

REVIEW AND APPROVAL

ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE
PEA ISLAND NATIONAL WILDLIFE REFUGE

MANTEO, NORTH CAROLINA

ANNUAL NARRATIVE REPORT

Calendar Year 1992

Jim C. Johnson 3/29/93 Bill A. Gallett 4/15/93
Refuge Manager Date Refuge Supervisor Review Date

Harold W. Benson 4/21/93
Regional Office Approval Date



M. Herb Lewis
August 18, 1947 - April 11, 1992

Herb volunteered a total of almost 1,000 hours in his 5+ years of refuge service. His primary focus was the Loggerhead Sea Turtle Nesting Program, though he was also the organizer of both the annual Beach Sweep and Youth Fishing Rodeo. He was involved in almost every phase of the volunteer program on both Alligator River and Pea Island Refuges. During 1992, he received the State TPIA Award and the USFWS Director's Award for Outstanding Contribution. He was named Outstanding Volunteer for the Refuge in 1991. Diagnosed in January, 1992, he lost his short, but fierce, battle with cancer in April of the same year.

The 1992 Annual Narrative Report is dedicated to the memory of M. Herb Lewis - "Mr. Turtle".

ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE

Manteo, North Carolina

ANNUAL NARRATIVE REPORT

Calendar Year 1992

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

INTRODUCTION

Alligator River National Wildlife Refuge is approximately 151,000 acres in size and lies at the eastern end of a broad, flat, and swampy peninsula in northeastern North Carolina. Most of the refuge is located in the mainland portion of Dare County, with some land reaching southward into Hyde County. The refuge is part of a five-county region bounded on the north by the Albemarle Sound, on the east by Croatan and Pamlico Sounds, and on the south by Pamlico Sound and Pamlico River.

In the spring of 1984, Prulean Farms, the owner of most of what is now Alligator River NWR, withdrew its permit application for clearing forested wetlands and dissolved its organization. All property was transferred to Prudential Life Insurance Co. After more negotiation, Prudential decided to donate a total of 118,000 acres in Dare and Tyrrell Counties.

Before the donation was made, Prudential requested an "advanced ruling" from the Internal Revenue Service. Originally, the donation was to be made to TNC who planned to transfer the land to the FWS. In order to give an "advanced ruling", IRS required the donation be made to a federal agency so as to become a part of the public domain. Hence, the decision was made to make the donation directly to the FWS. The FWS accepted title to the land on March 15, 1984.

Since the decision to donate directly to the FWS was made rather abruptly, direct Service involvement did not occur until two weeks prior to the actual deed transfer. Although other management options existed, such as managing the area as a "coordination area" with the State, the decision was ultimately made to designate the area as a NWR and to move forward with appropriate funding and staffing. The 1988 acquisition of a functional farming area (approximately 5,100 acres in size) rounded out Alligator River's potential to include waterfowl management on a major level. This area is managed as moist soil units and cultivated fields (using cooperative farmers). Future management will include the restoration of some of the acreage into wooded swamp.

A portion of the original donated acreage (approximately 6,000 acres on the west side of the Alligator River) was transferred to Pocosin Lakes NWR in 1991 due to the close proximity of these lands to that refuge. At the same time, an additional 10,000 acre tract (the Dare Pocosin) was acquired in conjunction with the Pocosin Lakes property and added to Alligator River Refuge. Acquisition goals for Alligator River are to have contiguous land on the east/south sides of the Alligator River.

The vast expanse of undisturbed swamp forest and wetlands on the refuge contains many important wildlife and ecological resources. Since much of the Pamlico peninsula has been developed by clear-cutting, peat mining, and agricultural conversion, this area remains as one of the most remote and diverse swamps in eastern North Carolina. Principal natural communities in the refuge include broad expanses of non-riverine swamp forests, pocosins, freshwater and salt marshes. Its isolation and undisturbed quality add to the value of its rich wildlife habitats. The Alligator River area is part of the northern border of the American alligator's range and remains as one of the last strongholds of the black bear in North Carolina and the mid-Atlantic coast. The refuge also provides habitat for the endangered red-cockaded woodpecker and migrating bald eagle and peregrine falcon.

INTRODUCTION	<u>Page</u>
TABLE OF CONTENTS	i
A. <u>HIGHLIGHTS</u>	1
B. <u>CLIMATIC CONDITIONS</u>	1
C. <u>LAND ACQUISITION</u>	
1. Fee Title.....	2
2. Easements.....	2
3. Other.....	3
D. <u>PLANNING</u>	
1. Master Plan.....	"NTR"
2. Management Plan.....	3
3. Public Participation.....	4
4. Compliance with Environmental and Cultural Resource Mandates.....	4
5. Research and Investigations.....	5
6. Other.....	8
E. <u>ADMINISTRATION</u>	
1. Personnel.....	8
2. Youth Programs.....	10
3. Other Manpower Programs.....	"NTR"
4. Volunteer Program.....	11
5. Funding.....	14
6. Safety.....	14
7. Technical Assistance.....	15
8. Other.....	"NTR"
F. <u>HABITAT MANAGEMENT</u>	
1. General.....	16
2. Wetlands.....	16
3. Forests.....	18
4. Croplands.....	19
5. Grasslands.....	"NTR"
6. Other Habitats.....	"NTR"
7. Grazing.....	"NTR"
8. Haying.....	"NTR"
9. Fire Management.....	21
10. Pest Control.....	"NTR"
11. Water Rights.....	"NTR"

12.	Wilderness and Special Areas.....	"NTR"
13.	WPA Easement Monitoring.....	"NTR"

G. WILDLIFE

1.	Wildlife Diversity.....	"NTR"
2.	Endangered and/or Threatened Species.....	24
3.	Waterfowl.....	49
4.	Marsh and Water Birds.....	"NTR"
5.	Shorebirds, Gulls, Terns and Allied Species.....	"NTR"
6.	Raptors.....	"NTR"
7.	Other Migratory Birds.....	"NTR"
8.	Game Mammals.....	51
9.	Marine Mammals.....	"NTR"
10.	Other Resident Wildlife.....	"NTR"
11.	Fisheries Resources.....	"NTR"
12.	Wildlife Propagation and Stocking.....	"NTR"
13.	Surplus Animal Disposal.....	"NTR"
14.	Scientific Collections.....	"NTR"
15.	Animal Control.....	"NTR"
16.	Marking and Banding.....	"NTR"
17.	Disease Prevention and Control.....	"NTR"

H. PUBLIC USE

1.	General.....	52
2.	Outdoor Classrooms - Students.....	53
3.	Outdoor Classrooms - Teachers.....	53
4.	Interpretive Foot Trails.....	54
5.	Interpretive Tour Routes.....	"NTR"
6.	Interpretive Exhibits/Demonstrations.....	55
7.	Other Interpretive Programs.....	55
8.	Hunting.....	56
9.	Fishing.....	58
10.	Trapping.....	59
11.	Wildlife Observation.....	59
12.	Other Wildlife Oriented Recreation.....	"NTR"
13.	Camping.....	"NTR"
14.	Picnicking.....	"NTR"
15.	Off-Road Vehicling.....	"NTR"
16.	Other Non-Wildlife Oriented Recreation.....	"NTR"
17.	Law Enforcement.....	60
18.	Cooperating Associations.....	61
19.	Concessions.....	"NTR"

I. EQUIPMENT AND FACILITIES

1.	New Construction.....	63
2.	Rehabilitation.....	64

3.	Major Maintenance.....	66
4.	Equipment Utilization and Replacement.....	68
5.	Communications Systems.....	"NTR"
6.	Computer Systems.....	"NTR"
7.	Energy Conservations.....	"NTR"
8.	Other.....	69

J. OTHER ITEMS

1.	Cooperative Programs.....	69
2.	Other Economic Uses.....	"NTR"
3.	Items of Interest.....	70
4.	Credits.....	71

K. FEEDBACK

L. INFORMATION PACKET - - - (inside back cover)

A. HIGHLIGHTS

Wet weather.....acquisition request for Ark sent to RO. (See Section B.)

Laurel and Hardy go timber cruising.....(See Section F.3.).

Red Wolf Project reaches 5-year mark.....(See Section G.2.).

Volunteers have another banner year! (See Section E.4.)

Maintenance facility.....finally! (See Section I.1.)



Volunteer Don Perry received 1992 Regional Director's Award from RM Johnson.

1/93 BWS

B. CLIMATIC CONDITIONS

WET!!! That's the weather word for 1992! Although total rainfall for the year was only 9.64" above normal, the summer months made the staff think about getting wood together to build an ark! June rainfall totaled 11.66" (high of 5.79" in 6 days) and July rainfall totaled 14.33" (high of 8.44" in 7 days). The refuge was fortunate to have a new fire weather system to more accurately record weather data for this refuge (see Section F. 9.). Previous weather data was gathered from the Cape Hatteras Weather Station, which has weather that is very different from that on the mainland where Alligator River NWR is located. Temperatures were up overall, about 1.5 degrees above normal for the year.

C. LAND ACQUISITION

1. Fee Title

Appraisal activities by Realty on inholdings continued throughout 1992. Efforts to obligate FY-92 funds received for inholding purchases met with only limited success - appraisals on only three properties were approved and sent to the negotiators. Title issues, coupled with widely variable land values of properties that, for the most part, have highway frontage, complicated the normally slow process. Also, most of the properties in question are forested and must be cruised prior to appraisal completion.

Appraisal activities were also initiated late in 1992 on about 11,000 acres of Pamlico Eco Management property in Hyde County. That part of this property being examined includes the 4,800 acre Swan Lake Tract and the 5,700 acre Bear Paw Tract - both tracts are considered very important by the staff since they border the refuge on 2 sides. Efforts to cruise both tracts began in December by Realty and refuge foresters. The Nature Conservancy has committed to assisting in acquisition efforts.

Development of a PPP package for expanding the acquisition boundary remained at a virtual "standstill" throughout 1992. The refuge wrote an EA for this document in 1991, but no action has been taken by Realty in completing the PPP document. Refuge proposals became involved in a larger effort to develop "final" acquisition boundaries for all of eastern NC refuges and ARW established the acquisition priorities. Project development Biologist Krammer visited the refuge 10/19 to discuss differences between refuge and ARW proposals.

2. Easements

The easement agreement with the owners of the 4,800 acre Durant Island Tract expired during 1992. Efforts were underway to renew this agreement as 1992 ended.

Efforts were also initiated late in 1992 to obtain an easement/lease on the 10,000 acre Lux Farms property adjacent to the refuge's south boundary. An agreement for this property and the Durant Island Tract are needed for the red wolf program. At this point, it appears that a Partner's Agreement with these landowners may be the easiest (and quickest) way to acquire the right for wolves to utilize these private lands.

The refuge negotiated a Memorandum of Understanding (MOU) with John Hancock Life Insurance (Philadelphia, PA) in 1990 which designated approximately 45,000 acres of John Hancock property as a conservation easement of ARNWR. The easement is tremendously important in that, since September 1987, project

personnel have retrieved 4 different wolves that on 5 occasions wandered onto lands covered by the easement. The errant wolves had to be retrieved in order for the project to maintain compliance with federal regulations.

After over a year of periodic writing/rewriting, an easement was issued to the NC Forest Service for their use of 1.9 acres of refuge property as part of their Stumpy Point Shop Complex.

3. Other

The Stumpy Point Ball Field issue remained unresolved throughout 1992 (see 1991 narrative for an in-depth discussion of this problem). After receiving tentative verbal approval from the county for a 35 acre land exchange, the issue was referred to Realty for appraisals of both tracts. Because of problems with the initial appraisal (which attempted to show equal land values for the two tracts to facilitate an exchange), it became necessary to request USCOE wetland determination(s). These determinations and surveyor blue-line prints with acreage determinations were provided as requested.

The East Lake Methodist Church land issue also remained unresolved throughout 1992. The solicitor's office finally took initial action late in 1992 - a new lawyer was assigned. The issue was further complicated (as if anything else was needed!) by the fact that the Dare County School Board also has some right of ownership to the 5 acre tract being claimed by the church. Refuge staff and the church's lawyer hopefully resolved this new problem; the school board has agreed to waive any ownership rights. It is anyone's guess when this matter (ongoing since 1990) will be finalized.

D. PLANNING

2. Management Plan

Annual management planning completed and approved included the water management plan, cooperative farming agreements on 4,500 acres, and prescribed burning prescriptions on 4,500 acres (1,500 acres of pocosin habitat).

The refuge fire management plan was revised as directed by RO.

A Hurricane Contingency Plan was written and approved.

Handicapped accessibility evaluation of all facilities was completed.

After considerable refuge effort to initiate it, a Public Use Review was completed by RO June 8-10. Following this review,

the refuge staff developed a draft Public Use Plan which was eventually approved. See Section H. for details of this plan which will direct the development of badly needed public use facilities (trails, kiosks, signing, etc.).

Under the authority of an existing MOU, the refuge staff again conducted extensive surveys of select wildlife species on the Air Force's Dare County Range. Survey results and management recommendations for red cockaded woodpeckers, black bears, and alligators were submitted to the Air Force in November (some 60 pages of reports) and required roughly 6 months to complete. The Air Force provides funds for this work.

3. Public Participation

The public hunt information meeting was held in September.

A series of public information meetings were held throughout eastern North Carolina during August to summarize results of the first 5 years of the red wolf reintroduction effort. The possibility of expanding the reintroduction area west of the river (to include Pocosin Lakes NWR) was also discussed. Part of this process involved briefing the commissioners of 5 counties. Very few negative comments were received pertaining specifically to the wolf reintroduction itself. However, the refuge staff was subjected to severe criticism stemming from other issues involving the Service (land acquisition, public use programs, FWE comments/consultation on development projects, etc.). It is hoped that the Regional Directorate will not allow what the refuge staff views as efforts to "blackmail" the Service override decisions about expanding what has proven to be a highly successful experiment with the red wolf.

4. Compliance with Environmental and Cultural Resource Mandates

The preliminary field investigation report of the archaeological resources present on the proposed headquarters site (Roanoke Island) completed by a Park Service archaeologist indicated that a full scale ground survey was needed to identify specific sites needing further investigation. Based upon this recommendation, a contract (using salary savings from a vacant position) was issued to Coastal Carolina Research, Inc., Tarboro, NC to perform an Identification Survey of the site. The survey, completed in October, revealed the presence of 4 sites on the 35 acre tract. Two of these sites may be candidates for listing and will require further investigation if development plans call for soil disturbance in the vicinity.

Application for USCOE Section 404 permits and Section 401 State Water Quality Certification covering the replacement of 30 unsafe wooden bridges with WCS's and fill was made in December of 1991. The EA, Section 7, and FONSI for this work received RD

approval earlier. Due to the fact that the county had vigorously opposed a similar refuge project involving 3 structures in 1990, RM Johnson and DRM Noffsinger met individually with each county commissioner, the county planner, and county manager during January of 1993. Although this effort did not result in the county issuing their required permits (the ordinance requiring county permits was passed in response to the refuge's 404 permit application for 3 structures in 1990), the USCOE did issue the 404 permits in March. Water quality certification/coastal zone consistency determinations were received in April. Obviously the county's intent was to stop USCOE from issuing 404 permits since a normal requirement of USCOE is for the applicant to obtain all other necessary permits. Since the county did not see fit to issue their permit(s) in a timely manner, the refuge began the bridge replacement project in early summer. No further contacts from the county were received on this issue.

USCOE 404 permits for plowing firebreaks were received in April. The application for these permits, made in October 1991, was delayed pending action by Wilmington District USCOE on issuing a regional general permit covering fireline construction and plowing moist soil units. Alligator River staff had initiated the action to obtain the regional permit. The regional permit itself was issued - in fact, the 404 permit referenced here fell under the umbrella of this general permit. Other eastern NC refuges are still experiencing extended delays in receiving project specific approvals (a condition of the regional permit). Hopefully, this problem can be resolved in the future.

5. Research and Investigation

The Fire Science Lab, USDA Forest Service, Missoula, Montana, initiated a research project entitled "Heat Transfer into Duff and Organic Soils" during 1992. Mr. Roger Hungerford, principle investigator, and several other BIFC staff visited the refuge in July to select study sites. They returned in November for a week to collect soil samples. Results of this work should generate guidance as to soil moisture levels that inhibit ground fire development in the peat soils of eastern North Carolina. This information is badly needed as the refuges here have begun the process of implementing large scale prescribed burning.

A cooperative agreement was finalized with the University of Tennessee initiating black bear research on Alligator River. This work, entitled "Population Dynamic of the Black Bear on Alligator River NWR", will concentrate on developing population estimates, age and sex ratios, and indices for tracking trends/changes in population levels. Dr. Michael Pelton is the principle investigator, with Dave Brandenburg assigned to do the field work. Trapping began in October and by mid-December, when efforts to trap were concluded for the year, 25 bears had been tagged. Initial funding for this work came from salary savings.

It should be noted that black bear is a priority species at this station - objective levels for population maintenance have been established. The refuge has been pressured to open a hunt by the public and NC Department of Wildlife Resources.



In 5 weeks, UT Research Assistant, David Brandenburg, had captured 25 bears around the farm units. 10/92 DB

In a similar "vein", the refuge staff participated in bear bait station studies at the request of the NC Wildlife Resources Commission (NCWRC). Several different types of baits, lures, etc. were placed on transects over a 2 month period. Track counts were also conducted at 1 week intervals during this same time period and at the same transect location. Results from our effort and those from several other locations will be evaluated in hopes of developing reliable indices applicable to eastern North Carolina.

The Air Force provided funding to initiate a long term Atlantic White Cedar regeneration project. White Cedar, on both the Dare County Range and the refuge, was virtually cut out during the mid-1980's from timber reservations issued by the prior owners. The refuge alone has in excess of 5,000 acres of clearcuts resulting from this operation. To a large degree, these areas have not regenerated. Very little success has been realized by public agencies or private forest industry in large scale cedar regeneration efforts. This wetland species has very specific site requirements and virtually always reproduced in even age stands. Due to the sites involved, mechanized site prep/planting is virtually impossible.

The initial funding for this effort, \$150K, was transferred to the refuge late in 1992. The efforts to date have concentrated on inventorying some 500 acres of refuge clearcuts initially examined in 1988-89 to determine impacts of competition on persistence of existing advanced regeneration. Plans call for planting test plots in '93-'94 to evaluate site prep methods with large scale planting to occur beginning to 1995. One of the current problems is the lack of a reliable supply of commercially grown seedlings due to unknown nursery cultural practices. A co-op agreement was developed with the U.S. Forest Service's Southern Forest Experiment Station Seedtree Lab at Mississippi State University in hopes of developing a data base for use in the project (optimum cone collection date(s), seed extraction techniques, germination requirements, seed viability, etc.). The refuge staff collected roughly two bushels of cones in December for the Lab's use. Other objectives of the project include evaluating site prep methods, stocking rates, implementing water management, and modifying existing harvesting methods in order to possibly obtain natural regeneration.

An SUP was issued to the NC Extension Service at NC State University for implementation of a long term research project entitled "Sustainable Agriculture in eastern NC". Principle investigators are Dr. John Anderson and Dr. Pete Bromley. The Extension Service has received long-term funding, \$1.0 million, for this project which will strive to develop methods for and demonstrate sustainable agriculture on a large scale basis. The 4,500 acre refuge co-op farming program will be modified to include several farming practice/crops as part of this effort. The Extension Service will actually farm roughly 100 acres. Two other privately owned farm operations in eastern North Carolina have agreed to participate in this effort.

Long term impacts of agricultural operations on quail populations will be a spin-off to the sustainable agriculture work. PhD candidate Bill Palmer will direct this 3 year effort which will evaluate impacts of "clean" farming compared to sustainable agriculture operations. As part of this effort, all existing refuge filter strips/set aside field borders will be put back into cultivation on two 500 acre blocks. The remainder of the farm will serve as a control. Palmer anticipates marking 50-100 quail each year with radios in order to evaluate nest site selection, hatching success, mortality, food habits, etc. NC State anticipates having 3 to 5 people involved in both projects on the refuge for at least 6 months each year.

Chris Devine, graduate student at Duke University, is developing a GIS system for the refuge as part of his Master's Degree requirements. The refuge purchased the scans and Chris digitized all physical features (roads, streams, lakes, etc.). Chris and an assistant spent a week ground truthing vegetative types. Atlas software is being used.

An SUP was issued to Robert Young, Research Associate, Dept. of Geology, Duke University, for conducting research on sea level rise. This work, funded by the Service's Wetland Research Center, will utilize several locations along North Carolina's east coast. The work consists of establishing numerous bench marks on transects, completing exhaustive vegetative surveys, and collecting soil profiles along the marsh/forest interface. Robert selected the Muddy Creek drainage adjacent to Long Shoal River as one of his study areas and established all the necessary bench marks during May. This site will be examined yearly through at least 1995.

6. Other

Numerous requests for Engineering Services were submitted during the year for replacing underground fuel tanks, construction of additional maintenance facilities (pole sheds, oil house, bridge replacement, WCS installation, graveling roads, constructing parking areas, etc., etc. Most were acted upon within a reasonable period of time.

E. ADMINISTRATION

1. Personnel



Left to Right - Front Row: 9, 23, 3, 14
 Middle Row: Roepcke*, 25, 21, 13, 12, 7, 15
 Back Row: 2, Craddock*, 24, 22, 16, 18, 17,
 10, 4, 6, 1

*New 1993 Fire Crew

1. Jim Johnson, Refuge Manager, GM-13, EOD 05-05-91
2. Robert Noffsinger, Deputy Refuge Manager, GS-12, EOD 04-13-87
3. Jonathan Windley, Supv. Refuge Opr. Spec., GS-09, EOD 02-26-89
4. Steven Fowler, Forester (FMO), GS-11, EOD 06-30-91
5. Michael Phillips, Wildlife Biologist (Red Wolf), GS-12, EOD 06-21-87
6. Michael Morse, Wildlife Biologist (Red Wolf), GS-07, EOD 04-08-90
7. Bonnie Strawser, Wildlife Intrp. Spec., GS-11, EOD 12-31-80
8. Angela Elmore, Refuge Technician (Pea Island), GS-07, EOD 04-19-82
9. James Beasley, Refuge Technician, GS-07, EOD 05-26-85
10. Arthur Beyer, Refuge Technician (Red Wolf), GS-06, EOD 12-02-90
11. Jennifer Dagen, Refuge Technician (Red Wolf), GS-05, EOD 06-30-91
12. Beverly Midgett, Office Assistant, GS-06, EOD 10-06-71
13. Janice Lane, Office Automation Clerk, GS-04, EOD 03-25-90
14. J. Bruce Creef, Crane Operator, WG-10, EOD 04-21-75
15. Alan Emery, Automotive Worker, WG-08, EOD 05-22-88
16. Jonathan Powers, Eng. Equip. Opr., WG-08, EOD 04-24-88
17. Doak Wilkins, Eng. Equip. Opr.(Pea Island), WG-08, EOD 02-28-88
18. Murphy Peterson, Eng. Equip. Opr., WG-08, EOD 04-22-90

Temporary Part Time

19. Edward Zakrajsek, Biological Tech. (NTE 1 year), GS-05, EOD 05-05-91
20. Belton Gray, Jr., Forestry Aid, GS-04, EOD 05-05-91
21. Amy Midgett, Forestry Aid, GS-04, EOD 05-05-91
22. Bobby Govan, Forestry Aid, GS-04, EOD 10-06-91
23. Eric Meekins, Forestry Aid, GS-03, EOD 10-04-92
24. Tami Stanberry, Forestry Aid, GS-03, EOD 10-04-92
25. Nolan Ambrose, Eng. Equip. Opr., WG-08, EOD 10-04-92
26. Stephen Grant, Motor Vehicle Oper., WG-05, EOD 05-05-91

The following employees were promoted in 1992:

January 26, Janice Lane, Clerk Typist to Office Automation Clerk, GS-04.

May 3, Bonnie Strawser, Park Ranger (Refuge Ranger) to Park Ranger (Interpretive Specialist), GS-11.

May 5, Jim Johnson, Refuge Manager, GM-13.

June 14, Murphy Peterson, Tractor Operator to Engineering Equipment Operator, WG-08.

August 9, Michael Morse, Refuge Technician filled the Wildlife Biologist, GS-07 position.

Crane Operator, Bruce Creef was selected for a WG-10 NTE 1 year appointment effective October 4.

An accretion of duties was sent in for Steven Fowler for a GS-12. No action has been taken as of end of year. Hopefully, this will be resolved early next year.

Edward Zakrajsek filled the position of Biological Technician, GS-05 on a NTE 1 year appointment effective June 26. He works seasonally as a firefighter; the remaining time is spent on the Red-Cockaded Woodpecker Study. Prior to this, he was a Forestry Aid.

The Refuge had 8 fire fighters during 1992 compared to 6 last year. Two Forestry Aids and 1 Engineering Equipment Operator were hired. One other Forestry Aid and Engineering Equipment Operator were selected but declined the positions while waiting to report for duty. There was not enough time to make another selection for these positions. They will be filled in 1993.

Jennifer Dagen filled the Refuge Technician, GS-05 position on November 15.

The GS-11 Refuge Biologist position, vacant since 1991, was not filled in 1992.

The GS-5/7/9 Refuge Operations Specialist position at Pea Island, vacant since 1991, was not filled during 1992.

2. Youth Programs

The 1992 Alligator River YCC program involved only 1 enrollee. Robert Sawyer had worked on the refuge during the 1990 and 1991 programs and was rehired as a Youth Leader for the 1992 program.

Robert was utilized as an assistant/helper to individual staff as the need arose. Because of his personal characteristics and his familiarity with the refuge and staff, this method worked very well. Robert proved to be a tremendous asset to the refuge during his 8 week tenure. When not in his "assistant" role, Robert worked on general maintenance/ management projects with the fire crew. Among their assignments were trail maintenance, litter pick-up, signing, installation of WCS's, and participation in several bird banding trips.

4. Volunteer Programs

This was another banner year for the ARNWR Volunteer Program. There were 18,706 hours donated by 403 individuals. A categorization of volunteer hours for FY 1992 is as follows: 4,000 - maintenance; 9,000 - biological support; 4,706 - public use; and 1,000 - administrative.

The Red Wolf Project has continued to draw a number of college students and/or recent graduates that volunteer blocks of time. During 1992, over 6,000 hours of volunteer time were donated by 5 individuals in red wolf caretaking positions.

Nino Badridze volunteered for 9 months with the Red Wolf project. Nino is a citizen of Georgia (former Soviet Union); her father has conducted behavioral research on gray wolves most of Nino's life. She provided much insight for the program - especially the captive colony.

The refuge utilized 8 student interns during 1992; 5 worked with the Red Wolf Project, as indicated above. Several interns worked with public use and/or general biological/maintenance work at Pea Island. Dr. Charles Howes (Charlie) worked for 12 weeks, taking the lead on the Atlantic White Cedar Project. A full professor for the University of Kentucky system, Charlie used his sabbatical for field work experience. In his final report, he assured us that in times when he sunk chest deep in the pocosins or had to attempt to sweet-talk an alligator off a log, that he was, in fact, "experiencing field biology". Charlie was a tremendous asset with this project.

Volunteers provided support in almost every facet of refuge work. By the end of 1992, almost each day included a "receptionist" in the front office in Manteo answering the phone and assisting with assorted office duties. Some wrote letters and handled public inquiries. The volunteer program also provided volunteer assistance for Pea Island Refuge. For details on these activities see Section E.4. of the Pea Island narrative.

Recruitment activities for 1992 were not major, but spontaneous efforts were made whenever the opportunity presented itself. At this point, most new volunteers are recruited by current volunteers.

The "Take Pride in America" recognition program has given groups more incentive in volunteering their efforts to benefit public lands. WIS Strawser has continued to act as the Dare County Coordinator for Take Pride in America.

In April, a van full of volunteers and WIS Strawser traveled to Raleigh to receive awards naming the Refuge Volunteer Program, Herb Lewis (posthumously), and Kris Kristoffersen as winners in

the North Carolina TPIA Program. Mid-year, WIS Strawser, volunteers Kris Kristoffersen and Gina Knollenburg (for Herb Lewis) accepted 5 Director's Awards from John Turner. The Manteo ADAP (a handicapped adult program) also received a Director's Award. The Alligator River NWR Volunteer Program received recognition for being a finalist in the National TPIA Program.



**Volunteer Kris Kristoffersen prepares for
hunting season! 8/92 BWS**

During volunteer week, an open house was held at the Manteo office. Approximately 100 volunteers participated, visiting with the staff and receiving a volunteer coffee mug.

Late in 1992, we received notification that the Alligator River NWR Volunteer Program and Volunteer Don Perry had each been selected as 1992 Take Pride in America winners at the State level. Their nominations, plus Manteo ADAP and the Outer Banks Surfrider Foundation will be forwarded to Washington to compete at the federal level.

In September, the annual Awards Ceremony of the Dare Voluntary Action Center was held, and Refuge Volunteer Don Perry received a beautiful engraved silver bowl, the Governor's Award for Outstanding Volunteer Service. Don also received the USFWS Regional Director's Award for Outstanding Volunteer Service.

Refuge volunteers continued to work through their non-profit organization, the Coastal Wildlife Refuge Society, to benefit the refuge. For details of their accomplishments during 1992, see Section H.18. of this report.

Cumulative hours tallied through September 30, 1992 yielded 56 awards. Certificates were awarded to:

100+ hour certificates were presented to: Adele Mathers, Dana Powers, Tonya Stevens, Fitz Sthreshley, Nancy Thompson, Tracey Windley, Nino Badridze, Marilyn Knight, Paul Dumont, Tama Cathers, Monique Kramer, John Wright, Resha Ryan, Marlo Shedlock, Charles Howes, Tim McCarthy, Wayne Harris, Dave Brandenburg.

Pins without rockers (250+ hours) were awarded to: Bill Ackiss, Nino Badridze, Marilyn Knight, Monique Kramer, Resha Ryan, Marlo Shedlock, Charles Howes, Tim McCarthy, Wayne Harris, Dave Brandenburg.

Pins with 500 hour rocker were presented to: Bertha Burris, Henry Dagit, Marie Vansickle, Nino Badridze, Marilyn Knight, Monique Kramer, Tim McCarthy, Wayne Harris, Dave Brandenburg, Dick Wood, Resha Ryan.

Pins with 1000 hour rocker were awarded to: Aylene Goddard, Don Perry, Nino Badridze, Marilyn Knight, Monique Kramer.

Pins with 1500+ hours rocker were awarded to: Warren Davis, Ken Dyar, Kris Kristoffersen, Nino Badridze, Marilyn Knight, Monique Kramer.

Ken Dyar, Nino Badridze, Kris Kristoffersen, and Marilyn Knight received pins with 2,000 + hours rocker and Friend of the Refuge Awards.

The refuge purchased special plaques for Nino Badridze (4,500 hours), Marilyn Knight (2,500 hours), and Manteo ADAP (2,000 hours).

The 1992 "Outstanding Volunteer" Award was presented to Win Copeland and Ritchie Buckingham. Their names were added to the plaque in the office, and they received individual plaques to take home.

Establishing the volunteer program for these refuges required much time and effort in the beginning. Keeping the program going demands ongoing effort and money commitment; however, the refuge receives far more than it gives to the volunteers. As always, we owe a debt of gratitude to our dedicated refuge volunteers. They set a fine example for all who see them. Without them, so much work would be left undone. Without them, the refuges would not be the same. . . .

5. Funding

FY 92, Alligator River received the following funding: Initial Allocations of 863.2 (1261/1262/1113); Oregon Inlet Groin Study 16.0; Co-op Student Program 7.6; Wetland Management Education 7.0; YCC 1.5; Small Maintenance Projects 23.0. Reimbursable Agreements: Wildlife Surveys & Monitoring 9.1, Pea Island Beach Disposal 47.4, and Atlantic White Cedar 85.0. Construction Carryover: Bridge Replacements 114.7, New Maintenance Facility 247.4. Staffing Seasonal Firefighters 53.2; Prescribed Burning 3.0; NUS Maintenance of Fire Equipment 25.0. Equipment for Presuppression: Boom Axe 40.0, K-G Blade 18.0, Slip-on Unit 7.0, Truck Dually 18.0, Remote Weather Station 31.5, Low Boy Trailer 30.0 and Low Boy Trailer Modification 5.0, Engine Body 21.0, Mark III Pumps 6.0, Radios 3.0, Dump Truck 39.8, Vehicle Winches 4.5, Portable Welder 3.0, Tires 1.6, Vehicle and Trailer Repairs 4.5.

FOUR YEAR FUNDING COMPARISON

	<u>1992</u>	<u>1991</u>	<u>1990</u>	<u>1989</u>
1261	460.1	390.7	374.0	349.0
1262	182.0	204.1	169.5	135.8
1113	220.0	200.0	185.0	160.0
1971	141.5	95.0	26.8	17.3
2821	362.1	845.8	22.5	98.1
9110	52.4			
9120	327.9	450.4	117.2	

6. Safety

This year a new Safety Committee was appointed for Alligator River and Pea Island NWRs. The members are ROS Jonathan Windley, WB Mike Morse and AW Alan Emery. The committee was helpful in identifying unsafe working conditions, habits, and attitudes at the refuge. They encouraged action to correct these problems. The safety committee met and developed a list of topics for monthly safety meetings. The topics included: safety belt usage, battery recharging and jump starting, forklift safety, ladder safety, and boating safety. Employees also

completed CPR training and received certification cards from the American Heart Association.

Alligator River and Pea Island Refuges ended the year with 33,760 hours worked since the last lost-time accident. EO Jonathan Powers and OAC Janice Lane each had a lost-time accident in 1992. Both received minor injuries to the eyes. Other accidents that occurred during the year included: ROS Windley received treatment for elbow tendinitis, YCC Sawyer was treated for an itchy case of poison ivy, and MVO Grant received treatment to his right hand after it was mashed while positioning pilings. Two accidents involving vehicles were reported. Volunteer Nino Badridze and RT Dagen each collided with parked vehicles in the Alligator River NWR office parking area.

Also completed for 1992 were revisions and updates for the Alligator River NWR and Pea Island NWR hurricane contingency plans and fire plans.

7. Technical Assistance

Under a Cooperative Agreement with the U.S. Air Force, the refuge continued to provide technical assistance to the adjacent Dare County Bombing Range on wildlife management. Some of the activities included the black bear study, red-cockaded woodpecker surveys, alligator surveys, and white cedar study (see Sections F. and G.).

In July, refuge staff met with Dr. Pete Bromley from the NC Extension Office to discuss development of a wildlife management brochure for private land owners (Challenge Grant).

FMO Fowler, DRM Noffsinger, and RM Johnson met with researchers from Boise IAFC in July to conduct preliminary planning on research entitled "Heat Transfer in Organic Soils".

WIS Strawser conducted a session in September for the televised TPIA training for TPIA County Coordinators in N.C.

RM Johnson and DRM Noffsinger met with Dr. John Anderson and Bill Palmer from N.C. State University to discuss plans for a sustainable agriculture and quail research project on Alligator River NWR.

RM Johnson and DRM Noffsinger provided technical assistance to the University of Tennessee in developing a black bear research proposal for Alligator River NWR (see Section G.).

In November, WIS Strawser conducted a Wetlands Education Workshop for local teachers at Roanoke River NWR.

F. HABITAT MANAGEMENT

1. General

Five categories of natural, vegetated habitat are found on ARNWR: marshes, pocosins, mixed-hardwood pine swamps, hard-wood swamps, and white cedar swamps. These are classified as wetlands based on the vegetation present, the degree of soil saturation, and the hydro-period. ARNWR represents one of the last remaining large tracts of pocosin-type habitat along the east coast. Although much of the refuge is relatively unaltered by humans, large portions have undergone changes in vegetation composition and hydrology caused by ditching and canal dredging for access and logging purposes. The purchase of the Prudential farmlands in March of 1988 added agri-cultural land to the list of habitats.

2. Wetlands

In May, after 5 months in the 404 permit application process, the refuge finally received a Corps of Engineers permit needed for bridge replacement project, which involves the installation of 38 water control structures. The structures allow safe movement over the canals by fire equipment and better water management for fire suppression and prescribed burning activities. The risers replace severely deteriorated wooden bridges



Otters are among the many "critters" that benefit from wetland restoration efforts.

PS 11/92

at road intersections. Boards are placed in the risers up to ground level of the adjacent swamp/pocosin. These structures have restored a more natural hydrological regime on approximately 4,400 acres of wetlands and partially restored another 3,000 acres.

This year, risers were installed at the intersections of Borrow Pit Road and N.C. Highway 264, Blueberry and Milltail Roads, Bay and Milltail Roads, Sandy Ridge and Butler Roads, Borrow Pit and Longcurve Roads, and Lake Worth Road. The restoration of the past hydrology of the area will continue with the installation of additional structures in 1993.

Table 1 presents acreage by vegetative community/land use currently under fee title ownership. See previous narratives for in-depth descriptions of the various vegetative types.

Table 1
Habitat Types
AR NWR, 1992

Habitat Type	%	Approximate Acreage		
		Dare	Hyde	Total
White Cedar Swamp	5	6,900	1,000	7,900
Hardwood Swamp	11	11,700	3,700	15,400
Mixed Hardwood				
-Pine Swamp	29	36,000	6,000	42,000
Low Pocosin	12	18,100	--	18,100
Cane Pocosin	2	2,300	--	2,300
Tree Pocosin	19	25,500	2,600	28,100
Lakes/Open Water	1	1,000	--	1,000
Marsh	17	25,200	--	25,200
Farmland and Moist Soil	4	5,100	--	5,100
Totals	100	131,800	13,300	145,100

3. Forests

Forestry at Alligator River NWR was highlighted by 2 important events last year. The first was the initiation of an Atlantic white cedar regeneration project which is being funded by the DoD Legacy Resource Program. Partners in this project are the DoD, (the Dare Bombing Range Forester), the North Carolina Forest Service Research Division, and the USFWS. All funding is transferred to the refuge.

The initial target for this project is to re-establish 1200 acres of cedar clear-cuts on the Dare Bombing Range and 1500 acres of cut-over land on the refuge. Very little work has been done on natural regeneration of this valuable species. This project hopes to answer some questions about stocking levels, regeneration techniques (both natural and artificial), seed collection and extraction and harvest techniques as related to stand replacement.



A common resident of the forestlands at Alligator River.

3/92 JCJ

The second event of interest (although perhaps not to everyone) was the possible acquisition of approximately 11,000 acres of land adjacent to the Refuge's south boundary. This proposal necessitated a timber cruise to establish timber values, not a pleasant prospect, since all the tracts were pocosin and aerial photographs and experience told us that timber values would be low to non-existent. Undaunted, and at the insistence of Realty in Atlanta, we persevered. With the help of a Forester from the

Regional Office, experienced cruisers from other stations and the Forester and selected crew from Alligator River, we set out.

After extracting a key member of our expedition from the cold, deep waters of a canal (where he decided to exit a boat prematurely and, not being able to swim, proceeded to nearly drown), we hefted our machetes and began to cut lines through the surrounding jungle. (The "swimmer", knowing considerably more about boats than we at first gave him credit for, produced a change of clothes during the hiatus of crew paralysis resulting from intense laughter and that lasted some 15 minutes. Interesting how people compensate for lack of certain skills!)

On the very first cruise line, one of our intrepid Cruisers from a Refuge where beautiful hardwoods and pine grow in abundance radioed to ask if he should tally the "sawbriar". Not knowing what the current market was at the time, I replied "Yes, but don't take anything under 6 inches". Using a cluster-plot cruise method (the only method practical outside of a helicopter), we eventually triumphed and firmly established that due to past logging, poor site conditions, inferior tree species and inaccessibility that, by and large, the timber values were \$0.0 or slightly less.*

This exercise did give us the always welcome opportunity to traverse new territory, make some discoveries about our local swamps and "go where no one has gone before" at least not for a long time without good reason such as escaping a Sheriff's posse.

Our friends in Realty tell us that we have several thousand more acres to look forward to in 1993. Good thing too; we were beginning to think we would run out of things to do next year.

* Just kidding! We did, eventually find some pockets of timber which are marketable.

4. Croplands

The acquisition of the 10,000 acre Prudential Farms inholding in March, 1988 gave the refuge even greater diversity of habitats and a great potential for managed habitat for waterfowl, shorebirds, and wading birds. The tract included 5,100 acres of cropland. Prudential had developed the area from forested wetlands by encircling it with dikes and placing parallel drainage ditches at 300 foot intervals. These ditches, in conjunction with large receptor canals, moved water to 2 large pump stations. The pumps had the ability to remove 250,000 gallons of water per minute from the farm fields. Pumping was required to keep the area dry enough to farm. The reconversion of the area to wetland habitat was basically simple - don't pump the areas where plans call for permanent water or reduce pumping

on moist soil areas. This action was accomplished by judicious placement of flashboard risers in conjunction with existing dikes and building small, permanent cross dikes and temporary rice dikes. In 1988 and 1989, management efforts concentrated on the Twiford Unit (1,355 acres) where the best water control existed. In 1990, efforts expanded into the Creef Unit with the installation of three water control structures which allowed flooding an additional 300 acres. Another structure was added in the Twiford Unit restoring 100 acres. Six miles of dikes were improved and revegetated.



Heavy summer rains produced excellent moist soil production in those units recently plowed.

JCJ

In 1991, Ducks Unlimited matched refuge funds through their MARSH program to convert drained swamp and agricultural land in the North Twiford Unit. DU's share of the cost was \$22,500. Seven water control structures with sand-cement bag headwalls were installed and approximately 20,000 feet of dike constructed and seeded, creating four units with separate water level control. One unit was a drained swamp (96 acres), and 3 units were prior converted agricultural lands (108, 135, and 65 acres).

The farming program this year was limited due to various obstacles encountered throughout the year. The refuge farm unit for 1992 consisted of 1,157 acres of moist soil along with 75 acres of corn left in the field. Although the refuge received the necessary 404 permits for plowing moist soil units, unusually large amounts of rainfall canceled plans for disking and planting the different units. Early September vegetation surveys revealed moist soil unit plant species composition were at best average. Refuge co-op farmers were unable to plant crops until late in the summer due to unseasonal rain, which resulted in record low yields for 1992. Farming program problems continued with 2 of the co-op farmers becoming financially troubled, and 1 farmer eventually filing for Chapter 11 reorganization. Presently, co-op farming contracts are being renegotiated to improve the farming program for 1993.

9. Fire Management

Fire Management has realized continued progress at Alligator River NWR. In accordance with plans, the refuge has added 3 more seasonal firefighters, for a total of 8, and 1 (2 total) additional firefighting equipment operator (FFEO).

New fire equipment acquired over the past year included a tractor/boom-axe, 50 ton lowboy trailer, Terrevah, D6H, 300 gallon wildland engine, KG blade for D6H, 200 gallon slip-on unit for the Terraveh and a 15 yard dump truck which was cost shared (50/50) with 9100 and 2821 funds. Additional cache items were also ordered to restock depleted items and to get closer to our goal of having a complete 25 person cache.

The remote automated weather station at Alligator River NWR has been collecting data continuously since first set up in March. There is now nearly a year's worth of accurate, hourly weather information which will be of great benefit to fire management, as well as other Refuge programs, both for planning purposes and historical records.

The cache was moved from the Buffalo City area to its new location at the recently completed maintenance facility. The cache will be housed in a portion of one of the new buildings where badly needed storage space and security for these items will be adequate.



The new D-6H LGP received in '92 will serve as an initial attack fire machine and provide badly needed ability to clear roads. 7/92 J CJ

As is typical, much of the season was spent in preparation for wildfire and prescribed burn activities. Classes were taught in "Standards for Survival", S-211, S-130, S-190 and, for the first time this side of the Mississippi, a course in fireline explosives. Fireline explosives have a definite role to play in pocosin habitat (see notes on the Barge Canal Fire below). Sponsoring this training course is the direct result of local testing and evaluation of this line construction method over the last two years. Training classes were held at various places throughout the district.

As in the previous year, FWS personnel from this district and Fire Management District 3 participated in the NCFS Region I Fire School. This year's school was particularly significant in light of the fact that the ICS Unified Command concept was the central theme for the first time. This is the basis of planned operations on large fires involving refuge lands in North Carolina.

A revised Fire Management Plan was written and approved. This Plan will remain in effect until the final draft of the USFWS Fire Management Handbook becomes official and the FIREPRO system goes into full operation.

Prescriptions to burn approximately 1500 acres of pocosins, 300 acres of marsh impoundments and agricultural debris, and 2700 acres of beach scrub and brackish marsh were written and approved for this year. Included in the pocosin tracts were prescriptions specifically designed to improve and maintain RCW habitat. Although much time and effort went into preparing the pocosin tracts and improving the firelines etc., they were not burned due to the extremely wet summer and fall. This is the second year in a row that the RCW burns were scheduled and scuttled due to wet conditions. All other burning was accomplished.

Wildfires this past year occurred during, and after, the "normal" spring fire season. Numerous small fires occurred including one (Flare Fire) that resulted when a military helicopter fired a flare onto refuge property during maneuvers. Ignition occurred even though fuels were wet from heavy rain and a misting rain was still evident when the fire was quenched. Had conditions been otherwise, a serious problem almost certainly would have been the result.

The greatest problem fire on Alligator River in 1992, and in the District for that matter, was the 185 acre Barge Canal Fire in mid-May. This fire began as a lightning strike in one of the most isolated and inaccessible portions of the refuge. Ground conditions in this typical tree pocosin were so onerous that 7 LGP tractor plow units were mired down at one time while attempting to reach the fire. Extracting these machines before the fire overran them added an extra burden to the main objective of stopping the fire.

Aerial attack, along with some fortuitous weather conditions (mainly high RH and 180 degree wind shifts), managed to stop the head of the fire long enough for two soft-track fire plows to arrive at the fire. One of the machines was equipped to handle water. Plowing was impossible, but they were able to track a double line around the fire and mop-up hot spots. With higher winds and drier conditions this fire would have had the potential to burn many thousands of acres. Had fireline explosives and trained personnel been readily available, this fire provided a classic example, in terms of terrain, for its use.

Three of the firefighters were activated during the Woodland, California staging operation, and the District FMO was dispatched to Florida as a member of the Blue Team to participate in the hurricane relief effort.



The lighting-caused Barge Canal Fire resulted in the loss of 185 acres and occupied most of the staff's time for a week.

5/92 SF

Of special interest this past year is the initiation of a research project entitled "Heat Transfer into Duff and Organic Soil". This venture is being directed by personnel at the Fire Science Lab of the USDA Forest Service Inter-mountain Research Center in Missoula, Montana. There are many stated objectives of this research with the ultimate goal being to better understand the role of fire at various levels of intensity and its effects on the organic components of soils. The USFWS is a co-sponsor of this 3 to 4 year project. The preliminary work has begun at this station where soils are typically up to 99 percent organic and pose unique problems to fire management.

G. WILDLIFE

2. Endangered and/or Threatened Species

Five endangered species have been documented on the refuge. Management programs are in place for the red wolf and red-cockaded woodpecker. An inventory program is in place for American alligators. There are no plans to manage specifically for or inventory bald eagles or peregrine falcons.

a. Federally Listed Endangered and Threatened Species

American Alligator (Threatened): American alligators reach the northern extent of their range on the refuge and probably were never very numerous in the area. A few have been seen each year in the marshes, ponds, streams, and canals. The U.S. Air Force contracted with the refuge to survey the Dare County Bombing Range for alligators in 1988, 1990, 1991, and again in 1992. The highest density alligator population was found on Whipping Creek Lake. This route also had the highest density of all the routes surveyed. Information on number of alligators observed per mile for all routes on the refuge and bombing range for 1992 and for all survey years is given in Tables 2 and 3.



RT Jim Beasley counted a number of young 'gators during the summer months. This refuge has the northern-most known reproducing 'gator populations.

7/92 MS

During 1991, the staff was very pleased to finally document successful 'gator nesting and was able to mark young alligators on Whipping Creek and Lost Lake by notching tail scutes. Young from both locations were recaptured during 1992. Table 3 gives

Table 2
Number of Alligators Observed Per Mile For All Routes
1988 - 1992

Survey Route	1988	1989	1990	1991	1992
Whipping Creek	1.6		.6	1.0	1.0
Air Force Target Area	.07		-0-**	.14	-0-
Navy Target Area	.07		.12	.12	-0-
Lake Worth	-0-				
Milltail Creek	.39	.13	.13	.13	.26
South Lake				-0-	.19
Swan Creek				.18	.55
Sawyer Lake			-0-	-0-	-0-
Laurel Bay Lake				-0-	-0-
Lost Lake				.88	3.5
Callaghan Creek					-0-

** This is not to say that there are no alligators present, only that none were observed on the survey.

the changes in total length and weight from the young alligators that were recaptured. Night surveys in September to locate the young followed by daylight searches of specific locations where young were found resulted in improved success locating young alligators.

Nest searches and mark-recapture searches for young will continue to improve knowledge of growth rates, survival rates, and movements. Marking additional alligators next year and recapturing those marked this year will improve data and may provide some insight as to the effects of winter on growth and survival of young alligators.

Table 3
Growth Rates of Alligators Captured in 1991
and Recaptured in 1992

Alligator # & Location	Date Captured	Age (days)	Length (in.)	Weight (oz.)
#1 Whipping Creek	10-18-91	30	11.1	3.5
	06-23-92	280	12.8	3.5
	09-10-92	358	19.8	11.5
	sample period	328	8.7	8.0
#2 Whipping Creek	10-18-91	30	9.6	3.4
	04-20-92	215	10.8	---
	06-23-92	280	12.3	3.0
	09-10-92	358	18.1	9.0
	sample period	328	8.5	5.6
#3 Whipping Creek	10-18-91	30	11.6	4.0
	06-23-92	280	13.3	4.5
	09-20-92	368	19.6	12.0
	sample period	338	8.0	8.0
#1, #2, #3 average increase for sample period			8.4	7.2
#16 Lost Lake	05-14-92	623	20.9	11.5
	10-08-92	770	30.1	40.0
	sample period	147	9.2	28.5
#17 Lost Lake	05-14-92	623	22.6	13.5
	09-14-92	746	30.3	----
	sample period	123	7.7	----
#16,#17 average increase for sample period			8.5	----

Bald Eagle (Endangered): Refuge staff sighted an immature bald eagle on January 15. The sighting was on the South Twiford Unit near Milltail Road.

Peregrine Falcon (Endangered): Although no sightings were reported for 1992, peregrine falcons are known to move through the refuge during migration.

Red-Cockaded Woodpeckers (Endangered): Most of the work to manage for the red-cockaded woodpecker (RCW), thus far, has revolved around surveys to locate their colonies. ARNWR has

been working with the Dare County Air Force Range (DCAFR) since 1990 to completely survey both refuge and range for RCW colonies. A Memorandum of Understanding will soon be initiated between ARNWR and DCAFR for cooperative RCW management efforts.

This year, 4 active RCW colonies were recorded. One (Whipping Creek Colony) is located on refuge land. This colony was located last year (1991) by a helicopter survey. This year, it was located again by helicopter and found on foot (with a lot of help from a sharp machete!). Eight to 10 colony trees were spotted from the helicopter; however, the colony has not yet been completely surveyed from the ground. The 3 other active colonies - Faircloth North, Faircloth South, and Jackson East - are on DCAFR. They were all located and mapped in 1990 and 1991.

Two inactive colonies were previously located. The Chip Road colony, on ARNWR, has been inactive since 1987. The Jackson Road West colony is on DCAFR.

Five additional colonies were located on ARNWR and DCAFR by helicopter. They have not yet been reached on foot. Consequently, their status is unknown.

Once the colonies are located, the understory/midstory vegetation must be controlled. Currently the understory beneath all the colonies is too thick to even walk through, and the midstory is too thick to see through. Also the midstory is at or near cavity level in all of the active colonies. Historically, this is known to cause cavity abandonment.

Prescribed fire was planned for the Whipping Creek colony and other areas on ARNWR to control this hardwood understory/midstory encroachment. This prescription, however, has not yet been carried out. This will be a priority in the coming years.

Red Wolf (Endangered): September 31, 1992 marked the fifth year of the 5-year experiment to reintroduce red wolves to the Alligator River National Wildlife Refuge. By almost every measure the experiment was successful. Currently, a plan is being developed to expand the reintroduction program to the Pocosin Lakes National Wildlife Refuge. Data presented in the following tables were calculated relative to the termination date for the 5-year experiment (i.e. September 30, 1992). Although somewhat lengthy, this information is provided for the record as a synopsis of the 5-year experiment.

RELEASES

The only release of 1992 occurred on August 3 and involved an adult pair (372M and 382F) and their 4 pups (517M, 518M, 519M, and 523F). For the 5-year experiment, 42 wolves (adults: 10

males and 9 females; yearling: 1 female; pups: 12 males, 10 females) were initially released on 15 occasions (Tables 4 and 5). Four releases were conducted in 1987, 2 in 1988, 5 in 1989, 2 in 1990, 1 in 1991, and 1 in 1992. By late December, there were 27+ wolves in northeastern North Carolina (Table 6).

Table 4
Captive-born red wolves released in the Alligator River National Wildlife Refuge from 14 September 1987 through 30 September 1992.

Wolf# & sex	Release Period in Wild age (mos)	# Mos. in wild	Fate
140M	88.4 09/14/87-10/20/87	1.2	captured because frequenting a community
	10/30/87-11/19/87	0.7	captured because frequenting a community
	12/02/87-01/31/88	2.0	captured because left reintroduction area
	04/12/88-06/15/88	1.9	died after collision with vehicle
	Total # Mos	5.8	
184M	76.8 10/01/87-10/30/87	1.0	captured to replace radio-collar
	11/07/87-05/29/88	6.7	died after collision with vehicle
	Total # Mos	7.7	
194F	76.8 10/01/87-10/21/87	0.7	captured because left reintroduction area
	10/29/87-12/11/87	1.4	captured because left reintroduction area, never re-released
	Total # Mos	2.1	

Table 4. Continued

Wolf# & sex	Release Period in Wild age (mos)	# Mos. in wild	Fate
196F	76.8 10/01/87-01/08/88	3.3	captured to replace radio-collar
	01/11/88-06/25/88	5.5	died due to uterine infection
	Total # Mos	8.8	
205F	65.1 10/01/87-12/22/87	2.7	captured to replace radio-collar
	01/11/88-01/05/89	11.8	captured for breeding purposes
	08/01/89-11/14/90	15.4	captured to replace radio-collar
	11/30/90-09/02/91	9.1	captured to replace radio-collar
	09/03/91-11/03/91	2.0	returned to captivity for breeding purposes
Total # Mos	41.1		
208M	85.8 07/03/89-07/31/89	0.9	died after collision with vehicle
	Total # Mos	0.9	
211M	64.9 10/01/87-01/09/88	3.3	captured to replace radio-collar
	01/11/88-10/25/88	9.5	captured to replace radio-collar
	10/28/88-12/27/88	2.0	suffocated
	Total # Mos	14.8	
227M	53.1 10/01/87-11/08/87	1.3	captured to replace radio-collar
	04/14/88-05/16/88	1.1	captured because frequenting a community
	08/01/89-09/05/89	1.2	died due to intraspecific aggression
	Total # Mos	3.5	
231F	52.1 09/14/87-11/20/87	2.2	captured for translocation
	12/02/87-12/18/87	0.5	died due to pleural effusion and internal bleeding
	Total # Mos	2.7	

Table 4. Continued

Wolf# & sex	Release age (mos)	Period in Wild	# Mos. in wild	Fate
300F	23.1	04/12/88-01/08/89	8.9	captured for breeding purposes captured to replace radio-collar captured for management reasons free-ranging
		07/03/89-01/24/91	18.7	
		02/07/91-01/17/92	11.4	
		01/31/92-present ^a Total # Mos	3.6 42.6	
304F	52.3	09/17/90-09/25/90	0.3	accidental capture returned to captive for breeding purposes
		10/04/90-11/19/90	1.5	
		Total # Mos	1.8	
313F	27.8	08/22/89-10/18/89	1.9	captured because left reintroduction area captured because frequenting a community returned to captive because frequenting a community
		10/03/90-06/29/91	8.8	
		07/01/91-09/18/91	2.6	
		Total # Mos	13.3	
316F	28.3	09/04/89-12/27/89	3.8	radio-collar malfunctioned, fate unknown
		Total # Mos	3.8	
319M	28.3	09/04/89-01/26/91	4.8	captured to replace radio-collar captured to replace radio-collar free-ranging
		02/07/91-01/17/92	11.3	
		01/31/92-present	3.6	
		Total # Mos	19.6	
322F	11.0	04/14/88-06/06/88	1.8	returned to captive because frequenting a community
		Total # Mos	1.8	
327M	40.1	09/17/90-10/04/90	0.6	drowned
		Total # Mos	0.6	

Table 4. Continued

Wolf# & sex	Release Period age (mos)	in Wild	# Mos. in wild	Fate
328M	27.2	08/22/89-10/12/89	1.7	returned to captivity because left reintroduction area returned to captivity after injured by vehicle
		10/03/90-07/01/91	8.9	
		Total # Mos	10.6	
331M	9.1	01/25/89-present	39.7	free-ranging
		Total # Mos	39.7	
332M	9.1	01/25/89-11/21/89	9.9	died after collision with vehicle
		Total # Mos	9.9	
337F	39.2	08/13/91-10/26/91	2.5	returned to captivity for breeding purposes
		Total # Mos	2.5	
352M	27.9	08/13/91-09/15/91	1.1	died after collision with vehicle
		Total # Mos	1.1	
372M	38.9	08/03/92-present	1.9	free-ranging
		Total # Mos	1.9	
382F	38.6	08/03/92-present	1.9	free-ranging
		Total # Mos	1.9	
392M	3.1	08/01/89-03/26/91	19.8	captured to replace radio-collar free-ranging
		04/04/91-present	12.7	
		Total # Mos	32.5	
393F	3.1	08/01/89-01/24/90	5.8	died after collision with vehicle
		Total # Mos	5.8	
394F	3.1	08/01/89-11/30/90	15.9	captured to replace radio-collar free-ranging
		12/04/90-present	15.9	
		Total # Mos	31.8	

Table 4. Continued

Wolf# & sex	Release age (mos)	Period in Wild	# Mos. in wild	Fate
395F	3.1	08/01/89-01/11/90	5.4	drowned after being captured in leg-hold trap
		Total # Mos	5.4	
397M	5.5	09/17/90-09/25/90	0.3	accidental capture
		10/04/90-10/12/90	0.3	drowned
		Total # Mos	0.6	
398F	5.5	09/17/90-09/23/90	0.2	accidental capture
		10/04/90-10/15/90	0.4	drowned
		Total # Mos	0.6	
399F	5.5	09/17/90-09/23/90	0.2	accidental capture
		10/04/90-10/12/90	0.3	last recorded location, fate unknown
		Total # Mos	0.5	
426M	5.1	10/03/90-07/15/91	9.4	died after collision with vehicle
		Total # Mos	9.4	
427M	5.1	10/03/90-10/20/90	0.6	shot
		Total # Mos	0.6	
430F	5.1	10/03/90-present	19.4	died due to unknown causes
		Total # Mos	19.4	
459M	3.6	08/13/91-09/09/91	0.9	died due to intraspecific aggression
		Total # Mos	0.9	
460M	3.6	08/13/91-09/09/91	0.9	died due to intraspecific aggression
		Total # Mos	0.9	
461M	3.6	08/13/91-09/10/91	0.9	died due to intraspecific aggression
		Total # Mos	0.9	

Table 4. Continued

Wolf# & sex	Release age (mos)	Period in Wild	# Mos. in wild	Fate
462F	3.6	08/13/91-09/09/91	0.9	died due to intraspecific aggression
		Total # Mos	0.9	
466F	3.6	08/13/91-09/12/91	1.0	died after collision with vehicle
		Total # Mos	1.0	
517M	3.5	08/03/92-present	1.9	free-ranging
		Total # Mos	1.9	
518M	3.5	08/03/92-present	1.9	free-ranging
		Total # Mos	1.9	
519M	3.5	08/03/92-present	1.9	free-ranging
		Total # Mos	1.9	
523F	3.5	08/03/92-present	1.9	free-ranging
		Total # Mos	1.9	

a - Presented indicates 30 September 1992

Table 5
Social groups of captive-born red wolves released in the
Alligator River National Wildlife Refuge from 14 September
1987 through 30 September 1992.

Year Wolves	Social Group	Date of Initial Release
<u>1987</u>		
140M/231F	adult pair	09/14/87
184M/205F	"	10/01/87
211M/196F	"	"
227M/194F	"	"
<u>1988</u>		
140M/300F	adult/yrl	04/12/88
227M/322F	adult/pup	04/14/88
<u>1989</u>		
331M/332M	sibling pair	01/25/89
208M/300	adult pair	07/03/89
227M/205F and pups (392M, 393F, 394F, 395F)	family	08/01/89
328M/313F	adult pair	08/22/89
319M/316F	adult pair	09/04/89
<u>1990</u>		
327M/304F and pups (397M, 398F, 399F)	family	09/17/90
328M/313F and pups (426M, 427M, 430F)	family	10/03/90
<u>1991</u>		
352M/337F and pups (459M, 460M, 461M, 462F, 466F)	family	08/13/91
<u>1992</u>		
372M/382F and pups (517M, 518M, 519M, 523F)	family	08/03/92

Table 6
Free-ranging red wolves in eastern North Carolina as of 30
September 1992.

Wolf# & sex	Birth location	Age ^a (mos)	# in wild (mos) ^b	Mos.	Location of home range	Comments
300F	captivity	77.5	43.3		ARNWR ^c	breeding female
316F	captivity	65.0	----		ARNWR	radio-collar malfunctioned 3 months after release, fate unknown
319M	captivity	65.0	19.9		ARNWR	breeding male
331M	captivity	53.2	40.3		private land	breeding male
344F	wild	53.7	53.7		private land	breeding female
372M	captivity	40.8	1.9		private land	released 8/3/92
382F	captivity	40.4	1.9		private land	released 8/3/92
392M	captivity	41.1	33.0		private land	breeding male
394F	captivity	41.1	32.4		ARNWR	pack member
442M	wild	28.7	28.7		private land	lone wolf
443F	wild	28.7	28.0 ^d		private land	lone wolf
444F	wild	28.7	28.7		private land	pack member
496F	wild	17.5	17.5		private land	lone wolf
497M	wild	17.5	17.5		private land	lone wolf
499?	wild	17.5	----		-----	last observed 6/8/91, never captured
500F	wild	17.0	17.0		private land	pack member
501F	wild	17.0	17.0		private land	pack member, radio-collar malfunctioned 11/20/92
502F	wild	17.0	17.0		private land	pack member
503F	wild	17.0	17.0		private land	lone wolf
504M	wild	17.0	17.0		private land	pack member
505F	wild	17.1	17.1		private land	lone wolf
506M	wild	17.1	17.1		ARNWR	pack member
507M	wild	17.1	17.1		ARNWR	pack member
508M	wild	17.1	17.1		ARNWR	pack member
509?	wild	17.1	17.1		ARNWR	pack member, last observed 6/10/92 never captured
517M	captivity	5.5	1.9		private land	pack member, implant transmitter malfunctioned 9/11/92
518M	captivity	5.5	1.9		private land	pack member
519M	captivity	5.5	1.9		private land	pack member
523F	captivity	5.5	1.9		private land	pack member
580F	wild	4.9	4.9		ARNWR	pack member
581M	wild	4.9	4.9		ARNWR	pack member
582?	wild	4.9	4.9		ARNWR	pack member, last observed 9/7/92, never captured
583M	wild	4.9	4.9		private land	pack member

a - Age was calculated relative to 30 September 1992.

Table 6. Continued

- b - Number of months in the wild did not necessarily span the period from the date of release through 30 September 1992 as some captive-born wolves were returned to captivity for varying periods of time and subsequently re-released.
- c - ARNWR represents Alligator River National Wildlife Refuge.
- d - 443 spent time in captivity so we could administer medication and implant an abdominal transmitter.

Animals were initially released as members of 7 adult pairs, an adult and a yearling, an adult and a pup, 5 families, and 1 sibling pair (Table 5). Adults were defined as animals \geq 24 months of age, yearlings between 12 and 24 months of age, and pups \leq 12 months of age. Released adults ranged in age from 2.25 years to 7.33 years (Table 4).

OUTCOME OF RELEASES

The 1992 release was successful as all members of the family, with the exception of 517M, restricted movements to the area within a few miles of the release site through December 31. Unfortunately, 517's implant transmitter ceased functioning on September 11. His fate is unknown.

For the 5-year experiment, wide-ranging movements that created management situations or led to an animal's death soon after release were common (Tables 7 and 8).

Table 7
Information about movements of captive-born red wolves released as a yearling (300F) or adults in the Alligator River National Wildlife Refuge from 14 September 1987 through 30 September 1992.

Wolf# &sex	Length of acclimation (mos)	Date ^a of release movements		Time in V</Dir release traveled area (mos) ^b	Comments ^c
140M	10.5	09/14/87	10/16/87	1.0	12 km E returned captivity
		10/30/87	11/12/87	0.5	12 km E returned captivity
		12/02/87	01/19/88	1.6	80 km N, returned W and S captivity
	12.8 ^d	04/12/88	05/19/88	1.2	60 km S, returned E and N captivity
184M	10.5	10/01/87	-----	6.8	----- died 5/29/88
194F	10.5	10/01/87	10/19/87	0.6	22 km S returned captivity
		10/29/82	11/06/87	0.3	32 km S returned captivity

Table 7. Continued

Wolf# &sex	Length of acclimation (mos)	Date ^a of		Time in release area (mos) ^b	V/Dir traveled	Comments ^c
		release	movements			
196F	10.5	10/01/87	-----	8.7	-----	died 6/25/88
205F	10.5	10/01/87	-----	14.6	-----	1/5/89 returned captivity
	17.3	08/01/89	-----	26.6	-----	11/3/91 returned captivity
208M	5.7	07/03/89	07/29/89	0.8	15 km SE	died 7/31/89
211M	10.5	10/01/87	-----	14.8	-----	died 12/27/88
227M	10.5	10/01/87	-----	1.3	-----	returned captivity
	15.6	04/14/88	05/05/88	0.7	12 km E	returned captivity
	30.1	08/01/89	-----	1.2	-----	died 09/05/89
231F	10.5	09/14/87	-----	2.2	-----	moved w/mate
		12/02/87	-----	0.6	-----	died 12/18/87
300F	2.6	04/12/88	-----	8.9	-----	returned captivity
	8.4	07/03/89	-----	33.7	-----	
304F	2.2	09/17/90	10/12/90	0.8	32 km S	returned captivity
313F	18.9	08/22/89	09/24/89	1.1	35 km S	returned captivity
	30.4	10/03/90	-----	11.4	-----	returned captivity
316F ^e	19.4	09/04/89	-----	3.8	-----	fate unk.
319M	19.4	09/04/89	-----	19.6	-----	
327M	2.2	09/17/90	09/21/90	0.2	?????????	died 10/4/90
328M	18.9	08/22/90	10/08/90	1.5	35 km S	returned captivity
	30.4	10/03/90	-----	8.9	-----	returned captivity
337F ^g	27.3	08/13/90	09/19/91	1.2	17 km NW	returned captivity
352M	8.2	08/13/90	09/12/91	1.0	17 km NW	died 09/15/90
372M	16.6	08/03/92	-----	1.9	-----	
382F	27.5	08/03/92	-----	1.9	-----	

Table 7. Continued

- a - No date is listed for wolves that did not exhibit wide-ranging movements that led to management situations or death.
- b - For wolves that did not disperse, time spent in release area was calculated through date of death or 30 September 1992.
- c - No comment is provided for wolves that restricted movements to release area and survived through 30 September 1992.
- d - For wolves that experienced 2 or more acclimation periods, the value given represents total acclimation time.
- e - 316F's movements are not well understood because her radio-collar malfunctioned 3.8 months after release. However, she restricted movements to the release area prior to the collar malfunctioning.
- f - Question marks are provided for 327M because we do not know what direction or distance he traveled as he left Durant Island. We know he drowned as he tried to cross Albemarle Sound. We found his carcass floating in water 9 km WSW of release site.
- g - 337F was born in captivity at Alligator River NWR.

Table 8
Information about movements of red wolves released as pups in the Alligator River National Wildlife Refuge from 14 September 1987 through 30 September 1992.

Wolf# &sex	Length of acclimation (mos) ^a	Date ^b of release	movements	Age at movements (mos)	Time in V/Dir release area (mos) ^c	traveled
322F ^d	2.6	04/14/88	04/22/88	11.3	0.30	20 km sw
began frequenting a community, returned to captivity on 6/6/88						
331M ^d	0.2	01/25/89	-----	----	44.25	-----
became breeding male and survived through 9/30/92						
332M ^d	0.2	01/25/89	-----	----	10.00	-----
died 11/21/89						
392M	----	08/01/89	03/22/90	10.8	6.75	30 km sw
became breeding male and survived in dispersal area through 9/30/92						
393F	----	08/01/89	-----	----	5.75	-----
died 1/24/90						
394F	----	08/01/89	-----	----	38.00	-----
became breeding female and survived through 9/30/92 in release area						
395F	----	08/01/89	-----	----	5.50	-----
died 1/11/90						
397M	----	09/17/90	10/12/90	7.1	0.75	-----
died 10/12/90						

Table 8. Continued

Wolf# &sex	Length of acclimation (mos) ^a	Date ^b of release	movements	Age at movements (mos)	Time in release area (mos) ^c	V/Dir traveled
398F died 10/15/90	----	09/17/90	10/15/90	7.2	1.00	-----
399F disappeared 10/12/90, fate unknown, presumed drowned	----	09/17/90	10/12/90	7.1	0.75	-----
426M died 7/15/91	----	10/03/90	-----	----	9.50	-----
427M died 10/20/90	----	10/03/90	10/10/90	5.3	0.25	34 km SW
430F died 5/18/92	----	10/03/90	-----	----	19.50	-----
459M died 9/9/91	----	08/13/91	09/03/91	5.3	0.75	-----
460M died 9/9/91	----	08/13/91	09/03/91	5.3	0.75	-----
461M died 9/10/91	----	08/13/91	08/30/91	5.1	0.75	-----
462F died 9/9/91	----	08/13/91	09/03/91	5.3	0.75	-----
466F died 9/12/91	0.7	08/13/91	09/10/91	0.9	1.00	-----
517M inhabited release area and survived through 9/30/92	----	08/03/92	-----	----	2.00	-----
518M inhabited release area and survived through 9/30/92	----	08/03/92	-----	----	2.00	-----
519M inhabited release area and survived through 9/30/92	----	08/03/92	-----	----	2.00	-----
523F inhabited release area and survived through 9/30/92	----	08/03/92	-----	----	2.00	-----

- a - Length of acclimation was not determined for wolves born in captivity at the Alligator River National Wildlife Refuge.
- b - No date is listed for wolves that did not exhibit wide-ranging movements that led to management situations or death.
- c - For wolves that did not widely wander time spent in release area was calculated through date of death or 30 September 1992.
- d - 332F and siblings 331M and 332M were not released with parents. Rather, 322F was released with an adult male and 331M and 332M were released together.

Eighteen of 31 releases of adults and 10 of 22 releases of pups required us to return the animal to captivity or led to the animal's death within 2 months. Length of acclimation, release area, location of resident wolves, and type of social group released all affected a wolf's probability of successfully establishing itself in the wild.

During 1992 only 1 released animal (430F) died. Cause of death is unknown. During the experiment, of the 42 wolves released, 22 died (Table 9), 7 were returned to captivity for management reasons (Table 10), 11 were free-ranging through 30 September 1992 (Table 11), and the fates of 2 are unknown. Length of time in the wild varied from 16 days (399F) to 3.5 years (300F) (Table 4).

Table 9
Mortality of captive-born red wolves released in the Alligator River National Wildlife Refuge from 14 September 1987 to 30 September 1992.

Wolf# & sex	Year Date of death	Age at death (mos)	Period in wild (mos)	Cause of Death
<u>1987</u>				
231F	12/18/87	55.2	2.8	pleural effusion and internal bleeding
<u>1988</u>				
184M	05/29/88	84.7	7.7	vehicle
140M	06/15/88	97.4	5.8	vehicle
196F	06/25/88	85.6	8.7	uterine infection
211M	12/27/88	79.8	14.8	suffocated
<u>1989</u>				
208M	07/31/89	86.8	0.9	vehicle
227M	09/05/89	76.2	3.5	intraspecific aggression
332M	11/21/89	19.0	9.9	vehicle
<u>1990</u>				
395F	01/11/90	8.2	5.4	drowned
393F	01/24/90	8.6	5.8	vehicle
327M	10/04/90	40.6	0.6	drowned
397M	10/12/90	6.1	0.6	drowned
398F	10/15/90	6.1	0.6	drowned
427M	10/20/90	5.6	0.6	shot
<u>1991</u>				
426M	07/15/91	14.4	9.4	vehicle
459M	09/09/91	4.5	0.9	intraspecific aggression
460M	09/09/91	4.5	0.9	intraspecific aggression
462F	09/09/91	4.5	0.9	intraspecific aggression
461M	09/10/91	4.5	0.9	intraspecific aggression
466F	09/12/91	4.5	1.0	vehicle
352M	09/15/91	28.9	1.1	vehicle
<u>1992</u>				
430F	05/18/92	24.5	19.4	unknown, necropsy rpt. pending

Table 10

Captive-born red wolves that were released in the Alligator River National Wildlife Refuge but were returned to captivity during the period 14 September 1987 through 30 September 1992.

Wolf# & sex	Date of return	Age at return (mos)	# Mos. in wild	Cause of Return
194F	12/11/87	79.2	2.2	left reintroduction area
205F	11/03/91	114.1	41.8	for breeding
304F	11/19/90	53.7	1.9	for breeding
313F	09/18/91	51.6	13.6	frequenting a community
322F	06/06/88	12.8	1.8	frequenting a community
328M	07/01/91	49.5	10.8	injured by vehicle
337F	10/26/91	41.6	2.5	for breeding

Table 11

Captive-born red wolves that were released in the Alligator River National Wildlife Refuge (ARNWR) and were free-ranging as of 30 September 1992.

Wolf# & sex	Date of initial release	Age at release (mos)	# Mos. in wild ^a	Location of Home Range
300F	04/12/88	22.8	43.3	western portion of ARNWR
319M	09/04/89	27.6	19.9	western portion ARNWR
331M	01/25/89	9.5	40.3	central portion ARNWR
372M	08/03/92	38.8	1.9	private land south of ARNWR
382F	08/03/92	38.8	1.9	private land south of ARNWR
392M	08/01/89	3.2	33.0	private land south of ARNWR
394F	08/01/89	3.2	32.4	central portion of ARNWR
517M	08/03/92	3.5	1.9	private land south of ARNWR
518M	08/03/92	3.5	1.9	private land south of ARNWR
519M	08/03/92	3.5	1.9	private land south of ARNWR
523F	08/03/92	3.5	1.9	private land south of ARNWR

a - Number of months in the wild did not necessarily span the period from the date of release through 30 September 1992 as some wolves were returned to captivity for varying periods of time and subsequently re-released.

During the 5-year experiment, reintroduced wolves were killed by 1 of at least 7 mortality factors (Table 9). Vehicles (n = 8), intraspecific aggression (n = 5), and drownings (n = 4) were the most important sources of mortality. It is a measure of the program's success that all but 2 of the deaths were natural or accidental and apparently not the result of a citizen acting irresponsibly.

PRODUCTION IN THE WILD

During 1992, 2 of 3 pairs of free-ranging adults produced litters in the wild. At least 4 pups survived through fall; 3 of these were captured and outfitted with radio-collars.

For the 5-year experiment, a minimum of 22 wolves were born in the wild (Table 12). These animals were members of 8 litters produced by 11 adults (6 males and 5 females). Two litters were produced in 1988, at least 1 in 1990, 4 in 1991, and at least 1 in 1992. No pups were born in the wild during 1989 because there were no adult pairs together during the breeding season.

Table 12
Red wolves born in the wild in northeastern North Carolina from 14
September 1987 through 30 September 1992.

Wolf# & sex	Parents (M/F)	Year		# Mos. monitored	Comments
		Birth date ^a	Period monitored		
<u>1988</u>					
344F	211/196	05/05/88	04/16/89 09/11/92	40.8	presumed still alive
351F	184/205	04/28/88	11/10/88 01/24/91	26.4	died 01/24/91
<u>1990</u>					
442M	319/300	05/07/90	09/11/90 11/24/90 02/05/91 present ^b Total ^c	2.4 19.8 22.2	-----
443F	"	"	10/02/90 08/20/92 09/04/92 present Total	22.5 0.9 23.4	-----
444F	"	"	01/23/92 present	8.2	-----
<u>1991</u>					
496F	328/313	04/15/91	09/18/91 present	12.4	-----
497M	"	"	09/30/91 present	12.0	-----

Table 12. Continued

Wolf# & sex	Parents (M/F)	Year Birth date ^a	Period monitored	# Mos. monitored	Comments
498F	328/313	04/15/91	09/30/91 12/15/91	2.5	died 12/15/91
499?	"	"	-----	----	observed 06/08/91 fate unknown
500F	392/344	05/01/91	08/15/91 present	13.5	-----
501F	"	"	08/15/91 08/30/91 10/18/91 present	0.5 11.4	-----
			Total	11.9	
502F	"	"	08/23/91 present	13.2	-----
503F	"	"	10/18/91 present	11.4	-----
504F	"	"	10/18/91 present	11.4	-----
505F	331/205	04/28/91	10/31/91 present	11.0	-----
506M	"	"	11/15/91 present	10.5	-----
507M	"	"	11/17/91 present	10.5	-----
508M	"	"	08/02/92 present	1.9	-----
509?	319/300	04/30/91 ^c	-----	----	observed 6/10/92 presumed alive
580F	319/300	<u>1992</u> 05/06/92	-----	----	observed 9/7/92 presumed alive
581M	"	05/06/92	-----	----	observed 9/7/92 presumed alive
582?	"	05/06/92	-----	----	observed 9/7/92 presumed alive
583M	392/344	04/28/92	11/18/92	????	-----

a - Birth dates are estimated from movements of parents.

b - Present indicates 30 September 1992.

c - Total months monitored is calculated for wolves that were not monitored continuously from date of capture through death or 30 September 1992.

Only 2 wild-born wolves died (Table 12), and the fate of 1 is unknown. As of 30 September 1992, wild-born wolves accounted for 63% of the population (19 of 30) (Table 6).

Table 13
Mortality of red wolves born in the wild in northeastern North Carolina from 14 September 1987 through 30 September 1992.

Wolf# & sex	Date of death	Age at death (mos)	# Mos. in wild	Cause of Death
351F	01/24/91	33.5	33.4	intraspecific aggression
498F	12/15/91	8.1	8.1	vehicle

Of the 11 adults that bred in the wild, 1 was wild-born and 10 were captive-born. Wild-born offspring are compelling evidence that captive-born-and-reared adults can make the transition from captivity to life in the wild.

DISPERSAL

During 1992, 4 wild-born wolves dispersed from natal home ranges (Table 14). During the 5-year experiment, wild-born pups exhibited wide-ranging movements as they dispersed from natal home ranges (Table 14). These animals, with the exception of 498F, travelled up to 192 km before establishing new home ranges on private land south or west of Alligator River. 498F was killed by a vehicle before she established a new home range. Dispersal age ranged between 7 and 22 months. The youngest dispersers were siblings (496F, 497M, and 498F) that left their natal home range after their parents were returned to captivity. Likewise, 505F dispersed at a young age after her mother was returned to captivity. It is likely that some or all of these pups would not have dispersed had their families remained intact.

FOOD HABITS

A total of 219 scats were collected during 1992. For the 5-year experiment, analysis of over 2,000 scats indicates that white-tailed deer, raccoon, and rabbit are important food items for wolves.

MANAGEMENT

Trapping was a common field activity during 1992. Wolves were trapped in order to manage potentially deleterious situations and to place/replace radio collars. Twenty-four wolves were captured 35 times, including the first-time captures of 1 wild-born pup from 1991, 3 wild-born pups from 1992, and an adult female coyote. Eight captures were accomplished using acclimation pens modified to act as traps, whereas the remainder used leghold traps (modified #3 soft-catch traps). No wolf evinced significant injury from the leghold traps. All of the animals were in excellent physical condition at the time of capture. Usually captured wolves were re-released immediately after processing.

Table 14
Information about dispersal by red wolves born in the wild in northeastern North Carolina from 14 September 1987 through 30 September 1992.

Wolf# & sex	Birth date	Dispersal date ^a	age (mos)	V/Dir travelled	Comments
344F	05/05/88	03/05/90	22	22 km sw	breeding female ^b
351F	04/28/88	-----	--	-----	died 1/24/91
442M	05/07/90	01/10/92	20	21 km sw	lone male
443F	05/07/90	10/21/91	17	21 km sw	lone female
444F	05/07/90	-----	--	-----	associating w/parents
496F	04/15/91	12/25/91	8	35 km sw	lone female
497M	04/15/91	11/25/91	7	79 km w	lone male
498F	04/15/91	11/15/91	7	13 km s	died 12/15/91
499?	04/15/91	?????????	??	?????????	not yet captured ^c
500F	05/01/91	-----	--	-----	associating w/parents
501F	05/01/91	-----	--	-----	associating w/parents
502F	05/01/91	-----	--	-----	associating w/parents
503F	05/01/91	09/01/92	16	192 km w	lone female
504M	05/01/91	-----	--	-----	associating w/parents
505F	04/28/91	02/09/91	10	85 km w	lone female
506M	04/28/91	-----	--	-----	associating w/parents
507M	04/28/91	-----	--	-----	associating w/parents
508F	04/28/91	-----	--	-----	associating a/parents
509?	04/30/91	?????????	??	?????????	not yet captured ^d
580?	05/06/92	-----	--	-----	not yet captured ^e
581?	05/06/92	-----	--	-----	not yet captured ^e
582?	05/06/92	-----	--	-----	not yet captured ^e

a - No date is listed for wolves that did not disperse or are believed to not have dispersed from their natal area.

Questions marks are listed for 499 because we have no information about the movements of this animal.

b - 344F's radio-collar malfunctioned between 8 and 11 September 1992. She is presumed to have survived through 30 September.

c - 499? was observed 6/8/91, fate is unknown.

d - 509? was observed on 6/10/92, presumed still alive.

e - Pups 580, 581, and 582 were observed in natal area on 7 September 1992 and are believed to still be in the area associating with parents.

Female 344's capture is noteworthy. She was the first wolf born in the wild to the project during spring 1988. She was initially captured after much effort on 16 April 1989. She was monitored until her radio-collar malfunctioned around 09/11/92. Recapture efforts had begun months earlier and culminated in her capture on 28 November. She was in excellent shape and weighed 57 lbs. (she weighed 54 lbs. when captured on 04/16/89). She produced a litter of at least 5 pups in 1991 and a litter of at least 1 pup in 1992. We expect her to produce a third litter in 1993.

For the 5-year experiment, 24 of the released wolves were recaptured 63 times, and 17 of the wild-born wolves were recaptured 39 times. Most recaptures were necessary in order to meet program objectives (replace radio-collars, place a specific wolf with a mate, translocate an animal to a suitable site, etc.). Every management problem was resolved without inflicting significant long-term damage to animals and with little or no inconvenience to residents of the area.



Red Wolf Volunteer Marilyn Knight treats red
wolf pup. 5/92 AB

CAPTIVE BREEDING

Between 9 and 24 wolves were maintained in captivity at ARNWR during 1992. For the 5-year experiment, captive breeding was an integral component of the reintroduction. Since 1986, 79 wolves were held in captivity at ARNWR for varying periods of time. As of 30 September 1992, 10 wolves were in captivity. During the 5-year experiment, 20 captive adult pairs produced 34 pups. With access to 12 pens, ARNWR will continue to be an important component of the red wolf captive breeding program.

SUMMARY

By almost every measure the reintroduction experiment was successful and generated benefits that extended beyond the immediate preservation of red wolves to positively affect local citizens and communities, larger conservation efforts, and other imperiled species. By late December there were 27 radio-collared wolves in eastern North Carolina. Thirty-three percent (9 of 27) of these wolves inhabit refuge and adjacent Department of Defense land, while 67% inhabit private land south and west of the refuge. During the last 5 years 3 important points surfaced:

1. Since every management problem was resolved without inflicting long-term damage to animals and with little inconvenience to residents of the area, it is established that wolves can be restored in a controlled manner.
2. Significant land-use restrictions were not necessary in order for wolves to survive. Indeed, hunting and trapping regulations for ARNWR remained essentially unchanged or were further relaxed during the experiment. Additionally, no restrictions were needed in order for wolves to survive on private land.
3. The current reintroduction area, which encompasses about 250,000 acres, probably cannot support 30 wolves for an extended period of time. Dispersal outside the reintroduction area by wild-born wolves has occurred and will continue. In addition to dispersal, the future of the wolf population is threatened by its smallness; many events (e.g. disease outbreaks) can cause extinction of small populations.

Increasing the size of the wolf population minimizes threats to its survival. The primary factor limiting population size is the size of the reintroduction area. A larger reintroduction area would provide habitat for dispersing wolves and provide the USFWS opportunities to release additional wolves. Fortunately, the reintroduction area can easily be enlarged by adding to the project the Pocosin Lakes National Wildlife Refuge. Pocosin Lakes is ideal for probably 15 to 25 wolves because of its large size, remoteness, abundant prey populations, and proximity to Alligator River NWR.

ACKNOWLEDGEMENTS

Many people and organizations contributed to the success of the 5-year experiment. Michael Morse, Art Beyer, Jennifer Dagen, Jonathan Windley, Chris Lucash, and other field personnel contributed mightily. Warren Parker and later Gary Henry acted as species coordinator and John Taylor and later Jim Johnson acted as manager of Alligator River NWR. All provided guidance and support. Bonnie Strawser helped with educational programs, volunteers, fund-raising, and procure-ment. Beverly Midgett and Janice Lane provided secretarial and moral support. Other staff members at ARNWR also con-tributed. Roland Smith, Sue Behrns, and Will Waddell from the Point Defiance Zoo and Aquarium provided technical and moral support. Recovery Team members Roland Smith, Don Wood, and Drs. David Mech, Ulie Seal, Mike Pelton, and Vic Nettles provided technical and moral support. Steve Jackson, Janet Walker, The North Banks Rotary Club, The Wake County Wildlife Club, The Coastal Wildlife Refuge Society, and The National Fish and Wildlife Foundation assisted with fund-raising.

3. Waterfowl

Historically, large numbers of waterfowl have not utilized ARNWR, but the refuge does support a substantial population of wood ducks year-round utilizing the numerous ditches, canals, natural openings, and swamps. Diving species such as scaup, canvasback, redhead, bufflehead, and mergansers can be found on the Alligator River and the associated sounds.



Wood duck populations continue to slowly build as wetland restoration continues.

JCJ

The fifth year's management of the farm fields attracted only fair numbers of waterfowl. Peak numbers were 305 blacks, 1090 mallards, 5500 pintails, 5440 green-winged teal, and 846 ring-necked ducks. Peak total was 13,855 from the aerial survey done on January 30. Tundra swan use rose to highest use-days and peak in the 5 year history of the area, with a peak number of 460 birds. The results of this year's surveys are given below in Table 15.

Table 15
Waterfowl Survey
ARNWR Fall 1991 - Spring 1992

Waterfowl Type	Oct 9	Nov 1	Dec 6	Dec 10	Jan 9	Jan 15	Jan 22	Jan* 30	Feb 6	Feb 21	Feb 28	Mar 17
Mallard	10	58	100	283	329	450	388	1090	323	227	227	56
Black Duck	0	34	85	128	71	198	264	305	219	252	181	8
Pintail	60	318	0	620	400	1500	2026	5500	3761	67	0	0
Widgeon	0	0	0	0	54	8	116	50	105	59	40	79
Gr.Winged Teal	0	312	400	1925	2830	1535	1695	5440	4670	1222	573	97
Wood Duck	189	252	146	183	252	115	243	60	152	143	107	3
Ring Necked Duck	0	20	230	410	490	70	661	650	846	361	157	2
Gadwall	0	0	0	6	0	0	0	0	0	0	18	0
Coots	0	0	0	0	0	0	4	0	0	0	0	34
Canada Goose	0	0	0	0	0	0	14	0	0	0	0	0
Tundra	0	0	0	83	300	6	400	460	0	401	60	0
Other	25	238	2000	559	260	550	340	300	545	221	175	45
TOTALS	284	1232	2961	4197	4986	4432	6151	13855	10621	2953	1538	324

*Aerial Survey



A few of our wood duck boxes are used -
mostly by non-target critters! 2/92 JCJ

8. Game Mammals

In 1992, the refuge developed a cooperative black bear research study with the University of Tennessee (UT). Information such as sex and age distribution, age at primiparity, birth rate, survival, and density of the bear population will be gathered to predict result of bear related management actions. (See Section D.5.)

Also this year, in cooperation with the North Carolina Wildlife Resources Commission (NCWRC), the refuge conducted bear track counts and installed bait stations to compare the effectiveness of various census methods for trend data. At present, there is not an established technique for monitoring trends of bear populations on the coastal plain of eastern North Carolina. The study was conducted by establishing 2 lines 5 miles in length. Track counts were run for 5 consecutive days on each line.

During the second week, sardine bait stations were established on one line and raspberry extract stations on the other. Bait stations were set .5 miles apart. After 5 consecutive days, baits were then switched on the 2 lines to further test response of the respective attractants.

Since 1972, there has been a prohibition on hunting black bear in Dare County. This local ordinance was justified on the claim that sport hunting had nearly decimated the population prior to 1972. During the last 17 years, the bear population has apparently increased in size. During January 1990, local politicians rescinded the 1972 ordinance prohibiting hunting of bears in Dare County. The NCWRC established a bear season for Dare County in 1991 and 1992 at the request of the County Commission. At this point, the refuge does not plan to allow bear hunting in the refuge because insufficient data is available upon which to develop a harvest strategy.

H. PUBLIC USE

1. General

Certainly the highlight of Alligator River's Public Use Program for 1992 was the scheduling and completion of a public use review and the resulting Public Use Management Plan. June 8-10, Frank Podriznik (PUM, Atlanta), Richard Mattison (PUM, Atlanta), Karen Cartlidge (RF-III, Atlanta), and Kelly Davis (Mattamuskeet NWR) joined WIS Strawser to evaluate potential sites and brainstorm conceptual plans. The group reached a consensus on the sites to be developed and the general direction of the program, Strawser wrote the resulting Public Use Management Plan, and RO approval was received on short notice. With this plan in place, the refuge is finally able to pursue the development of limited non-consumptive facilities for the refuge. Efforts began in July to find private and government funding sources for these projects. It is hoped that 2 sites will be functional by the end of 1993. Specific projects involved are discussed in appropriate sub-sections following.

Historically, the public use program has primarily been consumptive in nature, with the hunting program being most active. In the past, little, if any organized non-consumptive public use occurred on the refuge. The staff neither anticipates nor desires Alligator River to develop a large public use program; however, plans specifically target providing a very limited number of sites and a very high quality experience at those sites.

Total visits to the refuge in 1992 were estimated to be 10,706.

Administrative offices for the refuge remained in the GSA leased office space in Manteo. A few visitors continue to locate the office, but most information was disseminated by telephone, correspondence, and through the news media. During 1992, the refuge focused on providing a greater number of media contacts while keeping the messages short and simple. One method that proved successful was taking a number of black and white photographs with film provided by the local newspaper. Shots of wildlife, as well as refuge staff performing regular duties, volunteers receiving awards, etc. were provided as exposed film. The photos were run regularly with short, informative captions. A total of 29 news releases and 6 radio/tv spots were done.

2. Outdoor Classrooms - Students

Many teachers have established regular patterns in their utilization of the marshes of Pea Island for independent use with their classes. More recently, classes have begun to show an interest in visiting Alligator River NWR. Until the planned trails, etc. are "on the ground", the staff will continue to handle groups whenever and wherever possible, leading discussions and answering questions. More independent use by classes is anticipated once the trails, kiosk, and interpretive panels are in place.

To encourage contact between the classes and the refuge and to ensure a reasonable level of "wildlife literacy" in the local public schools, a core group of volunteers have prepared and stand ready to present in-classroom programs on assorted wildlife and refuge topics. Programs on the Red Wolf, Birds, Mammals, Amphibians, Reptiles, Fish and Animals without Backbones and Bird Banding and Migrations were available. These educational programs were presented to 1,785 participants (see Table 17, Interpretative Programs).

To encourage educational endeavors in the community, refuge staff served as judges for both the Manteo and Cape Hatteras High School Science Fairs and prepared packages of material (for vertical files) at all local high schools and middle schools (re: red wolf). WIS Strawser coordinated an effort to combine the information concerning educational programs available to eastern NC school classes. A joint leaflet was prepared (see packet in back). Sponsors of the effort included USFWS, NC Aquarium, NPS, Jockey's Ridge State Park, Elizabeth II State Historic Site, and Outer Banks Audubon.

3. Outdoor Classrooms - Teachers

There were no local requests for teacher training workshops in 1992. Since Alligator River and Pea Island Refuges are located in an area rich in conservation education/interpretation agencies, these refuges do not receive the requests common on

other stations that are often the sole sources available. The North Carolina Aquarium, Jockey's Ridge State Park, Nags Head Woods Ecological Preserve, and Cape Hatteras National Seashore offer environmental education and teacher training activities. Teachers here are hounded constantly to attend such functions. For this reason, the refuge has chosen to focus more on other educational needs rather than attempt to compete with other conservation agencies. The leaflet mentioned in the previous section offers teacher assistance in planning field trips.

In September, WIS Strawser assisted in conducting the Region IV Environmental Education Workshop at Okefenokee NWR. She also conducted an EE Teacher Workshop for Roanoke River NWR in November.

4. Interpretive Foot Trails

As mentioned earlier, no official trails exist on ARNWR. However, the approval of the Public Use Management Plan during 1992 paved the way for the development of several trails in the near future. The highest priority is the Creef Cut Wildlife Trail and Handicapped Fishing Area. The project involves converting an abandoned section of Highway 64 into a handicapped accessible trail with handicapped accessible bank fishing closely associated. The half-mile roadbed lies between a beautiful freshwater marsh and a moist soil management unit. A USFWS Challenge Grant, monies from the DoD (both Air Force and Navy), and assistance from the NCDOT should allow the accomplishment of this project during 1993. See Figure 1 for a conceptual plan of the Creef Cut Project.

In addition to the project on Creef's Cut, a half-mile trail on the south end of Buffalo City Road is scheduled to open for public use also during 1993. Sandy Ridge Trail will utilize a washed-out roadbed (Sandy Ridge Road) which parallels Milltail Creek. The area is excellent habitat for neotropical migrants and wetlands education. This trail is closely associated with the Milltail Creek Canoe/Kayak Trail System. Sandy Ridge Trail is shown in Figure 2.

Both of the above projects are "panning out" to be excellent "partners" projects for the refuge. Local, State, and regional support has been outstanding so far. Time will tell how it goes when it comes to actually getting the trails on the ground!!

6. Interpretive Exhibits/Demonstrations

Refuge staff manned displays and exhibits at the usual annual events around Dare County and eastern North Carolina. Table 16 represents the Outreach Exhibits/Shows for the refuge during 1992.

Table 16
Outreach Exhibits/Shows

Event	# in attendance
Exhibit at Dixie Deer Classic, Raleigh, NC	50,000
NC Wildlife Sportsman Show, New Bern, NC	30,000
March Exhibit at Dare County Library	3,000
Dare County Job Fair (12 presentations)	600
Washington Co Community College-Career Day	50

7. Other Interpretive Programs

Red wolf howlings have proven to be popular programs on the refuge. More than a dozen public howlings were advertized and conducted during 1992. In addition, staff cookouts, volunteer get-togethers, etc. often included a howling. The staff intends to pick up on the momentum of these programs during 1993 by involving more community organizations.

A number of off-refuge programs were conducted during 1992 by staff and volunteers. Many dealt with the Red Wolf Program; others addressed specific and general refuge related topics. These programs and other related off-refuge programs are shown in Table 17.

Table 17
Off-Refuge Programs - 1992
Alligator River NWR

Program Description	# programs	# participants
Bird Banding and Migration (standard volunteer)	8 (school)	120
ARNWR and the Red Wolf	1 (school)	55
Red Wolf Update	1	60
Red Wolf Program (standard volunteer)	7 (school)	210
Misc. (snakes, sharks, exotic wildlife, etc.)	7 (school)	190
Birds (standard volunteer)	12 (school)	360
Red Wolf (pre-howling)	4	42
Red Wolf (conservation field day)	24 (school)	503
Management on AR and PI NWRs	1	40
Red Wolf (RW staff) -		
University of Florida, Gainesville, FL	1	85
Audubon Society, Goldsboro, NC	1	35
Bath Jr. High School, Bath, NC	2 (school)	50
Carlton University, Northfield, MN	1	35

8. Hunting

With approval of the master plan shortly after establishment, the refuge was divided into 3 basic public use areas, with several additional safety or management zones closed to all hunting. As new areas have been acquired, they have been added to 1 of the 3 existing categories, or (in the case of the farm fields) put into a newly created category. The farm fields were designated as open to all authorized uses during September and October (except waterfowl hunting), but closed to public entry during all other times. With additions and deletions of land in the refuge, the ratio of land designated for hunting with chase dogs and land designated as chase dogs not allowed has remained relatively constant (1:1). The 5-year review of the master plan is scheduled for 1993. Some changes in the hunting area designations will probably result from this review.

By the 1992-93 hunting season, the 6,000 acres of USFWS land around the Frying Pan area of Tyrrell County had been officially transferred to Pocosin Lakes NWR and their staff had assumed the responsibility for managing the hunting there.

For the first time ever, refuge hunting permits were required for the 1992-93 seasons. Due to the administrative requirements associated with minor changes in hunting regulations, refuge staff removed all special refuge regulations listed in the Federal Register and replaced them with "Permit required for all refuge hunts." The permit was printed on the front of the hunt leaflet and contained a certification statement that the leaflet had been read and understood. No apparent problems resulted from the permit requirement. Public response was positive.

White-tailed deer continued to be the most sought after game species on refuge lands. Since Alligator River contains over 150,000 acres of habitat traversed by more than 150 miles of logging roads, and because many of these roads share junctions with State roads, it is difficult to establish effective hunter check stations. The NCWRC again required hunters to register hunter-killed deer with a local wildlife cooperator agent; however, they assume that an estimated 40% go unreported. In past years, the figures reported by the State have been utilized and extrapolated to provide more realistic estimates. The best estimate indicates approximately 210 deer were harvested on the refuge during the 1992-93 season.

In September, the annual hunter information meeting was held at the Manns Harbor Community Center. Approximately 30 people attended. Although there were no significant changes in the refuge regulations this year, there were routine comments concerning youth hunting regs, waterfowl unit management, road

maintenance, areas open to chase dogs, roads open to motorized vehicles, etc. NCWRC Officer Earl Brinkley was also present to provide current information about State and Gamelands Regulations.



A typical buck from pocosin habitat. 11/92 BWS

This year was Dare County's second annual bear season since the NCWRC and County Commissioners re-instated a bear season. The 5 day bear season ran November 9-14; 3 bears were documented as taken.

The 16 hunter information boards on the refuge were replaced with brochure boxes labeled with signs stating "Hunter Information". Extra effort was made throughout the seasons to ensure that leaflet were always available, since the brochure contained the required hunting permit. This new procedure saved money and time in administering the refuge hunt and assuring that the necessary information reached the public.

September 7, bow season began along with the usual weekend patrol assignments for refuge officers. Muzzle loader season came in on October 7, a 3 day duck season occurred October 5-10, and regular gun season started on October 12. On November 1, the farm field gates were closed and locked. For the rest of the year (and through September, 1993), this area was closed to all public entry.

Waterfowl seasons were October 1-3, November 26-28, and December 27 - January 1. A limited amount of waterfowl hunting took place on the refuge, but most occurred over open water in the sounds and in Milltail Creek. The farm fields were open to public use during October; however, the area was closed to waterfowl hunting.

Though the new regional hunting policy for youths has been difficult to enforce, the fact that Dare County Schools already had the State Hunter Safety Course as a part of the seventh and eighth grade curriculum certainly helped. Beginning in 1991, North Carolina now requires all first-time hunters to successfully complete the Hunter Safety Course. In addition to the courses offered in the public schools, NCWRC Officer Brinkley and Volunteer Jeff Nycze conducted several extra classes to enable other youths in the area to qualify to hunt on the refuge. The refuge staff has yet to hear of a person who has needed the course and was unable to find a class.

Estimated public hunting activity appears below:

<u>Activity</u>	<u>Visits</u>	<u>AH</u>
Duck	237	1,082
Deer (gun)	1,885	11,340
Deer (bow)	340	1,763
Small Game	285	1,260
Upland Game Birds	90	262

There are very few places to quail or rabbit hunt on the refuge. Small game hunting is primarily for raccoon, squirrel, and rabbit.

9. Fishing

The heaviest recreational fishing effort in the vicinity on the refuge is in the surrounding sound system from October through April. Fishing pressure on the refuge is relatively low and is a reflection of the isolation of the area and limited access rather than of low catch per unit effort. Angling for bluegill, crappie, chain pickerel, channel catfish, flier, largemouth bass, and yellow and white perch is considered good.

During October, Alligator River sponsored a "Pathway to Fishing" event for 90 eighth graders at Manteo Middle School. Twenty-five instructors from USFWS (ARNWR, Edenton NFH, Enhancement, Fisheries Assistance), NPS, NC Aquarium, NCDMF, NC State Parks, etc. participated in conducting the activity, which was considered to be a big success by all involved.



The kids all agreed...this was their favorite part in Pathway to Fishing!

10/92 BWS

During 1992, there were an estimated 1,803 fishing visits to the refuge with 7,212 activity hours spent participating in this activity.

10. Trapping

Furbearer trapping was allowed under North Carolina regulations. Since trapping is considered a commercial use of the refuge, neither visits nor activity hours are normally recorded under public use. For the 1992 trapping season, no special use permits were issued for refuge trapping.

11. Wildlife Observation

Canoeists enjoyed paddling on Milltail and Whipping Creeks and observing an occasional alligator, wood duck brood, or other wildlife in the area. The Milltail Creek Canoe/Kayak Trail development began during 1992. The trail system is expected to be completed by March, 1993. (See map in informational packet.)

Wildlife photographers utilized the refuge to some extent for a chance at bear, deer, or any number of birds and other animals. General habitat scenes were popular for an adventuresome few.



The proposed Milltail Canoe/Kayak Trails and Sandy Ridge Wildlife Trail offer prime viewing of neotropical migrants. Though obviously not a shot of the refuge - prothonotary warblers are frequently observed in this area. LD

The following figures represent wildlife/wildlands observation during 1992:

<u>Activity</u>	<u>Visits</u>	<u>AH</u>
Foot	2,085	4,171
Vehicle	5,201	10,403
Boat	731	2,925
Photography	185	555

17. Law Enforcement

Refuge collateral duty officers participated in considerably more LE patrols during the 1992-93 season than in the past. For the most part, each hunting day had at least 1 officer working. Heavy use days involved all officers.

As stated earlier, extra attention was paid to keeping refuge hunt leaflets/permits in the leaflet boxes. Prior to the opening of the seasons, regulatory signs were checked and replaced where needed.

During 1992, ARM Windley completed the 9-PT Basic LE training at FLETC bringing our total collateral duty office number to 5. All officers completed the annual LE Refresher and semi-annual firearms qualifications.

Three NOV's were issued on the refuge during 1992, 2 for transporting a loaded firearm and 1 for hunting with the aid of bait. In addition, the following State NOV's were issued on the refuge:

- 2 Federal Duck Stamp violations
- 3 State Duck Stamp violations
- 3 Unplugged guns
- 6 License violations
- 2 Night hunting violations
- 4 Closed season hunting violations

Late in 1991 and early in 1992, there were a series of break-ins around the maintenance facility resulting in the theft of a number of tools, binoculars, radios, etc. In December, the culprits were apprehended and approximately half of the stolen items were recovered. They are being prosecuted by the State.

18. Cooperating Associations

In April of 1989, a group of refuge volunteers formed the Coastal Wildlife Refuge Society, a non-profit support organization for refuge I&R functions. During 1992, the Society completed it's third full year of existence.

The first issue of WINGS, the newsletter of the Society, was published in the Spring. The newsletter has been a great medium for keeping members abreast of happenings on the Refuge and the Society. It is also proving to be a great source of membership renewals. Several issues are provided in the informational packet in the back of this report.

During the spring of 1992, a valuable member of the Society and Refuge Volunteer was lost. Herb Lewis passed away after a short, but intense battle with cancer. Money left by Herb and additional funds donated by his friends and family were designated for the turtle project. A new 4-wheeler, 2 radios, and a pair of binoculars (see list below) were purchased. The remaining money was put toward the new Pea Island leaflet.

A \$14,000 contribution from the National Fish and Wildlife Foundation (from the special red wolf funds) was designated for a truck, hospitalization insurance for a foreign student, and a TV/VCR combination. Also, the Society assisted Pocosin Lakes NWR with their dedication ceremony by accepting several designated donations on their behalf.

Major refuge projects for the year included:

- providing a \$50/week stipend for a summer intern for Pea Island
- upgrading of the public use computer system with a MacIntosh Classic, Laser printer, and several graphics software packages.

- Ford 150 4 X 4 pick-up truck
- TV/VCR combo
- 4-wheeler
- 2 high frequency hand-held radios
- 2 pairs of binoculars
- a 35 mm camera
- health insurance for foreign red wolf intern
- design and printing of 10,000 copies of a new general leaflet for Pea Island

Table 18

Coastal Wildlife Refuge Society - Financial Statement- FY 1992

Sales Unit:

Revenues-			
Non-taxable sales		\$ 5,210.18	
Taxable sales		8,928.93	
Total		\$14,139.11	
Expenses-			
Cost of goods		\$12,146.96	
Sales tax		462.38	
Total		\$12,609.34	
Net Revenue (included in revenue section below)			\$1,529.77

Revenue:

donations- red wolf from NFWF	\$14,000.00	
donations- red wolf - general	764.96	
donations- PLNWR	200.00	
donations- Herb Memorial	6,580.00	
donations- dues/general	4,853.00	
Total donations	\$26,397.96	
Interest earned	272.04	
Net revenue from sales	1,529.77	
Total revenue		\$28,199.77

Expenses:

Herb Memorial (tp/Pea Island)	\$ 6,580.00	
PLNWR	200.00	
Red wolf- to NFWF	764.96	
Red wolf- general	13,959.02	
Run Project	7,381.66	
Refuge- general	4,317.22	
Total USFWS expenditures	\$33,202.86	
Administration of CWRS	129.25	
Total Expenditures		\$33,414.11

Balance on hand October 1, 1992	\$7,980.07
Total Revenue/Expenses for FY 1992	-\$5,132.34
Balance on hand September 30, 1992	\$2,847.73

At the winter Board meeting, a decision was made to increase the size of the Board by 1 member and assign duties for the 3 non-executive positions. The 1993 Board will consist of President, Vice-president, Secretary, Treasurer, Membership Chairman, Newsletter Chairman, Sales Chairman, and Refuge Liaison.

See Table 18 for complete financial information for FY 1992. Note that a total of \$33,202.86 was spent on refuge projects.

I. EQUIPMENT AND FACILITIES

1. New Construction

As reported in last year's narrative, construction began on new maintenance facilities for Alligator River in October, 1991. Wimco Corp. of Washington, NC completed construction of the \$572,000 facility in July (formally accepted on 7/16). The completed facilities include a 40' x 108' shop/office building, a 24' x 80' vehicle storage building, two 2,000 gallon above ground fuel tanks and pumps, well, security fencing, and all associated site work. The office section of the main building contains space for 8 people, a break room, shower, and lockers. The only real problem with these badly needed facilities is that the refuge does not have the funds to equip them properly. What's new, huh?? Excess office equipment was obtained from



The East Lake maintenance facilities were completed in July. The staff finally has a place to hang their hats. 9/92 JCJ

several sources and the crew had set up "housekeeping" by late July. RM Johnson served as the construction rep for the project.

Several other RES's for additional construction were submitted in July since funds still remained in this construction account. These include purchase and installation of water treatment hardware, construction of 250 linear feet of vehicle storage (pole sheds), graveling the entrance road to the buildings (Milltail Road), and constructing an oil storage building. RO Engineering staff visited the refuge 9/29-30 to select building locations and develop site plans.

2. Rehabilitation

Work finally began on force account replacement of 28 wooden bridges with structures and fill during 1992 (construction funding). Over a year of work was required to obtain all of the necessary permits for this project. This work is multi-purpose in nature - replace unsafe wooden bridges that vary from 20' to 50' in length (virtually all of these bridges are unsafe for even standard vehicles, much less heavy equipment) and restore natural hydrology to about 60,000 acres of forested wetlands by utilizing water control structures and fill in this replacement. Most of the pocosin habitat on the refuge has been severely impacted by drainage from inter-connecting road ditches/canals. Also, project completion will provide the needed water control for large scale use of prescribed fire in these fire adapted wetland habitats.

Although severely hampered by wet weather and equipment breakdowns, the staff succeeded in replacing 5 bridges starting in July. Those replaced included Borrow Pit Road X Highway 264, Long Curve X Borrow Pit, Blueberry X Milltail, Bay X Milltail, and Butler X Sandy Ridge. Also, installation of the Lake Worth structure (did not replace a bridge) was completed in order to decrease outflows of fresh acidic water directly into Pamlico Sound. An estimated 4,000 - 4,500 cu. yds. of fill were hauled to complete these projects which occupied most of the maintenance crew's time during the latter part of 1992.

As part of the above project, 25 aluminum water control structures were purchased during the year - at a cost of \$57,720.

The 120 acre permanent water area of the South Twiford Unit was dewatered this year to facilitate levee repairs. Over 30 "slump" areas, and washouts were repaired by replacing fill and compacting. This unit was partially disked to set back plant succession. Wet weather and equipment breakdowns prevented completing the task.



The bridge replacement/wetland restoration project finally got under way this year. Unsafe wooden bridges were torn out.....
8/92 JCJ



.....and replaced with structures/fill. 8/92 JCJ

Refuge staff also disked about 100 acres of moist soil units (between rainy periods) to set back plant succession. This task, normally accomplished by the co-op farmers, is 2 years behind schedule due to wet conditions. Most of the 1800 acres of such habitat will have to be burned prior to disking because of an extremely heavy rough. Inability to renovate these units on a schedule has severely reduced waterfowl food production.

3. Major Maintenance

Stroud Engineering, Kill Devil Hills, NC, completed 2 separate boundary retracement surveys (Lake Neighborhood and East Lake) totaling 9.1 miles. These 2 projects finished the internal boundary relocation work needed around communities where acquisition of inholdings is highly unlikely.

The refuge staff posted about 75 miles of boundary lines during the year, including the 9 miles mentioned above and 10 miles from a survey late in 1991 (Manns Harbor, Mashoes). The staff also completed posting roughly 25 miles (out of 150 miles) of perimeter boundary along the various water bodies that surround the Dare County peninsula. Those areas posted included East Lake, South Lake, Swan Lake, Swan Creek, and a small part of Alligator River upstream of Swan Creek outlet. Completing this work will occupy a lot of staff time (and a lot of signs) during 1993.

After completing all of the environmental prerequisites, a 5 acre borrow pit was opened on the Creef A-2 unit of the farm. Fill material from this pit will be used in completing the bridge replacement project and in road rehab.

Refuge staff hauled and placed 1,500 cu. yds. of fill on various farm unit roads. This fill material was purchased by the co-op farmers from a local supplier as part of their rent.

As reported in the 1991 narrative, the refuge has embarked upon a major effort to improve the primary road system. Long unmaintained, most of these roads are totally overgrown with road shoulder vegetation and are generally nothing but 1 lane, 4x4 only during dry weather. Wet weather during 1992 prohibited making substantial progress in this project. In spite of poor working conditions, 6 miles of road (Point Peter and parts of Koehring and Blueberry Roads) were completely reworked. Road shoulder vegetation was removed by D-6 and KG shear blade, recrowned by use of angle blade on a crawler, disked, fill hauled to major holes/washouts, and regraded. Although time consuming, this work is well worth the effort because of the enhanced management capabilities to most refuge programs.



This refuge has over 200 miles of road, most in danger of being lost due to plant encroachment. Koehring Road, pictured above,..... 9/92 JCJ



.....was reworked with the refuge's new D-6H. Believe it or not, the same section of road is shown above and here. 9/92 JCJ

The refuge installed aluminum flap gates on Dare County's Highway 264 X Link Road culverts. During periods of wind driven tides, these 60" culverts were causing water inflows onto the farm unit and drastically increasing pumping costs. The County purchased the \$3,000 gates and obtained the necessary permits.

Equipment/vehicle repairs at this station were a never ending problem - and a consistent budget breaker - due to the "junk" this station is forced to use. The more significant maintenance items completed during 1992 are as follows: repair Bucyrus 3/4 yd. dragline by replacing all clutch/brake bands, travel "dogs", track adjusters, track pins, sprockets, and drive chains (cost of \$11,200); rebuild engine in GMC truck/ tractor (\$4,000 cost); completely rework a 25 ton lowboy trailer by constructing and installing dove-tail/drive on ramps, install hydraulic pump to operate ramps, install bed outriggers, replace brake air chambers (cost \$4,200); replace engines in 2 vehicles (replacement engines, cannibalized from Park Service excess vehicles); replace injectors in Cat D-6 and in JD 350 crawlers, etc. It is sincerely hoped that MMS funding will make some inroads into the backlog of equipment maintenance/replacement needs existing in the Service.

4. Equipment Utilization and Replacement

Equipment borrowed during the year included Mattamuskeet's dump bed trailer and 4x4 tractor, Pee Dee's 5 yard dump truck, Back Bay's 15 yard dump truck, Pocosin Lakes' truck/tractor and lowboy trailer, and Okefenokee's trail pile driver.

Equipment loaned to other stations included the Bucyrus dragline to ACE Basin for 8 months, Cat excavator to Pocosin Lakes several times during the year, 35 ton drop deck lowboy to Pocosin Lakes and ACE Basin.

Major cleanup of junk equipment (obtained from excess property over the years) was accomplished by direct transfer to the Navy Bombing Range for use as targets.

Several pieces of equipment were purchased during the year. These included a Cat D-6H LGP crawler (\$225.6K - received 5/5); KG blade for the D-6 (\$17.5K - received 6/15); 50 ton Boaz lowboy trailer (\$28K - received 10/20); and 15 yd. Ford dump truck (\$68.0K - received 12/5). A soft track crawler, Terrevah Model 10T (\$121K) was received 2/2. The machine, ordered with hydrostatic drive, immediately developed final drive problems and after repeated attempts to fix it, was returned to the factory in July. The entire drive train, including engine, is being replaced with a standard transmission and is scheduled to be shipped from the factory in January 1993.



After receiving extremely high bids from other companies, the decision was made to try a relatively new name brand of soft-track machine, a Terrevah Model 10T. 2/92 JCJ

A local hunting club donated two house trailers to Mattamuskeet NWR who, in turn, transferred 1 unit to Alligator River. It will be used to house researchers.

8. Other

Crane Operator Bruce Creef spent 3 two-week details at ACE Basin NWR assisting in levee rehab work.

J. OTHER ITEMS

1. Cooperative Programs

USDA gypsy moth traps were monitored on the refuge once again by APHIS out of Elizabeth City, NC.

An SUP was issued to Dare County to provide draining of county farm land (located adjacent to the refuge farm fields).

One SUP was issued to operative beehives on the refuge.

An SUP was issued to USCOE and Dare County to use an existing disposal site for deposition of dredged material resulting from deepening of the Stumpy Point navigation canal.

3. Items of Interest

Roger Erb, Service Fire Coordinator, and Skippy Reeves, Regional Fire Coordinator, visited during March to review the refuge fire program.

Numerous Air Force personnel visited the refuge during the year to discuss various items - ranging from water management to endangered species management.

The Hollingsworths spent 3 days photographing refuge wildlife during March for their upcoming book.

Pam Mathias and Kathy Short, DOI Secretary's Office, visited 5/12-13 for briefings on several issues - Oregon Inlet, NCDOT's Highway 12, red wolf, piping plovers, etc.

Assistant Secretary Hayden, DOI, visited in June for briefings on the same topics.

The Service's Chief Realty Appraiser, WO, and several regional Realty personnel spent July 2-4 reviewing land acquisition activities at Alligator River.

Three of the regional Personnel Office staff (Consaundra Jackson, Dorrie Davis, and Jackie Flynn) spent June 23-25 at the refuge being briefed on various refuge programs. They were given intimate views of duties performed by various personnel.

The local SCS District Conservationist and several SCS design engineers requested and were given an in-depth tour of the refuge's water management program.

Public Use Review was conducted by Frank Podriznik, Richard Mattison (Regional Public Use Office), and Karen Cartlidge (Deputy Associate Manager, RF-III).

A seemingly endless string of university professors, graduate students, state agency, and other federal agency personnel visited to discuss research projects, environmental compliance issues, etc.

Several WO staff visited the refuge while on vacation to the Outer Banks.

Len Lussier and William Dolan, DOI's IG office, spent 10/19-20 on the refuge looking at maintenance deficiencies for a report to Congress.

While assisting Pocosin Lakes NWR in their dedication ceremonies on October 10, RM Johnson chauffeured Director Turner to and from the airport. The Director was given a quick windshield tour of Alligator River.

RM Johnson served as a team member on an inspection of Engineering 11/16-20.

Numerous other visits were made by RO staff during the year (Engineering, Surveyors, Appraisers, Realty Foresters, etc., etc.)

4. Credits

The Narrative Report was a joint effort by the entire staff. Special credit goes to WIS Strawser for editing and OAC Lane for typing.

PEA ISLAND NATIONAL WILDLIFE REFUGE

Manteo, North Carolina

ANNUAL NARRATIVE REPORT

Calendar Year 1992

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

INTRODUCTION

Pea Island National Wildlife Refuge was established in 1938 by Executive Order 7864 as a wintering area for the greater snow goose and other migratory waterfowl. At the last survey, the refuge contained 5,915 acres of beach, dunes, high marsh, dikes, salt marsh, impoundments, ponds, and salt flats; however, severe ocean overwash and beach erosion has caused the loss of a portion of the beach/dune acreage. Presidential Proclamation #2284 closed 25,700 acres of adjacent waters in the Pamlico Sound to migratory waterfowl hunting.

The refuge is located on the north end of Hatteras Island, a coastal barrier island which is part of a chain of islands known as the **Outer Banks**. These islands are separated from the mainland by a series of marshes and/or sounds which are up to 25 miles wide.

Pea Island's climate is generally moderated by the ocean, thus it is cooler in the summer and warmer in the winter than the NC mainland. The average daily maximum temperature is 69 degrees and the minimum is 56 degrees. Due to heavy and prolonged storms, the average rainfall is 55.6 inches, most of which occurs during the winter and summer. It is frequently windy during both day and night with 11 mph as the annual mean wind speed. The prevailing summer wind is from the southwest, and winds are usually from the northeast in the winter.

The diversity and abundance of bird life on Pea Island explain its reputation of being a "birder's paradise". The refuge is an important wintering ground for tundra swans, Canada geese, snow geese, and over 25 species of ducks. Many other interesting bird species can be found at Pea Island during the winter months and during spring/fall migrations. During the summer months, several species of herons, egrets, ibises, terns and gulls, along with American avocets, willets, black-necked stilts, other wading and shore birds and a few species of ducks nest on the refuge. Peregrine falcons, bald eagles, piping plovers, and loggerhead sea turtles are among the endangered or threatened species that utilize the refuge.

PEA ISLAND NATIONAL WILDLIFE REFUGE

Manteo, North Carolina

ANNUAL NARRATIVE REPORT

Calendar Year 1992

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

	<u>Page</u>
INTRODUCTION	i
TABLE OF CONTENTS	i
A. <u>HIGHLIGHTS</u>	1
B. <u>CLIMATIC CONDITIONS</u>	2
C. <u>LAND ACQUISITION</u>	
1. Fee Title.....	"NTR"
2. Easements.....	2
3. Other.....	"NTR"
D. <u>PLANNING</u>	
1. Master Plan.....	"NTR"
2. Management Plan.....	2
3. Public Participation.....	"NTR"
4. Compliance with Environmental and Cultural Resource Mandates.....	3
5. Research and Investigations.....	7
6. Other.....	7
E. <u>ADMINISTRATION</u>	
1. Personnel.....	7
2. Youth Programs.....	7
3. Other Manpower Programs.....	"NTR"
4. Volunteer Program.....	8
5. Funding.....	"NTR"
6. Safety.....	"NTR"
7. Technical Assistance.....	9
8. Other.....	"NTR"
F. <u>HABITAT MANAGEMENT</u>	
1. General.....	9
2. Wetlands.....	10
3. Forests.....	"NTR"
4. Croplands.....	12
5. Grasslands.....	"NTR"
6. Other Habitats.....	"NTR"
7. Grazing.....	"NTR"
8. Haying.....	"NTR"
9. Fire Management.....	12
10. Pest Control.....	"NTR"
11. Water Rights.....	"NTR"

12.	Wilderness and Special Areas.....	"NTR"
13.	WPA Easement Monitoring.....	"NTR"

G. WILDLIFE

1.	Wildlife Diversity.....	14
2.	Endangered and/or Threatened Species.....	14
3.	Waterfowl.....	16
4.	Marsh and Water Birds.....	18
5.	Shorebirds, Gulls, Terns and Allied Species.....	20
6.	Raptors.....	21
7.	Other Migratory Birds.....	21
8.	Game Mammals.....	21
9.	Marine Mammals.....	"NTR"
10.	Other Resident Wildlife.....	21
11.	Fisheries Resources.....	"NTR"
12.	Wildlife Propagation and Stocking.....	"NTR"
13.	Surplus Animal Disposal.....	"NTR"
14.	Scientific Collections.....	"NTR"
15.	Animal Control.....	21
16.	Marking and Banding.....	22
17.	Disease Prevention and Control.....	"NTR"

H. PUBLIC USE

1.	General.....	22
2.	Outdoor Classrooms - Students.....	23
3.	Outdoor Classrooms - Teachers.....	"NTR"
4.	Interpretive Foot Trails.....	23
5.	Interpretive Tour Routes.....	"NTR"
6.	Interpretive Exhibits/Demonstrations.....	24
7.	Other Interpretive Programs.....	25
8.	Hunting.....	"NTR"
9.	Fishing.....	25
10.	Trapping.....	"NTR"
11.	Wildlife Observation.....	25
12.	Other Wildlife Oriented Recreation.....	26
13.	Camping.....	"NTR"
14.	Picnicking.....	"NTR"
15.	Off-Road Vehicling.....	26
16.	Other Non-Wildlife Oriented Recreation.....	27
17.	Law Enforcement.....	27
18.	Cooperating Associations.....	28
19.	Concessions.....	"NTR"

I. EQUIPMENT AND FACILITIES

1.	New Construction.....	"NTR"
2.	Rehabilitation.....	28

3.	Major Maintenance.....	28
4.	Equipment Utilization and Replacement.....	"NTR"
5.	Communications Systems.....	"NTR"
6.	Computer Systems.....	"NTR"
7.	Energy Conservations.....	"NTR"
8.	Other.....	"NTR"

J. OTHER ITEMS

1.	Cooperative Programs.....	"NTR"
2.	Other Economic Uses.....	"NTR"
3.	Items of Interest.....	"NTR"
4.	Credits.....	29

K. FEEDBACK

L. INFORMATION PACKET - - - (inside back cover)

A. HIGHLIGHTS

North Carolina Department of Transportation places sandbags on beach along NC Highway 12. (See Section D.4.)

"Conditional" permits issued by the Secretary's office for the Oregon Inlet Jetties. (See Section D.4.)

Herb Lewis, long-time refuge volunteer, age 42, succumbs to cancer. (See Section E.4.)

North Pond Trail dedication held in October. (See Section H.4.)



Both platform and tower for North Pond Trail were dedicated on November 11, 1992. Randy Latta of the Outer Banks Community Foundation is shown here cutting the ribbon for the tower dedication.

10/2/92 BWS

B. CLIMATIC CONDITIONS

The year began with normal temperatures and rainfall. During the spring, rainfall was below normal, making it necessary to pump water into the impoundments to maintain optimum levels. With the onset of summer monsoon-like rainfall necessitated keeping gates on the impoundments open much of the time (entire month of August) to get the excess water out! A tropical storm brushed the refuge 9/23-24 - 50 mph winds and heavy rain but no damage! A nor'easter blew in 12/14-17 and caused NC Highway 12 to be closed 12/15-16 due to overwash. This overwash flooded all of the impoundments and killed the wheat in New Field (see Section F.4.). By years' end, rainfall amounts for the year were close to average.

C. LAND ACQUISITION

2. Easement

In 1988, the U.S. Coast Guard (USCG) abandoned their facility at the north end of the refuge. The facility was endangered by severe erosion - in excess of 125 feet per year. USCG actually owned 10 acres (the only inholding on Pea Island Refuge) and had an easement on 10 acres of refuge property. Repeated efforts by the Service to acquire this 10 acres (less the old station - a National Register site) met with failure. In July, USCG notified the refuge that, at the request of Congressman Walter Jones, they had quit claim deeded their 10 acres to Dare County, including the old station itself. The County's plans for this area are unknown.

The USCG easement on Service property will terminate once they remove all facilities (storage building, pier, tanks, etc.). Removal is scheduled for completion by June, 1993. When completed, the NC Department of Wildlife Resources has agreed to develop an access point for the public by rehabing the existing boat ramp and constructing a parking area.

D. PLANNING

2. Management Plan

A Hurricane Contingency Plan was developed for the refuge during the year.

The annual water management plan for all impoundment units was completed and approved.

A prescribed burn prescription and Section 7 covering 3,500 acres were written and approved.

4. Compliance with Environmental and Cultural Resource Mandates

As reported in last year's narrative, severe "nor'easter" storms battered the refuge in October and December, 1991. These storms, coupled with years of high erosion caused by hopper dredging of Oregon Inlet, resulted in the loss of almost all dunes along the oceanfront. Although this loss was not, in itself, a major impactor of refuge resources, overwash of several section of Highway 12 now occurs even in mild "blows". Closure of Highway 12 stops all vehicle traffic to the 5 villages located south of the refuge on North Carolina's Outer Banks, and, during 1992, resulted in tremendous pressure on North Carolina Department of Transportation (NCDOT) to do something to protect the highway. NCDOT proposed an emergency sandbagging operation at one location as a temporary protection measure in January, 1992. After many meetings and plan revisions, NCDOT finally obtained all the necessary regulatory permits and was issued a refuge SUP for 4,800 linear feet of sandbags along the highway immediately north of the headquarters site. This project, completed in late March, was to provide temporary protection against highway loss until NCDOT could complete planning for a long range solution. NCDOT did not initiate any planning through most of 1992 - until the onset of the winter storm season again brought new cries of "do some-



NCDOT installed 4,800' of sandbags along a stretch of NC Highway 12 as a temporary protection measure. 5/92 J CJ

thing". NCDOT requested approval for additional sandbagging, was denied approval by the refuge, and as of this date, has begun planning for a large scale beach nourishment project at the sandbag location. It should be noted that large scale nourishment was a special condition of the refuge SUP issued for the sandbags. Please understand - the above account is only a brief sketch of the events around the issue. The refuge staff did little else other than deal with this issue for over 2 months.

As reported in previous years, NCDOT was issued a R-O-W permit by the Service in 1989 to construct a 3,200' rock revetment, called a terminal groin, on the north end of Pea Island to protect the south base of the Oregon Inlet Bridge. This structure was completed in March, 1991. One of the special conditions of the permit was the conduction of an in-depth monitoring program. If erosion on the first 6 miles of refuge beaches, beyond an agreed upon background rate, occurred over 2 consecutive, 2 month periods, NCDOT must initiate nourishment. This "trigger" was in fact exceeded during the January-February and March-April, 1992 monitoring periods. NCDOT responded to the refuge's request for nourishment with a "new" interpretation of the R-O-W permit language that - you guessed it - exempted them from providing nourishment of slightly over 1 million yards of material at an estimated cost of \$3-4 million. Several meetings with NCDOT and numerous phone calls failed to resolve this issue. As the year ended, final plans were underway to send this issue to the Solicitor.

NCDOT implemented emergency repairs to the Oregon Inlet Bridge in April. Severe scouring had endangered 7 sets of bridge piers around the navigation span. Following several meetings, DOT issued a contract for placement of rock gabbions around these pilings. DOT also conducted scoping meetings with Service (FWE and Refuge) personnel as part of the planning process for replacement of the Oregon Inlet Bridge.

As most readers probably know (certainly any Service employees from this area), the Oregon Inlet Navigation Project has been a thorn in the Service's side since the early 1970's. This project authorized the U.S. Corps of Engineers (USCOE) to maintain a 200' wide, 20' deep navigation channel through the Inlet, long reputed to be one of the most dangerous bodies of water on the east coast. The USCOE proposed constructing roughly 5000' long rock jetties to "stabilize" the inlet and to constrict water flows, thus forcing scour which would assist in maintaining the approved channel. Among many other potential adverse impacts, these jetties would completely stop all southerly nearshore transport of sand and result in massive amounts of erosion immediately south of the inlet, i.e., Pea Island Refuge. Since the north jetty would be anchored on Cape Hatteras National Seashore, the south jetty on the refuge, and

many major environmental impacts would certainly occur, Interior has consistently opposed the jetties in spite of strong local, state, and congressional delegation support. The latest round of deliberations on this project, as directed by Secretary Lujan, centered on the formation of an independent task force of coastal geologists/engineers to study this project, meet with the Service, Park Service and USCOE to "resolve differences", and prepare a report for the Secretary.

The refuge staff, Raleigh FWE staff, Wilmington USCOE staff, and various members of the task force met many times in 1991 to discuss the project. A report was presented to the Secretary in January of 1992. The Secretary finally issued "conditional" permits to the USCOE for jetty construction on 10/28/92 (just prior to the elections). The "conditional" nature of the permits issued are completion of a supplemental EIS and development of an acceptable sand bypass system. The refuge and Raleigh FWE office operated under a direct gag order issued by the Secretary - no comment pertaining to the jetty issue. As the year ended, USCOE was working very hard on finalizing the supplemental EIS (draft due in April 1993).

The USCOE has annually dredged the navigational channel at Oregon Inlet since the project was authorized. For years, USCOE'S contracts were for hopper dredging with offshore deposition of the dredged material. This action, among other things, greatly accelerated the erosion rate on Pea Island.



USCOE's deposition of Oregon Inlet dredge material created a 350' wide beach for 3 miles south of the inlet. 9/92 JCJ a



Winter storms quickly began eroding the newly created beach - as expected. The material lost due to erosion is still in the sand budget.
12/92 MLM

Beginning in 1991, the USCOE finally opted to place this dredged material on the beaches at roughly double the cost of hopper dredging. During 1991, roughly 400,000 yards of material were hydraulically deposited on the beaches. The 1992 round of dredging, performed 8/2 - 9/5, deposited 898,000 yards of material on slightly over 2 miles of beaches (beginning at the old Coast Guard Station). The refuge staff initiated a large scale monitoring program, beginning in July, on 6 miles of beaches to document impacts, if any, of this deposition. Although such large scale projects performed annually have the potential to cause adverse impacts, the refuge staff strongly concurs with the necessity of this action in light of the impacts caused by hopper dredging. As with NCDOT's Highway 12 problems, the dredging operation occupied a great deal of staff time and involved many different entities including county, state, and federal politicians.

The CASS contract issued to Coastal Consultants for data analysis of the 1991 nourishment monitoring plan could not be renewed (a decision made by WO CGS). The refuge developed all the specs and technical requirements for solicitation of a new contract in August. WO CGS finally approved the package in December, and as of this date, RO CGS has the entire package "on the street". In the interim, the refuge continues to collect the field data called for in the SUP issued to USCOE for spoil deposition.

Finally, Tideland Electric advised the refuge in October of plans to upgrade the powerline crossing Pea Island from 35KW to 100KW. The substation, located on the south end of the refuge, will be moved to the north end to facilitate this upgrade. Tideland Electric and REA were preparing the EA's, Section 7's, R-O-W permit amendment, etc. as the year ended.

5. Research and Investigation

Robert Klips, Dept. of Biology, Ohio State University, continued the pollination study on rose mallow (Hibiscus moscheutos). Thirty plants were marked, flowers covered with mesh bags, and then hand pollinated.

MTL Systems, Inc., under contract from the Air Force, conducted trials for navigational beacon evaluation in April.

Joe Fucella, PhD candidate from University of Virginia, finalized the nourishment monitoring contract issued in 1991. The report, received in July 1992, provided analysis of sand samples and mole crab data in an effort to determine impacts of the placement of 400,000 yds. on Pea Island beaches.

Dr. Robert Dolan served as the Service's technical representative on the team monitoring impacts of NCDOT's Oregon Inlet Terminal Groin through September. Dolan's contract expired 9/30 - a new contract was finally issued in December after a solicitation went through the competitive process.

6. Other

Pea Island again participated in the Atlantic Flyway Canada Goose Study during 1992. A quota has been assigned for the 92-93 season.

E. ADMINISTRATION

1. Personnel

Technically, all staff in this complex of refuges are ARNWR staff. On a regular basis, RT Elmore and EO Wilkins reported for duty at Pea Island. Other staff assist as needed.

2. Youth Programs

During 1992, Pea Island's YCC program was a facet of the Alligator River program. Since the Alligator River program involved only 1 enrollee, the amount of time available for work on Pea Island was limited. The enrollee assisted in maintaining the North Pond Trail, performed litter pick-ups, and participated in pelican and tern banding.

For more information of YCC, see Section E.2. of the Alligator River NWR narrative.

4. Volunteer Programs

During 1992, volunteers at Pea Island again formed the hub, both in spirit and in numbers, for the entire Alligator River volunteer program. The Host/Hostess program began in April and continued through October. Again, as in past years, a few Saturdays and Sundays were covered. The Visitor Contact Station was covered all weekdays during that time period.

The turtle patrol was also a popular volunteer program during 1992. Turtle patrollers participated in an 8 hour training program, then conducted the patrol 1 day each week from mid-May through the end of August. The "turtle watch" program was initiated to provide better opportunities for hatchlings to successfully reach the water. During 1992, the "turtle watch" program was initiated in the beginning and followed throughout the nesting season. (See Section G.2. for details.)

Herb Lewis, a long-standing volunteer who received a North Carolina Take Pride in America Award in 1991 for his involvement in these programs, died on April 11 after a short, but fierce battle with cancer. Herb named the Coastal Wildlife Refuge Society as a beneficiary of his estate, plus family and friends made memorial donations in his name. The turtle program benefitted tremendously through Herb's life and his death; he will be missed.

Summer and fall bird walks and summer Children's Wildlife Discovery programs were conducted by volunteers. Special programs requested by schools and other groups were also conducted by volunteers. In fact, essentially all public programs conducted during 1992 at Pea Island NWR were conducted by refuge volunteers.

The September "Big Sweep" occurred again in 1992. This activity continues to be the single event that involves the most volunteers during the year. At the 1992 Pea Island "Big Sweep", 98 volunteers participated and succeeded in cleaning the entire 13 miles of refuge beach. Since we had people ready and willing to work, we organized each section to walk up the beach, then back on NC 12. Consequently, during the "Big Sweep", all the beaches and road shoulders on the refuge were cleaned.

For additional information about the Volunteer Program, see Section E.4. of the Alligator River NWR Annual Narrative Report.



Manteo Adult Development Program received a 1991 Director's Award for Outstanding Contributions to the USFWS. 8/92 DS

7. Technical Assistance

RM Johnson, DRM Noffsinger, and ROS Windley participated in numerous meetings with County officials, FHWA, NCDOT officials, and CAMA officials concerning emergency work to protect NC Highway 12.

RT Elmore and other staff members provided assistance to Dr. Robert Dolan, University of Virginia, throughout the year in the development and implementation of a mole crab and sand study to identify effects of beach nourishment projects on Pea Island NWR.

During July, refuge staff and volunteers assisted John Weske of the Smithsonian Institute in brown pelican and tern banding on islands located just off of the refuge.

F. HABITAT MANAGEMENT

1. General

Pea Island, a coastal barrier island, consists of 7 basic habitat types. The most recent survey revealed 456 acres of ocean beach; 518 acres of barrier dunes; 630 acres of sand ridge, brush, and grassland; 3,024 acres of irregularly flooded

salt marshes; 328 acres of salt flats; and 3 brackish water impoundments totaling 940 acres. Beach and dune acreages change from year to year. Intense northeast storms caused severe erosion along the beach and dunes during 1992.

2. Wetlands

North Pond was drawn down in 1991 (for the first time in at least 9 years) and partially disked. As a result of this effort, sago pondweed and widgeon grass increased to 42% occurrence in 1992. (See Table 1). These 2 excellent waterfowl food species had comprised only 19% and 16% of the plants in 1990 and 1991, respectively. Maintaining higher than normal water levels into early summer helped keep salinities close to target levels even with all the pumping that was necessary. A couple of dips in salinity occurred with the heavy rains and helped keep salinities from going too far beyond the 20% sea strength (6.7 ppt) target. Apparently, the combination of the drawdown, keeping good water depths (>1.8), and keeping salinities in the 5-7 ppt range produced the right conditions to increase sago pondweed and widgeon grass, particularly sago.

In late October and early November, 1991, New Field impoundment was inundated with salt water from a severe northeast storm (Halloween storm) that overwashed the island. Impoundment water levels increased over 1 foot and salinities rose to 66% sea strength (22 ppt). Water control gates were opened until levels dropped below target elevations. Rain water helped lower salinities. By January of 1992, the salinity was down to 49% sea strength (16 ppt) and, with each rain, continued to decline through April and early May.

New Field water levels were held close to target elevations except during summer when warm, windy days required the pumps to be operated daily to keep the impoundment at target levels. However, the pumping increased salinities beyond target levels. It became apparent that muskgrasses (*Chara* spp.) tolerate more saline conditions than thought. Occurrence of muskgrass actually was the highest in the last four years (1989-7%, 1990-13%, 1991-18%, 1992-35%). Saltgrass increased dramatically around the shallow fringes, up from 6% in 1991 to 30% in 1992. While it is not much of a seed producer, it is considered a good substrate for invertebrate production.

In late October and early November of 1991, South Pond impoundment was also inundated with salt water from the Halloween storm. Impoundment water levels increased over 1 foot and salinities rose to over 70% sea strength (23 ppt). Water control gates were opened until levels dropped below target elevations. Rainwater helped lower salinities. By January of 1992 the salinity was down to 55% sea strength (18 ppt) and with each rain continued to decline through April and early May.

Table 1
Summary of Vegetative Transect Line Sampling
Pea Island NWR, 1992

Line	Feet Sampled	Sample Stops	Sampling Points	Percent Vegetated	Percent Bare	Plants per Pt. Sampled
South Pond	2,340 ft.	78	390	56%	44%	.64
New Field	2,670 ft.	89	445	94.3%	5.7%	1.16
North Pond	2,700 ft.	90	450	95.7%	4.3%	1.5
Salt Flats	3,660 ft.	122	610	68.9%	31.1%	.86
TOTALS	11,370	379	1,895			
AVERAGES	---	--	---	78.7%	21.3%	1.04

Combined Food Values *	Major Plants (% Occurrence)
Good - 23.8 (20.6)	South Pond - Sago Pondweed 38% (20)
Fair - 31.4 (46.6)	- Muskgrass 14% (75)
Non - 44.8 (32.7)	- Bacopa 1.3% (.8)
	New Field - Muskgrass 35% (18)
	- Sago Pondweed 10.8% (21)
	- Salt Grass 29.9% (6)
* 1991 Figures in ()	North Pond - Muskgrass 43.5% (47)
	- Sago Pondweed 34% (14)
	- Widgeon Grass 7.9% (1.7)
	Salt Flats - Salicornice 21.6%
	- Patens 15.6%
	- Sea Oxeye 10.5%

South Pond water levels were held close to target elevations until late summer by pumping. However, due to the already high salinities caused by overwash, the pumping increased salinities beyond target levels. Levels dropped below the targets in late summer when the pump could not be run due to mechanical problems. Many of the submerged aquatics were lost at this time as indicated by the large amount of bare areas found in the surveys (44%, only 2% in 1991). South Pond's maximum salinity during

the growing season was higher than New Field's (63.6 sea strength, 21 ppt, in South Pond, while in New Field it was 51.5% sea strength, 17 ppt). With the higher salinities in South Pond and/or the lower water levels, muskgrass dropped from 75% in 1991 to 14% in 1992. Saltgrass did not increase as it did in New Field.

Wetlands in the Salt Flats are flooded and dewatered by natural ebb and flow in wind/tides and by rainfall/runoff. Vegetation has remained relatively unchanged for many years in this area. The predominant vegetation is glass wort (Salicornia sp.), while almost one-half of the area is bare.

The 2 small mitigation ponds created by NCDOT again produced good widgeon grass. The pond fringes also continued to produce stands of Bacopa sp., Scirpus sp., and Cyperus sp. Waterfowl use remained low and continued to be limited to the days when the adjacent sound waters were rough.

4. Croplands

Much of the plantable area of New Field has been lost to sand deposited by overwash. Approximately 10 acres were planted in November, a late planting date, at best. The wheat came up in spots, and the stand was eaten by geese before it had a chance to establish itself. The nor'easter in December inundated New Field with sea water and killed what little wheat that was present.

South Field, a small, 10 acre field located south of the refuge headquarters, was also planted with wheat. Growth in South Field was marginal due to wetness. Geese and ducks made moderate to heavy use of the area.

9. Fire Management

Pea Island had several units, totaling over 2,700 acres, scheduled for prescribed fire in 1992. Habitat improvement (browse) for migratory waterfowl was the primary goal. These units were burned on December 18, 1992. A combination of drip torch and terra torch ignition methods were used.

The results of the burn were mixed and overall less satisfactory than last year. Several reasons can be given, some of which were anticipated, but one interesting phenomenon occurred which had not been given prior consideration. Burning parameters for Pea Island call for winds from the northeast or east quadrants for at least 24 hours in order to best manage smoke and avoid obscuring NC Highway 12. The soundside marshes appeared to be ready to burn with adequate fuels present and only requiring a decent wind (7 mph or better) to sustain and push the fire across the marsh. The day of the burn, winds were northeast



For the second year, prescribed fire was applied to upland sections..... 12/92 SF



.....to remove heavy accumulations of shrubs. 12/92 SF

at 7 to 12 with frequent gusts of 15 mph and higher. The impoundment dikes are 10 to 12 feet high, and the terra torch fired from the dike roads into the marshes. It was found that the dikes provided such an effective wind break that the winds effect on the fire was practically nil. Due to eddies adjacent to the lee of the dikes, wind may have actually hindered fire spread. This has caused the staff to rethink prescriptions for these marshes; some changes are anticipated.

Another meaningful result of this year's prescribed fire was that the area burned last year could not be coaxed to burn, no matter how much fuel and wind was applied. This fact became quickly apparent, despite the fact that at first glance the unit appeared to have at least as much fine fuel as the previous year. Close examination of these units revealed a lack of accumulated dead grasses and the presence of a large component of seaside pennywort. This plant, which is almost fireproof, was not nearly as prevalent in 1991. A reduced intensity of the '92 burn was anticipated, but still planned due to hope for increased benefits from burning some units 2 years in a row.

G. WILDLIFE

1. Wildlife Diversity

Pea Island has a high natural diversity of habitat types. Habitat management practices, such as prescribed burning, moist soil management, disking, brush removal, and green browse planting, serve to enhance habitat and wildlife diversity. Pea Island provided habitat for a wide variety of mammals, birds, fish, reptiles, amphibians, mollusks, and crustaceans during 1992. This diversity was especially evident in birds; more than 315 species of birds have been identified in the area.

2. Endangered and Threatened Species

a. Federally Listed and Endangered Species

American Bald Eagle (Endangered): Bald eagles, Haliaeetus leucocephalus, often pass over Pea Island. Only 2 sightings occurred this year. Refuge staff reported 1 immature on March 11 and another on July 17. None were seen during the mid-winter eagle survey conducted January 1-15. Two were seen during the survey last year. However, the survey period in 1992 was an unusually wet, cold, and foggy period.

Peregrine Falcon (Threatened): The Arctic Peregrine, Falco peregrinus tundrius, is the subspecies of peregrines most often seen at Pea Island. Thirteen peregrine sightings were made by the refuge staff during the year. All sightings were associated with the impoundment areas of the refuge.

Piping Plover (Threatened): The Atlantic coast population of Piping Plover, Charadrius melodus, was listed as a threatened species under the Endangered Species Act in January 1986. This species occurs all along the coast of North Carolina. Refuge staff conducted bi-weekly shorebird counts from May through October. A count was done on Pea Island by a North Carolina State University student under contract with NPS on March 31st. Three piping plovers were seen in a pool near the terminal groin. Four piping plovers were seen in the same area on April 1. Both groups, thought to be migrating, were seen feeding in the pool near the groin. On July 21, 2 plovers were sighted moving from North Pond to New Field and back again. On July 24, 2 were seen on a sandbar in North Pond.

Atlantic Loggerhead Sea Turtle (Threatened): The sea turtle season of 1992 on Pea Island NWR was very similar to last year. Since dune and beach erosion and ocean overwash continued to be major problems, only 1 small stretch of beach was designated "safe" for relocation purposes. Thus, instead of relocating nests to sites up and down the beach, 8 nests from Pea Island, 2 from NPS, and 1 from Nags Head were relocated to the "safe" area. One nest was left in place. Beach erosion and high tides were not a problem on the selected area, so hatch rates were good this year. The biggest problem this year (as previously) was ghost crab predation - these crabs were the number one enemy of hatchlings. In previous years, many turtles hatched out of nests but never made it to the water. "Reinforcement" crabs actually formed a line along the uprush zone to capture the few turtles that had managed to crawl safely through a beach covered with hungry, hunting ghost crabs.

Once again, the Turtle Watch Program was implemented. It entailed digging a 10" deep by 10" wide trench from each nest to the ocean. Volunteers started watching each nest at day 55. They arrived just before dusk and swept the trench smooth; wire cones were placed around the nest with a "sliding board" emptying into the crab free trench. Turtles followed flashlights (which volunteers leap frogged) to the end of the trench and arrived safely at the ocean. Monitoring the nests took an intensive effort; however, it played a vital role in greatly increasing the percentage survival of the hatchlings from the nest to the ocean.

At the season's end, it appeared that the decision to relocate all but 1 of the nests was a good one. The decision was made only after input from other biologists and much deliberation. Most, if not all, of the nests would have been lost to salt water inundation from high tides and storm surges. The Turtle Watch also greatly increased the number of hatchlings reaching

the ocean. Observations in past years indicated that, on some nights, as many as 75% of hatchlings were lost to ghost crabs (prior to trenching). Survival rates to the ocean after trenching approached 100%. If the same narrow beach is evident next year, a similar program will again be implemented.

Numerous stranded turtles washed up on Pea Island's beaches in 1992. At least 10 dead loggerheads were measured and recorded. One leatherback, the first in over 10 years, was found.

b. State Listed Endangered and/or Threatened Species

Of the other species that occur on the refuge, the State of North Carolina lists 7 as threatened and 26 as species of special concern. Although the refuge is not managed for all these species, present practices do provide benefits for many of them. Species specifically managed for are:

Osprey (Special Concern): The number of adult ospreys observed on Pea Island increased during 1992. Total recorded production was 6 young (8 in 1991). There were 6 nesting pairs, but each pair produced only 1 surviving young. Competition was fierce for one of the artificial platforms. A returning osprey tried to chase a great horned owl off her old nest site. The owl stood it's ground and produced a chick. The osprey chose a dilapidated old tower for her new nest and was also successful.

Least Tern (Special Concern): They're back! For about 8 years, least terns have chosen not to nest on Pea Island beaches. This year they came back to an area historically utilized by nesting terns and skimmers - a section of beach about 1.5 miles south of the headquarters. The area was closed to public entry in late May. In July, 250-300 nesting least terns, along with 40+ black skimmers, 50 common terns, 4 royal terns, 2 oyster catchers, and 4 sandwich terns, were observed in the area. Least terns were documented on 7 of the 11 bi-weekly shorebird counts. They were also documented once on an island in North Pond. All other times they were seen on the south beach.

3. Waterfowl

Overall duck and goose use on Pea Island NWR was down 17.1% from the preceding wintering year (see Table 2), the fourth lowest population level in the 27 years of records. The peak waterfowl populations, 16,700, occurred during December 14-20.

Tundra swan use days were up 65% from last year. The peak number was 3,150, double last year's peak.

Table 2
Wintering Waterfowl Occurrence
Pea Island NWR
1992-1993

Group	Percent	Number of Use Days	% Difference 1990-1991	Peak Number	Peak Period
Tundra Swans	11.3	169,351	+ 65.0	3,150	Nov 17-23
Canada Geese	3.6	53,291	- 9.8	1,000	Jan 3-16
Snow Geese	11.6	172,984	+ 3.5	3,000	Dec 27 -Jan 2
Brant	Trace	14	+100.0	2	Nov 17-23
Ducks	70.1	1,047,200	- 25.6	11,600	Dec 14-20
Coots	3.4	50,715	- 22.5	750	Nov 3-9,17-23
All Waterfowl	100.0	1,493,555	- 17.1	16,700	Dec 14-20

Table 3
Composition of Wintering Ducks
Pea Island NWR
1991-1992

Species	Percent	Number of Use Days	% Difference 1990-1991	Peak Number	Peak Period
Widgeon	28.2	295,526	+ 3.7	4,600	Oct 20-26
Pintail	22.7	237,223	- 26.5	3,450	Oct 5-12
Gadwall	12.4	129,514	+ 1.7	2,300	Dec 14-20
Black Duck	9.3	96,992	- 12.1	1,500	Dec 14-20
G.W. Teal	9.1	95,781	- 71.3	900	Mar 14-20
Shoveler	7.7	80,353	- 7.1	1,025	Dec 27-Jan 2
Ruddy Duck	2.5	26,250	+ 19.8	315	Dec 14-20
Bufflehead	2.4	24,752	- 35.6	2,065	Dec 14-20
Mergansers	1.7	18,284	- 13.9	320	Dec 7-13
Scaups	1.5	15,568	- 29.8	500	Dec 27-Jan 2
Unidentified Ducks	1.2	12,523	- 28.4	400	Dec 14-20
Mallard	0.5	5,068	- 9.6	160	Dec 14-20
B.W. Teal	0.4	4,620	- 53.3	215	Sep 14-20
Ring-necked Duck	0.4	4,235	- 2.9	165	Feb 28-Mar 6
Redhead	Trace	497	- 57.5	32	Dec 7-13
Canvasback	Trace	14	- 81.8	2	Dec 27-Jan 2
Wood Duck	0.0	0	-100.0	0	-----
All Ducks	100.0	1,047,200	- 25.6	11,600	Dec 14-20

Canada goose use days dropped, but the peak number increased by 250. The peak is still drastically below the long term average (i.e. the peak was only 25% of the long term average).

Snow goose use was similar to last year's low numbers; it was less than half of the long term average.

Duck use dropped by 25% from last year. This was the third lowest use in 27 years. Use days and peaks for individual duck species are given in Table 3. Coot use also dropped. The peak number of 750 was the lowest in 27 years.

Brood counts were conducted on Pea Island again this year. A total of 7 counts were made; all of these were ground counts - no aerial counts were flown this year. A total of 118 broods were counted during the surveys (see Table 4). Again, the majority were black duck broods. Brood numbers were up for South Pond. Canada goose broods were down to 5 this year compared to 16 last year. A blue wing teal brood was counted in South Pond this year. Money was not available for aerial broods counts; therefore, last year's aerial count was used to estimate broods produced along the sound edges. The estimate of broods produced on Pea Island NWR for 1992 is 162.

Table 4
Brood Count Totals
Pea Island NWR
1992

Species	South Pond	New Field	North Pond	Species Total	Species % of Total
American Black Duck	29	28	38	95	81
Gadwall	0	9	8	17	14
Blue Wing Teal	1	0	0	1	.8
Canada Goose	0	2	3	5	4.2
Area Total	30	39	49		
Area %	25%	33%	42%		

4. Marsh and Waterbirds

Refuge beaches, marshes, and impoundments were heavily utilized by many species of marsh and waterbirds for both nesting and

feeding. Although no active management occurred exclusively for these species, an upward trend in use days has been observed in recent years. Habitat management practices for waterfowl and other species have had a positive influence on marsh and water bird use of the refuge. For example, there was evidence of small heronries on several islands in both North and South Ponds during 1992.

On June 1, a quick check on one heronry island in South Pond revealed about 15 nests. At the end of June, another check revealed about 10 active nests. Dredge spoil islands in Oregon Inlet are another favorite nesting site for a variety of colonial nesting waterbirds.

Again this year, marsh and waterbird counts were extended into October instead of ending in August. Therefore, a shift was seen in the peak population month, from July to September. Peaks were recorded for a variety of marsh and waterbird species found in the impoundments at Pea Island. These included: pied billed grebe - 213; double-crested cormorant - 257; eastern brown pelican - 85; white ibis - 218; glossy ibis - 34; great blue heron - 22; common egret - 146; snowy egret - 195; tri-color heron - 143; little blue heron - 50; cattle egret - 60; green heron - 5; black-crowned night heron - 9; yellow-crowned night heron - 10; clapper rail - 2; and common gallinule - 2.



Staff aren't the only ones who get a bit territorial at times!

JCJ

The trend toward increased use of the refuge may have also been due to the dramatic loss of habitat along the Outer Banks. Increased human disturbance continually forces birds to smaller and smaller areas, many times utilizing habitat that's less than optimal.

Brown pelican numbers have increased steadily over the past few years as the species has expanded northward into coastal North Carolina and Virginia. These birds were once considered a threatened species in this state and were rarely sighted. They have since been de-listed in North Carolina and are quite common. During 1992, pelicans utilized the spoil islands in and around Oregon Inlet extensively.

5. Shorebirds, Gulls, Terns, and Allied Species

Shorebird surveys were conducted from April through October. The peak population occurred in late July when 6,997 gulls, terns, and shorebirds were recorded. This peak was lower than last year's peak of 12,526 birds. It is possible that increased erosion and public use on the refuge have made Pea Island's beaches less attractive. The dredge spoil islands in Oregon Inlet provide excellent nesting habitat for the birds; however, even these islands have begun to suffer from human encroachment and have required posting by the NCWRC to protect nesting shore and marsh birds. Terns and other colonial nesting waterbirds have continued to nest on the islands in spite of the disturbance. This year, on July 1 and 17, a group of refuge staff, YCCers, and volunteers assisted Dr. John Weske of the Smithsonian Institute in banding 2,561 royal terns, 116 sandwich terns, 2 caspian terns, and 747 juvenile and 3 adult pelicans. A return trip on August 20 added 12 sandwich terns, 6 royal terns, and 86 pelicans. The number of banding trips was influenced by the unusual non-synchronized nesting periods of the terns and pelicans. Weird birds this year!

The low water levels in South Pond attracted unusual sightings (along with thousands of our regular shorebirds). These drew huge crowds of birders the latter part of July and beginning of September. Curlew sandpipers, piping plovers, American avocets, an immature bald eagle, and an American golden plover were the major attractions (curlew sandpipers were the STARS of the show!). In spring and early summer, RT Elmore found several oyster catcher nests on the dikes around the impoundments. None of these nests survived to produce young (hawk, gull, and cat attacks); however, a couple were successful on the finger islands in North Pond, on islands in New Field and in salt flats. Also, numerous (6-8) families with young were viewed and recorded on the beach. Numerous black necked stilts young were observed in the 3 impoundments and salt flats.

6. Raptors

Carolina Raptor Center did not band this year. Also see Section G.2. for information on peregrine falcons and bald eagles.

7. Other Migratory Birds

The diversity of bird life on Pea Island is so great that it is sometimes referred to as a "birder's paradise". This is especially true when considering the passerines. Some 115 different species of song birds migrate through Pea Island.

8. Game Mammals

Rabbits are the only game mammals that occur in any numbers on Pea Island. Cottontail and marsh rabbit numbers have declined in recent years.

Raccoons are fairly common on Bodie Island to the north. In recent years, raccoon tracks have been observed on Pea Island with higher and higher frequency. The staff even sees raccoons on occasion and often catches them in cat traps.

Evidence has been found to indicate an influx of foxes and opossums. The immigration of foxes and the presence of feral house cats may be one of the causes for the decline in rabbit and pheasant populations.

Two deer have been observed on Pea Island. Tracks have been found on numerous occasions in the salt flats and South Pond area. Staff members have seen both doe and buck on Pea Island. Watch out for more - oh deer!

10. Other Resident Wildlife

Ring-necked pheasants were occasionally observed in the salt marsh, brushland, the browse area in New Field, and in the dunes in years past. Sightings of pheasants have dropped drastically in recent years. Occasionally, 1 or 2 have been observed feeding in New Field (both male). No females were observed during 1992. The exact status of the pheasant population is unknown.

15. Animal Control

Feral cats continued to be a problem with nesting birds, waterfowl, turtles, etc. Cat tracks were found from the beach to the sound. A total of 11 cats were trapped in 1992 - 7 were male and 4 were female (traps were set early and late in the year). Observations reported by the public and NPS rangers increased dramatically this year. Trapping efforts will continue during 1993.

16. Marking and Banding

Pea Island was directed to band and neck collar Canada geese as part of the Atlantic Flyway Canada Goose study during the 1991-92 season. A quota of 100 geese was assigned. Rocket net trapping was plagued by frustrations which ranged from technical problems to "tourists" scaring geese off net sites. The first shot didn't occur until the beginning of March and resulted in 19 geese being caught. One other shot increased the yearly total to 27.

The Gypsy Moth Pheromone Trapping Program continued on Pea Island during 1992. Ten traps were set near heavy traffic areas and checked periodically. The final result was the capture and verification of 9 gypsy moths. The USDA responded that trapping a few moths does not necessarily indicate that there is an infestation. A single catch could be the result of a visitor from an infested area to the north inadvertently transporting an egg mass onto the refuge. Artificial introduction do not always develop into infestations but are reason for increased attention.

H. PUBLIC USE

1. General

Based on the National Park Service vehicle counter at Bodie Island, estimated visitation to Pea Island NWR during 1992 was 1,790,095. The Host/Hostess program continued to provide visitor information and operate the Coastal Wildlife Refuge Society's sales unit at the Visitor Contact Station from April-October.

YCC, volunteers, and the fire crew provided manpower for a re-vamping of the sign program, minor trail maintenance, general clean-up in visitor areas, and routine maintenance of the structures associated with public use.

Since the 1989 vacating of the Oregon Inlet Coast Guard Station, little has happened in relation to its deposition. Misinformation and rumor abounded in local communities about newly found heirs to a portion of the land, political actions to give the property to Dare County, etc. The North Carolina Wildlife Resources Commission (NCWRC) has expressed an interest in operating the area as a public boat access area. Moving in this direction will require an MOA placing the responsibility for maintenance, repairs, enforcement, and litter pick-up solely on the NCDOT. Until the final accounting and listing is done by the USCG, the entire issue remains in limbo.

As in the past, public demand for beach access has increased and the amount of undeveloped beach frontage property locally available has decreased. Towns and villages in the area are supported almost entirely by the tourist industry, yet the burden to supply services for these visitors is thrust toward the federal government. The NPS expands its services as the budget allows. The Pea Island Master Plan established a maximum number of parking spaces on the refuge. At Pea Island, public use efforts continue to be governed by the limits set up in the Master Plan, thus providing some relief from the constant demand for more and more access. Refuge efforts continue to aim toward a high quality visit, as opposed to more visits.

2. Outdoor Classrooms - Students

The emphasis on non-staff conducted activities continued during 1992. School groups, scouts, etc. were encouraged in the independent use of the refuge for educational activities. Marsh investigation equipment (seines, mud sieves, etc.) was available for loan from the Visitor Contact Station (VCS). Table 17 in the Alligator River ANR includes educational programs conducted associated with Pea Island, as well.

Since no registration was required for the use of outdoor classrooms, the refuge has no record of the actual number of such uses that occurred. The N.C. Aquarium also utilized Pea Island marshes for a number of conducted salt marsh studies. On the whole, this type of use is increasing on Pea Island.

4. Interpretive Foot Trails

The Coastal Wildlife Refuge Society (CWRS) continued to assume primary responsibility for maintenance on the North Pond Trail. During 1992, some additional trail grooming was done by the YCC enrollee and the Alligator River fire crew. The North Pond Trail Dedication was held in October. Four fiber glass embedment interpretive plaques were installed on the tower in November. Construction of the 100' boardwalk is scheduled for February, 1993.

Approximately 149,250 visitors (298,500 AH) utilized the interpretive foot trail (self guided). Another 2,220 visitors (4,440 AH) participated in conducted trail walks.



North Pond Trail features an enlarged and ramped observation platform near it's beginning (note tower at end of trail)
(See Section A. for photo). 10/2/92 BWS

6. Interpretive Exhibits/Demonstrations

The 2 interpretive kiosks and the exhibits displayed in the Visitor Contact Station continue to be popular with refuge visitors. The kiosks provide basic visitor information 24 hours a day, 7 days a week. The VCS (at the headquarters building) provides a few minor exhibits, but is open only from 9-4 seasonally.

At Pea Island, there continues to be a need to provide a place for visitor contact and limited interpretive exhibits. The Alligator River Public Use Review conducted during 1992 addressed this need and resulted in an amendment to the Pea Island Public Use Management Plan. Construction of a small VCS at the trailhead for North Pond Trail has been added to the master projects list.

During 1992, 82,122 visits (20,530 AH) and 40,800 visits (10,200 AH) were spent at the kiosk and VCS, respectively.

7. Other Interpretive Programs

All regularly scheduled (summer and fall) interpretive programs during 1992 were conducted at Pea Island by refuge volunteers.

Four bird walks and two Children's Wildlife Discovery Programs were scheduled each week during June, July, and August. Participation during the 1992 summer follows: Bird Walk - 52 programs and 630 participants; Children's Wildlife Discovery - 27 programs and 862 participants. Nine regularly scheduled fall bird walks were conducted on Saturdays during October, November, and December for a total of 87 participants. In addition to these regularly scheduled programs, approximately 19 special bird walks were conducted into the South Pond or other refuge areas for 285 people.

Refuge staff and volunteers conducted 10 special programs ranging from marsh walks to talks about small mammals for 290 people, including school groups, civic organizations, museum groups, and environmental clubs.

9. Fishing

Pedestrian surf fishing continued to be the major form of consumptive, wildlife-oriented recreation on Pea Island during 1992. Bluefish, spot, pompano, croakers, and trout were the major fish caught. A total of 283,610 visits (1,134,440 AH) were spent fishing.

11. Wildlife Observation

Pea Island continues to be a "birders paradise". Though numbers of some species, waterfowl in particular, have declined in recent years, the rich diversity continues to draw crowds of bird watchers year-round.

Due to the location of the road (NC Highway 12) through Pea Island, it is difficult for a traveler to pass without observing wildlife. On most days of the year, the quality of observation is quite high. During fall and winter, greater snow geese frequently feed on the road shoulders.

During spring and summer, cattle egrets replace snow geese as the most easily observed wildlife. Various species of raptors utilize the dunes, power line poles, and sign posts for resting and hunting. An estimated 1,342,571 visitors spent time in association with vehicular wildlife observation during 1992.

The number of birders requesting special permission to bird in the closed areas of the refuge dropped drastically during 1992, as was expected. During 1990, South Pond was drawn down for management purposes, creating excellent wading and shorebird

habitat. Several rare species, including curlew sandpipers, white-winged terns, and others attracted "life listers" from all over the country. During 1991, North Pond, already completely open to the public, was drawn. Having a very different bottom configuration, the North Pond drawdown did not create the quality of excellent wading and shorebird habitat as was produced during the South Pond drawdown. Birders requested access to South Pond a time or two until the word was dispersed that there was no real reason to go there. The staff has learned that, though some folks want access to a closed area just because it's a closed area, most folks are honorable in their intentions and trusting of FWS evaluations of their need for access.

Refuge trails and other access points are located to make wildlife observation (on foot) easy and enjoyable. In choosing the North Pond area for a focal point for public use and closing the areas around the other 2 impoundments, the needs of the public were seriously and diligently considered. There are many refuge visitors who realize and support this policy. Refuge visitors spent approximately 443,500 AH (295,667 visits) participating in wildlife/wildlands observation (on foot) on Pea Island during 1992.

12. Other Wildlife Oriented Recreation

In the past, a few well placed photo-blinds have provided limited numbers of refuge visitors with a unique opportunity to photograph wildlife. Several years ago, Hurricane Gloria destroyed the few blinds available at Pea Island. Since then, several special requests have been sent to RO for funding, when opportunities were offered. It is hoped that, eventually, photo/observation blinds may be constructed.

It is still our contention that the best photographs at Pea Island have resulted from being in the right place at the right time -- with a camera in hand. During 1992, approximately 23,236 AH (5,809 visits) were spent with wildlife/ wildlands photography.

15. Off-Road Vehicling

The use of ORV's on Pea Island is restricted to NC Highway 12. Illegal ORV traffic continues to plague the refuge; however, probably due to rapid erosion of the beach and repeated ocean overwash of NC 12 on Pea Island, 1992 has been a year for fewer ORV violations. As long as there is a physical way for vehicles to reach the beach, there will always be some problems with ORV traffic there.

As public use of Outer Banks beaches continues to increase dramatically, the importance of the few remaining tracts of

natural, relatively undisturbed beach habitat is becoming increasingly apparent for gulls, terns, shorebirds, and allied bird species. It appears from weekly surveys conducted at Pea Island and along other beaches in Dare county, including Cape Hatteras National Seashore, that increasing human activity on beaches is adversely affecting bird use of this important habitat. The birds are simply avoiding areas of heavy to moderate human use and are concentrating on beaches where public access is limited and the numbers of swimmers, sunbathers, surfers, and fishermen are low.

16. Other Non-Wildlife Oriented Recreation

Because Pea Island is associated with the "beach scene", non-wildlife related recreational activities will always occur on the refuge. Swimming, surfing, and sunbathing are major summer activities. Approximately 1,424,332 AH (356,083 visits) were spent in non-wildlife oriented recreation during 1992.

17. Law Enforcement

Due to a MOU with Cape Hatteras National Seashore, the NPS has the primary responsibility for non-wildlife related public use on Pea Island. For this reason, a law enforcement presence is maintained regularly, though not constantly, on the refuge.

There is still an obvious need for more LE presence on the refuge. It is hoped that this need can be met during 1992. The most common problems are car clouting, illegal parking, vandalism to NPS restrooms, public nudity, littering, and dogs off a leash.

Pea Island's beach is a desolate place and has had drugs wash in from vessels whose cargo has been dumped at sea. In these cases, there are usually people on shore searching for the drugs, as well as Coast Guard and other officials.

There are minor poaching problems at Pea Island; occasionally cars will stop and shots will be fired at waterfowl from the road. Poachers sometimes slip in from Pamlico Sound to quickly shoot as many waterfowl as they can and then speed away. Some illegal hunting may take place within the refuge boundaries in the Pamlico Sound. These types of violations are difficult to detect the violators are difficult to apprehend.

18. Cooperating Associations

Though the Coastal Wildlife Refuge Society is officially the Cooperating Association for Alligator River NWR, most of its activity for 1992 related to Pea Island.

The Sales Unit at the VCS continued its activity. During 1992, Pea Island patches and pins, duck stamp pins and key chains, insect repellent, wildlife note cards, 7 styles of T-shirts, and 23 titles of wildlife-related books were on the sales list.

A tremendous amount of support was provided for Pea Island during 1992 by the Coastal Wildlife Refuge Society. (See Section H.18. of Alligator River NWR Annual Narrative Report for more details about this Cooperating Association.)

I. EQUIPMENT AND FACILITIES

2. Rehabilitation

Refuge staff constructed two 30' long wheel chair ramps for 1 of the North Pond Trail towers. This trail is now completely handicap accessible.

RES's were submitted and MMS funding received in FY93 budgets for replacing the WCS's on Pea Island's impoundments. The existing structures became inoperable years ago and had been closed off with fill. Replacing these structures will greatly enhance water management capabilities. Pumping costs to maintain optimum water levels should be cut in half following installation.

RES's were submitted and funding received in FY93 budgets to replace two 2,000 gallon underground fuel tanks. The proposed project is to remove the old tanks, complete all soil/water testing, and install two 1,000 gallon self-contained above ground tanks. RO Engineering paid the refuge a site visit in December to look at the site.

3. Major Maintenance

All 3 relift pumps on the impoundment units were rewired and new emergency kill switches installed. Salt spray had rendered the kill switches inoperable.

Regional Surveyors Beneke and Rasberry spent over 2 weeks relocating Pea Island's 25,000 acre proclamation boundary (in Pamlico South) using refuge boats, staff, and their satellite equipment. The refuge will "jet" piling down to mark this boundary where possible and get the USCOE's piling boat to finish the deep water areas. This boundary was lost several years ago when the sound froze over.

J. OTHER ITEMS4. Credits

The Narrative Report was a joint effort by the entire staff. Special credit goes to WIS Strawser for editing and OAC Lane for typing.