawtimber sale were marked and sold during the year. In addition, five pine straw sales were sold. Pine straw sales were conducted in longleaf pine plantations which had not been previously prescribed burned. The removal of pine straw in these areas should greatly reduce the heavy pine litter thereby reducing wildfire danger. Stumpage prices ranged from \$13.50 to \$16.99 per cord for pine pulpwood and \$148.63 per MBF for pine sawtimber. Pine straw prices ranged from \$95.83 per acre to \$313.46 per acre.

A refuge salvage and miscellaneous sale was advertised and sold to E. J. Dixon (D. J. Creed, Inc.) for \$9.00 per cord (mill tally). This sale consisted of trees which were dying or had died due to fire and insect damage or other natural causes (lightning, wind, etc.). The majority of the salvage wood came from a wildfire area. Miscellaneous cutting included removal of trees at designated areas for road widening and dam spillway clearing.

Table 6. Refuge Timber Sales - 1988

<u>Permittee</u>	<u>Compt #</u>	<u>Sale #</u>	<u># Acres</u>	<u># Cords</u>	<u># Bd. Ft.</u>	<u>Revenue</u>	<u>Treatment</u>
Canal Wood SUP 39621	10	4-87	20	12	104,453	\$15,525	Release
D. J. Creed SUP 39630	9	2-88	67	295	N/A	\$ 5,012	Thinning
D. J. Creed SUP 38156	8	1-88	100	391	N/A	\$5,280	Thinning
Young Plpwood SUP 38159	8	2-88	82	220	N/A	\$3,300	Thinning
E. J. Dixon SUP 38155	*	Slvg.	300	140	N/A	\$1,263	Salvage & Misc.
TOTALS			569	1,058	104,453	\$30,380	

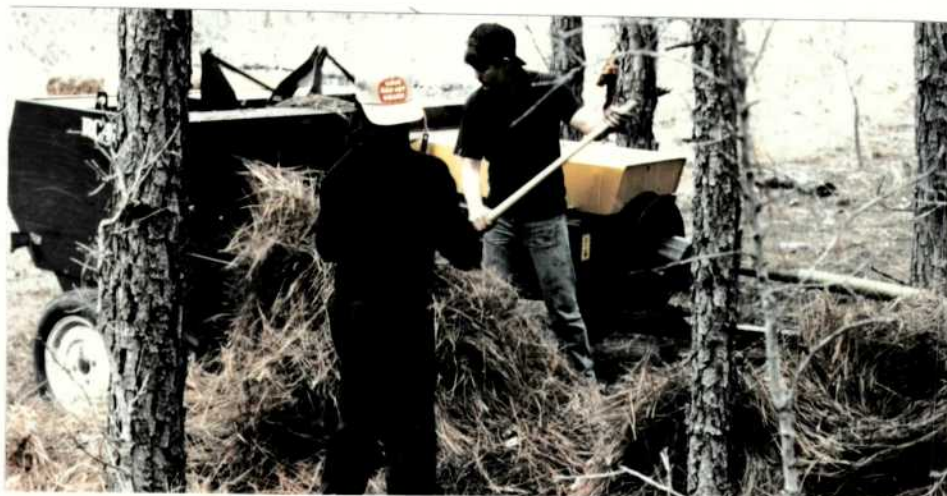
*Salvage operations in Compartments 2, 3, 5, 6, & 9.

Table 7. Refuge Pine Straw Sales - 1988

<u>Permittee</u>	<u>Compt #</u>	<u>Sale #</u>	<u># Acres</u>	<u># Tons</u>	<u>Revenue</u>	<u>Treatment</u>
Pioneer Southern SUP 39623	9	1-88	65	357	\$8,551	Pine Straw Removal
Trinity Straw SUP 39629	8	1-88	70	368	\$6,708	Pine Straw Removal
Richmond Mulch SUP 38147	8	2-88	65	305	\$11,468	Pine Straw Removal
Richmond Mulch SUP 38150	5, 6, & 8	1-88	56	264	\$17,554	Pine Straw Removal
Robinson Trckng SUP 38157	2	1-88	90	470	\$14,500	Pine Straw Removal
TOTALS			346	1,764	\$58,781	



We discovered a gold mine in pine straw this year. The demand for good straw is high and competition between companies is practically cut-throat. (88NR-19, Robinson)



The straw is raked and baled on site. We now reserve a certain number of bales for the refuge as part of the payment for the straw. (88NR-20, 5-88, Robinson)



These bales sell for \$4.00+ on the retail market. Some bidders have even been willing to take a loss on a particular bid in order to obtain the sale and maintain a supply of straw to their customers. (88NR-21, 5-88, Robinson)

Approximately 142 acres of pine sawtimber habitat located adjacent to active red-cockaded woodpecker colony sites were roller chopped using a crawler tractor (JD 750) and roller chopper. The roller chopper was used in the woodpecker colony sites in Compartments 2, 3, 6, and 8 to knock down understory vegetation growing up around existing and potential cavity trees. Sprouts from downed turkey oaks also provide favorable browse for deer during spring and early summer.

4. Croplands

Cropland management proceeded this year basically as in the past few years. Randy Catoe and Campbell McLeod continued as our cooperative farmers. They managed our sericea and bicolor lespedeza fields and planted 26.3 acres of corn for the refuge. In addition the refuge planted 27 acres of wheat for green browse and to attract wildlife along the Wildlife Drive. Several small patches were planted to a mixture of browntop millet, peas, and milo to assist in our turkey restoration program. (See Figure 1 for acreage planted.)

Corn production this year was especially good, considering our soil conditions and total precipitation. Plenty of hot food was available in fall and winter. Although it was not fully utilized by waterfowl, the deer, racoon, doves, other birds made good use of it.

Wheat production was very good this year and was heavily utilized by geese, deer, turkey, and dove. This was the first year in some time that growth was substantial enough to provide for seed production after sustaining heavy grazing. Dove in particular fed in the wheat fields until early fall. The growing turkey flock utilized the fields extensively for bugging and breeding grounds.

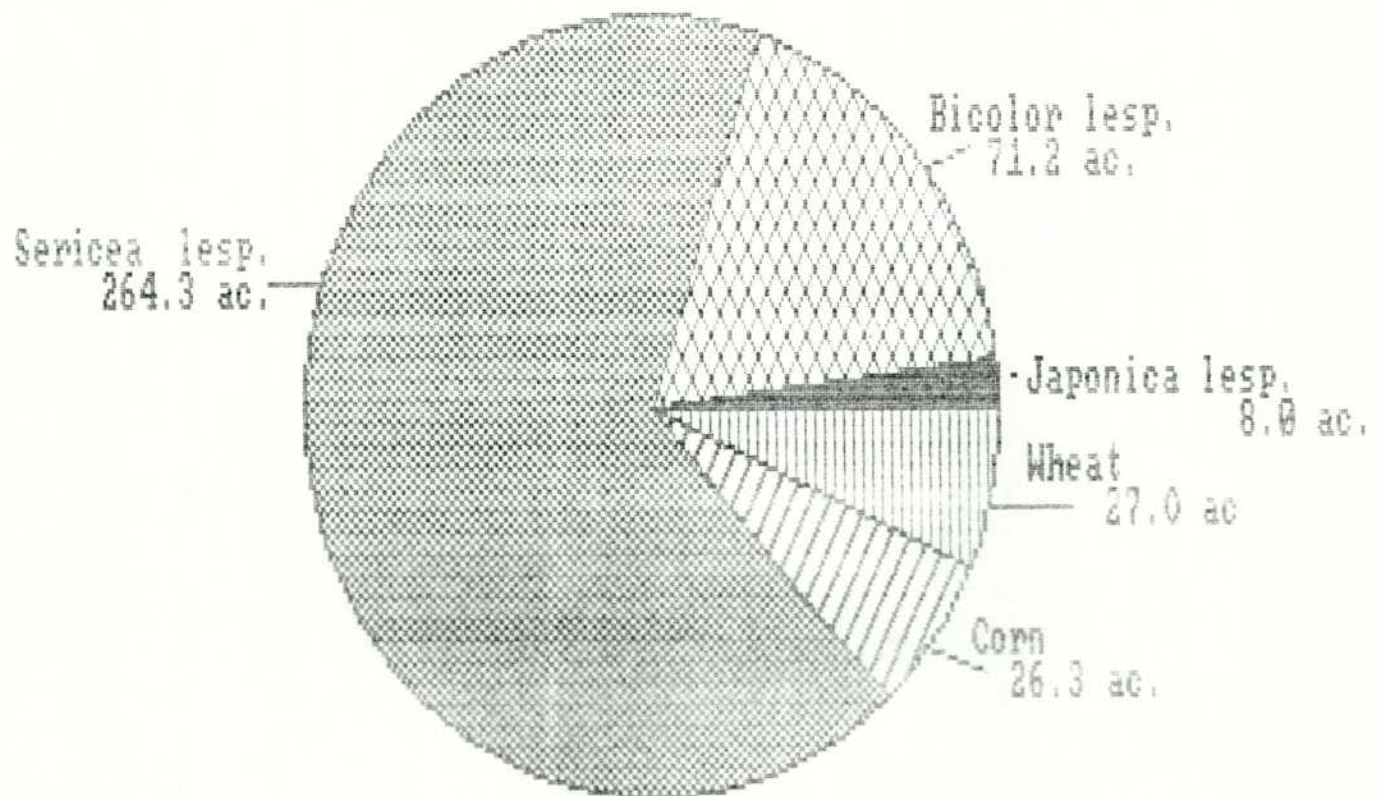
Food plot areas planted to the browntop, pea, milo mixture were moderately successful. The browntop did very well. The peas were immediately consumed by deer. The milo provided only a poor stand and little seed production. However, the plots were heavily utilized by turkey, deer, quail and dove. We are gradually establishing other food plots utilizing perennial vegetation such as bahia grass and lespedezas in old firebreaks and other open areas. This will hopefully replace most of the need for annual food plot plantings.

6. Other Habitats - Fields

There are nearly 90 fields and clearings on the refuge comprising approximately 1,200 acres. Most of these are permitted to remain fallow producing wild native grasses and other herbaceous species. Management is limited to prescribed burning and mowing in order to prevent encroachment by woody species, primarily pine trees. Food plots/strips were planted in several fields.

Table 5. Summary of Management Practices for Open-Fallow Fields - 1988

<u>Practice</u>	<u># of Fields</u>	<u>Total Acreage</u>
Burned	19	78.3
Mowed	18	63.7
Food Plot Strips	5	9.0



1988 MANAGED CROPLAND PRODUCTION



A mixture of browntop millet, milo, and game peas was planted in strips in several fields. The browntop was very successful, but the milo and peas yielded little. Quail were often flushed from this food strip. (88NR-18, 8-88, Cartlidge)

9. Fire Management

Prescribed burning is an important management tool used on Carolina Sandhills to maintain valuable habitat for a number of wildlife species including the endangered red-cockaded woodpecker. One of the requirements of the red-cockaded woodpecker is open stands of mature pine. By burning these stands periodically, optimum habitat conditions for these birds are created and maintained.

Prescribed burning helps to create and maintain a diversity of habitat types on the refuge which are essential for the support of a wide array of wildlife species. Unpalatable brush and litter are removed following a prescribed fire allowing production of palatable new plants and sprouts.

There is an increase in yield and quality of browse from hardwood and resprouting plants. Higher protein content has been reported for sprouts of both grasses and shrubs.

If left undisturbed, upland pine stands (longleaf) on the refuge will eventually develop into dense stands of scrub oak. These scrub oak stands occasionally produce a good crop of acorns, but most years, they produce very little in the way of wildlife food. Prescribed burning helps to control these scrub oaks by slowing down their successional process. Following the second or third burn of an area, the understory becomes more open and hardwoods less numerous. Those individuals left produce more acorns and at a higher rate.

Flammable vegetation and litter accumulate rapidly in pine stands. This heavy rough which collects to a dangerous level every three to five years, acts as a tinder for accidental or natural causes of wildfires. When fire is prescribed to reduce this hazard fuel accumulation, the area becomes virtually fireproofed for the next couple of years. Wildfires that do occur over the next few years in these areas are of low intensity and are much easier to control.

Other beneficial effects from prescribed burning include:

1. Control of brown spot needle rust on longleaf pine seedlings;
2. Seed bed preparation for longleaf pine regeneration sites and increased germinating of understory plant and tree seeds;
3. Improved working conditions for individuals engaged in management and harvest activities; and
4. Provides a safe environment with greater opportunity for the visiting public to achieve their objectives, whether consumptive or nonconsumptive.

In accordance with an approved prescribed burning plan for the 1988 burning season, approximately 5,810 acres of woodlands in Compartments 2, 3, 4, 5, 6, 7, 8, and 9 were prescribe burned using aerial ignition. This was the sixth year in which aerial burning was used on the refuge. Aerial ignition by helitorch has proven to be a very efficient burning method. Our aerial ignition burning was accomplished under contract with the South Carolina Commission of Forestry at a cost of \$4.00 per acre.

All firebreaks which were used in prescribe burning operations were reseeded with a recovery plow, fertilized and seeded with

a mixture of bahiagrass, lovegrass, and sericea to help prevent erosion and provide habitat diversity.

Under the terms of a contract agreement, the S. C. Commission of Forestry is responsible for wildfire suppression on the refuge and is paid \$0.76 per acre for wildfire detection and suppression. When needed, refuge personnel serve as a back-up force with refuge fire equipment. There were no wildfires reported on the refuge during the year.

10. Pest Control

The refuge again cooperated with the U. S. Forest Service by placing two gypsy moth traps on the refuge. These traps were located at refuge headquarters and Lake Bee recreation area; they were checked monthly by the refuge foresters. No gypsy moths were found.

Scattered occurrences of black turpentine, ips, and ambrosia beetle attacks were discovered over the refuge during the year. The heaviest concentration of impacted trees were found in Compartment 6, where a wildfire burned in 1984. Beetle infested attacks have been mainly limited to severely scorched trees damaged from fires, and in lightning struck trees. Infested trees located in Compartment 6 which were close to access roads were marked for cutting and removal. No pesticides were used.

Pesticides are used at this station for both agricultural and silvicultural purposes. In either case, their use is limited. Most agricultural use is by our two cooperative farmers. Mr. A. C. McLeod, our primary cooperator, treated 346 acres of sericea lespedeza with 54 gallons (9.5 oz. A.I/acre) of 2,4-D amine for broadleaf weed control. He was attempting to establish a new crop. Mr. McLeod also treated 374 acres of established sericea with Lorsban-4E at the rate of 1/2 lb. AI/acre (46.75 gallons) for grasshopper control.

The refuge staff treated approximately two miles of refuge roads, sign bases, and building foundations with Roundup at the rate of 2 lbs. AI/acre. An additional forty acres of small farm fields were also treated with Roundup for Johnsongrass control. Wood duck boxes were treated for wasp eradication with a K-Mart brand aerosol wasp spray (Chlorpyrifos.25%).

12. Wilderness and Special Areas

Five hundred and fifty four acres of longleaf pine-scrub oak (S.A.F. type # 71) was set aside as a Research Natural Area in 1970. This was done in response to efforts by the Federal Committee on RNA's to include as many S.A.F. types as possible

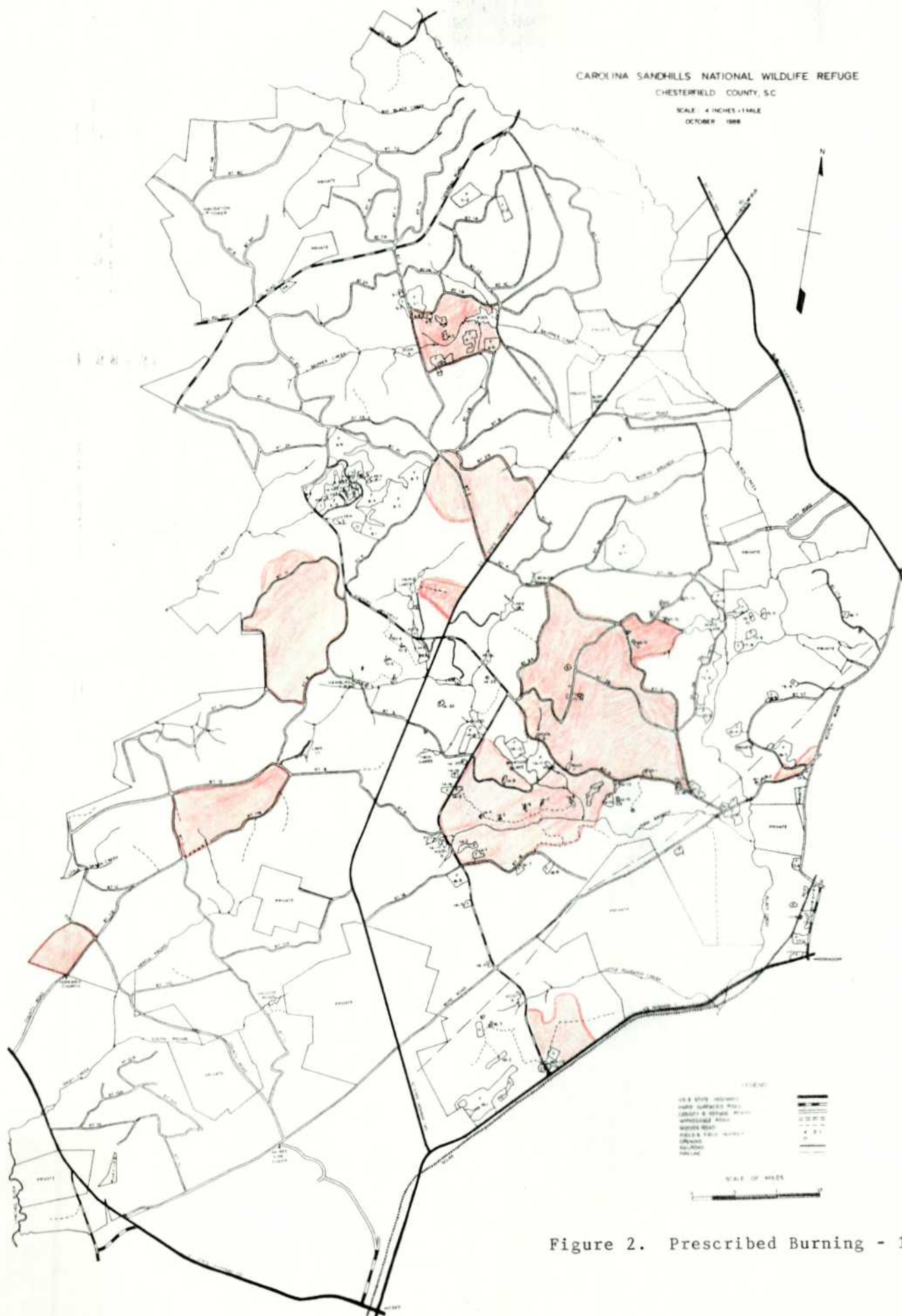


Figure 2. Prescribed Burning - 1988

within the system. This area is heavily covered with turkey oak with smaller amounts of blackjack and bluejack oak mixed in. Interspersed within this stand are a few, small longleaf pine.

Prevailing agricultural and timber management practices in the Sandhills region of North and South Carolina are causing a rapid decline in S.A.F. type # 71. This RNA ensures that this timber type is always available to act as a control for management and research. Since the climax species of S.A.F. # 71 is longleaf pine, management practices are limited to those which encourage the development of this species. No prescribed burning takes place within this unit. Public use is limited to incidental hunting. Protection was the only management activity afforded this area in 1988.

Many other areas which are unique to the refuge have been plotted on compartment maps and were afforded special management consideration and protection during the year.

G. WILDLIFE

1. Wildlife Diversity

The physiographic region in which Carolina Sandhills Refuge is located consists of a ridge of rolling sandhills which run from North Carolina to Georgia and parallel the fall line between the Atlantic Coastal Plain and the Piedmont Plateau. Because of its position on this fall line there is to be found on the refuge an abundance of plants, animals, and habitat types characteristic of both of these regions. Present also are many intergrades unique to the fall line.

One hundred ninety species of birds, 42 species of reptiles, 25 species of amphibians, and untold species of mammals and plants are known to be present on the refuge. Many plants, such as sundews, pitcher plants, Well's pixie moss, and white wicky, are rare and endangered.

As has been the case in prior years, few management practices in 1988 were species specific, i.e., most were designed to meet the needs of as many species of plants and animals as possible.

2. Endangered Species

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.

One of the specific objectives of the Carolina Sandhills Refuge is to provide habitat and protection for this species. Approximately twenty percent of the refuge is inventoried each year to determine the status of existing trees, and to locate new trees which the woodpeckers are using. Each active tree is numbered with an aluminum tag, and is marked with a band of white paint. This band allows the tree to be easily located, and serves as a flag for areas to receive special consideration in forest management activities. Start trees are located and mapped, but are not numbered or banded. Measurements are taken of each tree, and then are stored in the computer for statistical analysis. After the measurements are completed, scrub oak and brush are removed from around each tree to prevent cavity blockage and possible desertion.

Over 40,000 acres of forested land provide nesting and foraging habitat for the woodpecker. Forest management and habitat improvement are used to maintain optimal conditions. A three-pronged plan consisting of hand removal of brush, roller chopping, and prescribed burning are used together to create and maintain an 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 6 and 8 were located and mapped. A total of 222 cavity trees, and 11 starts were found. Each cavity tree was tagged and banded, and the undergrowth cleared away.

Compartments 6 and 8 had been previously surveyed in 1978 and 1983. Table 7. presents a comparison of the three surveys.

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

Compt #	# Cavity Trees Available 1978	# Cavity Trees Available 1983	# Cavity Trees Died 1983-88	# New Cavity Trees 1983-88	# Cavity Trees Available 1988	% Change 1983-88
6	169	195	70*	26	151 (58 active; 93 inactive)	- 22.6
8	67	77	15	9	71 (33 active; 38 inactive)	- 7.8

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

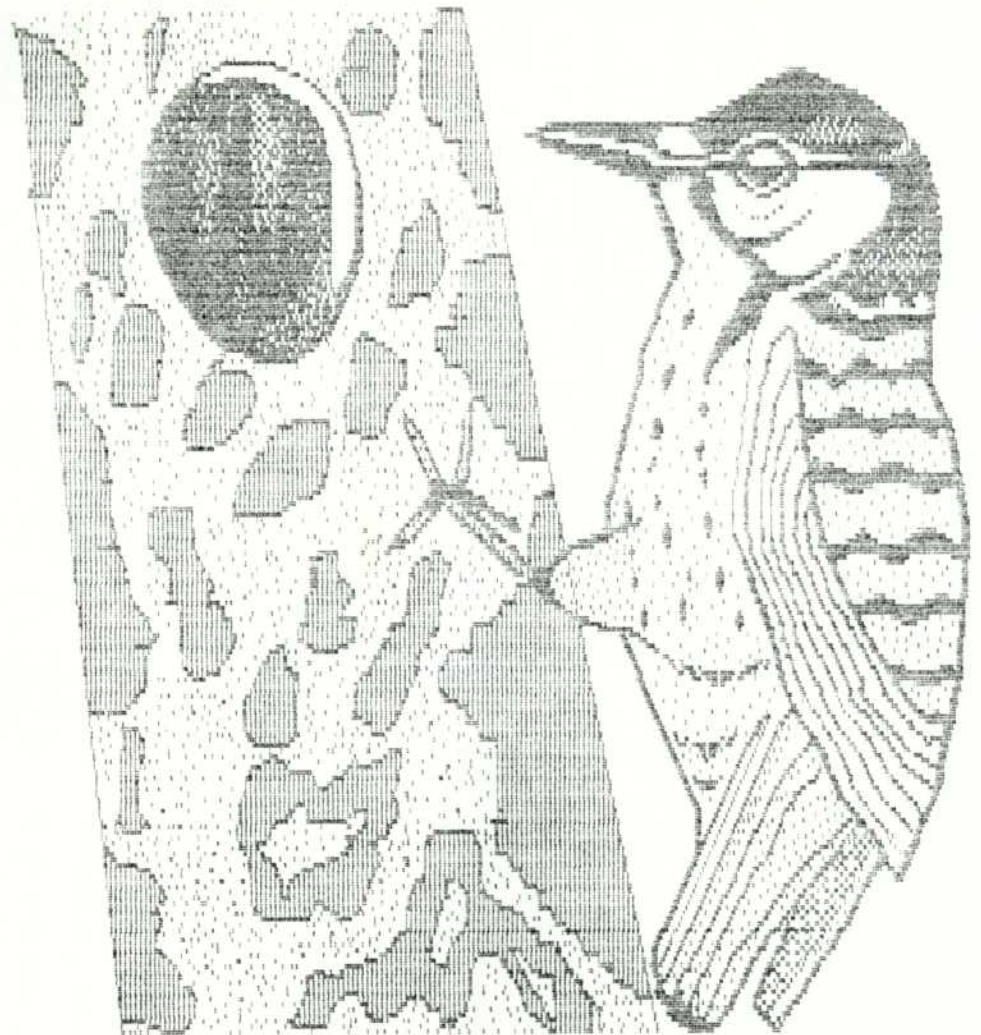
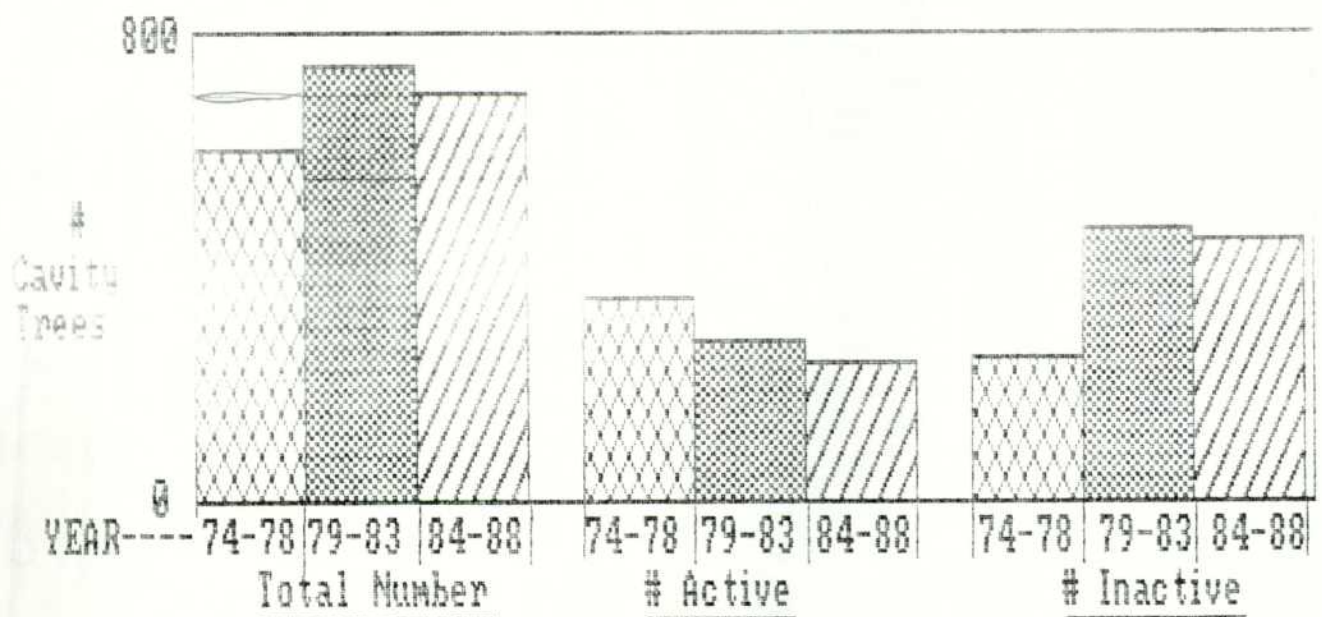


Figure 3.



RED-COCKADED WOODPECKER CAVITY TREES

b. Pine Barrens Treefrog

Carolina Sandhills Refuge supports the second largest concentration of pine barrens treefrogs in the state. Approximately ten colonies of this state listed species are found on the refuge with ninety percent of the known colonies found in Chesterfield and Marlboro Counties. Since plant succession is the greatest threat to the continued existence of this species, prescribed fire is used on all known "frog-bogs" on the refuge on a regular basis.

c. Eastern Cougar

No cougar sightings were made on the refuge during the year, however, an adjacent landowner reported sighting a long tailed cat.

d. Plants

White wicky (Kalmia cuneata) and Well's pixie moss (Pyxidanthera barbulata var. brevifolia) are two plant species present on the refuge that are under review for addition to the Federal List of Threatened and Endangered Species. Sweet pitcher plant (Sarracenia rubra jonessii) is also listed on South Carolina's Endangered and Threatened List.

White wicky is found in the open pocosin ecotone along Rogers Branch. Well's pixie moss is found scattered throughout the refuge along sandy ridge tops. Sweet pitcher plant occurs in acid seepage bogs and drains. All three species benefit from fire and are in peril due to loss of habitat through natural succession or human disturbance. An active and aggressive prescribed burning program has helped to promote these species.

3. Waterfowl

Refuge waterfowl populations peaked during the winter of 1976-77 and there has been a steady decline ever since. The decline of 1987-88 was of dramatic proportions. Our wintering Canada goose population peaked at 230 birds in December and January, a decline of twenty birds from the previous year. Goose use days declined to 16,775, a decrease of 7,120 from the 1986-87 season. However, our duck population showed the most severe decline. Use days for 1987-88 totaled only 103,061 a reduction of 96,817 from the previous year. These figures become even more significant when you consider that most recorded use days (approximately 82,350) can be attributed to our resident wood duck population.

Mallards were practically non-existent in our wintering population with the largest number appearing on January 9 when nearly every pond in the area was frozen over and covered by nearly four inches of snow. Eighty-nine birds were seen in an

"open hole" on Martins Lake on that date. American widgeon and Canada geese comprised the bulk of our wintering populations and most were found on Martins Lake with some incidental use of Pool D and Honkers Lake. Wood ducks were present throughout the year and are to be found in, on, or around most refuge wetlands.

Around the first part of May, two goslings were seen at Martins Lake. Several subsequent sightings were made throughout the spring and early summer. It is believed, however, that only one of these birds reached maturity. Our resident goose population was estimated to be between 25 and 30 birds at the close of the year.

Table 9. Peak Populations: Common Wintering Waterfowl

<u>Species</u>	<u>1976-77</u>	<u>83-84</u>	<u>84-85</u>	<u>85-86</u>	<u>86-87</u>	<u>87-88</u>
Canada Geese	2,000	500	350	225	250	230
Mallard	5,500	350	275	200	70	89
Black Duck	600	75	70	75	12	17
G. W. Teal	500	35	30	25	50	52
A. Widgeon	2,500	150	100	100	102	130
Wood Duck	3,500	550	600	650	600	600
H. Merganser	150	10	12	5	20	15

Table 10. Five Year Summary: Wintering Waterfowl Use Days

<u>Season</u>	<u>Canada Geese</u>	<u>Other Geese</u>	<u>Ducks</u>	<u>Coots</u>	<u>Total</u>
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
1987-88	16,775	0	103,061	0	119,836

Assistant Manager Cartlidge set up an R-Base program to store and analyze wood duck nest box data. Included in the database are fourteen years of nest box survey data and site specific data for all current boxes. After scrutinizing the data in a variety of ways, she has come up with a few preliminary conclusions. Since no statistical analysis has been done on the data the differences shown may or may not be significant.

The data seems to indicate:

1. Wood ducks showed a preference for (used a higher % of) paper boxes (Sonoco, paper tube) to wood, metal, or plastic (Tom Tubb).
2. The percent of successful nests from the boxes available varied from a low of 29% to a high of 57% over the fourteen year period.

3. Hatching success (eggs hatched/eggs laid) was greatest in wooden boxes and lowest in Tom Tubbs.
4. On the refuge the average clutch size has declined over the last fourteen years. From 1977-1983 the average was 9.4 eggs per clutch. From 1984-1988 the average was 8.0.
5. Wood duck nests are more successful in boxes that are placed over water and at least 25 feet from the shore.
6. Wood ducks prefer boxes that are placed in open versus shaded areas.
7. The color of Tom Tubb boxes (light vs. dark) makes little difference in hatching success.

Ms. Cartlidge will continue to work with the data and will report significant findings in next years narrative.

4. Marsh and Water Birds

Little in the way of suitable habitat for these species is to be found on Carolina Sandhills Refuge. Most such habitat is associated with lake bottoms during periods of draw down. Even these fail to attract significant numbers of these species. Great blue herons can be found feeding in our impounded areas throughout the year. Green-backed heron, cattle egrets, little blue herons, and great egrets are occasionally seen during the summer and fall months as are pied billed grebes. In the past anhingas and double-crested cormorants have been seen feeding in some of our deeper, larger ponds. However, there were no sightings during 1988.

5. Shorebirds, Gulls, Terns, and Allied Species

Habitat for these species is virtually non-existent on this refuge and few sightings are ever made. Snipe, yellowlegs, sandpipers, woodcock, and killdeer are the only species thus far identified. Killdeer are seen more often than any other species. Few observations were made in 1988.

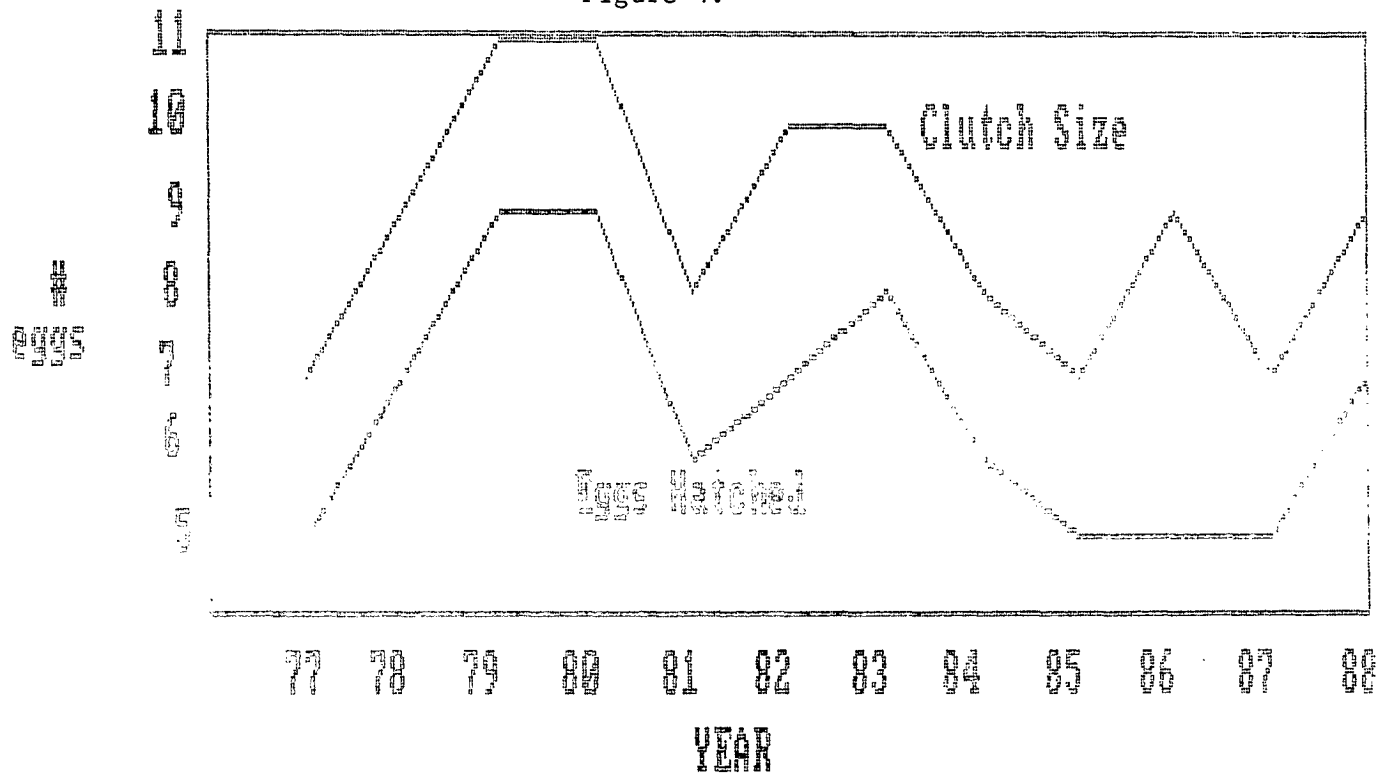
6. Raptors

There were two reported sightings of osprey on the refuge in 1988. One of these was an immature bird at Middle Triple Lake in March and the other as of a mature bird at Pool A in August. An adult bald eagle was sighted at Martins Lake on August 16 by Maintenance Mechanic Louis Tate.

The following species are known to nest on the refuge: red-tailed hawk, red-shouldered hawk, American kestrel, turkey vulture, barn owl, screech owl, great horned owl, and barred owl. Sharp-shinned hawks and Cooper's hawks are also believed to nest on the refuge, but no nests have ever been located.



Figure 4.



WOOD DUCK NESTBOX DATA

Table 11. ANNUAL NARRATIVE REPORT FORM
WOOD DUCK BOX PROGRAM INFORMATION

REFUGE: Carolina Sandhills

NESTING YEAR: 1988

	<u>NUMBER</u>	<u>PERCENT</u>
Total Usable Boxes	<u>102</u>	
Estimated Boxes Used By Wood Ducks	<u>53</u>	<u>52</u>
Estimated Boxes Used By Other Ducks	<u>0</u>	<u>0</u>
Estimated Boxes Used By Other Wildlife	<u>19</u>	<u>19</u>
Estimated Wood Duck Broods Produced	<u>46</u>	
Estimated Total Wood Ducks Hatched	<u>334</u>	
Estimated Wood Ducks Surviving To Flight Stage*	<u>167</u>	<u>50</u>

Plans for next year (indicate number):

 more boxes (See remarks)

 fewer boxes

 no change

Remarks: All paper and wooden boxes no longer serviceable were
replaced with Tom Tubbs fiberglass boxes (12 in all).

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

The many fields scattered throughout the refuge, especially those in the Oxpen unit, are commonly used as hunting grounds by large numbers of northern harriers which frequent the refuge during the winter months.

7. Other Migratory Birds

Mr. Bill Hilton, formerly of Rock Hill, SC. but now residing in nearby Hartsville, organized and conducted his 10th consecutive Christmas Bird Count on the refuge on Saturday, December 17, 1988.

8. Game Mammals

White-tailed deer, black bear, bobcat, fox (red and gray), mink, muskrat, opossum, otter, rabbit, raccoon, skunk, and squirrel (gray and fox) are all listed as game species by the State of South Carolina and, with the possible exception of muskrat, all are believed to be present on the refuge. Of these, only deer, opossum, rabbit, and raccoon are permitted to be hunted on the refuge.

General observation of the herd and data from deer killed during the refuge deer hunt indicate that deer on the refuge are in good health. Disease and parasites appear to be low to non-existent. Body fat was fair to good on all deer examined. Antler development has fallen off somewhat in the last couple of years and the ages of the deer killed have risen a little. It appears that the herd is moving toward an older average age with a larger percentage of doe deer. In order to reverse this trend we plan to increase the bag limit for antlerless deer this coming hunt season.

10. Other Resident Wildlife

The U. S. Fish and Wildlife Service began restocking the refuge with wild turkey in 1982. This restocking was done by the S. C. Wildlife and Marine Resources Department under the terms of an agreement between the Wildlife Department and the Fish and Wildlife Service. Six wild turkey gobblers trapped in Fairfield County were released in January and February. Nine hens were subsequently released in January, 1983 and the first brood was observed in June, 1983.

Numerous and frequent sightings of these birds and their signs have been made throughout the refuge ever since this initial restocking. This seems to indicate that the flock is doing well in spite of frequent reports of poaching by area hunters. However, there were fewer birds per sighting in 1988 than in previous years and only seventeen poults were seen.

Black bear have long been considered to be present on the refuge. The staff has had reports of observations and bear

tracks, and has seen bear tracks dating back to 1983. However, there have been no bear sightings or reports of sightings since 1983 leading us to believe that they may no longer be present on this station. If, in fact, they are still present, they are keeping to themselves well away from human disturbance. A bear scat was observed by Nora Murdock in Compartment 19 in early March.

11. Fisheries Resources

The fisheries resource at the refuge has always been poor due to water acidity and other factors. We requested Rick Eager, Fisheries Biologist, Charleston, SC, to conduct some studies and make some recommendations on how to improve the refuge fisheries. Rick was on the refuge the 23rd of February and did some electro-shocking in Pool J and Honkers Lake. He returned on the 26th and 27th of August to sample water chemistry and take some more fish samples. At year's-end we were still awaiting his report.



Rick Eager, Fisheries Biologist, and Henry Sansing, Coop Student sample water chemistry and fish populations at Pool J. (88NR-22, 8-88, Cartlidge)

12. Wildlife Propagation and Stocking

Several impoundments were stocked with fish during the year in an attempt to improve the fisheries on the refuge.

<u>Date</u>	<u>Type of Fish</u>	<u>Location</u>
2/22/88	1500 CCF 6-8", 650 CCF 3-4"	Mays Lake
2/26/88	3150 CCF 3-4"	Honkers Lake
2/26/88	3150 CCF 3-5"	Pool G
3/3/88	60 lbs. CCF fingerlings	Lake Bee
5/17/88	LMB fingerlings	Upper Triple Lake
10/26/88	500 CCF fingerlings	Oxpen Lake
10/26/88	500 CCF fingerlings	Mays Lake
10/26/88	1000 CCF fingerlings, 4800 RSF, 7200 BLG	Pool L
10/26/88	750 CCF fingerlings, 3000 RSF, 4500 BLG	Lake Bee

15. Animal Control

During the winter of 1940-41, the Fish and Wildlife Service released six beaver on the refuge. During this same period of time, beaver from Georgia began invading the counties along the Savannah River drainage system. The beaver in these two areas have significantly restocked twenty-eight of the forty-six counties of South Carolina. We now find it necessary, in most cases, to first control beaver before we can control water levels. This job is time consuming. In 1988, a total of nine (9) beaver were removed from refuge impoundments (3 from Pool L; 4 from Middle Triple Lake; and 2 from Pool E).

16. Marking and Banding

Our post season banding quota for mallards was reduced from 100 to 50 birds for 1988, a wise move in view of the fact that we estimated fewer than thirty birds on the entire refuge. We completed the banding season having banded only fourteen mallards and one black duck. Preseason wood duck banding efforts were considerable more successful. We successfully banded 98 birds, two short of our goal of one hundred. We were informed late in the year (October) by Migratory Bird Coordinator Otto Florschutz that we were to band and neck collar (both in-season and post-season) as many Canada geese as possible. However, by the end of the year, no geese had been captured and/or banded.

We began checking for the presence of collared geese on the refuge in mid-October at which time our population was estimated as being around sixty birds. At that time, only one collared goose was observed. It was an orange and white band but it was not until mid-November that the characters on the band could be read (OWKJ90). By the end of November, we were

still only able to locate one collared goose on the refuge and our population was still estimated at being only sixty birds. No off refuge areas had been surveyed at that time.

In late November, we hired a temporary employee (Eddie Taylor) whose primary duties were to keep track of the local goose population - both on and off the refuge. Eddie was finally able to determine that there are about 230 geese in this area; these birds moved around between local ponds both on and off the refuge. Eddie began making regular checks of six different areas (Martins Lake on the refuge, Cheraw State Park, Cheraw Fish Hatchery, Tucker Pond, Lake Robinson, and Prestwood Lake). He was only able to identify seven different collars; four of these had yellow and black bands and three had orange and white bands.

H. PUBLIC USE

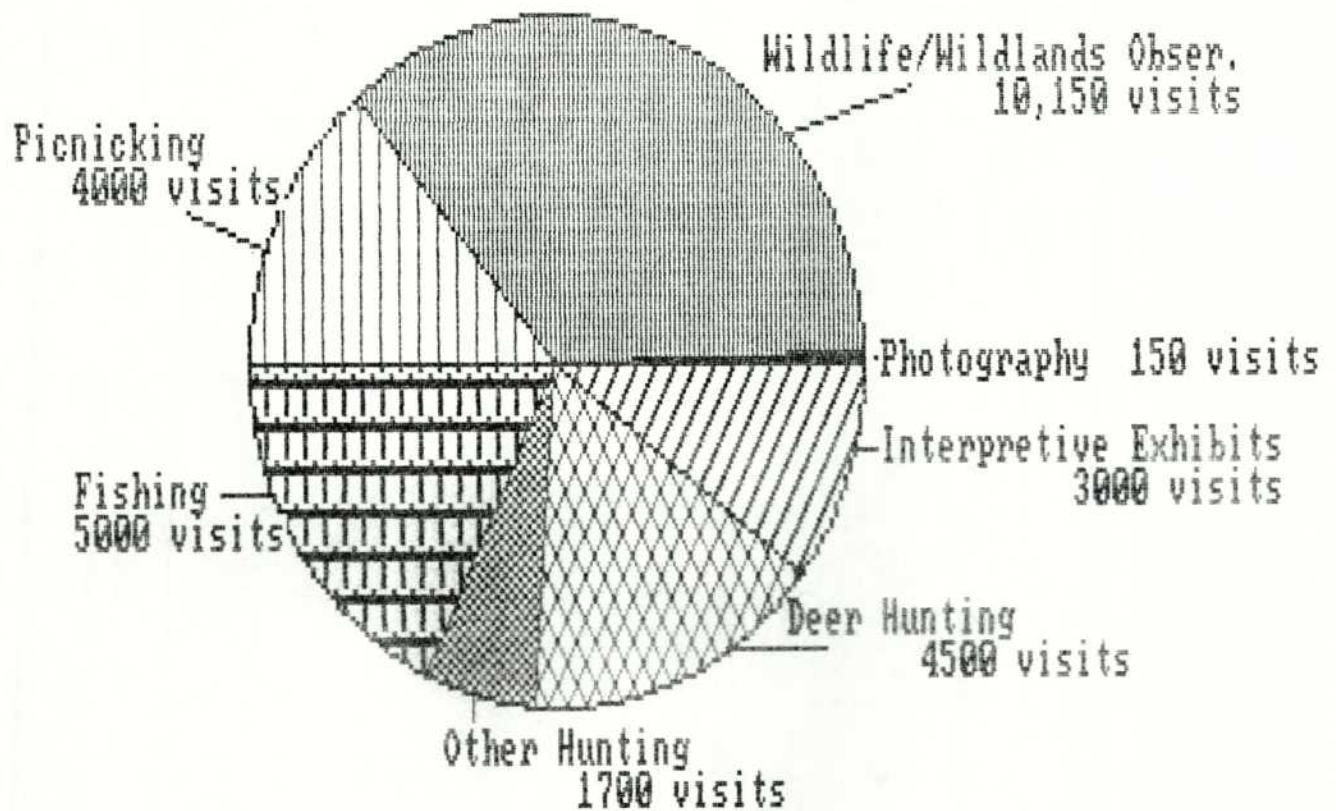
1. General

Over 28,500 visitors participated in public use activities on the refuge during the year. The Big Game Hunts accounted for the largest number of visitors.



Six new entrance signs were received in September and were placed along the refuge boundaries on U.S. Hwy 1, State Hwy 145, and Catarrah Road. (88NR-23, 10-88, Cartlidge)

Figure 5.



1988 PUBLIC USE

2. Outdoor Classrooms - Students

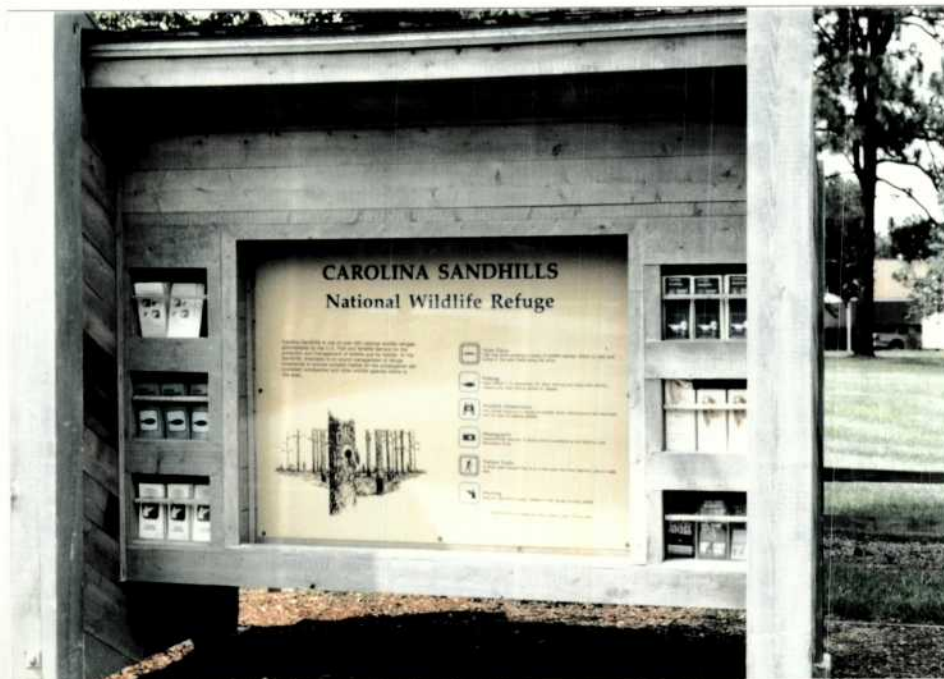
Although the refuge has no formal outdoor classroom program, we do get some use by school groups and others. Use that we know about in 1988 is as follows:

4/1	Petersburg Elementary School - 1st and 2nd graders - 39 students and 6 adults
5/16	UNC-Charlotte, Field Botany Class, 26 students and 2 instructors
6/17	UNC-Charlotte, Botany Class, 14 students and 2 instructors
8/13	Kershaw County 4-H, 15 students and 3 instructors

In addition, Bill Hilton, Science Instructor at the Governor's School For Science and Mathematics in Hartsville, uses the refuge extensively as an outdoor classroom for his students.

6. Interpretive Exhibits/Demonstrations

Information kiosks containing interpretive panels are located at both ends of the Wildlife Drive and receive considerable use. This year the panel in the headquarters kiosk was replaced because the plexiglass backing had warped. The new panel is on aluminum.



Intense heat caused by direct sunlight on this kiosk warped the old plexiglass interpretive panel. This new one is silkscreened on aluminum. (88NR-24, 9-88, Cartlidge)

7. Other Interpretive Programs

Ted Borg, photographer, and Glen Oeland, freelance writer, with the South Carolina Wildlife and Marine Resources Commission visited the refuge on several occasions in preparation for an article on hiking trails for the South Carolina Wildlife Magazine.

Assistant Manager Cartlidge presented programs to the Wildlife Action Clubs of Florence (10/6), Pageland (9/2), and Hartsville (4/26). A total of sixty-one people attended the three programs.

Assistant Manager Cartlidge participated in Career Day activities at Bethune High School on May 18, and talked with twenty-six students and two teachers about working in the wildlife field.

Assistant Manager Cartlidge delivered the Public Service Announcement on Refuges to TV stations WOLO, WIS, and WLTX of Columbia on April 20th.

Fourteen people of the Charlotte Audubon Society spent six hours birding on the refuge February 27th.

Assistant Manager Hoffmann met with four students and one instructor from Wofford College on January 22.

Assistant Manager Hoffmann met with Kershaw County student, Chad Hopkins on March 30. Mr. Hopkins was writing an essay on wildlife management.

Twelve clients and six staff members from the Hartsville Special Housing Authority visited on June 24 for wildlife observation and to try their luck at fishing in refuge ponds.

Twenty two area teachers, accompanied by personnel from the S. C. Parks, Recreation and Tourism Department, visited the refuge on June 22. They were given an overview of the national wildlife refuge system, Carolina Sandhills management programs, and environmental education materials and procedures by Refuge Manager Snider. A tour of the refuge was given the teachers by the S. C. Parks, Recreation, and Tourism personnel after Mr. Snider's presentation.



Refuge visitors Kati McCutcheon and Rebekah Farmer enjoy the walk down to Martins Lake in the snow. (88NR-25, 1-88, McCutcheon)

8. Hunting

Public hunting for the taking of white-tailed deer, bobwhite quail, mourning dove, raccoon, opossum, and rabbit is permitted on approximately 43,000 of the 45,586 acres comprising the refuge.

The taking of white-tailed deer is by far the most popular form of hunting to take place at this station. Seasons were as follows: six days of archery hunting from October 17 through October 22; five days of primitive weapons hunting (archery and muzzleloading weapons) from October 31 through November 4; and three days of modern weapons hunting on November 16, 17, and 18. As has always been the case, the bag limit for each of these hunts was the state limit plus one antlerless deer. It should be noted that our game zone has no limit on the number of antlered deer taken. During the first two of these three hunts, only antlerless deer were required to be checked and tagged (State regulations), thus we have no way of knowing the actual numbers of deer harvested or of the number of hunters who participated. We estimate that 4,364 hunter days were spent harvesting 139 deer during all three hunts combined.

A five year summarization of all three hunt programs is presented in the following three tables.

Table 12. History: Primitive Weapons Deer Hunting
1984-88

Year	Hunter		Harvest			HD/ Deer	HH/ Deer	HH/ Day	Days/ Hunt
	Days	Hours	Bucks	Does	Total				
1984	1,028	8,224	11	7	18	57	457	8.0	5
1985	983	7,864	10	13	23	43	342	8.0	5
1986	944	7,552	9	14	23	41	328	8.0	5
1987	734	5,868	7	4	11	66.7	533	8.0	5
1988	1,353	10,824	13	16	29	46.7	373.2	8.0	5
Total	5,042	40,332	50	54	104	48.5	387.8	8.0	-
Avg	1,008	8,066	10	10.8	20.8	--	--	--	5

Table 13. Five Year History: Archery Either Sex Deer Hunting
1984-88

Year	Hunter		Harvest			HD/ Deer	HH/ Deer	HH/ Day	Days/ Hunt
	Days	Hours	Bucks	Does	Total				
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	5,032	3*	4	7	89.8	718.8	8.0	6
1987	734	5,868	7	4	11	66.7	533	8.0	6
1988	698	5,584	1	2	3	232.7	1861.3	8.0	6
Total	3,093	24,740	23	18	41	75.4	603.4	8.0	-
Avg	619	4,948	4.6	3.6	8.2	--	--	--	6

Table 14. Five Year History: Modern Weapons Either Sex Deer
Hunting (1984-88)

Year	Hunter		Harvest			HD/ Deer	HH/ Deer	HH/ Day	Days/ Hunt
	Days	Hours	Bucks	Does	Total				
1984	3,000	24,000	44	51	95	31.6	253	8.0	3
1985	2,200	17,600	37	45	82	26.9	215	8.0	3
1986	3,009	24,072	65	63	128	23.5	188	8.0	3
1987	2,481	19,850	113	70	187*	13.3	106	8.0	3
1988	2,313	18,504	62	43	107**	21.6	172.9	8.0	3
Total	13,003	104,026	321	272	599	21.7	174	8.0	-
Avg	2,601	20,805	64.2	54.4	120	--	--	--	3

The refuge was opened for the taking of bobwhite quail on Thanksgiving Day and remained open through December 31. During this period, mourning dove could also be taken as an incidental species when the State season coincided with the refuge season. Rabbits could also be taken as an incidental species. We made no effort to keep track of the number of hunters who participated in this activity or of their success. Casual observation implied however that participation was light and that success was poor.

The period March 1 through March 10 was open season for the taking of raccoon and opossum on the refuge. An estimated 285 hunter days was spent harvesting approximately 125 coons. There were no reports of any opossums being killed. Permits were required for this nighttime activity but no quota was established.

9. Fishing

Sport fishing was permitted in most of the refuge impounded areas from March 1 through September 30. Year round fishing was permitted at Lake Bee and at the landings on Lynches River and Black Creek. Boats, with electric motors only, were permitted on Martins Lake, Lake Bee, Lake 16 and 17, and on Mays Lake. Fishing was permitted from one-half hour before sunrise to one-half hour after sunset.

Most areas, particularly those along the visitors drive, received moderate use early in the season, but pressure dropped off significantly during the hot summer months. The exception to this rule occurred in the Oxpen area, particularly at Pool J. This small impounded area has an excellent stock of bream, bass, and war-mouth and it was fished intensively throughout the season. The number of people who participate in this activity is difficult to determine and any figures given are speculative at best. However, we feel as if we received between 2,500 and 3,000 fishing visits during the course of the season. The average fishing visit is probably only four hours. This translates into between 10,000 and 12,000 hours spent on this activity. No efforts were made at determining the success of this activity.

12. Other Wildlife Oriented Recreation

The Palmetto Retriever Club held its annual retriever trials in the Oxpen area on March 26 and 27.

The Carolina Boykin Spaniel Retriever Club conducted a field trial in the Oxpen Area on June 18.

A designated area in the northern portion of the refuge was utilized by the Chesterfield County Coonhunters Association for a U.K.C. sanctioned coon dog field trial on December 10.

14. Picnicking

Lake Bee continued to get substantial use during the year. Several groups including McBee High School, the McBee Lions Club, McBee United Methodist Church, and many others used the picnic shelter facilities for their annual get-togethers. In addition the area was popular with local families and out of town visitors as well. If we are to continue to offer this facility, some rehab work will have to be done in 1989 to bring it up to standard.

17. Law Enforcement

In December, 1987, the Chesterfield Sheriff's Department organized a multi-jurisdictional task force comprised of all local law enforcement agencies for purposes of combatting the drug problem in this county. The stated objective of this task force are to share drug related (enforcement) equipment, to establish a common fund to share resources, to share information on drug related activities, to coordinate arrests and surveillance activities, to develop a county plan on drug related enforcement activities, and to provide and coordinate drug related activities training activities. This station was asked to participate in task force activities which we agreed to do within the limits of our authority. The task force meets monthly at the Sheriff's Department and this station is generally represented by Law Enforcement Officer Hoffmann.

In 1987, we reported that Officer Hoffmann and Robinson apprehended three individuals attempting to take pine straw from the refuge (a valuable cash crop in this vicinity). Since that time one of the subjects has died and one has had to serve a two week jail term plus court costs. The third subject is still at large.

Special Agent George Hines visited the refuge in February to inspect a possible marijuana cultivation area on the refuge. He concluded that there was insufficient activity to warrant any surveillance. This site was rechecked by Officer Robinson and Oliver in March. There had been no additional activity since Mr. Hines' inspection. However, the officer did locate .22 rifle shell casings on the ground and the remains of a previous marijuana crop. Apparently the person or persons responsible for this activity got spooked by something as they never did return to the site.



Stray hunting dogs continued to be a major problem again this year. No relief is in sight until the State outlaws hunting deer with dogs. Twenty six dogs were apprehended and a total of \$260 collected in impoundment fees. (88NR-26, 12-88, Cartlidge)

Refuge Officer Hoffmann received a telephone report from an informant in March concerning an illegal firewood cutting operation on State Forest lands south of McBee. He turned this information over to the State Forest supervisor and assisted in apprehending the three subjects responsible. The subjects were each fined \$15.00 and were permitted to keep the wood they had cut. Much ado about nothing.

On April 21, all complex enforcement officers and Project Leader Snider met with the U. S. Marshal in Florence to review arrest procedures and visit the Federally approved jail in Florence.



This small patch of marijuana was found by Refuge Officer Oliver while checking hunters in the vicinity of Hwy 145. The sheriffs office was called and after inspecting the site, removed the marijuana. (88NR-27, 12-88, Turner)

I. Equipment and Facilities

2. Rehabilitation

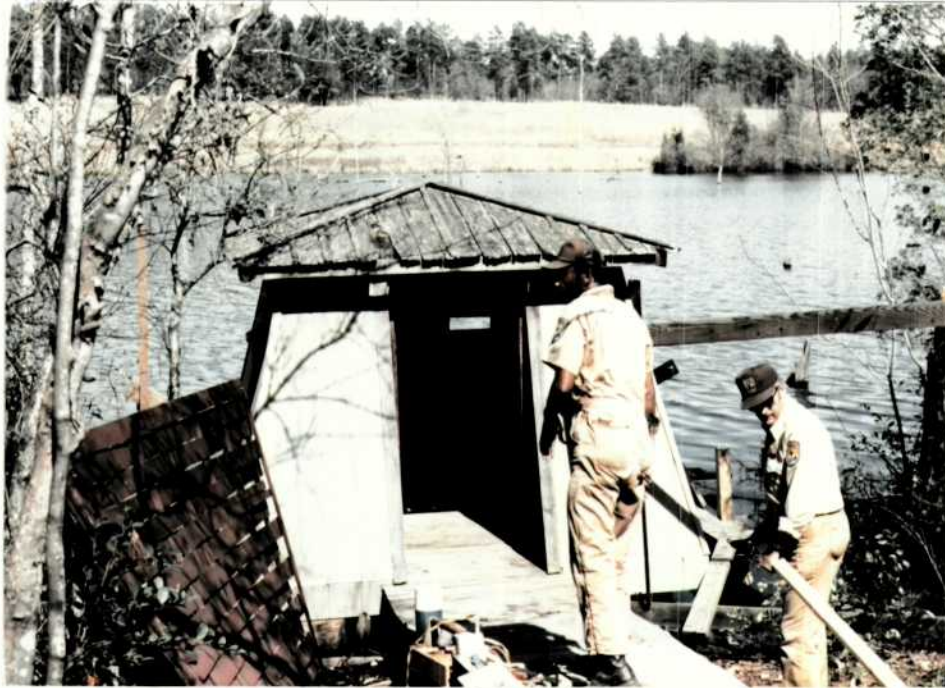
The photo blind at Martins Lake was stripped down to its frame and rebuilt.

Todd Rainwater, RO Engineering, inspected the windows in Quarters 212 in preparation for a contract on window and door replacement for that house. The request for bids was issued by the regional office, but only one contractor bid, and his bid was too high. The project will be re-advertised in 1989.

The window in the oil/paint house was replaced due to termite damage. The building was treated for termites at a cost of \$100.00.

The roof shingles were replaced on Quarters 1 and the refuge shop.

The dam, spillway and water control structure were rehabilitated during the year. Eroded areas of the dam were filled and revegetated. The spillway was cleared of trees and brush and seeded to grass. An accumulation of debris was cleared from around the water control structure.



Oliver and Tate hard at work on the photo blind. When completed the blind sported new siding, a new roof and new side panels.
(88NR-28, Cartlidge)

With the cooperation of the State Highway Department we attempted to vegetate several severely eroded areas along the shoulders of Highway 145. We provided the fertilizer and grass seed. The State used their HydroSeeder to apply the seed and fertilizer. We then mulched the areas with pine straw using our new blower unit. Success varied depending on the soil type, steepness, and moisture.



Along the shoulder of Hwy 145 before work began. (88NR-29, 9-88, Cartlidge)



The highway department applying a mixture of grass seed and fertilizer with their hydroseeder. (88NR-30, 9-88, Cartlidge)



Louis Tate spreading pine straw mulch on the just seeded area. (88NR-31, 9-88, Cartlidge)



Some areas responded better than others. The area above showed good response while the area shown in the first photo had almost no grass cover on it. (88NR-32, 12-88, Cartlidge)

There are many miles of old roads and abandoned trails that are creating serious erosion problems. In June we began an experiment along an old roadway in the Oxpen area to determine the best technique for combating the erosion problem. The following photos tell the story.



June, Area 1. Grass seed was drilled and mulched with wheat straw. (88NR-33, 6-88, Cartlidge)



August, Area 1. (88NR-34, 8-88, Cartlidge)



October, Area 1. (88NR-35, 10-88, Cartlidge)



June, Area 2. Grass seed was drilled and the area covered with a paper/fiber type erosion control mat. (88NR-36, 6-88, Cartlidge)



August, Area 2. Very little grass has emerged through the mat. (88NR-37, 8-88, Cartlidge)



October, Area 2. Finally we are seeing some results. (88NR-38, 10-88, Cartlidge)



June, Area 3. Grass seed was drilled and the area mulched with pine straw by hand. (88NR-39, 6-88, Cartlidge)



August, Area 3. This area showed the best response to date. (88NR-40, 8-88, Cartlidge)



October, Area 3. The pine straw mulch brought the best results with almost 100% coverage of the old road bed by the end of the growing season. (88NR-41, 10-88, Cartlidge)

3. Major Maintenance

All of the buildings (other than brick) were pressure cleaned, scraped and painted. Roof coating was applied to the tin roof of the vehicle storage shed.



All shop buildings were pressure cleaned, scraped and painted. The vehicle storage building before... (88NR-42, 5-88, Cartlidge)



...and after. (88NR-43, 8-88, Cartlidge)

4. Equipment Utilization and Replacement

Major purchases made during the year included:

1. A 1988 Dodge Dakota was received in June. This vehicle was purchased with FY 87 funds and was an addition to our fleet.
2. A 1989 Dodge Ram pickup was received in September. This vehicle was also purchased with FY 87 funds and replaced a 1981 Ford.
3. A straw grinder/blower was purchased at a cost of \$2,700.00. This machine will speed up the time it takes to mulch erosion control projects.
4. A Loran C navigation aid unit was purchased to assist with the forestry inventory and red-cockaded woodpecker cavity tree work. This model proved to be inadequate for our purposes. It was transferred to Mattamuskeet NWR and we then ordered another model more appropriate to our needs.
5. A Delta International Planer with a steel stand was purchased in September for a total cost of \$1,069.



This straw grinder/blower cut the time required to mulch erosion control projects considerably.
(88NR-44, 6-88, Cartlidge)



The air compressor purchased in 1987 was installed in the vehicle storage building and underground lines run to the maintenance shop. (88NR-45, 12-88, Cartlidge)

5. Communications Systems

Our cross-band two-way radio repeater system continued to provide the station with dependable communications this year. The system was upgraded somewhat this year. Six additional portable radios were purchased. Five of which operate on our refuge frequencies and one on the county sheriff's radio frequency. An additional cross-band repeater was purchased for installation at Pee Dee but had not arrived by year's end. With the addition of this repeater we will be able to have full time contact with all members of both refuge staffs. The portables we are using are multi-channel programmable units. They also contain channels which give us contact with the SC Forestry Commission, SC Wildlife and Marine Resources Department, the SC Law Enforcement Department coop channel, the NC Game and Freshwater Fish Commission, and the NOAA weather radio.

A 10 channel scanner was purchased and installed in our most used law enforcement vehicle. As was a electronic serine and public address system.

Several surplus low band radios were transferred to other refuges.

6. Computer Systems

Our much awaited microcomputer, which was ordered last year, finally arrived in May. It was immediately put to full use and proved to be a valuable asset to our program. So much so, that an additional microcomputer was immediately acquisitioned. This additional unit is presently being used to store and process our biological and timber management data. The older unit is used mainly for administrative data. Both machines are in high demand for word processing. We each have to wait our turn. Most of the staff has found that they can compose their written work faster and more efficiently at the keyboard. The resultant product is handled much faster because the office assistant does not have to retype it; just edit and print.

7. Energy Conservation

This station managed to stay within assigned quota allocations for gasoline, diesel, and number of miles driven for FY 88. However, our electricity use (KWH's) shot through the ceiling. We used nearly 5,000 more KWH's more than used in previous years. This increase is attributed to the fact that our staff was increased and that work on renovations to upgrade our shop facilities has been taking place and is nearing completion. Also, we have added in the past year several pieces of office and shop equipment that are add to energy used. If our programs progress as expected, our gasoline, diesel, and mileage quota allocations may need to be reviewed. Management responsibility for Pee Dee Refuge requires quite a number of on-site visits in addition to trips required for the exchange of equipment/manpower.

J. OTHER ITEMS

1. Cooperative Programs

A memorandum agreement exists between the U. S. Fish and Wildlife Service and the S. C. Commission of Forestry which allowed the Service to reimburse the Commission for wildfire protection (46,000 acres) and prescribed burning by aerial ignition on the refuge for fiscal year 1988. The total itemized invoice for these activities was as follows:

a. Fire Protection	
(46,000 acres @ \$0.76 per acre)	\$34,960.00
b. Prescribed Burning (aerial ignition)	
(5,378 acres @ \$4.00 per acre)	<u>\$21,512.00</u>
Total	\$56,472.00

A lease agreement executed in 1939 between the U. S. Fish and Wildlife Service and the S. C. Forestry Commission leases approximately 46,000 acres of Interior-owned land adjacent to the refuge to the S. C. Forestry Commission. This land, known as the Sand Hills State Forest, is managed as a multiple use area. The Forestry Commission is allowed to utilize all timber receipts on the state forest in carrying out their management activities. All management activities with emphasis on endangered species is monitored by the refuge forester. Proposed annual work plans and timber prescriptions are reviewed to insure compliance with the lease agreement.

The annual work plan and compartment prescriptions for Compartments 12 and 17 on the State Forest were received and reviewed by the refuge manager and forester. Specific goals for red-cockaded woodpecker management were included in the plans. These goals included roller chopping in red-cockaded woodpecker colony areas and prescribed burning. Actions to achieve these goals were carried out by State Forest personnel as prescribed. The annual work plan and prescriptions had been previously 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, Assistant Manager Cartlidge, and Forester Robinson represented the Service at this meeting.

2. Other Economic Uses

Economic uses of the refuge include pine straw baling and timber harvesting. Information on bid invitations issued and sales made for these products is found in Section F.3 (Forests). The only other money collected at Carolina Sandhills Refuge is a \$10/dog impoundment fee charged to dog owners when they pick up dogs that have been captured on the refuge. Total monies collected for this purpose in CY 88 were \$260.00.

3. Items of Interest

Manager Snider, Assistants Cartlidge and Hoffmann, and Special Agent George Hines, Columbia, SC, attended the first meeting of the newly formed Chesterfield County Drug Task Force at the courthouse in Chesterfield. Assistant Manager Hoffmann attended subsequent monthly meetings of this group.

Forester Robinson administered the "step test" to all personnel at Carolina Sandhills and Pee Dee Refuges who are involved in prescribed burning activities.

Forester Robinson and Forestry Technician Eller accompanied Mark Carter of the U. S. Forest Service on a aerial survey of the refuge on January 27 to locate any active beetle infestation areas on the refuge.

Personnel from Santee, Alligator River, Pee Dee, and Carolina Sandhills Refuges, along with Biologist Otto Florschutz were given a demonstration of the laser level at Pee Dee NWR on Feb. 10. Snider, Florschutz, and Cartlidge also discussed waterfowl objectives for Carolina Sandhills and Pee Dee at the same time.

Fisheries Biologist Rick Eager made visits to the refuge on the 22nd, 23rd, and 26th of February to deliver channel catfish to various ponds and to do some electroshocking in Pool J and Honker Lake. Rick's co-worker, Allen McLaurin, made another delivery of fish on March 3rd.

Biologist Eager made a return visit to the refuge on July 26 and 27 to conduct a fisheries survey. He sampled fish populations and conducted water chemistry analysis in several ponds.

Assistant Manager Hoffmann provided a tour and orientation of the refuge to Harvey Geitner of the Charleston Ecological Services Office on February 8. Mr. Geitner was gathering preliminary information about possible contaminant problems on refuges.

Nora Murdock, Asheville Endangered Species Office, visited on February 17 and 18 to survey several refuge areas for pixie moss colonies.

Nora returned on March 2, 3, and 4 in the company of John Fridell of the Asheville Endangered Species Office and Karen Harper of the Charleston Ecological Services Office. These persons conducted an in-depth survey of refuge pixie moss colonies and visited several areas on the state forest in search of this species.

Assistant Manager Cartlidge and Equipment Operator Oliver completed law enforcement refresher training in Quincy, FL during the week of March 7th through 11th.

A combined staff/safety meeting for Pee Dee and Carolina Sandhills Refuges was held on March 18.

Manager Snider took part in the Project Leader's meeting in Orlando, FL during the period March 1 - 4. He also attended a Farm Bill Workshop in Atlanta, Ga. on March 29 and March 30.

Travis McDaniel, Area Supervisor, visited the refuge on March 23-25.

Several refuge staff members participated in a health screening at the McBee Clinic in April.

All law enforcement personnel and Manager Snider traveled to Florence, S. C. on April 21. They met with U. S. Marshall Sevearance for a review of arrest procedures, magistrate appearances, and paperwork involved in arrest actions. A tour of the county jail and holding facilities followed the review.

Realty Specialists Eller and Wilhite of the Realty Office in Atlanta, visited on May 5 and 6 to conduct an appraisal of property purchased by a local landowner in hopes that the refuge would be able to trade a tract of refuge land that the landowner desired for the parcel that he had purchased.

Jim Scurry of the National Wetlands Center in Slidell, La. visited on May 17 to discuss mapping systems utilizing computer technology with Manager Snider.

Assistant Manager Hoffmann and Forester Robinson partook of law enforcement refresher training in Quincy, FL on May 9th through 13th.

Assistant Managers Hoffmann and Cartlidge, Forester Robinson, and Equipment Operator Oliver attended a Marijuana Workshop put on by the Chesterfield County Sheriff's Office on May 25.

Jay Carter of N. C. State University and associates visited the refuge on June 2 to look at our red-cockaded woodpecker habitat and management.

Forester Steve Lay attended basic fire training at Okefenokee NWR on June 14 through 16.

Refuge Assistant McCutcheon and Forester Robinson attended a Computer Workshop at Mt. Pleasant, S. C. from June 28 through July 1.

Travis McDaniel, Area Supervisor, visited the refuge again on June 30.

Assistant Manager Cartlidge attended a Moist Soil Plant ID workshop at Lake Mattamuskeet on August 18 and 19.

A coordination meeting was held at Carolina Sandhills in August to discuss administrative functions for the new fiscal year. Needed changes in responsibilities brought on by the impending retirement of Pee Dee Office Assistant Hazel Webb were determined.

Assistant Manager Cartlidge, Forester Robinson, and Manager Snider attended the annual meeting with the S. C. Forestry Commission on September 2. Refuge Supervisor Travis McDaniel joined the refuge contingent in Columbia, S. C., the site of this year's meeting.

Assistant Manager Cartlidge attended a training session on Performance Standards (OPM) in Atlanta on September 13 and 14.

Forester Robinson traveled to Gainesville, FL during the period Sept. 13 through 16 to meet with Mark Maffei of Loxahatchee NWR. Dave and Mark spent this time at the University of Florida working on computer digitizing of refuge maps.

Todd Rainwater, Engineering Division, Atlanta, visited on Sept. 20 to look at proposed improvements to the existing windows and doors of Quarters 212.

Skippy Reeves, a forester in the Refuges and Wildlife division in Atlanta, visited the refuge on September 17 to review our timber management program. He and Refuge Forester Robinson traveled to McKinney Lake Fish Hatchery to gather data for forest management recommendations for the hatchery. A habitat management plan for McKinney Lake was jointly written by Reeves and Robinson; it was approved by the regional office. A proposal detailing actions and responsibilities for prescribed burning and wildfire suppression on McKinney Lake Hatchery was sent to the regional office for approval.

Otto Florshutz, Waterfowl Biologist, Washington, NC was on the refuge October 4 - 6 to look at our water management program. While here he also took a look at the FmHA "Quick" property in Cheraw and at State Forest property along Lynches River.

Manager Snider attended a meeting of the Chesterfield County Soil Conservation Service on October 4. A five year operating plan for soil and water conservation activities for the county was reviewed.

Assistant Manager Hoffmann participated in a supervisory training course entitled "Working With People", in Columbia, S. C. on October 6.

Firearms requalification for law enforcement personnel from refuges in South Carolina and Mike Canada at Pee Dee Refuge was held on October 24th at Congaree Swamp near Columbia, S. C.

Foresters Robinson and Lay attended Aerial Ignition Training at Merritt Island NWR during the period October 31 through November 4.

Biologist Otto Florschutz visited November 4th - 6th to discuss water management; and to look at our moist soil units, the "Quick" FmHA property, and habitat along Lynches River within the Sand Hills State Forest Boundary.

Forester Steve Lay attended "Advanced Forest Fire Equipment Operation" training at Kinston, N. C. on November 14th - 18th.

Rick Eager made a visit to deliver fish obtained from Millen Fish Hatchery in Georgia and to pick up a copy machine that we had listed on surplus property on November 26.

Bill Hilton, instructor at the new Governor's School for Science and Mathematics, Coker College, Hartsville, S. C., served as leader/coordinator for this year's Audubon Christmas Bird Count on December 17. Several of Mr. Hilton's students took part in this year's count.

4. Credits

Sections F.3 (Forests), F.9 Fire Management), and J.1 (Cooperative Programs) were written by David Robinson. Section G.2 (Endangered Species) was written by Steve Lay. Karen Cartlidge authored Sec. A (Highlights), Sec. D (Planning), Sec. E (Administration), Parts 2, 3, 4, 6, and 7, Sec. G.11 (Fisheries Resources), Sec. G.12 (Wildlife Propagation and Stocking), all of Sec. H (Public Use) except parts 8 (Hunting) and 17 (Law Enforcement), Sec. I.2 (Rehabilitation), Sec. I.3 (Major Maintenance), and Sec. I.4 (Equipment Utilization and Replacement). Sections E.1 (Personnel), E.5 (Funding), I.7 (Energy Conservation) and Sec. J. 2 (Other Economic Uses) were written by Kay McCutcheon. John Hoffmann produced the remaining sections except Sec. C (Land Acquisition), Sec. F.4 (Croplands), Sec. I.5 (Communications), Sec. I.6 (Computer Systems), and Sec. K (Feedback) which were written by Ronald Snider. Cartlidge, Hoffmann, Robinson, and McCutcheon provided input for Sec. J. 3 (Items of Interest).

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

K. FEEDBACK

The new initiatives we have undertaken in the areas of "Partners in Waterfowl" and "FmHA Lands" give us a myriad of opportunities to do "good things" for the waterfowl resource. However, we seem to be stretching the old rubber band pretty tight when it comes to our resources of money and manpower. Someone needs to give the field a little more direction on just where our priorities lie. We have reached the point already where we have got to make some choices about what projects will be left undone in order to accomplish matters of "highest priority". As the comedian Jerry Clower says, "Shoot up here amongst us. One of us has got to have some relief!"

Our dealings this past year with our regional personnel office have been disappointing at best, and downright aggravating at its worst. We submitted documentation of several continuing problems to our supervisor about mid-year, but have seen no improvement to date. For example, we hired a 30 day emergency appointment employee who did not receive a single paycheck until several weeks after his employment ended. Repeated written and verbal requests were made concerning this matter to no avail. One regional personnel employee responded by stating that we should not worry about getting this employee paid because, after all, he no longer works for us. We have experienced this apathetic attitude repeatedly as evidenced by failures to respond to our inquiries on numerous occasions.

In summation I would like to thank and congratulate my refuge staff for the completion of a year's determined efforts at successfully helping to bring our refuges closer to fulfilling their place as a part of this nation's natural resource