ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE
PEA ISLAND NATIONAL WILDLIFE REFUGE

Manteo, North Carolina

ANNUAL NARRATIVE REPORT

Calendar Year 1990

Review and Approvals

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Submitted By — Date

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Refuge Supervisor Review — Date

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Regional Office Approval — Date

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

INTRODUCTION

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Location

The 141,253 acre Alligator River National Wildlife Refuge 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 in Tyrrell and Hyde Counties. Most of the refuge is part of a five-county region bounded on the north by Albemarle Sound, on the east by Croatan and Pamlico Sounds, and on the south by Pamlico Sound and Pamlico River.

Dare County is separated from Tyrrell County by the Alligator River, which forms part of the Intracoastal Waterway. On its southern border, Dare County joins Hyde County at a seven-mile-wide neck of land between Alligator River and Long Shoal River of Pamlico Sound. Approximately 122,263 acres of the refuge lie on the mainland portion of Dare County. Another 13,000 acres lie in Hyde County; the remaining 6,000 acres are in Tyrrell County.

Background

Alligator River Refuge and the surrounding areas were first inhabited by native Indians. The first attempt at English settlement was made on nearby Roanoke Island in 1587. The largest settlement by whites was made in the late 1700's or early 1800's by a community called Beechlands in the refuge area near Milltail Creek.

In 1885, three lumbermen from Buffalo, New York purchased 168,000 acres of Dare County's mainland to set up a lumber industry and camp at Buffalo City, on Milltail Creek. The land changed owners several times over the years and eventually was obtained by the West Virginia Pulp and Paper Company. In 1974, the land was sold to McLean Industries in a large farming experiment called First Colony Farms. Prudential Life Insurance Company obtained all of the Prulean Corporation land as well as some of first Colony Farms land. Years before the Prudential Life Insurance Company donated what is now Alligator River NWR, discussions began between Prudential and The Nature Conservancy (TNC) concerning the possibility of a small donation of land on the Dare County mainland for the purpose of conservation. Although the discussions continued for some time, no actual land transfer occurred.

In March of 1980, the U.S. Army Corps of Engineers (COE) became aware of recent ditching and clearing in Prulean Farm's Dare County landholdings and ordered the operation to cease until after the issuance of a Section 404 permit.

In November of 1980, Prulean Farms applied for a Section 404 permit to clear and drain approximately 23,000 acres for agricultural purposes in the vicinity of Milltail Creek. A Clean Water Act Section 404 permit was granted in March 1981 for the Prulean Farms proposal to convert 2,800 acres to farmland in Dare and Tyrrell Counties while an EIS was being prepared on the 23,000 acre area. In June of 1982, the COE determined that Prulean's activities on approximately 3,457 acres in the Laurel Bay and Sawyer Lake Creek basins of Dare County satisfied the requirements for a nationwide permit under Title 33, U.S. CFR. While the land clearing continued, the National Wildlife Federation filed a law suit to stop the clearing and conversion of wetlands on Prulean's Dare County landholdings.

In response to the permit proposal to convert 23,000 acres of wetlands to agricultural land by Prulean Farms, the Fish and Wildlife Service Ecological Services Office in Raleigh, N.C. initiated a habitat evaluation procedures study to analyze the fish and wildlife impacts of the proposal. The N.C. Museum of Natural History was contracted to compile a wildlife inventory of the area, and the FWS Asheville Endangered Species office was called in to analyze the possible impacts on endangered species.

In the spring of 1984, Prulean Farms withdrew its permit application 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 4,000 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.

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

HABITAT MANAGEMENT (Cont.)

G. WILDLIFE

H. PUBLIC USE

I. EQUIPMENT AND FACILITIES

J. OTHER ITEMS

A. HIGHLIGHTS

1. Red wolf is alive, well, and reproducing....(see Section G.2.).

2. Refuge volunteer program contributes almost 16,000 hours; wins second Take Pride in America National Award. (See Section E.4.).

In one day, Alligator River staff, volunteers and programs received two National TPIA Awards four Director's Awards... 8/90 CM

3. Moist soil management/farming areas pay off! (See Section F.4.).

4. Proposed state bear season complicate management....(see Section G.8.).

5. Dog hunters still complain....(see Section H.8.).

B. CLIMATIC CONDITIONS

1990 proved to be a memorable year for weather. September of 1990 was the driest September on record with only .59 inches of rain, in direct contrast to 1989's wettest September on record. Rainfall for the year was 8.03 inches below normal. The average temperature was 65.3 degrees F., 3.5 degrees above normal. Nor'easters in the fall spelled disaster for the Oregon Inlet Bridge. 66 mph winds smashed a dredge into the bridge, Pea Island NWR's link with the rest of the world. (See Section D.4. of the Pea Island

narrative. 78 mph winds in November spawned several tornados, but caused no major damage. As a bright spot, the percentage of sunshine for 1990 was the highest in several years!

C. LAND ACQUISITION

1. Fee Title

Due to pressure from the Republican Dare County Commissioners, Congressman Walter B. Jones removed the Fish and Wildlife Service from a bill in October, which would expand the National Park Services' Fort Raleigh site and would provide the refuge with land for a headquarters site. The Fish and Wildlife Service is pursuing efforts to purchase the land.

On November 27, RM Taylor and RR Strawser met with the Stumpy Point Civic Association concerning the exchange of refuge lands enabling the community to construct a softball field. RM Taylor volunteered the refuge's assistance for a fund raiser to help Stumpy Point purchase lands for an exchange. This issue has been an on-going sore spot for the refuge. County officials refuse to understand that RM Taylor does not have the authority to just give up refuge lands. The congressional inquiries, prompted by Dare County officials, continue to roll in.

2. Easements

During April 1989 the USFWS negotiated a lease with the owners of Durant Island, a tract of land covering about 4,800 acres north of ARNWR. The lease cost $1,001 in 1989 and provided the USFWS the legal right to release red wolves on the island. The lease was renewed during March 1990 for 3 years at a cost of $1.

In addition to the lease agreement, the refuge negotiated a Memorandum of Understanding (MOU) with John Hancock Life Insurance (Philadelphia, PA). The MOU was signed on 15 February 1990, and designates approximately 45,000 acres of John Hancock property as a conservation easement of ARNWR. The easement is tremendously important: since September 1987, project personnel have retrieved four different wolves that on five occasions wandered to the land considered by the easement. The errant wolves had to be retrieved in

order for the project to maintain compliance with federal regulations. Due to the MOU, wolves can now legally inhabit the 45,000 acres owned by John Hancock in northeastern North Carolina.

As a result of the lease agreement and the MOU red wolves can now legally inhabit approximately 237,000 acres of federal and private land in eastern North Carolina. The precedent established by the owners of Durant Island and John Hancock will hopefully prompt other landowners to cooperate with red wolf restoration. If so, red wolves could have access to a total of approximately 500,000 acres in eastern North Carolina. With adequate funding, it is reasonable to expect that 50 to 100 wolves could be restored to such an area within 5 to 10 years.

D. PLANNING

2. Management Plan

Fire Management Officer (FMO) Steve Fowler assisted ROS Lanier in revamping the format for the refuge's prescribed burning plan. This new format provides more extensive pre and post burn monitoring of the burn area and utilizes the latest state-of-the-art computer fuel type models.

4. Compliance with Environmental Cultural Resource Mandates

The refuge received emergency authorization from the Corps in early January to fill a section of canal needed to repair our perimeter dike around the farm fields. The dike "blew out" at Christmas. The maintenance crew was able to temporarily plug the 30 foot long hole; however, a 60 foot section of the dike near the first blow out (which was mostly peat soil), was in danger of blowing out. The Corps gave the refuge emergency authorization to fall back to the Long Curve Road and Milltail Road intersection and replace an old wooden bridge with a culvert and flash board riser and add clay fill material.

In June, the Corps of Engineers received recommendations from Dare County and the U.S. Air force Bombing Range to recommend denial for our 404 permits to replace three deteriorated wooden bridges with culverts and flash board risers. We discussed the situation with the Corps and submitted our written rebuttal to them. We resolved the Air Forces concerns, and the Corps agreed with the Fish and Wildlife Service solicitors opinion that it was not necessary for the refuge to obtain county permits.

E. ADMINISTRATION

1. Personnel

Permanent Full Time

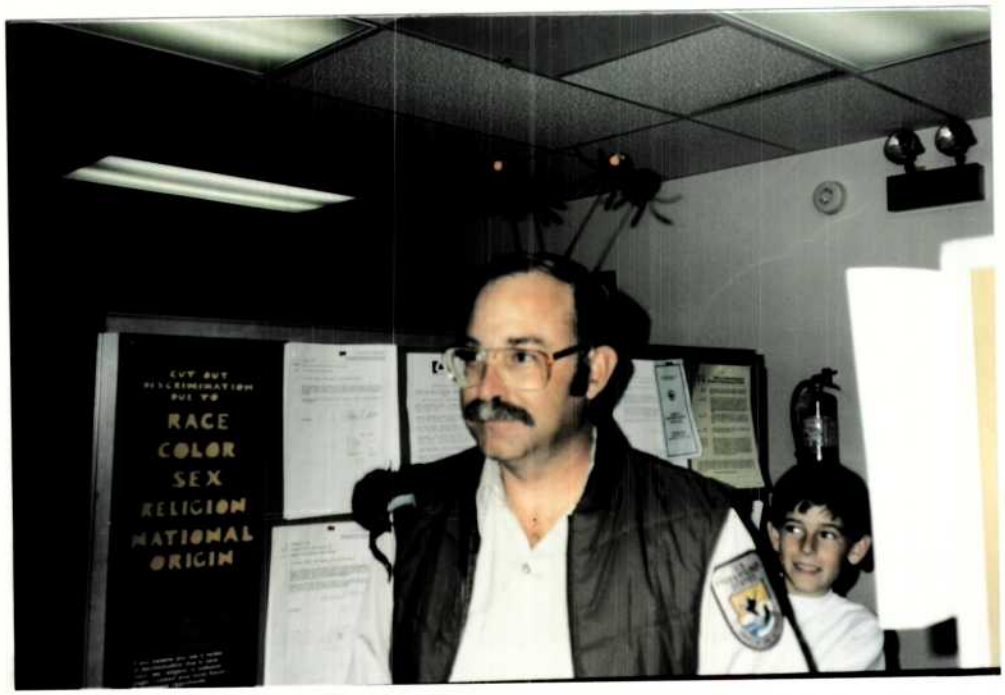
1. John Taylor, Refuge Manager, GS-13, EOD 01/07/85
2. Alan Schriver, Supervisory Refuge Opr. Specialist, GS-12, EOD 05/11/85
3. R. Scott Lanier, Refuge Opr. Specialist, GS-09, EOD 09/02/86
4. Jonathan Windley, Refuge Opr. Specialist, GS-05, EOD 02/26/89
5. Robert Noffsinger, Refuge Biologist, GS-11, EOD 04/13/87
6. Michael Phillips, Refuge Biologist, GS-11, EOD 06/21/87
7. Bonnie Strawser, Refuge Ranger, GS-09, EOD 12/31/80
8. Angela Elmore, Refuge Technician, GS-07, EOD 04/19/82,
9. James Beasley, Refuge Technician, GS-06, EOD 05/26/85
10. Chris Lucash, Refuge Technician, GS-06, EOD 07/01/88
11. Michael Morse, Refuge Technician, GS-05, EOD 04/08/90
12. Arthur Beyer, Refuge Technician, GS-05, EOD 12/02/90
13. Beverly Midgett, Office Assistant, GS-06, EOD 10/06/71
14. J. Bruce Creef, Crane Operator, WG-09, EOD 04/21/75
15. Alan Emery, Automotive Worker, WG-08, EOD 05/22/88
16. Jonathan Powers, Engineering Equip. Oper., WG-08, EOD 04/24/88
17. Doak Wilkins, Engineering Equip. Oper., WG-08, EOD 02/28/88
18. Murphy Peterson, Tractor Operator, WG-05, EOD 4/22/90

Temporary Part Time NTE 1 Year

19. Janice Lane, Clerk Typist, GS-03, EOD 03/25/90

OUR INFAMOUS LEADERS

The one and only - John T. Taylor at a hard days work.



As Alan Schriver's son looks on he's probably hoping he doesn't have those weird antenna's on his head when he grows up.

Front Row: 13, 19 Back Row: 4, 7, 3

Front Row: 6, 8 Back Row: 5, 11, 12, 9

Front Row: 15, 14, 17 Back Row: 18, 16

On January 14, ORP Strawser's title was changed to Refuge Ranger.

R. Scott Lanier was promoted to GS-09 on February 11, filling the vacant Refuge Operations Specialist position.

Janice Lane filled our temporary part time Clerk Typist position on March 25. The appointment is NTE one year.

Michael Morse filled the vacant GS-05 Refuge Technician position with the Red Wolf Project on April 4. Mike was previously on a temporary appointment NTE one year as a Biological Aid.

Murphy Peterson filled the new position of Tractor Operator on April 22.

Chris Lucash, Refuge Technician with the Red Wolf Project was promoted to GS-06 on July 30.

Jonathan Windley filled the vacant GS-05 Refuge Operation Specialist on October 7. Jonathan was previously with the Red Wolf Project as a Refuge Technician.

Doak Wilkins and Jonathan Powers were promoted to WG-8 Engineering Equipment Operators on November 18.

Arthur Beyer filled the vacant GS-05 Refuge Technician position for the Red Wolf Project on December 2.

Angela Elmore, Refuge Technician was promoted to GS-07 on December 6.

2. Youth Programs

The 1990 Alligator River YCC program began on June 18, and involved three enrollees and two youth leaders.

YCC 1990: Daniel Williams, Courtney Holden, Charlie Cooper, Robert Sawyer, Jeff Ambrose
8/90 BWS

On the first day, the station safety officer, "Calamity Ange", presented an orientation program on the safe use of tools and environmental hazards. All projects were reviewed from a safety standpoint. YCCers were also oriented about the FWS and the refuges on which they would be working. The YCC program ended on August 10.

For most of the summer the YCCers were supervised by one fire crewman. Assignments ranged from boundary posting to brushing dikes. However, many mistakes were made in accomplishing the assignments, and several avoidable accidents occurred.

From this experience, we learned to evaluate more closely the need for YCC programs. It is imperative to provide solid, mature, continuous supervision for YCCers for the program to work.

Alligator River projects included maintaining gates, signing, mulching dikes, brushing dikes, surveying, clearing the grates at the pumps, assisting with office work, banding brown pelicans, and processing a litter of red wolf pups. Special effort was made with each project to discuss the purpose, benefits, etc., of the project and relate it to the overall refuge and Service policies and plans.

4. Volunteer Programs

1990 was another banner year for the Alligator River NWR Volunteer Program. 15,681 hours were donated by 225 individuals. A categorization of volunteer hours for FY 1990 follows: 2,778 - maintenance; 9,500 - biological support; 2,978 - public use; and 425 - administrative.

The Red Wolf Project has drawn a number of college students to volunteer blocks of time to the project. During 1990, 7,902 hours of volunteer time were spent in caretaking positions for the red wolves.

The refuge utilized six student interns. All interns worked for the red wolf project during 1990; most stayed 12-16 weeks.

Volunteers provided support in almost every facet of refuge work. Several "receptionists" worked at the Alligator River office answering the phone and assisting with assorted office duties. Some wrote columns and handled public inquiries. The volunteer programs also provided volunteer assistance for Pea Island Refuge. For details on these activities see Section E. 4 of the Pea Island narrative.

Again this year the Dare Voluntary Action Center sponsored a "Red V" campaign and the refuge participated. To help the public in identifying volunteers, each was encouraged to wear a red ribbon "V" throughout the week.

Recruitment activities for 1990 were not major, but spontaneous efforts were made whenever the opportunity presented itself. At this point, most of our 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. RR Strawser has acted as the County Coordinator for Take Pride in America for several years.

On February 17, ten refuge volunteers and RR Straswer traveled to Raleigh to receive an award naming the Refuge Volunteer Program as a winner in the North Carolina TPIA Program. Volunteer, Ken Dyar was named as an individual winner for his efforts on the refuge and for his efforts in the formation of the Coastal Wildlife Refuge Society. Eagle Scout Donald Phillips received an Honorable Mention for his work on Alligator River NWR, and volunteer "Kris" Kristoffersen was named as an Honorable Mention.

Mid-year, volunteers Dyar, Kristoffersen, and Phillips accompanied RR Strawser to Washington to accept a number of National Awards. In the National TPIA Program Kristoffersen accepted an award on behalf of the Alligator River NWR Volunteer Program as a National Winner, Dyar was named as an Individual Winner and Phillips was named as an Honorable Mention. In addition to the TPIA Awards Program, the ARNWR representatives attended a special awards ceremony at the Director's office. RR Strawser, Kristoffersen, Dyar, and Phillips received individual Director's Awards. The ARNWR Volunteer Program also received a Director's Award.

On September 27, the annual Awards Ceremony of the Dare Voluntary Action Center was held, and the Refuge Volunteer Program received an award as an outstanding volunteer organization.

Cumulative hours tallied through September 30, 1990 yielded the following awards:

100+ hour certificate: Barbara Mallory, Win Copeland, David Leake, Sherri Lemnios, John DeLucia, Cindy Newton, Dwight Arnett, Heather Collins, and Sarah Downing.

250+ hour pin: Bill Bagwell, Henry Dagit, Hilda Bayliss, Aylene Goddard, Herb Lewis, Anne Wood, Dick Wood, Veda Jones, Fran Jolliff, and Dee Sarver.

500+ hour pin: Bob Gaul, Warren Johnson, Don Perry, Patsy Zoll, and Cindy Newton.

1,000 hour pin: Dwight Arnett, Justine Smith, Chuck Peoples, Jennifer Campbell, and Art Beyer.

1,500+ hour plaque: Jennifer Campbell, Art Beyer, "Kris" Kristoffersen.

2,000+ hour plaque: Chuck Peoples and Ken Dyar.

Two special plaques were also prepared and presented that will be permanently housed in the Refuge Visitor Center. A special "Outstanding Charter Volunteers" plaque was

dedicated to: E. J. and Ritchie Buckingham, Jane and Warren Davis, Virginia and Allen Valpey, Margaret Burnes, Jessie and Arch Bush, Bob Pitcher, and Bill Perkinson. An "Outstanding Refuge Volunteers" plaque was established with 24 blank name plates. Recipients were named for 1988, 1989, and 1990. These outstanding volunteers were Warren Davis, Ken Dyar, and "Kris" Kristoffersen, respectively.

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

In FY 90, Alligator River received funding of $1,762,700. Alligator River received the following: 4.3k Reimbursable monies from the U.S. Air Force to conduct a black bear study, 884.0k Construction monies for the new maintenance facility, 22.5k Reimbursable monies for Ducks Unlimited Project, 117.2k for Presuppression, 15.0k for Special Operations for MARSH project, 7.0k for Special Operations for the Oregon Inlet consultant study, and 6.2k for the YCC program. Pea Island received 10.0 for Challenge Grants to build handicapped facilities on North Pond Trail.

FOUR YEAR FUNDING COMPARISON

	1990	1989	1988	1987
1230				15.0
1260				411.2
1261	374.0	349.4	268.4	
1262	169.5	135.8	215.1	
1113 (ENDG SP)	185.0	160.0	130.0	80.4
2821	884.0	22.5	98.1	30.6
1971	26.8	17.3		
YCC	6.2	5.2	4.7	4.8
9120	117.2			
TOTAL	1762.7	690.2	716.3	567.2

6. Safety

This year a Safety Committee was formed for Alligator River NWR. The members are WB Mike Phillips, MW Jonathan Powers, and RT Angela Elmore. The committee was helpful in identifying unsafe working conditions, habits and attitudes. They encouraged actions to correct these problems. The committee was most helpful when conducting The Annual Safety Program Audit and with The Annual Safety Inspection.

Employees and volunteers were involved in numerous training sessions. Several of these were: YCC hand tool training; all-terrain vehicle workshop/certification; dozer, utility tractor, motorgrader, backhoe and wheeled loader training/certification; CPR training/certification; USCG Skippers Course/certification; and the Hiemlick maneuver review. Other safety topics included lyme disease, firefighting, and float plans. Staff members gained experience on October 11 and 12, when we implemented the Contingency Plan for Hurricane Lilly. Also this year we established a fire equipment closet to prepare for the "soon-to-be-hired" fire crew.

This year we added 30,855 hours to our total of hour worked since a lost time accident. With the accident in 1989, we only have a grand total of 54,223 hours. No time loss accidents occurred this year. However, there were six reportable accidents this year which include the following: February 9, MW Powers pulled a muscle in his shoulder while raking debris from grates at a pump site; June 15, AW Emery was thrown from the seat into the windshield while operating the D-3 dozer. He received minor head injury; July 27, YCC enrollee Sawyer was struck in the chest with a large piece of earth thrown by another enrollee and coughing ensued as blood came from his mouth and nose; September 27, TO Peterson was injured when rust from the exhaust pipe blew in his eye while operating the front-end loader; November 14, ROS Windley was bitten on his hand which resulted in a puncture and bruise by a red wolf while preparing to transport the animal to the vet.

7. Technical Assistance

Under a cooperative agreement with the U.S. Air Force, the refuge provided considerable technical assistance to the adjacent Dare County Bombing Range on wildlife management. This year the black bear study and the alligator surveys, joint FWS and Air Force projects, were continued (see Section G. Wildlife).

In July, RM Taylor, RB Noffsinger, and FMO Fowler met with The Nature Conservancy biologists and fire specialist to discuss pocosin burning prescriptions and common problems and concerns with fire management on pocosin habitat.

8. Other

On March 1, SROS Schriver and RR Strawser served as judges for the Manteo High School Science Fair.

From April 29 through May 18, ROS Lanier attended the Basic Refuge Academy in Blair, Nebraska. On May 14, RM Taylor conducted a class on "Career Survival Skills in the USFWS" for the class.

On June 2, RM Taylor attended The North Carolina Nature Conservancy Annual Meeting in Cashiers, NC to accept their Public Service Award for 1990.

On August 15, Assistant Director Olsen and Jim Loach (Assistant Secretary's Office) toured Oregon Inlet and discussed jetty issues with RM Taylor and NPS Superintendent Hartman. RM Taylor and RB Noffsinger accompanied them to Wilmington, NC the following day to meet with the Corps of Engineers.

Throughout the year various members of the refuge management staff met with members of the Dare County Board of Commissioners and the Planning Board in an effort to brief them on various refuge projects and to foster better community relations.

Alligator River staff volunteered to man the Dare County Recycle Center one Saturday each month.

Refuge staff and families volunteer at the Dare County Recycle Center. 6/90 UNK

F. HABITAT MANAGEMENT

1. General

Five categories of natural, vegetated habitat types are found on Alligator River Refuge: marshes, pocosins, mixed-hardwood pine swamps, hardwood swamps and white cedar swamps. These are classified as wetlands based on the vegetation present, the degree of soil saturation, and the hydroperiod. Alligator River Refuge 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 man, large portions have undergone changes in vegetative 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 agricultural land to our list of habitats.

2. Wetlands

On September 6, 1990, after five months in the 404 permit application process, we received a Corps of Engineers permit needed to replace four deteriorating wooden bridges with culverts and flashboard risers. Dare County objected to the issuance of the permit because of alleged problems with mosquitos, inconsistency with the Dare County Land Use Plan, anticipated impacts to 800 acres of farmland the county owns and plans to use as a landfill, creation of stagnant water bodies and failure to receive County authorization. After discussions and on site meetings with the Corps, NC mosquito control personnel, Office of Coastal Management, NC Division of Environmental Management and County Commissioners Sonny Ambrose and Mikey Daniels, the Corps issued over the objections of the County. The risers purchased with fire monies will allow safe movement over the canals by fire equipment and better water management for fire suppression and controlled burning. When the risers are in place they will restore a more natural hydrological regime on approximately 4,400 acres of wetlands and partially restore another 3000 acres (these will need additional risers or small ditch plugs to completely close of drainage of the areas). The restoration of the past hydrology of the area will be accomplished in 1991 when the flash board risers are installed in four major canals that drain the central portion of the refuge.

Santee's excavater made this culvert installation much easier. 9/90 BWS

A few sore backs and a few tired bodies later... 9/90 BWS

Wetland types present on the refuge are described as follows:

Marsh - Marshes on the refuge consist of irregularly flooded salt marshes and several freshwater marshes. The largest portion of marsh on the refuge consists of salt marshes along the eastern boundary adjacent to Croatan and Pamlico Sounds. These salt marshes are also associated with the mouth of almost every creek emptying into East and South Lakes.

Dominant vegetation within these marshes includes big cordgrass, black needlerush, salt meadow cordgrass, sawgrass, and saltmarsh cordgrass. Cattail, wax myrtle, baccharis, and many species of sedges, rushes, and other wetland plants are also present.

The freshwater marshes occur along the fringes of streams, lakes, and in isolated pockets in disturbed areas. Panic grasses, sawgrasses, arrow arum, cattail, and water lily are predominate in these areas.

Alligator River NWR Habitat Types

Vegetated Wetlands		Approximate Acreage			
Habitat Type	%	Dare	Tyrrell	Hyde	Total
White Cedar Swamp	6.2	6,900	1,000	1,000	8,900
Hardwood Swamp	10.5	11,700	1,800	3,700	17,200
Mixed Hardwood-Pine Swamp	29.1	36,000	3,200	6,000	45,200
Low Pocosin	6.4	8,100	--	--	8,100
Cane Pocosin	1.8	2,300	--	--	2,300
Tree Pocosin	19.0	25,500	--	2,600	28,100
Lakes/Open Water	1.0	1,000	--	--	1,000
Marsh	19.7	25,200	--	--	25,200
Farmland and Moist Soil	--	5,100	--	--	5,100
		121,800	6,000	13,300	141,100

Pocosin - Alligator River NWR has typical pocosin vegetation, characterized by dense shrub growth associated with scattered trees. The dominant tree species are usually pond pine, with some loblolly bay, red bay, and sweet bay. Common shrubs are titi, fetterbush, bitter gallberry, and sweet gallberry. Shrub and smilax growth is a often so dense that walking through it is impossible. Shrub-dominated areas are known as short or low pocosin. These areas are usually found over deeper peat deposits and

experience long hydroperiods. Tree or tall pocosins contain more trees than shrub pocosins but lack the grasses, sedges, and herbaceous plants in the understory. Cane pocosins are dominated by a switch cane understory.

3. Forest

Alligator River swamp forests can be categorized into three general types.

Mixed Hardwood-Pine - The mixed hardwood-pine forest type is found primarily in the western half of the refuge but also occurs in scattered areas throughout. Red maple, red bay, and black gum are the dominant hardwood species and are usually mixed with loblolly and pond pine. The understory contains fetterbush and bitter gallberry with little or no herbaceous vegetation.

Hardwood Swamp - Hardwood swamps are restricted to the western half of the refuge. They are characterized by red maple, black gum, and red bay as the dominant species with red bay and fetterbush comprising the understory. Very little herbaceous vegetation is present. Pockets of lizards tail and arrow arum are found in more open areas when the swamp floor receives more sunlight. Scattered old growth bald cypress is present particularly in stands bordering the Alligator River and Milltail Creek.

The hardwood swamps are found on deep organic soils (e.g. Pungo and Belhaven Mucks) as well as shallow organic soils (e.g. Roper Muck) or wet mineral soils (e.g. Cape Fear Loam, Hyde Loam). The wet mineral soil and, in some instances, the shallow organic soils are capable of supporting water and willow oaks. Spot checks of areas with these soil types have identified scattered oaks, primarily water oaks. We believe these areas had a large oak component in the past. Possible past logging and/or drainage practices reduced the amount of oak regeneration on these areas. Areas of wet mineral soils not identified on SCS soils maps have also been found. These are usually in the less accessible areas and occur as "ridges" or "fingers" running through the organic soils.

The Dare County Alternative High School provided volunteers in December of last year to plant acorns on 15 acres of abandoned cropland near the Air Force bombing range. Unfortunately the survival was very poor. Competition from woolgrass was heavy, and we had the second highest rainfall on record this part of the year. The planted area had standing water until well into June. We plan to replant the area next year if we have a good harvest of water oak acorns from the oaks found along Milltail Creek this fall.

White Cedar Swamp - Atlantic white cedar swamps are found on the western half of the refuge, primarily along Milltail Creek and in the southwest corner in the Whipping Creek area. This forest type contains dense stands of dominant white cedar with black gum as an important subdominant. Sweet gallberry and fetterbush make up the understory. Virginia chain fern is the only herbaceous plant present in substantial amounts.

4. Cropland

The acquisition of the 10,000 acre Prudential Farms inholding in March, 1988, gave us an even greater diversity of habitats and a great potential for managed habitat for waterfowl, shorebirds, and wading birds. The tract includes 5,100 acres of cropland. Prudential had developed the area from forested wetlands by encircling it with a dike and placing parallel drainage ditches at 300 foot intervals. These ditches, in conjunction with large receptor canals, move water to two large pump stations. The pumps can remove 250,000 gallons of water per minute from the farm fields. Pumping is required to keep the area dry enough to farm. The reconversion of the area to wetland habitat is basically simple: Don't pump the areas where we plan for permanent water or reduce pumping on moist soil areas. This is accomplished by judicious placement of flashboard risers in conjunction with existing dikes, building small permanent cross dikes and temporary rice plow dikes. In 1988 and 1989, we concentrated our management efforts on the Twiford Unit (1,355 acres) where we had the best water control to begin with.

In 1990, we placed four water control structures in the Creef Unit allowing us to flood an additional 300 acres. Another structure in the Twiford unit gave us 100 more acres. By temporarily plugging five small field ditches in the Laurel Bay unit we flooded an additional 40 acres. Six miles of existing dike was upgraded in the Twiford Unit.

This year we had 1093 acres of moist soil plants flooded, 22 acres of milo, 22 acres of millet and 89 acres of corn flooded. We also had 270 acres where the farmers got off a crop of early soybeans and produced millet for us to flood.

The Creef Unit had 191 acres of moist soil, 133 acres of early crop/millet and 57 acres of corn. The Twiford unit had 867 acres of moist soil, 97 acres of early crop/millet, 22 acres of milo and 22 acres of millet. The Laurel Bay unit had 35 acres of moist soil, 40 acres of early crop/millet and 32 acres of corn.

A good crop of winter wheat browse for the geese coming up after the soybeans were harvested.
10/90 RSL

Our vegetated field borders provide good wildlife cover and improve water quality. 10/90 RSL

9. Fire Management

A slight modification to the Refuge Fire Management Plan for prescribed burning has been made due to the Red Wolf Project. Because of the introduction of the red wolf on the refuge, no large-scale, big block burning is planned. When burning is conducted, it will be done in small blocks in order to avoid any possibility of injuring or killing the animals.

Under our co-op agreement with the N.C. Division of Forest Resources, the State agrees to provide presuppression, detection, and suppression services, and will assume overall command of all fires on Alligator River NWR. During 1990 we began a process of renegotiating our contract with the state.

The N.C. Division of Forest Resources suppressed four wildfires on the Refuge in 1990. These are listed below:

June 4- Callaghan Creek Fire. This fire burned 3,000 acres of pocosin and marsh. Started by lightning, the fire was south of Callaghans Creek and north of Point Peter road along the Croatan Sound. The fire was declared out June 8.

June 19- One Tree Fire. This fire burned .1 acre approximately 1 mile northeast of Stumpy Point. It was caused by a lightning strike in an old cypress snag. The fire was put out same day by helitanker.

June 23- Snake Fire. This fire, caused by lightning, burned 14 acres directly south of South Lake. The fire was put out the same day by a handcrew and helitanker.

June 24- Fourth Avenue Fire. This fire, also caused by lightning, burned .5 acre. The site was one mile south of the Alligator River, west of Roper Island and the Intracoastal Waterway, and north of Mattamuskeet Farms. The fire was suppressed the same day by tractors and a handcrew.

G. WILDLIFE

1. Wildlife Diversity

Alligator River NWR and its surrounding waters support a variety of resident and migratory wildlife. Of these, 48 species are fish, 145 are birds, 48 are reptiles and amphibians, and 40 are mammals. The refuge's interior lakes and streams support fish species characteristic of

blackwater or oligohaline systems. The refuge's large size and habitat diversity provide for forest dwelling, as well as marsh and shrub dwelling, avian and mammalian species.

2. Endangered and/or Threatened Species

a. Federally Listed Endangered and Threatened Species

Five endangered species have been documented on the refuge. Management programs are in place for the red wolf and the 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.

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 are 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 and again in 1990. One of the survey routes was on Whipping Creek and Whipping Creek Lake and was partly on Refuge lands. This five mile route had the highest population index in both years (1.6 and .6 alligators observed per mile in '88 and '90, respectively) and highest population estimated of all routes (27-40 and 10-15 alligators, respectively). A good range of sizes occurred along the route in 1988 but not in 1990. The immature to adult ratio was 62:38 in 1988 and 60:40 in 1990 indicating no significant change. However, the 1988 survey had a range of sizes from 2 to 12 feet. In 1990, only alligators larger than 4 feet were seen. While we can only speculate on the cause of this, the hard freeze in December-January of 1989-90 could have selectively hurt smaller alligators.

Bald Eagle (Endangered) - Refuge staff sighted a mature bald eagle on February 2nd and a mature and immature on February 7. These sightings were on the south Twiford Unit, near Milltail Road. A mature bald eagle was seen on the southern end of the Creef Unit on February 8.

Peregrine Falcon (Endangered) - Although no sightings were reported for 1990, peregrine falcons are known to move through the refuge during migration.

Red-cockaded Woodpecker (Endangered) - There have been four reported sightings of active red-cockaded woodpecker colony sites. Two have been reported along Whipping Creek Road, one near the intersection of Cedar and Koehring and one along Chip Road. These were all

reported from 1981 to 1983 before the area came into the refuge system. The reported sightings have been plotted on maps and aerial photographs as closely as the descriptions will allow. The Chip Road colony was located in 1987, and the hardwood understory, which was within one foot of the only active cavity tree, was removed by our YCC crew. The colony on the south side of Chip Road was located in 1989 with the help of one of the persons who originally located it in 1982. It's also in need of understory removal, but we were unable to accomplish this in 1990. We were unable to locate the site on the north side of Chip Road or the site near the intersection of Koehring and Cedar Roads. We will continue to try to locate these and other colonies as time and personnel are available. It appears that the hardwood understory has grown above the cavity that was spotted on the north side of Chip Road in 1982.

Locating our RCW colonies will continue to be a major problem. The understory is so thick in the area that a trail has to be cut to walk through the area. Even so, the adjacent shrubs are so high that even nearby trees are obscured. A trail has to be cut to each pine tree and an area must be cleared all around the base of each tree to allow a view of the hole to check for cavities. Ground surveys are not very practical on Alligator River. Helicopter surveys appear to hold the best potential for locating other RCW colonies.

The Air Force may be willing to develop a joint survey and management plan for the refuge and the range. This did not materialize in 1990 but will be pursued again in 1991.

Red Wolf (Endangered) - 1990 Annual Report for Alligator River NWR Red Wolf Project 1990 marked the third full year of the red wolf reintroduction program being conducted in the refuge. Since 1987, 29 wolves have been released on 13 occasions. During 1990, 9 wolves were released on two occasions. Additionally, two wolves born in the wild during 1988 and a minimum of 3 wolves born in the wild during 1990 were free-ranging throughout 1990.

The first release in 1990 occurred on September 17 and involved a pair of adults (M#327 and F#304) and their three pups (M#397, F#398, and F#399). These five wolves arrived at the refuge from the Ross Park Zoo (Binghamton, NY) on July 12. Their acclimation began immediately as they were taken to a pen located on Durant Island.

During September 17 the family was released from the pen on the island. This event represented the first release of red wolves onto private land (the 3,888 acre island is being leased by the wolf project at a cost of $1.33/year).

A wide-ranging aerial search failed to locate 327 on September 21. Fearing the collar had malfunctioned prematurely, the acclimation pen was rigged as a trap in hopes of re-collaring 327. On September 23, pups 398 and 399 were captured. On September 25, the remaining pup 397 and 304 were captured. That same day 4-coil, #3 soft-catch leghold traps were set for 327. The trapline was maintained through the end of the month. No sign of 327 was seen through September 30, despite several wide-ranging aerial and ground searches. By the end of September, we had concluded that 327 was probably dead and the collar had malfunctioned. On October 4, 327 was found floating in along the western shore of Alligator River about 8 miles from Durant Island. 327 had not been located since September 18. After retrieving 327, we released 304 and the pups. By October 8,304 had begun travelling east. On October 9, she left Durant Island. She continued to wander throughout the central portion of the refuge until November 19 when she was recaptured and returned to captivity for breeding purposes.

The three pups stayed near the release site until the middle of the month. On October 15, 397 and 398 were found dead near the northwest tip of Durant Island. Cause of death for each was drowning. Despite numerous aerial searches since October 15, the final pup (399) was not located. She is presumed to have drowned. Since she was outfitted with an abdominal transmitter which was not fastened to her body, it is likely that we will not locate the carcass.

It is believed that the wanderings of 304 and the pups were caused by the loss of 327. His departure from the island may have been caused by a short acclimation period. For logistical reasons and because it was decided to release the wolves before the deer hunting season was well underway, we were only able to acclimate the animals to the island for about 60 days. We are considering acclimating another family to the island for a minimum of 3 months and releasing them during August 1991.

Biologist Mike Phillips checks
incision from abdominal implant.
8/90 BWS

RT Mike Morse weighing red wolf with assistance from volunteer Chuck Peoples and YCC Robert Sawyer. 7/90 BWS

The second release of 1990 took place on October 2 and involved an adult pair (M#328 and F#313) and their three pups (M#426, M#427, and F#430). The adult pair arrived at Alligator River during January 1988 and were initially released during August 1989. For management purposes they were returned to captivity during the fall of 1989. During May 1990, 313 gave birth the 426, 427, and 430 at the Alligator River captive facility.

On October 2, the family was released in the southwest portion of the refuge. Through October 22, all the animals except 427 restricted their movements to the release area. On October 7, 427 initiated wide-ranging movements. During the next 5 days he travelled about 10 miles west of the release site. We were unable to locate him on October 15 and 17, despite wide-ranging aerial searches. On October 19, he was about 5 miles southwest of the restoration area, about 3 miles north of the small community of Fairfield, NC. Since little was known about his movements, we decided to wait at least 24 hours before organizing a recapture attempt. On October 20, he was located near a paved road about 1/3 of mile from his previous location. A ground check revealed that 427 had been shot (by a high caliber rifle) early that morning.

That 427 was outside the "restoration area", combined with the fact that at a distance a young, 40 lb. red wolf would resemble a coyote, prompted us to believe that the shooter might have thought that 427 was a

coyote or wild dog. North Carolina has an open season on coyotes year round. Nonetheless, special agents from the Service's Washington, NC office are investigating.

The remaining family members quickly established themselves on a tract of private land that lies just south of Alligator River.

Excluding the wolves released during 1990, 6 to 10 wolves were free-ranging throughout or at some time during 1990. Six to eight of these animals inhabited the refuge, while two inhabited private land south of the refuge.

Analysis of approximately 1500 scats indicated that white-tailed deer, raccoon, and rabbit are the most important food items to wolves in eastern North Carolina.

Seven free-ranging wolves died during 1990. As mentioned above 327, 397, and 398 drowned, and it is believed that 399 also drowned. Additionally, 427 was shot. Other mortalities included F#393 and F#395.

On January 11, 395 (a 9-month-old pup) drowned after being captured in a steel leghold trap. Necropsy revealed that she was in excellent condition (weight 45 lbs). A number of unanswered questions about the death prompted the Service to initiate an investigation. In related law enforcement action, the North Carolina Wildlife Resources Commission charged the trapper with violating four State trapping regulations. On March 6, project personnel testified in a court case concerning illegal trapping in Dare County. The trapper was cited by wildlife officers from the North Carolina Wildlife Resources Commission for violating four trapping regulations. The officer's determinations were upheld in court as the trapper was convicted on three counts and fined $200. One of the violations involved the trap that captured 395. An investigation into 395's death is being conducted by the Service.

On January 24, 393 (a 9-month old pup) was hit and killed by a vehicle while traveling along U.S. 64. Since the project began, five wolves have been hit and killed by vehicles. On January 31, project personnel met with a representative from the North Carolina Department of Transportation. The Service and the State are working to erect 12 to 15 road signs designed to alert motorists to the presence of the wolves. Additionally, project personnel prepared public service announcements about the wolves for local radio stations to broadcast. The road signs and the PSA's, by increasing the public's awareness of the project, should help minimize the number of wolves killed by vehicles in the future.

Although a number of deaths were recorded during 1990, the year also provided some births. By the end of the April females 205 and 300 had restricted their movements to small areas of thick pine forests. We believe that both established dens in these areas and gave birth to pups sometime during late April. 205's den was also attended by her mate, 2-year-old male 331, and her daughter, yearling 394. 300's den was also attended by her mate, 3-year-old male 319. On May 11 we observed 300 with distended nipples. The two litters produced by 205 and 300 represent the third and fourth litters produced in the wild since the restoration project began

in September 1987. The first two litters were born in 1988. A pup from each of the first two litters survived through 1990.

During September field activities centered on capturing wild-born pups. During the evening of September 11, two 4 1/2 months old pups were captured with a 4-coil, #1 1/2 soft-catch leghold traps. Neither sustained apparent trap related injuries. Although the male (#442) only weighed 9 kg, he appeared to be in good health. He was collared and released at the capture site. Throughout the remainder of the month he exhibited restricted movements near the capture site. He was frequently located with his parents (319M, 300F). The second pup was a female (#443) that weighed 6 kg and was in poor health. Her pot-bellied appearance suggested that intestinal parasites were giving her the blues; examination of a stool sample revealed hookworm and whipworm eggs. Because of her poor condition, she was placed in captivity for intensive treatment. On September 20, she was implanted with an abdominal transmitter. She remained in captivity through the remainder of the month and on October 2, she was released. Immediately after release she began travelling with her family. On October 8, 443 was observed with her parents and two siblings (442M and an unmarked pup). Prior to this sighting we were unaware of the third pup! Sign indicated that the third pup survived through the year.

We were unable to capture 205's pup. Sign revealed that she probably was only able to rear one pup to fall. Its whereabouts remained a mystery through the end of the year.

The Alligator River crew continued to assist other red wolf projects throughout 1990. During the year, we made six trips to assist other components of the recovery program. We captured 9 animals and transported a total of 11. Additionally, we presented material at two planning meetings dedicated to the Great Smoky Mountains National Park red wolf project.

On May 30, we traveled to the Sabine NWR in southwest Louisiana. There is a chance that red wolves still inhabit the area. From June 1 to 8, over 90 trap nights were logged trying to capture animals. Although no canids were captured, sign of medium to large-sized canids was found; it's possible that red wolves still occur in the area. Thus, we plan to return to Sabine during February 1991 when conditions are more conducive to trapping.

The Alligator River red wolf project continued to serve as a large captive facility for red wolves. Twenty-six different wolves were involved in the captive program at ARNWR. The number of animals simultaneously held at the facility ranged from 7 to 15. The captive program at ARNWR could play an even bigger role in red wolf recovery if money was available to upgrade the facility (construct additional pens). Since this upgrade would parasitize on the existing captive program, the cost would be relatively minor compared to the benefits and compared to costs for initiating captive programs elsewhere.

3. Waterfowl

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

Wood ducks are still seen frequently; however, now they're joined by pintail, wigeons, scaup, redhead, etc. etc..... DC

Our third year's management of the farm fields has attracted fair numbers of waterfowl. Peak numbers were 5,825 blacks, 6,567 mallards, 10,770 pintails, 4,500 green-winged teal and 4,850 ring-necked ducks. Peak total was 30,681 from the aerial survey done on January 19.

We are eagerly anticipating more waterfowl use in coming years as we bring more and more of the farmland into waterfowl management. The results of this year's surveys are given below. The survey route (Sawyer Lake Road) runs along the southern edge of the South Twiford Unit which covers about two-thirds of the acreage flooded in the Twiford Unit.

We are also expecting increased wood duck production as we achieve restoration of past water levels in the swamps on drainage ditches.

Sawyer Lake Road Waterfowl Survey - South Twiford Unit

	Jan 5	Jan 11	Jan 19	Feb 14	Feb 23	Mar 2	Mar 16
Mallard	995	475	385	40	65	37	2
Black Duck	505	215	125	118	112	132	85
Pintail	3400	4050	4250	0	0	20	58
Widgeon	0	125	30	10	25	4	0
Green-winged Teal	1190	2300	4500	740	240	130	174
Wood Duck	375	0	150	43	24	38	103
Ring-necked Duck	1370	2605	275	230	95	3	94
Shoveler	0	0	0	0	0	10	18
Gadwall	0	20	0	0	0	0	0
Coots	0	25	0	10	0	10	4
Canada Geese	0	0	0	165	95	125	0
Tundra Swans	0	0	15	83	46	8	0
Other Waterfowl	1100	3070	2000	65	85	80	0
Total	8935	12885	14055	1504	787	597	538

Sawyer Lake Road Waterfowl Survey - Twiford Unit

	Mar 20	Mar 28	Oct 30	Nov 14	Nov 27	Dec 5	Dec 14
Mallard	12	12	45	25	123	23	53
Black Duck	28	16	20	38	100	78	91
Pintail	0	0	140	2172	1720	1830	775
Widgeon	10	0	0	0	12	33	0
Green-winged Teal	72	58	400	694	3750	441	2150
Wood Duck	48	56	32	174	293	49	87
Ring-necked Duck	20	10	50	575	750	354	498
Shoveler	8	6	0	0	0	10	0
Gadwall	0	0	0	0	0	0	0
Coots	0	0	0	0	0	0	0
Canada Geese	0	0	0	0	0	0	0
Tundra Swans	0	0	0	0	0	2	0
Other Waterfowl	64	14	0	51	1000	325	754
Total	262	172	637	4104	7748	3144	4408

Sawyer Lake Road Waterfowl Survey - South Twiford Unit

	Dec 20	Dec 27
Mallard	96	90
Black Duck	28	20
Pintail	615	83
Widgeon	30	2
Green-winged Teal	2414	3100
Wood Duck	60	25
Ring-necked Duck	325	780
Shoveler	0	0
Gadwall	0	8
Coots	0	0
Canada Geese	0	0
Tundra Swans	0	0
Other Waterfowl	450	400
Total	4018	4508

Two aerial surveys were flown. One on January 19 and one on February 5. We are missing a lot of ducks on the ground survey route along Sawyer Lake Road. The dense moist soil vegetation and long distances across some of the flooded areas (up to 3000 feet) hide many of the ducks there. The aerial survey also included about 300 acres of flooded moist soil in the NE Twiford Unit and 35 acres in the Laurel Bay Unit. These areas cannot be practically surveyed from the ground. These two areas accounted for 2167 (7%) of the ducks counted on January 19 and 478 (13%) of the ducks counted on February 5. While the February dates are spread apart, the January aerial and ground survey indicate that we need to use aerial surveys or adjust ground counts for birds not seen in the rank moist soil vegetation.

Comparison of Aerial and Ground Surveys

	Aerial Jan 19	Ground Jan 19	Aerial Feb 5	Ground Feb 14
Mallard	6567	385	758	40
Black Duck	5825	125	329	118
Pintail	10770	4250	1520	0
Widgeon	0	30	10	10
Green-winged Teal	2000	4500	610	740
Wood Duck	370	150	70	43
Ring-necked Duck	4850	2750	295	95
Shoveler	0	0	0	0
Gadwall	0	0	0	0
Coots	0	5	10	10
Canada Geese	160	0	145	165
Snow Geese	1	0	0	0
Tundra Swans	35	15	28	83
Other Waterfowl	103	2000	10	65
Total	30681	14055	3775	1504

8. Game Mammals

In 1988, the refuge in cooperation with the Department of Defense initiated a study of black bear movements and habitat use in Dare County. Prior to this study the refuge's bear population had not been studied and the processes that controlled the population were poorly understood. Radio-tracking was the primary field activity of the bear project during 1990.

Bears were usually located once or twice a week from a fixed-wing aircraft. A total of 179 locations were recorded (Table 1). Monitoring ceased at the end of fiscal year 1990

(i.e. 30 September 1990). Using the convex polygon method, overall home ranges varied in size from 51.8 km^2 to 113.5 km^2 with seasonal home ranges substantially smaller (Table 1 and Fig. 1). Home ranges were mostly non-overlapping (Fig. 1) except in an agricultural area where the bears fed heavily on beans and corn.

Bears were frequently located in areas characterized by thick vegetation (e.g. medium/high tree pocosin, pine/hardwood). These areas were usually about 600 m and 1800 m from unpaved and paved roads.

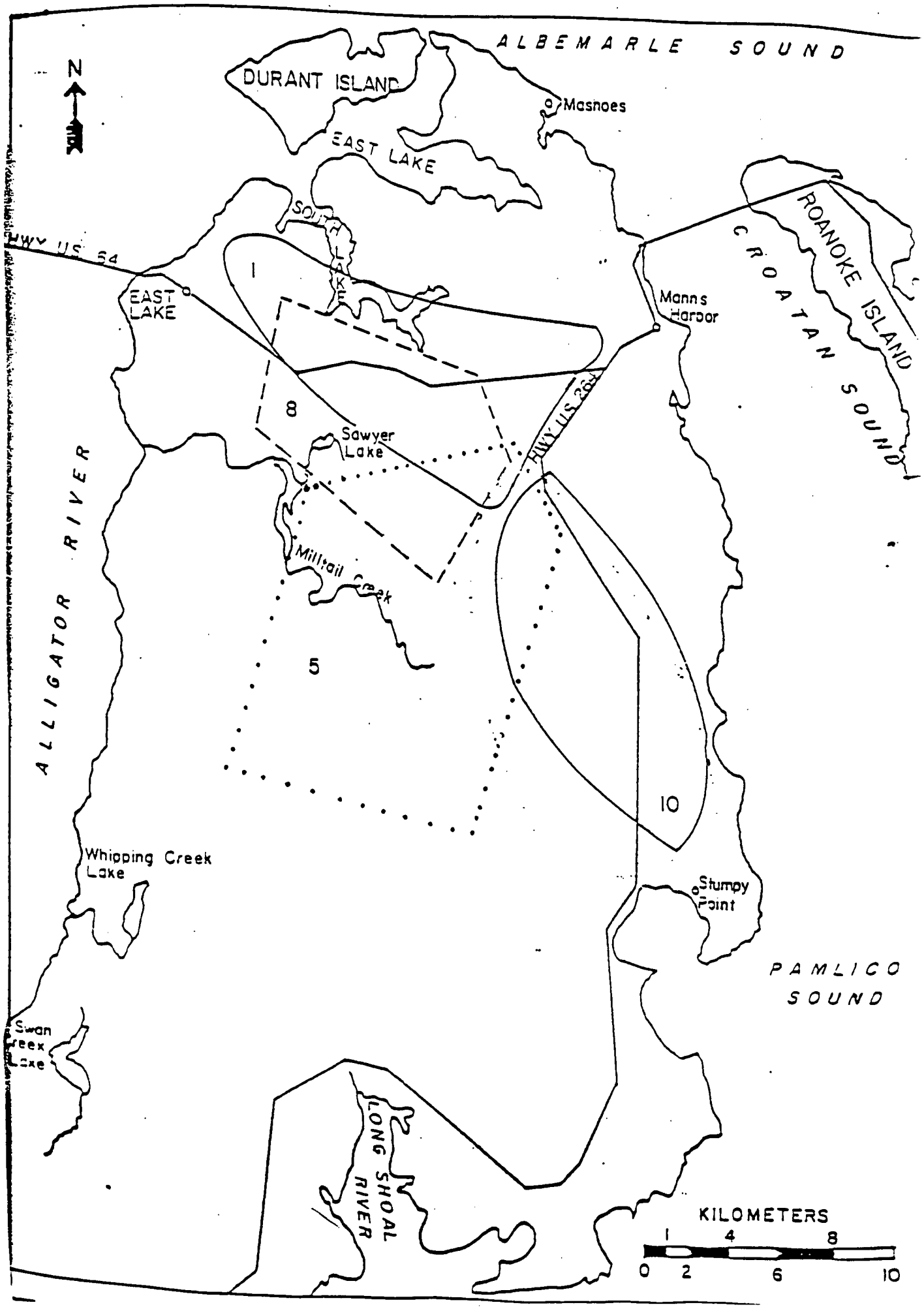
Black bear are becoming more of a focal point each year... LD

Table 1. Seasonal home ranges (km^2) for adult male black bears studied from 1 January 1990 - 30 September 1990 at the Alligator River National Wildlife Refuge, northeastern North Carolina.

	Spring mar - may	Summer jun - aug	Fall sep - nov	Winter jan - feb	Overall
Bear 1	28.7	50.2	---	36.9	79.8
	18[A]	15	--	13	46
Bear 5	30.2	62.4	---	24.3	113.5
	18	13	--	15	46
Bear 8	20.6	38.5	---	9.4	51.8
	17	14	--	12	43
Bear 10	13.7	25.8	---	20.1	57.8
	18	13	--	13	44

a - The second value is the number of locations.

Figure 1. Areas used by Black Bears during 1990.



Since 1972 there has been a prohibition on hunting black bears 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, in response to concerns over depredations caused by bears, local politicians rescinded the 1972 ordinance prohibiting hunting of bears in Dare County. The North Carolina Wildlife Resources Commission recommended a bear season for Dare County for 1991.

At this point, the U.S. Fish and Wildlife Service does not plan to permit bear hunting in the refuge because insufficient data are available upon which to develop a harvest strategy. Information such as sex and age distribution, age at primiparity, birth rate, survival, and density of the bear population in Dare County is necessary to predict results of bear-related management actions such as hunting.

Numerous researchers have shown that the reproductive rate of black bears is low because animals are slow to mature, litters are small (probably no more than 1 to 1.5 cubs per litter), and the reproductive interval is long (probably 2 - 3 years). Thus, a black bear population cannot respond quickly to excessive hunting pressure and is relatively easy to over-harvest.

Significant controversy surrounds black bear populations in the southeastern Atlantic Coastal Plain, including Dare County. Habitat modification resulting from peat mining, forestry, and agriculture has effectively fragmented bear habitat throughout the region. Mainland Dare County is an excellent example. Here, tracts of pocosins and associated coastal plain habitats are surrounded by extensive acreage of cleared lands. Dare County black bears effectively live in an island of suitable habitat surrounded by inhospitable environs.

The potential of the unhunted population in Dare County to act as a reservoir for black bear reproduction and dispersal in the Atlantic Coastal Plain is unknown. In recent years, development of land in and around Dare County has accelerated. This, along with the initiation of bear seasons in Tyrrell and Hyde Counties, makes Dare County a vital sanctuary for bears.

Unfortunately, the bear population in Dare County may not be secure biologically. Bear populations in areas similar to Dare County which have been studied have been shown to have a very small "effective size". For example, the effective size of the bear population in the Great Dismal Swamp NWR is

56, which is only slightly above the recommended size of 50 for short-term survival and well below the 500 recommended for preservation of genetic variability and long-term survival.

Thus, the U.S. Fish and Wildlife Service will maintain the prohibition on bear hunting in the refuge until data are available to design a harvest strategy that ensures the continued existence of the population. This prohibition is commensurate with the legal mandate of the Wildlife Refuge System.

It is likely that the U.S. Fish and Wildlife Service will continue to receive pressure to permit bear hunting in the refuge. Unfortunately, the current telemetry study will not provide the data needed to design an appropriate harvest strategy. A study of the demographics and productivity of the bear population is needed. This could be best accomplished by contracting a University (i.e. graduate student) to initiate an extensive capture/recapture study. Experienced bear researchers from North Carolina State University, University of Tennessee, and Virginia Polytechnic Institute and State University have expressed interest in such a study.

The telemetry study conducted by the Service has adequately defined home ranges of adult male bears in Dare County. It is unlikely that additional monitoring would result in data that improves understanding of bear movements or habitat use. Additional monitoring is, therefore, not justified.

H. PUBLIC USE

1. General

Hunting is the major public use activity on Alligator River NWR. Little non-consumptive public use occurs on the refuge and public use is not expected to increase significantly in the future. Total visits to the refuge in 1990 were estimated to be 9,900.

Administrative offices for the refuge remained in the GSA leased office space in Manteo. A few visitors did actually locate the office, but most information is disseminated by telephone, correspondence, and through the news media. The staff responded to approximately 3,200 public inquiries and issued 65 news releases. In addition, staff members participated in numerous radio "spots" about the red wolf project, hunting, and other wildlife refuge topics. Most video and/or major magazine articles featured the red wolf project.

The media expressed strong interest in the wolf project throughout 1990. On January 19, Mary Riddle (reporter from WOBR radio, Wanchese, NC) visited the project. She was collecting information for a 15 min show for WOBR radio. On March 21, Jerry Allengood, a reporter from the Raleigh News and Observer, visited the project. On April 26, a news crew from WBTV, Charlotte, NC visited the refuge and filmed the wolf project along with other wildlife programs. The story will be a feature of a series the station is producing concerning the impacts of humans on wildlife. On June 1, Eddie Nickens visited the project. He was doing research for a paper about the wolf project for the magazine entitled "Friends of Wildlife", which is the official publication of North Carolina Wildlife Federation. On 5 November we gave a tour of the project to a film crew from WEDU, Tampa, FL. They were filming a story about the wolf project for the PBS series "The Gentle Doctor" (a series dedicated to veterinary issues).

The weekly column "What's Happening with Wildlife - A Refuge Point of View" has proven to be a valuable tool for disseminating information as well as fostering good will in the community.

The Coastal Wildlife Refuge Society funded an eight page tabloid for the refuges during 1990. The tabloid, printed on newsprint, was designed to provide information about both Alligator River and Pea Island NWRs, the Red Wolf Project, and the Coastal Wildlife Refuge Society. A total of 15,000 copies was printed. They will be distributed through the Pea Island and Alligator River offices and by mail, on request.

2. Outdoor Classrooms - Students

In more recent years, teachers have begun to utilize the marshes of Pea Island for independent use with their classes. Classes have begun to show an interest in visiting Alligator River NWR. To date, few classes have had the confidence to plan and execute a trip to Alligator River for Service defined "environmental education".

The draft written during 1989 for North Carolina Notebook sponsored by the N.C. Wildlife Resources Commission was published in 1990. This publication was distributed to approximately 10,000 teachers, thereby reaching literally hundreds of thousands of students (possibly).

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

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. Since these programs do not qualify as "environmental education", figures are included in Section H. 7 of this report.

3. Outdoor Classrooms - Teachers

There were no requests for teacher training workshops in 1990. RR Strawser attended the 1990 Public Use Workshop where training was provided for Project Wild Activities.

4. Interpretive Foot Trails

Currently, no official trails exist on Alligator River National Wildlife Refuge; however, many visitors enjoy wandering around Buffalo City Road. An off-shoot road leads through the old town of Buffalo City, where remains of the old structure can still be seen.

Ruins from the old Dare Lumber Company saw mill.
5/90 RSL

The old pulp mill, circa late 1800's, located deep in the swamp off Milltail Creek. 5/90 RSL

6. Interpretive Exhibits/Demonstrations

Refuge staff manned displays and exhibits at the typical annual events around Dare County and eastern North Carolina. These included the Job Fair, Dare Day, several Conservation Field Days, Earth Day, the Dixie Deer Classic, and an assortment of other community outreach functions. Staff also served as judges in several middle and high school Science Fairs.

7. Other Interpretive Programs

A number of other refuge programs were conducted during 1990 by staff and volunteers. Many dealt with the Red Wolf Program; others addressed specific and general refuge related topics. Totalled, programs were presented to 89 groups containing approximately 2,959 individuals.

8. Hunting

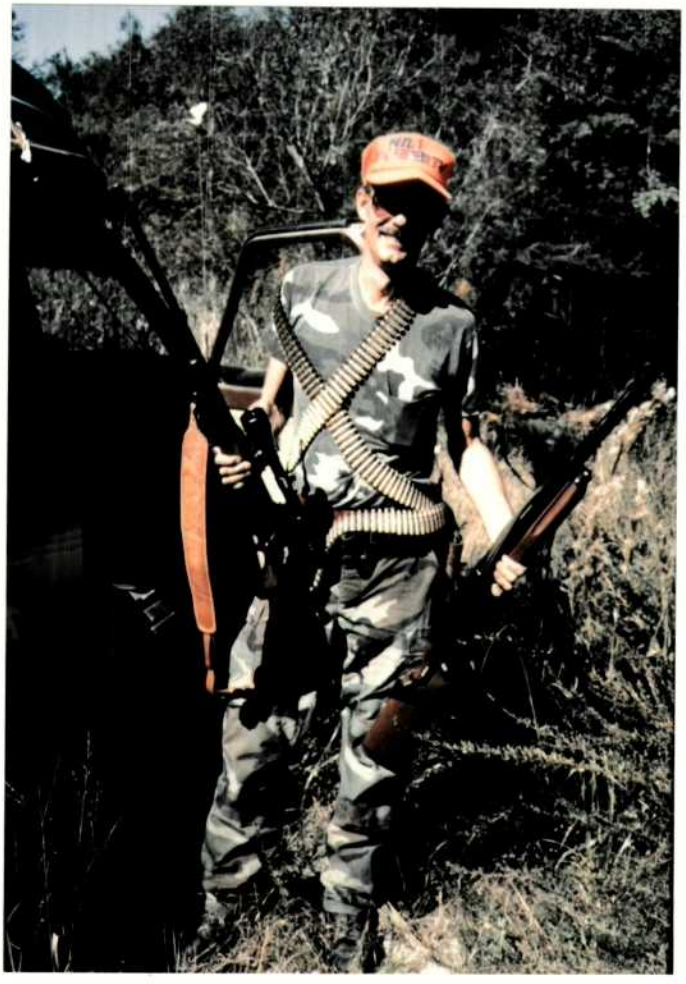
After approval of the master plan, the refuge was divided into three basic public use areas, with several additional safety or management zones closed to all hunting. As new areas have been acquired, they have been added to one of the three existing categories, or (in the case of the farm

fields) put into a newly created category. The farm fields are open to all authorized uses during September and October (except waterfowl hunting), but closed to all entry during all other times. (See map in hunt brochure in packet in back).

White-tailed deer are the most sought after game species on refuge lands. Since Alligator River contains over 141,100 acres of habitat traversed by more than 150 miles of logging roods, and because many of these roads share junctions with State roads, it is difficult to establish effective hunter check stations. The N.C. Wildlife Resources Commission requires hunters to register hunter-killed deer with a local wildlife cooperator agent; however, an estimated 40% go unreported. State figures showed that 51 deer (37 buck and 14 doe) were recorded as taken on Gamelands in Dare County this year. In the entire county, 84 deer (61 buck, 5 button, and 18 doe) were recorded. In Tyrrell County, 3 deer were recorded for Gamelands (only refuge acreage is considered to be Gamelands in Tyrrell County). Unfortunately, one of the major registration points for deer was the Harbor Convenience Store, which burned to the ground toward the end of deer season. Three books of registration forms burned in the fire with no record of what, if any, entries had been made. Dave Rowe, NCWRC Big Game Biologist, commented that the harvest for 1990 was much lower than 1989 in Dare County, even considering the lost reports.

If we use the same methods of estimating harvest as we have in previous year,s the actual reported harvest would be 37 bucks and 14 does, for a total of 51 deer. Since an estimated 40% go unreported, this translates to a more realistic estimate of 71 deer. Rowe stated that as many as 60-70 deer could have been reported on the books that burned.

In September, the annual hunter information meeting was held at the Manns Harbor Community Center. Approximately 90 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 and Scott Smith, Forester for the Air Force bombing range, were also present to provide current information about State Regulations and special info about the Bombing Range.



Typical hunter on Alligator River?
11/90 BWS

September 10, bow season began along with the usual weekend patrol assignments for refuge officers. September was spent re-vamping the 16 hunter information boards on the refuge. For the first time since its establishment, the refuge hunting regulations remained the same for two consecutive years.

Muzzle loader season came in on October 8, a three day duck season occurred October 11-13, and regular gun season started on October 15. On November 1, the farm field gates were closed and locked. For the rest of the year (and through September, 1991), this area was closed to all public entry.

Waterfowl seasons continued November 22-24 and December 13 - January 5. 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 is 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. In addition, during September, NCWRC Officer Brinkley conducted a Hunter Safety Course to enable other youths in the area to qualify to hunt on the refuge. Several additional Hunter Safety Courses were conducted prior to and during the hunting season. We have yet to hear of a person who needs the course and is unable to find a class.

Estimated public hunting activity appears below:

Activity	Visits	AH
Duck	230	1,150
Deer (gun)	1,500	7,500
Deer (bow)	326	1,631
Small Game	285	1,140
Upland Game Birds	85	255

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 1990, there were an estimated 1,455 fishing visits to the refuge with 5,820 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. Only two special use permits were filled out for refuge trapping. Special

regulations on the permits limited trap size and required that trappers report their take. No completed "trapping results" forms were received by this office.

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.

Canoeing on Milltail is on the rise. This group provided a trash pick-up in the process! 7/90 BWS

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 following figures represent wildlife/wildlands observation during 1990:

Activity	Visits	AH
Foot	2025	4050
Vehicle	5050	10100
Boat	710	2840
Photography	180	720

17. Law Enforcement

Staff officers conducted regularly scheduled weekend patrols beginning with the opening of the deer season. Mike Panz, Refuge LEO for Mackay Island NWR, continued his half-time duty for Alligator River as the budget allowed. Unfortunately, because travel expenses must be provided for Panz's time at Alligator River and Pea Island, his time on these refuges was severely limited during 1990.

Due to a political controversy over a citation written on Milltail Road/Milltail Creek, NC Wildlife Resources Commission officers were disallowed (by the Commission) from further enforcement of refuge regulations. This formed a gap in enforcement capabilities for the refuge.

Information boards complete with maps, regulations, and other pertinent information for hunting on the refuge were updated and added to key access points. Extra efforts were made to ensure that appropriate regulatory signs were in place prior to the respective seasons and that hunt brochures were available at all entry points to the refuge.

Noteworthy incidents are described below:

A vandalism case reported in December of 1988 resulting in over $18,000 in damages developed a few leads during 1989. In 1990, two youth/young adults were charged. After several postponements, the two were convicted on May 29 and sentenced to 18 and 24 months (suspended), 5 years active probation (during which time they may not consume alcoholic beverages and may not set foot on FWS land), $300 fine and court costs ($50), 72 hours of community service, and $8,500 restitution to FWS for damages.

On August 20, ROS Lanier attended Federal Court in Manteo representing RM Taylor concerning the a transporting loaded firearms. The defendant had been approached by NCWRC Officer Earl Brinkley who filled in a pink slip and turned it into RM Taylor. (It is not a violation of state law to transport a loaded firearm in a vehicle.) The case was complicated by the fact that the defendant was driving on a state maintained road. The defendant was fined $15 on a prayer for judgement; however, due to phone calls made by his father to the commission, NCWRC Officer's can no longer enforce special refuge regulations on National Wildlife Refuges in North Carolina.

Probably the most significant case of the year involved the trapping death of a red wolf. A Dare County Commissioner who had been quite vocal in his negative comments about the refuge called to report that a red wolf had accidentally

been caught in one of his traps and drowned. Investigation of the incident lead to the man being charged by NCWRC Officers with two tagging violations, one suspended trap violation, and one chain length violation. He was convicted of the two tagging violations and the suspended trap violation, but was acquitted on the charge of the chain length being too short. The appeal was pending at the close of 1990.

Refuge officers received appropriate training during 1990:

Officers attended the 40 hour refresher in Tallahassee during the week of March 25th.

All refuge officers requalified with their Service revolvers in October.

A summary of Federal NOV's for 1990 follows:

Duck stamp violation	1
Transporting loaded firearms on refuge	4
Hunting without a license	1
Hunting with the aid of bait	3
Deer tagging violation	1
General traffic violations	3
Violation of trapping regulation	2
General trespass	1
Vehicle trespass	1

In addition, the following State NOV's were issued on the refuge:

Hunting with the aid of lights	7
Taking doe deer during closed season	1
Possessing a gun	1
No hunting license	1
Failure to wear Hunter orange	1

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 1990, the Society completed it's first full year of existence, and it was a banner year! During the first twelve months, the 100 members goal was met; at year's end, the membership had reached 188.

At this time last year, the Society was selling the "Back to the Wild" Red Wolf T-shirts through the NC Aquarium. By the end of 1990, the sales had greatly expanded. A small outlet was organized at the Pea Island Wildlife Refuge. Four

designs of T-shirts were sold, plus note cards printed on recycled paper. Before next summer, the Society plans to expand its inventory to include Pea Island pins and patches, duck stamp pins, and an assortment of books.

The North Pond Trail Renovation and Upgrade Project, which was in the planning stages last year, is well underway. Patsy Zoll initiated a fund raising effort to raise the money to match a $10,000 Challenge Grant received from the USFWS. The Outer Banks Community Foundation donated $4,000 for two spotting scopes, and the Bob Pitcher Memorial Fund has accumulated enough for an additional scope. The Society has received many other significant donations of money, supplies, and labor for the North Pond Trail, as well as other projects on the refuge. (See Pea Island Narrative).

The Society funded 15,000 copies of an 8 page tabloid (copy included in the information packet) which includes information about Alligator River and Pea Island National Wildlife Refuges, the red wolf project, and the Coastal Wildlife Refuge Society. The Society also purchased a spotting scope and tripod to be used for public bird walks. Total expenditures for the refuge during the year were $8958.10. This included $1200.00 used to purchase fill for Sandy Ridge Road, which was taken from contributed funds designated for the red wolf program.

I. EQUIPMENT AND FACILITIES

1. New Construction

Preliminary steps were taken this year for the construction of the new maintenance facility at Alligator River. Plans for the facility were drawn by Engineering. Surveying and soil tests of the area were also completed. The actual construction should take place soon.

A contaminant survey was conducted on the property for the proposed headquarters/visitor center on Roanoke Island by ROS Lanier and FWS Biologist Bob Croft.

Leveling and seeding were completed on the newly constructed farm field perimeter dike. This new dike will give us greater water control over the South Twiford farm field/moist soil unit.

Throughout the summer and fall, ROS Lanier, RB Noffsinger, and the maintenance staff installed flashboard risers with sand/cement bag headwall at various locations on the farm field/moist units. These structures allow for the flooding of additional acreage of corn, millet, and milo. The

majority of September was spent refitting the flashboard risers and installing a sand/cement bag headwall at the Buffalo City water control structure. This structure is the primary source of water control for the farm field/moist soil units. Water flow through the pipe had caused the risers to tilt away from the pipe. Our hats go off to the Santee NWR for the use of their excavator. It certainly made the job much easier.

3. Major Maintenance

Road maintenance is a continuing problem at Alligator River; however, the maintenance staff made great strides this year in getting the roads in shape. Headway was even made on roads that had not been graded in years. Maintenance on some of those roads helped to boost the refuge's image with many of our local hunters. We owe a great debt of thanks to Mattamuskeet NWR for the use of their boom-axe which helped in the mowing of refuge road shoulders.

5. Communication Systems

SROS Schriver installed our new repeater and antenna on the N.C. Highway Patrol tower near Engelhard this year. The addition of the repeater has greatly increased our communication capabilities. We can now readily communicate with most of the refuges in eastern North Carolina and with other State and local agencies.

6. Computer Systems

The refuge received three new additions to the computer fleet. RB Noffsinger received a new CompuAdd computer which will help tremendously in processing and storing biological data. Another CompuAdd computer for just word processing was purchased and put into the computer room to replace the IBM computer which OA Midgett received at her desk. She also received a new Okidata printer to add to her computer. This enables her to work on the budget at her convenience as well as complete other computer work. The Red Wolf Project received the third CompuAdd computer.

OA Midgett has worked the past year and a half with Stan Cornelius at Ottawa NWR on his DCR - Document Control Register Program. When he sent her his program, she entered data and got back with him on errors and corrections that needed to be made. After much frustration and patience endured, a final updated program was sent out. The budget was put on computer and the DCR program was used and in turn sent to Atlanta for other stations to use. OA Midgett has had several calls from other stations and has assisted in getting them set up on the program.

J. OTHER ITEMS

1. Cooperative Programs

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

A SUP was issued to Dare County to provide drainage of county farm land adjacent to the refuge farm fields.

One SUP was issued to operate beehives on the refuge.

4. Credits

The annual narrative report was written by the following staff:

Lanier - C, D, E.8, F, I, J
Noffsinger - G (all except red wolf section)
Phillips - Red Wolf Section of G.2
Strawser - A, E.2, E.4, H
Midgett - E.1, E.5
Elmore - E.6
Lane - B

Photo credits: Don Cook - Volunteer at Iroquois NWR
Larry Ditto - Lower Rio Grand NWR
Ken Dyar - Refuge volunteer - ARNWR
Others were refuge staff members

The narrative was edited by ROS Lanier and RR Strawser and typed by OA Midgett.

PEA ISLAND NATIONAL WILDLIFE REFUGE

Manteo, North Carolina

ANNUAL NARRATIVE REPORT

Calendar Year 1990

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

INTRODUCTION

INTRODUCTION

LOCATION

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. The Refuge contains 5,915 acres of beach, dunes, high marsh dikes, salt marsh, impoundments, ponds and salt flats. 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.

Located within the boundaries of Cape Hatteras National Seashore, Pea Island is approximately 175 miles east of Raleigh, N.C. and 225 miles southeast of Washington, D.C.

Pea Island's climate is generally moderated by the ocean, thus it is cooler in the summer and warmer in the winter than the North Carolina 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 from the northeast in the winter.

The diversity and abundance of birdlife 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 species can be found at Pea Island during the winter months and the spring and fall migrations. During the summer months, several species of herons, egrets, ibises, terns, gulls, along with American avocets, willets, black-necked stilts, other wading and shore birds and a few species of ducks nest on the Refuge.

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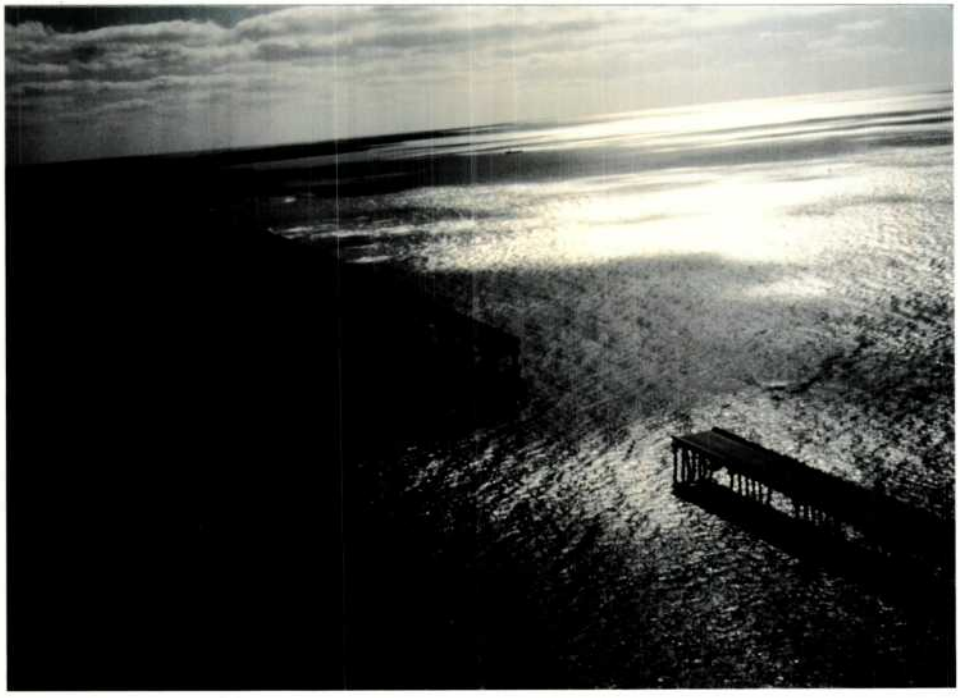
J. OTHER ITEMS

A. HIGHLIGHTS

1. Herbert Bonner Bridge collapses! (See Section D.4.)



This one will go down in the local history books. Actually, it made life on the refuge rather pleasant. We didn't hear the birds complain at all. JTT 11/90

2. Oregon Inlet controversy still in headlines. (See Section E.8.)

3. 1990 good year for turtle hatches. (See Section G.2.)

4. South Pond pump station is finally repaired. (See Section I.2.)

5. Volunteers continue to help us keep it all going! (See Section E.4.)

B. CLIMATIC CONDITIONS

See Alligator River NWR narrative.

C. LAND ACQUISITION

1. Fee Title

Due to severe erosion at the North Point of the refuge, the Oregon Inlet Coast Guard Station vacated its facility in early winter of 1988. There has been quite a bit of interest in the historic section of the station by the County. The refuge considered pursuing the utilization of the structure as a VCS. Because of the strict requirements pertaining to historic structures, we opted to "withdraw from the race" in 1989. We have, however, officially requested that the 10 acres of land and all buildings and outbuildings, except the historic part, become property of the refuge. At this writing, two years and numerous meetings later, we have no official word as to the disposition of any of the property.

D. PLANNING

4. Compliance with Environmental and Cultural Resource Mandates

Throughout the year, SROS Schriver, ROS Windley, and RB Noffsinger attended meetings with officials from the North Carolina Department of Transportation (NCDOT), U.S. Army Corps of Engineers (COE), and Hardaway Construction Company to discuss groin construction clean-up. A right-of-way permit was issued by the Service to the NCDOT in early 1989 to construct a 3,200 foot long groin and revetment on the north end of the refuge to stabilize the south approach of the Bonner Bridge. This permit was issued only after NCDOT agreed to mitigate for any erosion losses which occurred as a result of the groin. The completion date for the project was scheduled for late March 1991.

On October 25, the Herbert Bonner Bridge over Oregon Inlet became impassable as a result of a dredge colliding with the bridge. This bridge is the only link from the mainland to Hatteras Island and also carries the power line which provides electricity to the island. After meeting with the NCDOT, the Service issued a permit for the construction of a ferry dock and approach road at the north end of Pea Island NWR to provide transportation from the island. NCDOT has also proposed to leave these structures in place for use during future emergency situations.

The north end of Pea Island will never be the same. BWS 7/90

SA Ted Curtis offered tremendous support to us while the Bonner Bridge was out. BWS 10/90

6. Other

Pea Island once again participated in the Atlantic Flyway Canada Goose Study. Efforts were made to observe and record as many neck collars as possible. For the 1990-91 season, we were directed to leg band and neck collar geese; however, our first cannon net shot did not occur until January 1991.

E. ADMINISTRATION

1. Personnel

See Alligator River NWR narrative.

2. Youth Programs

Again during 1990, Pea Island's YCC program was a facet of the Alligator River program. One enrollee spent most of the summer working on Pea Island NWR. The routine maintenance jobs usually accomplished by YCC were completed. These included cleaning the storage building, re-organizing the Pole Shed, assisting with information and sales, and assisting in an assortment of biological and maintenance work. The Pea Island staff did an excellent job of directing, supervising, and teaching this enrollee about the refuge.

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

4. Volunteer Programs

During 1990, volunteerism 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 May and continued through October. During 1990, some Saturdays and Sundays were covered, but not all. The Visitor Contact Station was covered all weekdays during that time period.

The turtle patrol was also a popular program during 1990. The turtle patrollers participated in an 8 hour training program, then conducted the patrol one day each week from mid-May through the end of August. As a first, several patrollers encouraged and assisted RT Elmore in setting up a system whereby newly hatched turtles could have a much greater chance of surviving to reach the ocean. (See Section G.2. for details.) Many additional volunteer hours were contributed during hatching time to this innovative project.

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 1990 at Pea Island NWR were conducted by refuge volunteers.

The September "Big Sweep" occurred again in 1990. This activity continues to be the single event that involves the most volunteers during the year. At the 1990 Pea Island "Big Sweep", 95 volunteers participated and succeeded in cleaning the entire 13 miles of refuge beach.

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

5. Funding

See Alligator River NWR narrative.

6. Safety

See Alligator River NWR narrative.

7. Technical Assistance

RM Taylor and SROS Schriver answered numerous requests for information from the NCDOT and also CZR Inc. (an environmental consulting firm contracted by the State) concerning Pea Island NWR. The information will be used in the planned replacement of the Herbert Bonner Bridge.

ROS Windley, RB Noffsinger, and RT Elmore participated in the development of a mole crab and sand study plan for a beach nourishment project, proposed by the COE, along with Dr. Robert Dolan, University of Virginia.

During June, refuge personnel assisted John Weske of the Smithsonian Institute in brown pelican and tern banding on islands located just off of the refuge. The staff banded approximately 1,317 brown pelicans, 2,056 royal terns, and 277 sandwich terns.

Volunteer Don Perry points out identifying characteristics on a young gull. BWS 6/90

The Oregon Inlet tern colony finally found a home on a new spoil island. We banded 2,333 during 1990. BWS 6/90

8. Other

On August 15, Assistant Director Olsen and Jim Loach (Assistant Secretary's Office) toured the Oregon Inlet. RM Taylor participated in the tour of the inlet and a briefing on the proposed Jetty Project. In April of 1970, the U.S. Army Corps of Engineers applied for a permit from the Department of the Interior to construct a pair of jetties to stabilize Oregon Inlet, a navigable channel between Bodie Island and Hatteras Island. Land north of the inlet is a part of Cape Hatteras National Seashore. Pea Island NWR borders the inlet on the south. The basic design of the project includes the construction of twin rubble mound jetties and a sand bypass system.

This project has been stopped in Congress over the past several years; however, despite outcry from various environmental groups, the National Park Service, and the USFWS, a small minority of local commercial fishing interests and the COE continue to lobby and keep the project alive.

F. HABITAT MANAGEMENT

1. General

Pea Island, a coastal barrier island, consists of seven basic habitat types which cover approximately 5,915 acres. 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. Hurricanes, combined with intense northeast storms, have caused severe erosion along the beach and dunes.

On almost half of the refuge (approx. 6 miles), this is a typical shot of the location of NC 12 in relation to the Atlantic Ocean. Looks great, huh?
BWS 7/90

2. Wetlands

Refuge wetlands consist of irregularly flooded salt flats and impoundments. The impoundments include North Pond (461 acres), New Field (266 acres), and South Pond (223 acres).

In the spring of 1990, the refuge staff attempted to draw South Pond impoundment down. This was the second consecutive year that South Pond was drawn down in hopes of encouraging the production of emergent waterfowl foods. Although much of the impoundment was covered with 1/2 - 1 inch of water throughout the summer, beneficial emergent waterfowl food plants such as spikerush (Eleocharis sp.), panic grasses (Panicum sp.), and water hyssop (Bacopa sp.) were produced. The portions of the impoundment which remained covered with water produced stands of sago pondweed (Potamogeton pectinatus) and widgeon grass (Ruppia maratima). The impoundment draw down provided excellent foraging and brooding habitat for most of the shorebirds. Black-necked stilts, yellowlegs, and a variety of plovers and sandpipers could be found throughout the summer and fall. South Pond was also frequently visited by the rare curlew sandpiper.

Water levels in Sound Pond impoundment were maintained by rainfall throughout the summer and fall. South Pond pump station had suffered from erosional problems for a number of years until the refuge finally had the bulkheading repaired in 1990. See Section I.2. for details.

North Pond impoundment continues to be managed as a permanent pool to favor the growth of submergent vegetation. Water levels remained close to target levels throughout the year, so operation of the North Pond pump was minimal. Species such as muskgrass and widgeon grass continued to flourish in the impoundment (See Table 1). Waterfowl continue to feed extensively on the submergents produced in North Pond.

New Field impoundment continued to produce valuable submergents in 1990. Water levels in this impoundment also remained at target levels throughout the year, minimizing the operation of the New Field pump. Widgeon grass and muskgrasses continue to respond to the high water levels. The percentage of bare ground also dropped from 9.1% to 7% this year (see Table 1).

Table 1

Summary of Vegetation Transect Line Sampling
Pea Island NWR 1990

Line	Feet Sampled	Sample Steps	Sampling Points	% Vegetated	% Bare	Plants per Point Sample
North Pond	2,670	89	445	89	11	1.07
South Pond	2,220	74	370	65	35	.73
New Field	2,910	97	485	93	7	1.34
Salt Flats	2,700	90	450	68	32	.97
Total	10,500	350	1,750	79	21	1.05
Average	2,625	88	438	79	21	1.03

Combined Food Values:
Good - 28.7% *(45.7)
Fair - 29.4% *(29.7)
Non - 41.7% *(24.6)

Major Plants Combined:
Widgeon grass - 20.5% *(46.7%)
Muskgrass - 28.3% *(31.7%)
Sago Pondwood - 12.1% *--
Salt Meadow Cordgrass - 21.7% *(11%)
Glasswort - 10.3% *(15.8%)
Sea Oxeye - 3.3% *(5.7%)
Spikerush - 3.4% *(0.3%)

Major Plants:

North Pond -	Muskgrass	61%	*(42%)
	Widgeon grass	19%	*(86%)
South Pond -	Sago Pondweed	37%	*--
	Spikerush	49%	*--
New Field -	Saltmeadow cordgrass	26%	*(29%)
	Widgeon grass	24%	*(39.6%)
	Muskgrass	13%	*(7.2%)
Salt Flats -	Glasswort	26%	*(44.6%)
	Saltmeadow cordgrass	16%	*(8.8%)
	Sea Oxeye	8%	*(11.8%)

* 1989 figures in parenthesis.

Waterfowl used New Field extensively in 1990. Shovelers, pintail, gadwall, and snow geese fed heavily on the emergents found along the impoundment adjacent to the planted field. Diving ducks fed on the widgeon grass beds in the deeper portions of the impoundment.

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

The two small mitigation ponds created by NCDOT were monitored for vegetation production and waterfowl use. Vegetation in these ponds was sparse. The smallest pond continues to produce a few small stands of Bacopa sp., Scirpus sp., and Cyperus sp. The larger pond also produced a few stands of Bacopa sp. and Cyperus sp. Waterfowl use continues to be moderate on these ponds and use seems to be limited on days when the adjacent sound waters are rough.

4. Croplands

The farming regimen for Pea Island in 1990 saw few changes from 1989. Cooperative Farmer Ernie Wynne plowed and planted 25 acres of wheat, oats, and rye in New Field. This year, however, the field was initially plowed using a larger and deeper plow in an attempt to avoid over competition by quick growing native species. Due to the poor cation exchange rate in the sandy New Field soil, an aerial applied fertilizer was once again used. The fertilizer was applied late in the year resulting in marginal plant growth.

Snow geese and Canada geese continued to feed heavily in New Field despite the marginal growth of plants. Better results may be obtained in the future by applying the fertilizer quickly after the plants have sprouted.

South Field, a small 10 acre field located south of the refuge headquarters, was planted with wheat, oats and rye. Similar to 1989, growth in South Field was better than that of New Field. Waterfowl use in this field also increased in 1990, although it was used less frequently than New Field.

6. Other Habitats

The areas of ocean beach and barrier dunes are not actively managed; they undergo constant gradual movement and are subject to abrupt changes during storms. Strong winds from hurricanes and northeast storms produce beach erosion, ocean overwash, and soundside flooding.

A dune erosion study was initiated in 1982 to document losses to the dune line from wave and wind action. The study indicates that severe winter storms cause the greatest amount of change in the dune line. Past measurements have shown that approximately 15' of dune is lost per year along the 12-13 miles of refuge beach. This average does not reflect the severe loss of beach and dune at the north end of the island adjacent to Oregon Inlet. In 1987, 293 feet of dune was lost in this area. The Coast Guard Station located at the north end next to Oregon Inlet has been vacated because of the erosional threat. Although a small portion of this erosion is due to the natural south westerly migration of the island, the vast majority of it is caused by the dredging practices of the COE. The COE claims that because of cost restraints and logistical problems they must place the dredge spoil from Oregon Inlet offshore as opposed to placing it in the near shore area of the north end of the refuge. This practice essentially robs the refuge of sand which would normally flow southward to replenish the refuge beach. They also maintain that jetties on the northern and southern sides of the inlet would eliminate the need for dredging. Erosion problems on the refuge associated with large jetties at Oregon Inlet would be severe.

In addition to the refuge's dune erosion monitoring, NCDOT and the USFWS have devised a beach erosion monitoring plan using aerial photography. This plan will monitor the effects of NCDOT's terminal groin and revetment on the north end of the refuge. It will also trigger any necessary beach nourishment (see Section D.4.).

9. Fire Management

No controlled burns were conducted at Pea Island in 1990. This was due to the lack of equipment available as a result of the Bonner Bridge accident (see Section D.4.).

10. Pest Control

The red wolf project once again trapped New Field impoundment to supply prey items for the wolves. 27 nutria were trapped in 1990. Since the public trapping program at Pea Island was disbanded years ago, this helps to control the damage which occurs to the refuge impoundment dikes as a result of the burrowing activities of the nutria.

Pea Island is also plagued by a feral cat population. Attempts at controlling this population were made in the late spring and early winter just before waterfowl nesting season. Four cats were trapped.

G. WILDLIFE

1. Wildlife Diversity

Pea Island has a 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 provides habitat for a wide variety of mammals, birds, fish, reptiles, amphibians, mollusks, and crustaceans. This diversity is 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 often pass over Pea Island, and each year several sightings are made. The number of sightings this year was lower than last year's record of six adult and eight immature birds. Refuge staff reported six adults and two immatures during the year. Though the number of sightings was down from last year, we believe the number of eagles using the refuge is increasing overall.

Peregrine Falcon (Threatened) - The arctic peregrine, Falco peregrinus tundrius, is the subspecies which is most often seen at Pea Island. The Carolina Raptor Center sighted 36 peregrines from their banding station in early fall. In 67 hours spent observing from 9/29/90 to 10/20/90, thirty-six peregrines were seen for a rate of 1 per 1.9 hours. This was the highest rate of

observation for all the species observed. Peregrines represented 28% of the sightings. (See Section G.6. for details.)

Six peregrine sightings were made by the refuge staff during the year. These included an immature on 8/22/90; an adult on 10/16/90; a pair working together on 10/13/90 chasing shorebirds (one was larger than the other and they were seen "doing aerobatics"); an adult on 10/25/90; and two adults sighted hunting near New Field on 12/7/90.

Piping Plover (Threatened) - No piping plovers were sighted on the refuge shorebird surveys this year; however, several sightings were made just across Oregon Inlet to the north on Cape Hatteras National Seashore beaches.

Atlantic Loggerhead Sea Turtle (Threatened) - The sea turtle season of 1990 on Pea Island NWR had a few interesting changes in comparison to previous years. Since dune and beach erosion and overwash continue to be major problems, only one small stretch of beach was designated "safe" for relocation purposes. Thus, instead of relocating nests up and down the beach, all 15 nests were relocated to the same general area. Beach erosion and high tides were not a problem on the selected area, so hatch rates increased this year. Our biggest problem was ghost crab predation. Ghost crabs were the number one enemy of turtle hatchlings. They raided the beach in mass numbers after dark. Crabs were observed eating, dragging and trapping hatchlings. 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 who crawled safely through a beach covered with hungry, hunting ghost crabs.

After realizing the scope of the losses to ghost crabs, we implemented a turtle watch program. It basically entailed digging a 10 inch deep by 10 inch wide trench from the nest to the ocean. Volunteers started watching the 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. The waiting was the hardest part; however, once they began to emerge, it was well worth the wait! Turtles followed the trench to the light posted at the end and safely arrived at the ocean.

Monitoring of 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 the nests was a good one. We made the decision 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. The "turtle watch" also greatly increased the number of hatchlings reaching the ocean. Unfortunately, we can't quantify how much the survival rates were increased, one reason being the variation in ghost crab numbers from night to night. Some nights the beach would be covered from dunes to water with crabs; other nights there would be few enough to count all you could see. There seemed to be a correlation between cool nights and lower crab activity. Since we didn't start the watch until the end of the hatching season, it is impossible to determine concrete information on crab activity trends and losses of hatchlings. Our observations indicate that, on some nights, as many as 75% of hatchlings were lost to ghost crabs prior to the "turtle trench". Survival rates to the beach after the "turtle trench" approached 100%.

These little fellows - as few as they are - make all the work worthwhile. AJE 8/90

If we have the same narrow beach, prone to overwash and nest inundation next year, we intend to again relocate nests and implement the "turtle watch" program for the entire hatching period.

b. State Listed Endangered and/or Threatened Species

Of the other species that occur on the refuge, the State of North Carolina lists seven as threatened and 26 as species of special concern. Although the refuge is not managed for all these species, they do benefit from present practices. The species specifically managed for are:

Osprey (Special Concern) - With the addition of two new nesting platforms (one at the south end of South Pond and one on the sound side), our number of adult ospreys increased. The pair at the west side of North Pond produced one young; the pair on the east side of North Pond produced two. Nesting activity was observed at the New Inlet platform. No young were viewed. Both of the new nesting platforms were utilized by osprey; however, no young were observed. A pair tried to nest on the Navy microwave tower, but a storm ruined their nest. Later that same week, a pair was observed building a nest in a blown over myrtle bush in North Pond The nest was not completed and no eggs were laid. By late July, all of the young osprey had fledged.

Least Tern (Special Concern) - For many years least terns have nested at a specific area of the refuge beach; however, no least terns have nested on the eroded beach in 1990. In July, 40 were observed feeding on the South Pond drawn down area. Excluding that one day, least terns were only documented on 7 other weekly shorebird counts. The average of these sightings was only 7 birds.

The dredge spoil islands just north of the refuge in Oregon Inlet have proven to be suitable nesting sites in the past, but these islands are now being encroached upon by campers and boaters who often disturb the colonies, killing the chicks and destroying the eggs.

3. Waterfowl

Overall waterfowl use on Pea Island during the '89-'90 season was down 18.2 percent from last year. This was a decrease of about 370,000 use-days, slightly above

the average of the past five years but down 23 percent from the past ten year average and 39 percent under the past 20 year average. Combined peaks were about half of the past 25 year average. See Table 2.

Table 2

Composition of Wintering Waterfowl on Pea Island NWR
1989-90

Group	Percent	Number of Use Days	%Diff from 1988-89	Peak
Tundra Swan	15.5	253,505	+77.0	3,150
Canada Geese	2.9	46,627	-24.8	1,900
Snow (& Blue) Geese	8.3	135,744	-42.0	3,150
Ducks	62.8	1,024,674	-32.0	10,000
Coots	10.5	171,920	+285.4	2,650
All Waterfowl	100.0	1,632,470	-18.2	18,700

Tundra swan use increased for the second consecutive year, to the second highest use in at least the last 25 years. It was second only to the Refuge record high of 264,000 set in 1978-79. Their peak was the highest of the last five years.

Canada goose use decreased to the second lowest of the last 25 years. This was second only to the Refuge 1987-88 record low. However their peak of 1,900 was the highest in the past four years.

Greater snow goose use dropped to the second lowest of the past 25 years. Their peak was also their fourth lowest.

Duck use decreased 32 percent (500,000 use days) from the previous year but was only slightly under the past five year average on the area. The peak of 10,000 was second lowest for at least 25 years. It was second to the peak of 7,000 in 1986-87. Four of six high use species had declines in use from last year (Table 3).

Table 3
Composition of Ducks Wintering on
Pea Island NWR
1989-90

Species	%	No.of Use-Days	% Diff. 1988-89	Peak No.	Peak Period
Widgeon	31.7	325,108	+80.0	4,000	Dec.14-20
Pintail	19.6	200,354	-57.3	3,300	Nov.17-23
G.W. Teal	13.1	134,596	-47.1	2,100	Fe.28-Ma.6
Gadwall	8.9	91,147	+41.3	1,100	Dec.21-27
Black Duck	8.3	84,729	-42.6	1,100	Jan.24-30
Shoveler	4.0	41,405	-73.5	450	Feb.7-13
Ruddy Duck	2.9	29,232	-1.7	600	Jan.3-9
Mergansers	2.5	25,515	+84.4	1,150	Jan.10-16
Bufflehead	2.0	20,846	+149.5	1,500	Jan.24-30
Unidentified	1.8	18,613	-70.2	300	Mar.14-20
Scaups	1.6	16,387	-83.0	600	Dec.21-27
Ring-neck.duck	1.3	12,894	+219.6	400	Mar.7-13
B.W. Teal	0.8	8.603	-42.8	500	Se.21-Oc.4
Mallard	0.6	6.174	+0.2	140	Oct.20-26
Redhead	0.5	4,928	+100.0	270	Dec.21-27
Canvasback	0.4	4,109	+582.6	200	Jan.3-9
Scoters	Trace	14	+100.0	2	Jan.24-30
All Ducks	100.0	1,024,674	-32.0	10,000	Dec.1-7

Widgeon replaced pintails as the most abundant duck on the refuge for only the second time in the past 25 years. It was their highest use on the area in 11 years and their sixth highest in 25 years. Their peak of 4,000 was the highest in four years. Pintails fell to second in importance for only the fifth time in the past 25 years with a loss of over 270,000 use-days and 1,400 from their peak population from the previous year. This was their second lowest use and third lowest peak of at least the past 25 years. Green-winged teals slipped from second to third place with a 110,00 drop in use days and a 1,100 bird drop in peak from 1988-89. However they were still 54 percent above the past five year average and 33 percent over the previous ten year average. Gadwalls replaced shovelers in fourth place with their highest use in eleven years and second highest in at least the past 25 years. Black ducks remained in fifth place despite a reduction in use and peak to the lowest levels on the area in 24 years.

Coot use nearly quadrupled from the previous year and use and peak numbers were the highest in the past ten years.

Brood counts were conducted on Pea Island again this year. A total of four ground counts were made. No aerial counts were done. Aerial counts are the only way to census sound broods. The percent of broods from the sound was based on the proportion of sound broods to impoundment broods during last years aerial surveys. A total of 85 broods were counted during the surveys (Table 4); again the majority were black duck broods. The brood counts were down for South Pond and New Field. South Pond was drawn down and a leaking water control structure at New Field caused lower than usual water levels in spring and early summer. No mallard broods were seen this year, however, three Canada goose broods were seen. It was estimated that Pea Island produced 198 ducks which reached flight stage.

Table 4
Pea Island NWR Brood Count Totals for 1990

# of Broods Seen

Species	South Pond	New Field	North Pond	Sound Edge	Species Total	Species % of Total
Black Duck	6	7	37	0	50	59%
Gadwall	0	8	24	0	32	38%
Canada Goose	0	2	1	0	3	3%
Area Total	6	17	62	0		
Area % of of Total	7%	20%	73%	0%		

4. Marsh and Water Birds

Refuge beaches, marshes, and impoundments were heavily utilized by many species of marsh and water birds for both feeding and nesting. Although no active management occurs 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, a yellow-crowned night heron rookery was established on a small island in South Pond - we estimate about 15 nests. A peak of herons, egrets and other associated water birds were counted in July. Summer peaks were recorded for a variety of marsh and water birds: snowy egret 127, cattle egret 90, little blue heron 74, tri-color heron 62, white ibis 58, glossy ibis 50, common egret 43, yellow-crowned night heron 20, black-crowned night heron 14, and great blue heron 14.

The increasing use of the refuge may also be due to the dramatic loss of habitat along the Outer Banks. Increased human disturbance is continually forcing those birds to smaller and smaller areas, many times utilizing habitat that is suboptimal.

The black-necked stilt has come to be recognized as the symbol for Pea Island. LD

Brown pelican numbers have increased steadily over the past few years as the species has expanded northward into coastal North Carolina. These birds were once considered an endangered species in this state and were rare sightings. They have since been removed from the endangered species list in North Carolina and are quite common. They utilize the spoil islands in and around Oregon Inlet extensively. This year 1,317 brown pelicans were banded on the Oregon Inlet islands. Five of these were adults, the rest were juvenile pelicans.

We still feel that a good photo is the result of being in the right place at the right time. LD

5. Shorebirds, Gulls, Terns, and Allied Species

Shorebird surveys were conducted from April until September; the peak population occurred in late May when 9,878 gulls, terns, and shorebirds were sighted. This peak is slightly lower than last year's peak of 11,084 birds. It is possible that increased public use and access to National Park Service beaches north and south of the refuge make Pea Island's beach a little more attractive to the shorebirds. The dredge spoil islands in Oregon Inlet also provide excellent nesting habitat for the birds, although even these islands are beginning to suffer from human encroachment. The terns

continue to nest there, however. This year, on June 21, a group of refuge staff, YCCers, and volunteers assisted John Weske in banding 2,056 royal terns and 277 sandwich terns.

The draw down of South Pond not only encouraged emergent growth, but also attracted some unusual sightings (along with thousands of our regular shorebirds). On July 15, 1990 a curlew sandpiper, a Hudsonian godwit, white-winged black tern, two rufous-necked stints, a ruff and 3 stilt sandpipers were observed. With the draw down on North Pond next year, there's no telling what we'll attract!

On June 20, we found a yellow-crowned night heron rookery in South Pond. We estimate about 15 nests. On June 21, RT Elmore viewed 3 baby oystercatchers in North Pond and 2 baby oystercatchers in New Field. On June 21, two different families of black-necked stilts were observed in New Field. During a shorebird count on July 5, a group of 10 adults and 14 baby black-necked stilts were observed in South Pond.

6. Raptors

The Carolina Raptor Center (CRC) again requested permission to census and band raptors on Pea Island this year. After thoughtful consideration a special use permit was issued to them to do so. The census results are given in Table 5.

Table 5
Summary Of Raptor Census
Pea Island NWR-Fall 1990

Date	Hrs	OSPR	NOHA	SSHA	COHA	RTHA	AMKE	MERL	PEFA	Total	#Hr
9-29	5.0			1			12	4	3	20	4.0
9-30	12.0			2	1		1	1	8	12	1.0
10-01	11.0						4	2	4	12	1.1
10-05	8.5	1	1	4					3	11	1.3
10-06	11.5	1	10	12	2		1		7	33	2.9
10-07	7.0	1	2	4			8		5	20	2.9
10-19	8.0		3	4	1	1	3		5	17	2.1
10-20	4.0						1	1	1	3	.8
Total	67.0	4	17	27	4	1	30	8	36	127	16.1
Percent		3.1	13.4	21.3	3.1	0.8	23.6	6.3	28.3		

OSPR = Osprey
NOHA = Northern Harrier
SSHA = Sharp-Shinned Hawk
COHA = Cooper's Hawk
RTHA = Red-Tailed Hawk
AMKE = American Kestrel
MERL = Merlin
PEFA = Peregrine Falcon

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. 115 different species of song birds migrate through Pea Island.

8. Game Mammals

Rabbits are the only game mammal 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 (we've even seen a road kill).

Evidence has been found to indicate an influx of foxes and the opossums in small numbers. 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.

One deer has been observed on Pea Island. Tracks were found in Salt Flats. A fisherman reported a buck on the sound shore and a state employee later reported a buck beside Highway 12 in front of the flats. This one must have migrated up from the south. A few weeks before the first sighting, one was reported in the Rodanthe area, which borders the refuge on the south.

10. Other Resident Wildlife

Ring-necked pheasant used to be seen in the salt marsh, brushland, the browse area in New Field, and in the dunes. Sightings of pheasants have dropped drastically in recent years. Occasionally we see one or two feeding in New Field; both are males. No females have been observed recently. The exact status of their population is unknown.

15. Animal Control

Muskrat and nutria thrive on Pea Island. Populations are estimated at 5,000 and 900 respectively. Some damage continues to occur on impoundment dikes and berms. The red wolf project staff trapped nutria and muskrat at Pea Island for prey species for the wolves. 27 nutria were trapped.

Feral cats continue to be a problem with nesting birds, waterfowl, turtles, etc. Cat tracks can be found from the beach to the sound, all around the refuge. Four cats were trapped in 1990. Several were killed by cars on the highway. Observations reported by the public increased dramatically. We plan a more intensive trapping effort in 1991.

16. Marking and Banding

For the second consecutive year, no waterfowl banding was attempted at Pea Island. We have been directed to band and neck collar Canada geese as a part of the Atlantic Flyway Canada Goose Study during the 1990-91 season.

H. PUBLIC USE

1. General

Based on the National Park Service vehicle counter at Bodie Island, estimated visitation to Pea Island NWR during 1990 was 1,760,315. 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 and volunteers provided manpower for a revamping of the sign program, minor trail maintenance, and general clean-up in visitor areas.

Because of the Groin Construction Project on the north end, the area was closed to public use. This eliminated the Bridge Parking area.

On October 25, the area became doubly inaccessible when the Bonner Bridge was hit by a dredge which knocked out approximately 300 feet of the bridge. The NC Department of Transportation immediately sought a permit to construct a ferry dock immediately west of the point where the bridge joined Hatteras Island. From October through February 15, a ferry system provided the only access to Pea Island NWR. Though the situation certainly made life inconvenient for Hatteras Island residents and visitors, it had amazingly little effect on visitation on the refuge.

New entrance signs were received at the end of the year; however, installation of the signs will not be scheduled until the construction on the North End has been completed and use of the bridge has been restored.

During 1989, the Oregon Inlet Coast Guard Station was vacated. Because of the historic designation of the old part of the station, the refuge had no interest in acquiring that structure. We did express an interest in the newer part of the facility, the storage buildings, and the land. The Etheridges, a local family, are seeking title through a reversionary clause in the deed. It appears this claim is valid. Several local politicians have pursued Congressional intervention in an attempt to acquire the facility for Dare County. The saga goes on....

As in the past, public demand for beach access has increased and the amount of undeveloped beach frontage property locally 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. Our efforts continue to aim toward a higher quality visit, as opposed to more visits.

2. Outdoor Classrooms - Students

The emphasis on non-staff conducted activities continued during 1990. 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 VCS.

Since no registration was required for the use of outdoor classrooms, we have no record of the actual number of such uses that occurred. The N.C. Aquarium 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 the responsibility for maintenance on the North Pond Trail. As the CWRS has grown and developed, the Upgrade and Renovation of the North Pond Trail Project (See Figure 1) has become a focal point for the Society. Volunteer Patsy Zoll planned and directed a fund raiser for the Society to gain the funds needed to complete this project. During 1990, the Society

received a $10,000 Challenge Grant from the USFWS to begin work on Phases I, II, and III. A $5,000 anonymous donation for trail work really set the wheels in motion. Then, the Outer Banks Community Foundation provided the Society with a $4,000 grant to purchase spotting scopes for Phase IV of the trail project.

At the close of 1990, seven permanently mounted, vandal- and weather-proof, binocular spotting scopes had been purchased for the trail. Building materials had been purchased to construct Phase I. Pilings had been donated and installed for Phase I, and many of the timbers for Phase I had been pre-cut. Unfortunately, because access was severely limited to Pea Island by the loss of the Bonner Bridge, construction plans had to be postponed until Spring.

Summer and fall birdwalks are popular. BWS 7/90

Approximately 145,208 visitors (271,832 AH) utilized the interpretive foot trail (self guided). In addition, 983 (1,9062 AH) people participation in conducted trail walks.

6. Interpretive Exhibits/Demonstrations

The two interpretive kiosks and the exhibits displayed in the Visitor Contact Station have been popular with refuge visitors. The kiosks provide basic visitor information 24 hours a day, 7 days a week. The Visitor

Contact Station provides a few small exhibits. A possible solution to our need for a place to greet the public and provide visitor information continues to be the newer part of the abandoned Coast Guard Station.

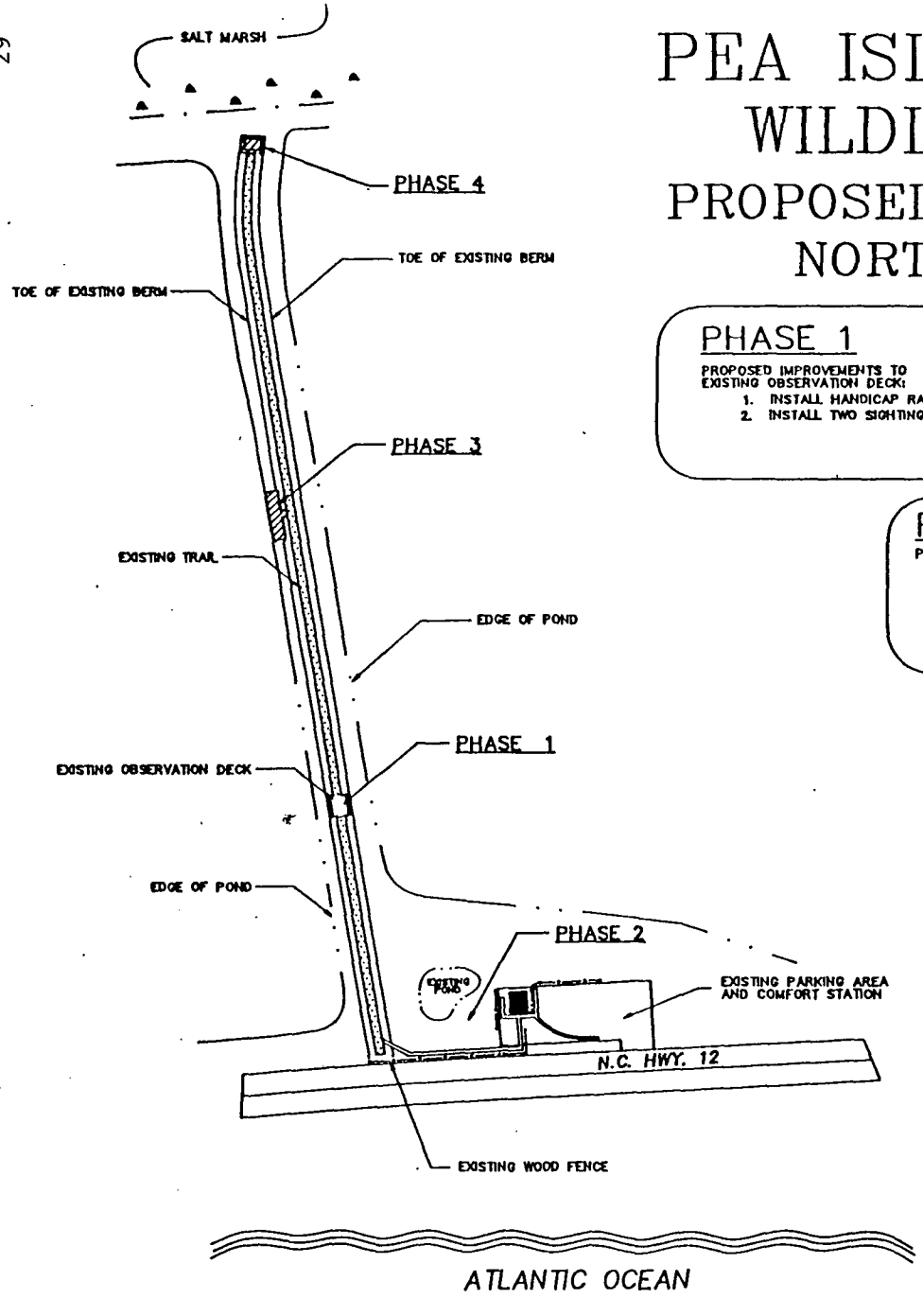
During 1990, 79,219 visits (19,799 AH) and 6,500 visits (1,650 AH) were spent at the kiosk and Visitor Contact Station, respectively.

7. Other Interpretive Programs

All regularly scheduled (summer and fall) interpretive programs were conducted at Pea Island by refuge volunteers.
Four bird walks and three Children's Wildlife Discovery Programs were scheduled each week during June, July, and August. Participation during the 1990 summer follows: Bird Walk - 41 programs and 774 participants; Children's Wildlife Discovery - 23 programs and 558 participants. Ten fall bird walks were conducted on Saturdays during October, November, and December for a total of 100 participants. Besides these regularly scheduled programs, 22 special bird walks were conducted into the South Pond area for 209 people.

The Children's Wildlife Discovery Programs often explore the salt marsh at New Inlet. BWS 7/90

FIGURE 1



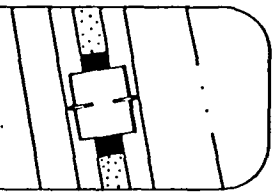
PEA ISLAND NATIONAL WILDLIFE REFUGE

PROPOSED IMPROVEMENTS TO NORTH POND TRAIL

PHASE 1

PROPOSED IMPROVEMENTS TO EXISTING OBSERVATION DECK:

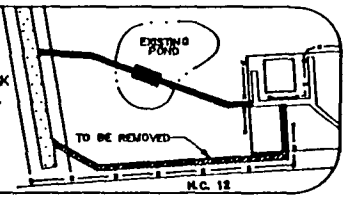
1. INSTALL HANDICAP RAMPS.
2. INSTALL TWO SIGHTING SCOPES.



PHASE 2

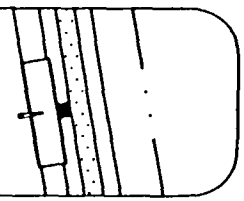
PROPOSED IMPROVEMENTS:

1. REMOVE CONCRETE SIDEWALK ALONG N.C. 12.
2. CONSTRUCT WOOD WALKWAY EXTENDING FROM COMFORT STATION TO INCLUDE AN ELEVATED WALKWAY WITH BENCH TYPE SEATING OVER EXISTING POND.



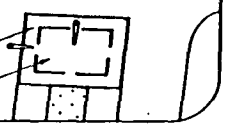
PHASE 3

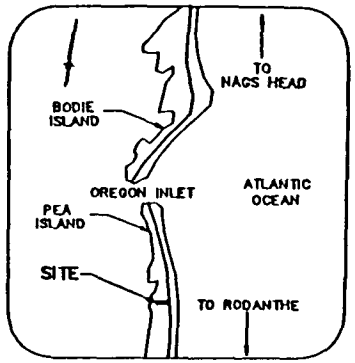
PROPOSED OVERLOOK OBSERVATION DECK WITH HANDICAP ACCESS AND SIGHTING SCOPE.



PHASE 4

PROPOSED MULTI-LEVEL OBSERVATION DECK WITH SIGHTING SCOPES.





LOCATION MAP
N.T.S.

COASTAL WILDLIFE REFUGE SOCIETY

In addition to the above programs, refuge staff and volunteers conducted 25 special programs ranging from marsh walks to talks about the Lifesaving Station for 684 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. Bluefish, spot, pompano, croakers, and trout were the major fish caught. A total of 1,111,458 AH (280,228 visits) were spent fishing.

Of course, everyone is aware that the groin and the revetment are closed to public use. BWS 7/90

Again, though access to the refuge was limited to a ferry system during several months of the year, fishing activity was affected very little.

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 (N.C. 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 1,320,115 visitors spent time in association with vehicular wildlife observation during 1990.

Night herons are among the "sought after" species for some of the "life listers". LD

The problem with birders requesting access into the closed areas around South Pond to view "rare" birds continued into 1990. Last year, we compromised the closure of the South Pond area by scheduling conducted bird walks when scheduled in advance. These walks were not publicized because we didn't want to have a lot of requests. 1990 brought events that required publicizing the special walks....

A birder who had illegally entered South Pond on July 15 found a variety of "rare" shorebirds (curlew sandpipers, a white winged black tern, a ruff, a red knot, black terns, stilt sandpipers, rufous necked

stints, and roseate terns). He reported his finds to the "Rare Bird Alert Hotline" which passed the information on to thousands of "life listers" around the world. We contacted the major birding groups and the Hotline quickly to provide appropriate information regarding legal vs. illegal entry into the South Pond area. The stints were never seen again; however, fourteen special bird walks were conducted during the last two weeks in July. The other species were seen at least one other time during the course of the month. Fortunately, these birds had moved on by the first of August, and the demand for South Pond bird walks diminished rapidly. Hasn't anybody guessed that maybe the reason the birds like South Pond is because it is closed to public entry??

North Pond Trail has terrific song bird habitat near it's start. BWS 8/90

Refuge trails and other access points are located to make wildlife observation (on foot) easy and enjoyable. Refuge visitors spent approximately 422,281 AH (289,381 visits) participating in this activity.

12. Other Wildlife Oriented Recreation

The use of refuge photo blinds was limited by dike work and lack of staff time to place them, but most

photographers wander around the impoundments or use the observation platforms. Approximately 22,260 AH (5,580 visits) were spent with photography.

Wildlife photography continues to be a big attraction at Pea Island. BWS 6/90

15. Off-Road Vehicles

The use of ORV's on Pea Island is restricted to North Carolina Highway 12. Though illegal ORV traffic has plagued the refuge somewhat in the past, significant erosion of the beach and dunes has caused a rise in violations of this nature. Increased signing has become a necessity. ORV violations have become more frequent and, as always, the violators are difficult to apprehend.

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 from observations of bird use at Currituck NWR and along other beaches in Currituck and Dare counties, 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 1,160,551 AH (340,142 visits) were spent in non-wildlife oriented recreation.

Bicycling becomes more and more popular each year. And, or course, NC 12 becomes more and more dangerous each year. BWS 7/90

7. 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. The assignment of Mackay Islands's LEO Mike Panz to Alligator River NWR half-time during 1990 helped the situation immensely; however, budget restraints prohibited us from utilizing him fully. There is still an obvious

need for more LE presence on the refuge. 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, and the violators are difficult to apprehend.

During 1990, the following violations were cited:

Vehicular trespass	1
General trespass	2

18. Cooperating Associations

Though the Coastal Wildlife Refuge Society is officially the Cooperating Association for Alligator River NWR, most of its activity for 1990 related to Pea Island.

The Visitor Contact Station was re-vamped to provide a small sales outlet for the Society. Several types of T-shirts and wildlife note cards printed on recycled paper were available for purchase. The 3,000 bird lists which were donated by the Society in 1989 carried the refuge through 1990, as well.

The North Pond Trail Upgrade and Renovation is underway. This is currently the focal project for the Society. (See Section H.18. of Alligator River NWR narrative for more details.)

I. EQUIPMENT AND FACILITIES

1. New Construction

In late October, construction began on NCDOT's ferry dock and approach road at the north end of Pea Island.

This was an emergency project undertaken after the Herbert Bonner Bridge over Oregon Inlet became impassable as a result of a dredge striking the bridge. (See section D.4. for details.)

2. Rehabilitation

After 3 years and numerous Requests for Engineering Services, the eroding foundation at South Pond pump station was finally repaired. The damaged bulkheading was removed and replaced with a new wakefield bulkhead. The 30" pump located at this station was also removed and an extension was welded on the end to minimize erosion around the new bulkhead and station foundation.

3. Major Maintenance

The only maintenance project completed on the Pea Island headquarters is year was the installation of four new garage doors. The buildings and storage facilities remain in dire need of repair. Roofs, ceilings, eaves, and windows are all in disrepair.

4. Equipment Utilization and Replacement

As a result of the coastal environment at Pea Island, and limited storage, equipment continues to be stored at Alligator River NWR and brought over on an as-needed basis.

5. Communication Systems

Early in the year Pea Island headquarters converted from HF to VHF.

J. OTHER ITEMS

1. Cooperative Programs

A SUP was issued to the Carolina Raptor Center to census and band raptors at Pea Island. (See section G.6. for details.)

A SUP was issued to NCDOT for the construction of a ferry ramp and approach road on the north end of Pea Island. (See section D.4.)

A SUP was issued to the COE to deposit 300,000 cubic yards of dredged sand along the eroding Pea Island beach.

A request by the U.S. Navy to relocate their navigation tower was granted.

4. Credits

The Pea Island narrative was written by the following staff:

Windley: Sections A, C, D, E 7 & 8, F, I, J
Noffsinger and A. Elmore: Section G
Strawser: Section E 2 & 4, H

Photos were taken by Larry Ditto (LD) and other staff as indicated.

The narrative report was edited by ROS Lanier and RR Strawser and typed and compiled by J. Lane.

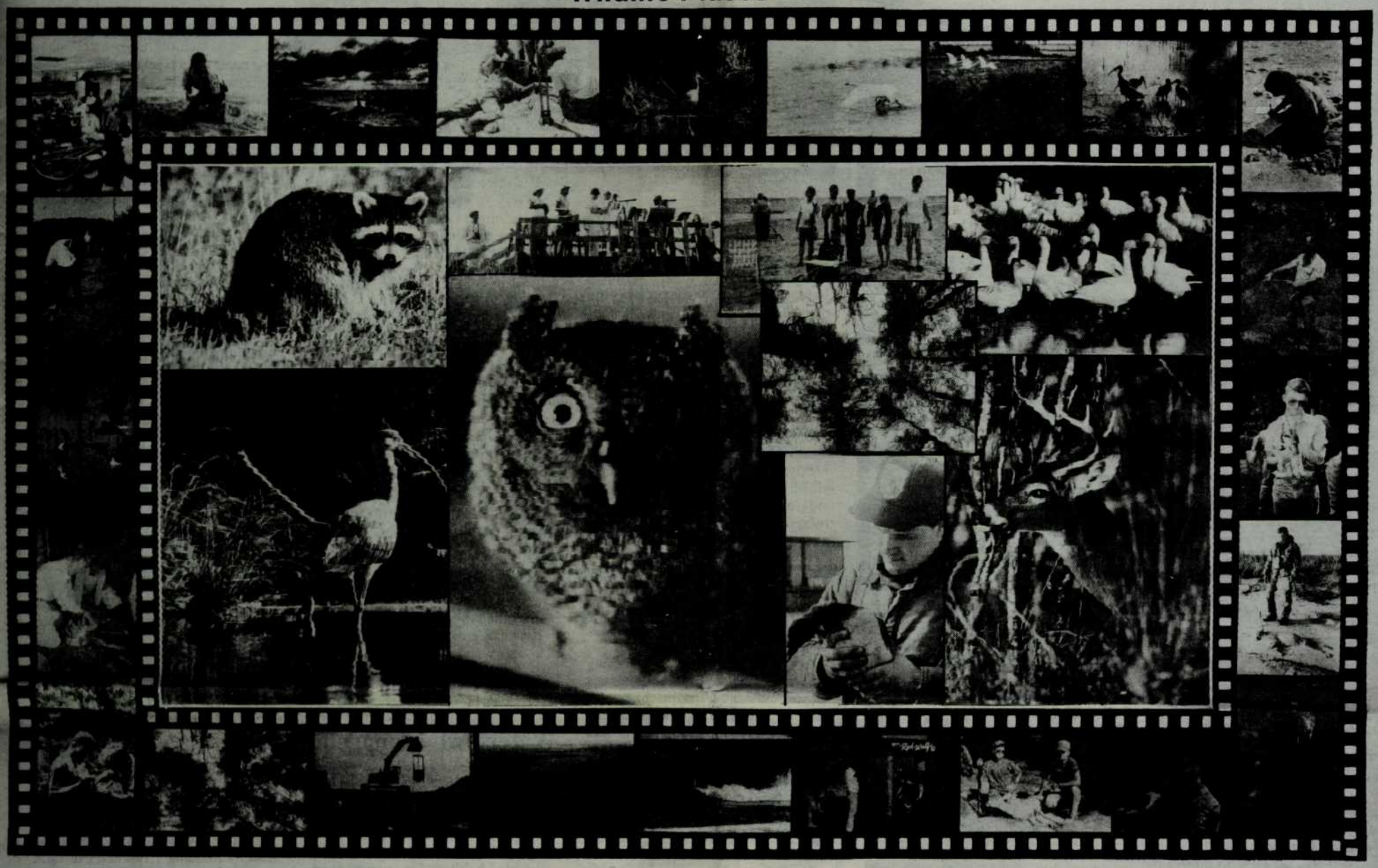
Alligator River & Pea Island National Wildlife Refuges

"A Publication of The Coastal Wildlife Refuge Society."

United States Department of the Interior Fish and Wildlife Service

Refuge Phone:
919-473-1131
Refuge Address:
P.O. Box 1969
Manteo, N.C. 27954

"Wildlife Places"



Take Pride in America
Public Lands Belong To All of Us!!

In their Take Pride in America song, the Oak Ridge Boys said it best:

When was the last time you saw an eagle on the flight?
Just look around you, we are that eagle in the sky.
Up here where God shines his light,
America never looked so bright!

Take pride in America, take pride in the USA.
Take pride in America; America, don't turn away!
Come on, it's our duty to preserve our country's beauty.
Take pride in America, take pride in the USA.

We've come a long way, There's still a lot of work to do:
Rivers to clean up, forests and parks we can renew.
More land for wildlife to roam, volunteers to clean up our home.

Take pride in America, take pride in the USA.
Take pride in America, America is on parade.
So join hands, tow the line; together we can make her shine.
Take pride in America, take pride in the USA.

When was the last time you had a chance to help this land?
To make a difference, to face a task and take a stand?
This land can't last forever; the sooner we begin, the better.

Take pride in America, take pride in the USA,
Take pride in America, America is on display.
We won't stop until we're done; the eagle's flight has just begun.
Take pride in America, take pride in the USA.

Public lands do belong to all of us. Each time we visit a national wildlife refuge, national or state park, forest, or other parcel of public land, it's important to remember that we're really "home". Does that mean we can act as we please? Does it mean that the resources there are ours to exploit if we see fit? Does it mean that the laws don't apply to us?

Certainly, the American public knows better. Because public lands belong to all of us, we have a tremendous responsibility to take good care of them and use them wisely. We have a responsibility to be good stewards of the lands and waters that have been left in our trust. To future generations, we owe public lands that are as good, or better, than the ones our forefathers passed on to us.

How can we be good stewards?? How can we assure that these resources are used wisely and managed effectively? How can we give guarantees to an unborn generation?

Practicing humility is a great way to start. If we always keep in mind that we are a small part of a giant picture.... If we always remember that our wants and our needs are very different and try to distinguish between them.... If we try to realize that even our genuine needs, as individuals, are insignificant compared to the consequences of meeting those needs without due precautions.... Then, and only then, can we begin to see the real world as it is today....

Be informed. Keep up with environmental issues. Spend lots of time in the great outdoors, and get to know the public lands in your area. Learn about management policies on these lands. Ask questions when you don't understand something. Look into ways you can help the "public servants" who are responsible for the lands.

Since we live in a democracy, we each have a voice — an equal voice — in government. Granted, each of us is not heard on a daily basis. One way to practice good environmental stewardship is to make our views known. Nothing in America has as much of an effect on a politician as voters. Write and call your congressmen! Pat them on the back when they perform well on environmental issues; chastise them when they don't. Encourage them to learn more about environmental issues. Send them information about issues that concern you.

We can teach more by example than we can by any other method known to man. If we each behave in an environmentally responsible way, what an impact it will have on everyone we meet! If we recycle, others will recycle. If we pick up trash on the beach, others will do the same. If we appreciate birds and flowers and a slow moving creek in the wilderness, folks around us will begin to appreciate the same things. If we volunteer to lead a bird walk, someone, somewhere will be affected by our involvement.

Children are the most important people in the world today, for the fate of the world, in fact, lies in their hands. For generations, we have squandered our resources, dirtied our air, poisoned our water, and abused our precious environment in every way possible. If we cannot begin to right the wrongs of the past today, there will be no hope for tomorrow.

Near Manteo, North Carolina, two vastly different national wildlife refuges have been set aside for wildlife and public enjoyment. These are your refuges. You have a right to enjoy them .... You have an obligation to "handle with care". If, as you learn about Alligator River and Pea Island National Wildlife Refuges, you want become more involved, give us a call. If you have time to volunteer, we can use you. If you just want to comment, we'd love to hear from you. If you wish to make a donation of equipment, materials of any sort, or money, it's as easy a phone call or letter.

These refuges are precious gifts. In a sense, we have inherited them from our parents. In an even greater sense, we have merely borrowed them from our children.

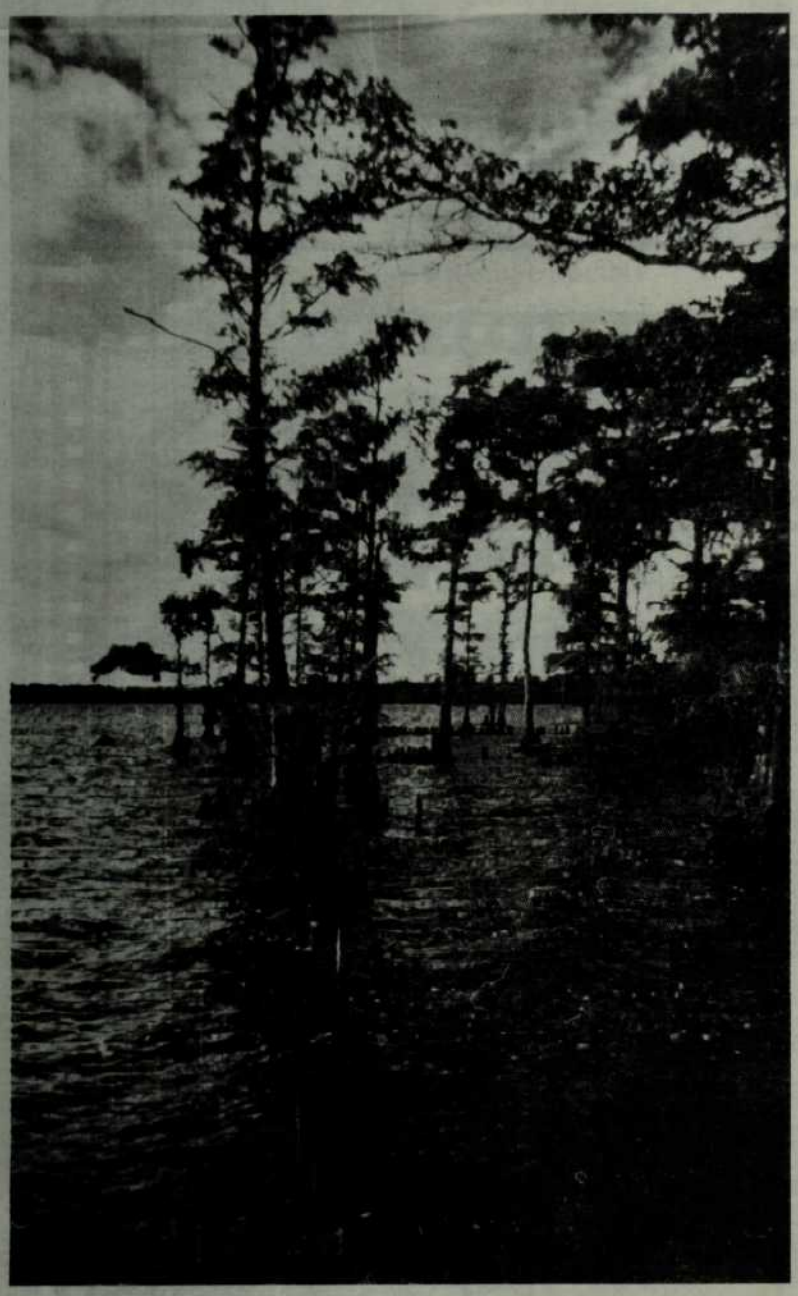
Remember that rights and responsibilities always go hand in hand. Exercise your rights. Live up to your responsibilities. Take pride in America's wildlife resources. And remember, **"The eagle's flight has just begun!"**

REMEMBER TO RECYCLE!

The three R's of conservation are:
- Reduce waste
- Re-use
- Recycle

Recycling makes a difference!
Take Pride in America's Natural Resources....

Cypress Trees Flourish



Alligator River – Swamp on a Hill

This large (approximately 150,000 acres), young (established in 1984) refuge of marshland, pine and hardwood forest, and swamp is located on the eastern North Carolina mainland just west of the Outer Banks. It was set aside to protect the region's unique pocosin habitat —"pocosin" is an Indian word that literally means 'swamp on a hill' — and to manage and preserve the wildlife found in this habitat.

Alligator River's wildlife populations are quite diverse and include many species of birds, mammals, reptiles, and amphibians. Endangered and threatened species found here include the American bald eagle, peregrine falcon, red cockaded woodpecker, and American alligator. What is believed to be one of the largest and last remaining concentrations of black bear along the mid-Atlantic coast is also located on the refuge. And within the last three years, the refuge has gained fame as the locale of a bold new experiment to reintroduce an extinct-in-the-wild native American mammal, the red wolf, into the wild. (The project has been quite successful to date — see separate article.)

An important Fish and Wildlife Service objective in managing the Alligator River refuge is to restore natural water conditions by plugging the man-made drainage ditches and canals that crisscross the area. By so doing, the original wetland character of the area will be largely replicated, and it will once again support larger populations of wood ducks, barred owls, red shouldered hawks, marsh rabbits, otters, and other wetland species. (See separate article.)

Another goal is to re-establish the stands of Atlantic white cedar trees that once dominated the area. This commercially very desirable species was heavily harvested by timber companies to the point that few viable groves now remain standing. (See separate article.)

Another important activity involves cooperative management with local farmers of some 3,800 acres of croplands within the refuge. Under this arrangement, the farmers plant and harvest some of the land, while portions of some crops they plant are left to benefit wildlife.

Until it became a National Wildlife Refuge, the area was exploited mostly by logging companies, farmers, and hunters. No public-use development has occurred since the refuge was established, and little is planned for the near future. While the refuge is open to the public for birdwatching, wildlife photography, etc., visitors should know that most refuge roads are unpaved, old logging roads, and use of a four-wheel drive vehicle is recommended during most of the year.

Hunting is allowed on most parts of the refuge during State seasons and in accordance with all State regulations. (White-tailed deer is the main species hunted, although a variety of small game is taken as well.) Fishing is also allowed on the refuge, again strictly in accord with State requirements. Before getting involved in these activities, interested persons should consult the information boards located near all entrances to the refuge, or call or write to the refuge office in Manteo (Alligator River National Wildlife Refuge, P.O. Box 1969, Manteo, NC 27954, tel. (919) 473-1131).

Tranquil Afternoon

Atlantic White Cedar

One of the features of the Alligator River National Wildlife Refuge that makes it so special is the diversity of natural habitats it contains. Among these, a habitat we regard as especially impressive and significant consists of those areas where stands of the Atlantic white cedar tree now predominate or have flourished in the past.

The white cedar is indeed a very useful tree. Stands of this species are highly beneficial to wildlife, a factor which of course is an important consideration in creating wildlife refuges. The habitat in which these cedars grow provides excellent cover (that is, shelter and protection) for many animal and bird species. Shrubs associated with the habitat provide berries as a food supply for the black bear as well as many other animals and birds.

And then there is the sheer beauty of the habitat itself. Try some sky gazing by standing at the base of a large white cedar and looking upward along its trunk through the dark green arched crown high above you. It can be a truly inspirational experience, and it is little wonder that many who visit a cedar grove for the first time comment that they feel as if they are standing in a natural cathedral.

Finally, the white cedar is highly prized commercially. It is used extensively in boat building and home construction. It is one of the few trees valuable enough in the business sense to cover the high costs of logging it in the wet peat soils of the Albemarle-Pamlico peninsula. This high dollar value has led to its depletion throughout its range.

Most of the white cedar lands in the refuge consist of areas that were clearcut in commercial logging operations a few years ago. Fish and Wildlife Service personnel are now seeking ways to salvage these areas and, hopefully, regenerate new stands of young trees that can grow to maturity. Preliminary observation has shown that the cedars have begun regenerating nicely, on their own, in some of these areas, but have been doing less well in others. A concerted effort has begun to find out why and then to try to apply this knowledge in the poor-regeneration areas.

Fortunately, a few thousand acres of living cedars, including both young and mature trees, still remain on the refuge; all commercial leases for logging operations within its borders ceased on or before the end of 1990. At this point, refuge staff and volunteers are in the process of conducting an inventory of the remaining cedar stands. This, as well as the regeneration efforts described above, will represent important first steps in efforts to nurture and hopefully restore the refuge's valuable and beautiful stands of the magnificent Atlantic white cedar.

Education a Plus . . .

Wetlands Management

Until quite recently, many of us assumed that our wetlands — marshes, swamps, pocosins and the like — were just about the least valuable pieces of property that exist, and the only way to make such lands useful was to drain them. Now, due to declining fish and game populations, increasing water pollution, and other problems, we are learning to our sorrow that we were wrong, and wetlands should be up there at the top of the list of land types we should have been protecting all these years.

At the Alligator River National Wildlife Refuge, work is now under way to try to restore the original wetland character of some of the area. If the experiment is expanded, it will require a lengthy and complex effort, but the potential payoff could be quite large.

Much of eastern North Carolina used to consist of vast tracts of marshy and forested wetlands. The extensive pine, cypress, and white cedar forests of the region became more and more attractive as a burgeoning American population developed a growing appetite for timber and wood products. Small wonder, then, that roads and canals were increasingly built throughout the area to give logging companies access to its rich stands of trees.

But the hitch, although no one realized it at the time, was that by building these roads and canals and removing its forests, the basic character of the land and its ability to support wildlife were changed for the worse. While the land remained wet, surface water could no longer be retained as long as it used to, meaning that water levels and many of the nutrients and foodstuffs needed for survival of and successful reproduction by many wildlife species were no longer there. The water run-off from these areas into nearby rivers and sounds became more severe. The changes may also have made it more difficult to regenerate the more valuable species of trees that had been harvested.

With the establishment of the Alligator National Wildlife Refuge in 1984, the Fish and Wildlife Service began to think about ways to try to undo some of the effects, and active efforts to this end got under way in 1989. And so, in the summer of 1989, Fish and Wildlife Service technicians succeeded in raising water levels in one area (approximately 8,000 acres) by placing a water flow control device in a canal and plugging 14 smaller ditches.

It is much too early to see any measurable results of this work, but water levels appear to be rising slowly. We are cautiously optimistic that this represents a small step in the right direction. Proposals have been made to expand the effort. In years to come and as we continue expanding the project, we may just be lucky enough to find that something approaching the original character of the wetlands in this area will have been successfully restored. And if that can happen here, why not in other areas as well?

Waterfowl Management

We have all been hearing a lot lately about the decline in the number of ducks and other waterfowl throughout North America, due primarily to the rapid loss of wetlands and other suitable habitat for these once-abundant birds. This has become a matter of increasing concern to wildlife enthusiasts and sportsmen alike, and many efforts — from creating artificial ponds along major flyways, to advertising the federal duck stamp program, to producing TV specials about the problem — are under way to do something about it before it is too late.

An important part of the battle to stop the drop in waterfowl populations is being waged by the Fish and Wildlife Service. Here in Dare County, the front lines of that battle are located on the Pea Island and Alligator River National Wildlife Refuges.

At Pea Island, efforts to enhance waterfowl habitat are centered on (1) maintaining proper water levels in three large fresh-water ponds, and (2) growing the kinds of food plants in and near those ponds that will attract and nurture a wide variety of ducks, geese, and wading birds. Efforts like these have been going on there for this refuge's entire 50+ year history.

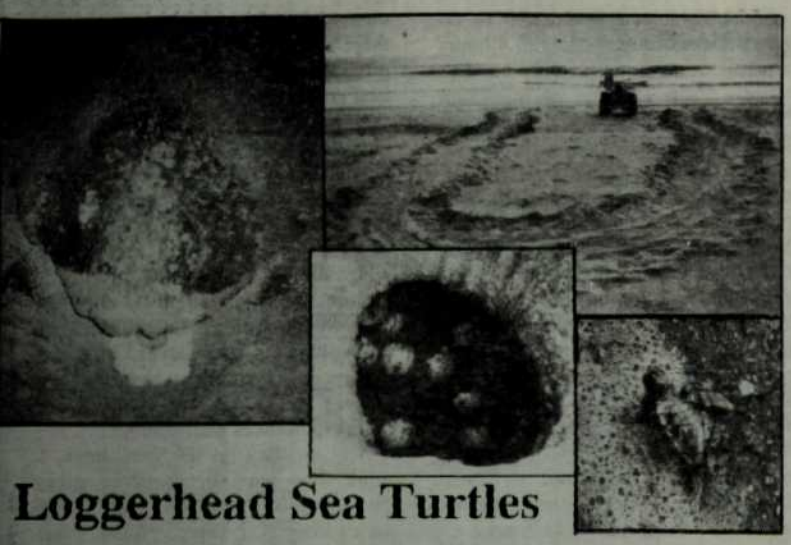
A newer and more ambitious effort is being undertaken at Alligator River. Here the work to help waterfowl really began in the late 1990s, and it is focused on a 4,800 acre tract of cropland. The previous landowner had modified this natural wetland area by building a perimeter dike around it, digging drainage ditches and installing pumps that can remove up to 250,000 gallons of water per minute from the area. Such pumping was necessary to make the area dry enough for farming.

In 1988, Fish and Wildlife Service personnel were able to make a start in restoring wetland conditions in the tract by flooding 1,100 acres of farm fields. In the two following years, a system of dikes and ditches was refined that permitted greater fine-tuning of water levels throughout the flooded area. The payoff from this engineering work has already been gratifying. The duck population in the area rose from essentially zero ducks to a high of 5,000 in the winter of 1988 to more than 30,000 a year later. Species present included ring-necks, green and blue-winged teal, wood ducks, mallards, black ducks, and pintails.

The next objective of the wetlands restoration project at Alligator River will be to create a checkerboard of moist soil impoundments, forested wetlands, agricultural fields, and permanent ponds throughout the area. Progress toward this goal will be slow and costly because of the resources that will have to be brought to bear. But the progress made already is a good indication of the tremendous potential this area has for helping reverse the decline in our local waterfowl populations. Waterfowl wintering here find abundant food and little disturbance, a good combination that sends them back to their breeding grounds in excellent condition for reproduction.

Our children and grandchildren may never again see the sky blackened by the flight of untold tens of thousands of migrating ducks, but at least we are now doing what we can to make it possible for some — and hopefully many — of these birds to survive.

COASTAL WILDLIFE REFUGE SOCIETY



Loggerhead Sea Turtles

Every morning from late May to early September, volunteers join the rising sun on the beaches from Oregon Inlet to the Rodanthe Pier. They spend the early hours searching for the characteristic tracks that indicate a female sea turtle has crawled from the waves' edge to the base of the dunes to lay her eggs. North Carolina beaches lie on the northern edge of the nesting range for loggerhead sea turtles. Loggerheads are a threatened species, now requiring special assistance to avoid extinction.

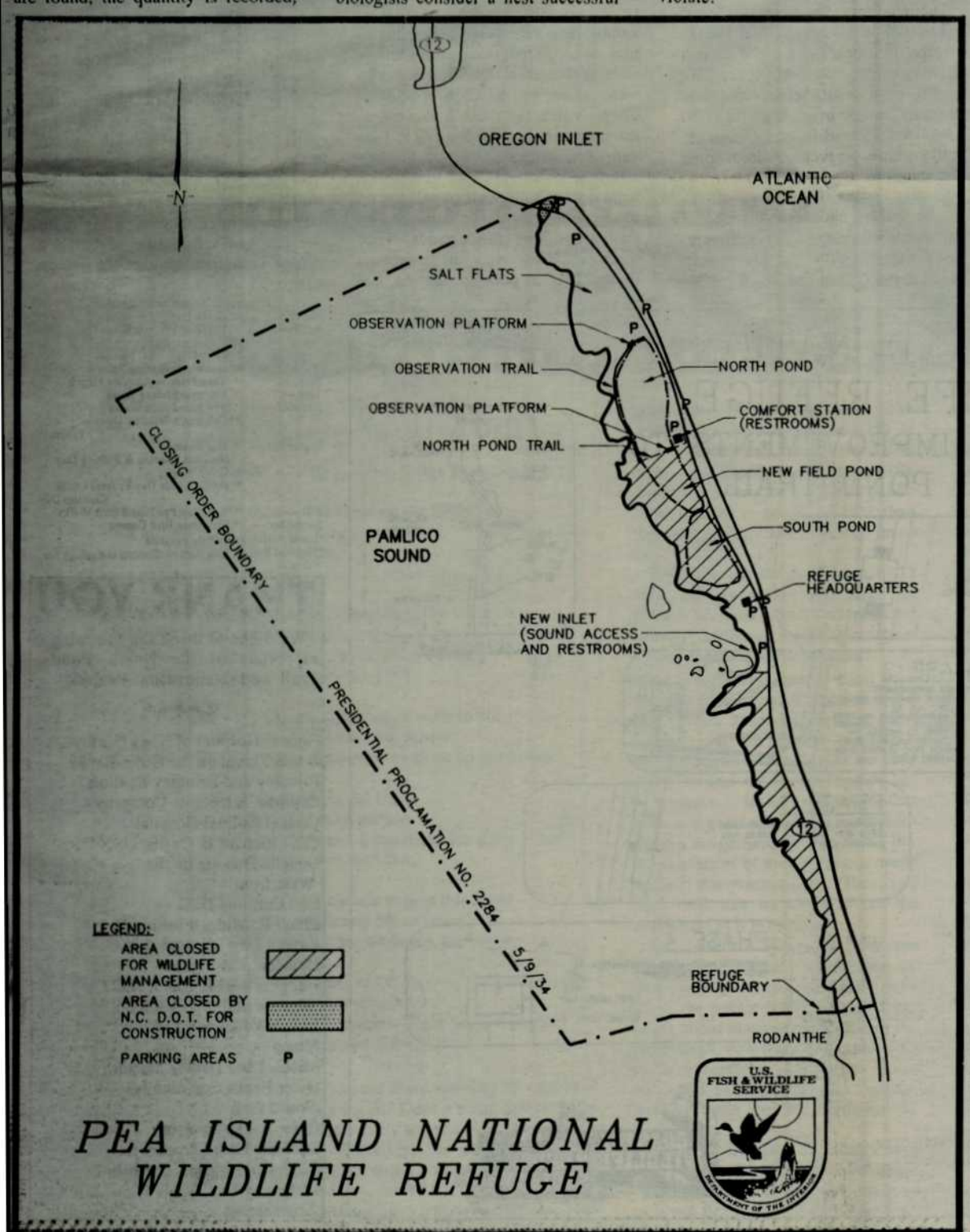
Locating a turtle nest begins the process by volunteers and staff of Pea Island Refuge that will offer each egg its best chance of survival. When a crawl is found, a trained professional comes out to "probe" to determine if, in fact, a nest was actually laid. Some crawls are "false," and no eggs are deposited. Once eggs are found, the quantity is recorded, and the nest is evaluated for relocation. If it is in an area of high erosion, overwash or excessive public use, it is carefully transplanted to a safer area of the beach.

Intense monitoring of the nest begins about 55 days later in expectation of hatching. There are many obstacles for the turtles to surmount on their journey to the Gulf Stream. Some don't survive the strenuous "dig" to get to the surface from the underground nest. Others fail to survive the dash across the beach to get into the water. The ghost crabs are vicious fighters and voracious eaters of baby turtles. Once in the ocean, turtles have to contend with another set of predators, including fish and sharks.

An average loggerhead nest will have 60-155 eggs. Pea Island usually has 10-20 nests each year. Most biologists consider a nest successful if one tiny hatchling survives to produce offspring. Mathematically speaking, that means Pea Island, at best, provides 10-20 turtles for the breeding population each year. Compare that to many southern beaches where hundred of nests are laid each night for weeks at the time. Why do we put so much time and energy into producing only 10-20 turtles?

A special factor in the biology of sea turtles makes the North Carolina turtle nests particularly important; the temperature of the environment around each egg determines whether a male or female turtle will emerge. As the northernmost and therefore coolest range for nesting loggerheads, it has been hypothesized that an unusually high percentage of males may hatch from the North Carolina nests. Since a single male sea turtle may service many females, Pea Island's nests could be the major source of males for the entire population. Since turtles normally have a low percentage of survival from a nest due to natural hazards, the increased mortality caused by man-made hazards has pushed the species towards extinction. Carelessly tossed baggies, abandoned pieces of gill net, and improperly managed trawling operations are all dangerous to sea turtles.

This makes our efforts that much more critical and each turtle that makes it from nest to ocean that much more special. In your visit to the Outer Banks, be respectful of areas marked for wildlife protection. Don't litter; obey refuge, State, and local laws; and report people who violate!



PEA ISLAND NATIONAL WILDLIFE REFUGE

Hunting at Alligator River

"Refuges Are For Adventuresome People"

Pea Island

Birding, fishing, nature study, and photography are the most popular wildlife related public uses of the refuge and its bountiful resources. Since it lies in the middle of Cape Hatteras National Seashore and is bisected by NC 12 (the only road to Hatteras/Ocracoke), Pea Island National Wildlife Refuge is impacted by more than 2 million visitors each year who at least "pass through." Many of these folks never realize they are on a national wildlife refuge; others take a quick look as they drive through, but never stop for further involvement.

In the fall and winter, driving along Highway 12 can offer a memorable wildlife viewing experience. Snow and Canada geese graze in fields which have been planted in cool season grasses. In the pond areas, also near the road, tundra swans, many species of ducks, and an assortment of wading and shorebirds can usually be seen.

Currently, two observation platforms are located on the north and south dikes of North Pond. The North Pond Trail, a half mile trail located on the south dike of the pond, is currently being upgraded and renovated. More serious birders (or folks who want more of a "walk on the wild side") may continue past the half mile trail and walk the entire perimeter of the North Pond on refuge service roads. This area is open for wildlife observation, but offers no special facilities. The walk is usually filled with swarms of biting insects, is a long one (4-4.5 miles) and the last leg is along Highway 12. Many visitors prefer to enjoy the North Pond Trail, then drive to the north dike and walk to the other overlook. New Field and South Ponds and the surrounding marshes are closed to all public entry. These areas are set aside to provide undisturbed resting, nesting and feeding areas for wildlife year-round. As staffing allows, a special bird walk in South Pond, is available by arrangement.

During the summer months, public bird walks and Children's Wildlife Discovery programs are scheduled. From October 1st through the Saturday after Thanksgiving, Saturday morning bird walks are offered, as well.

The 13 miles of pristine beach provide the surf fishing enthusiast an excellent opportunity to take home a good catch. Speckled and gray trout, spot, flounder, blue fish, red drum, and striped bass are some of the more sought after species. A walk on the beach also offers an excellent opportunity to observe shorebirds and marine birds and mammals.

The best opportunity for crabbing is along the shore of Oregon Inlet. New Inlet, a small soundside parking area about 7 miles south of Oregon Inlet, provides an appropriate spot to launch a small, shallow draft boat or canoe. Fishing in the sound is easier by boat, but many visitors prefer to wade from New Inlet or walk to the back of the island to fish from the shore on the north end. Many schools utilize New Inlet for marsh studies, as well.

Pea Island's beaches are closed to all vehicular traffic. Though North Pond is open for walking the perimeter, all pond areas themselves and New Field are closed to public entry. Fishing, crabbing, boating, and other water-related activities are prohibited in all three ponds. Likewise, dogs are prohibited from the pond areas. In all other public areas of the refuge, dogs are permitted, but must be leashed.

Visitors should obey refuge signs and regulations to ensure that wildlife has a place to grow and survive for future generations to enjoy. Pea Island National Wildlife is administered through Alligator River National Wildlife Refuge in Manteo. Visitors may request information by contacting the Pea Island office (919) 987-2394, the Alligator River office (919) 473-1131, or by writing to the refuge at P. O. Box 1969, Manteo, North Carolina 27954.

Summary of Regulations:

— Fishing is permitted in the ocean and sound. Fishing is prohibited in the ponds.

— Pets are prohibited in the pond areas. In all other public areas, pets are permitted if they are leashed.

— Camping is prohibited.

— Fires are prohibited.

— Hunting is prohibited

— Guns are prohibited.

— Driving on the beach is prohibited. Vehicles are allowed only on public roads and in designated parking areas.

— Littering is prohibited.

Fishing at Pea Island

The Coastal Wildlife Refuge Society

The Coastal Wildlife Refuge Society, a non-profit corporation, was established by a group of concerned citizens early in 1989 to fund educational and recreational programs on the Alligator River and Pea Island National Wildlife Refuges. The Society's objectives are to assist in recruiting refuge volunteers and to provide support for refuge interpretive, educational, and recreational programs.

Functioning through a Memorandum of Understanding with the US Fish and Wildlife Service, the Society works closely with Refuge staff to supplement and assist approved public use activities. Since the Society is a non-profit organization, it can serve as a receiving agent for monetary contributions intended to benefit the refuges. The major Society project, at present, is the upgrading and renovation of the North Pond Trail on Pea Island National Wildlife Refuge. This plan includes the construction of four observation structures. Except for the upper levels of one tower, all structures will be fully handicap accessible. Three of the structures will feature permanently mounted, vandal — and weather — proof binocular spotting scopes.

An upcoming project is the design and construction of two observation/photo blinds for Pea Island Refuge. These blinds will be free for the public to use. The Society provides brochures, spotting scopes for bird walks, and other educational equipment or materials as the refuge requests and funds are available.

Thus far, funds for these projects have been received through Federal Matching Grants, Community Grants, private donations, and sales. T-shirts, note cards, and an assortment of wildlife"oriented books are available from the office at Pea Island. Proceeds from these sales assist with Refuge projects. Individuals or groups interested in helping with these or other projects should contact the refuge office or the Society.

Coastal Wildlife Refuge Society, Inc.

Name_____

Address_____

_____

Phone (H)_____

(O)_____

Mail with check to:

Coastal Wildlife Refuge Society
P.O. Box 1808
Manteo, North Carolina 27954

Can You Help Out?

❑ Host/Hostess	❑ Fundraising
❑ Naturalist	❑ Secretarial
❑ Art/Photography	❑ Biological
❑ Carpentry	❑ Maintenance
❑ Bird books	❑ Litter Pick-up
❑ T-shirts	12.00 Adult XL-L-M-S
	10.00 Children L-M-S
❑ Notecards	2.50 4.50
❑ Lapel pins	3.00

Please check membership:

❑ Regular	$10.00
❑ Wildlife	$50.00
❑ Donor	$200.00
❑ Corporate	$500.00
❑ Other Donation $	___

Volunteers Make a Difference

ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE VOLUNTEERS TAKE PRIDE IN AMERICA That would be an appropriate headline in any newspaper around. What an incredible group of people! "Pride in America" is behind it all, but look at all the "symptoms" of this "disease." They take pride in our wildlife resources; they take pride in our environmental heritage. They teach folks of all ages what our environment is all about and how to take care of it. They show how to take care of our environment. They're proud of themselves, and they're proud of the job they do for the U.S. Fish and Wildlife Service. And, we're awfully proud of them, too! That's what Pride in America is all about, isn't it? That's what volunteerism is all about.

Alligator River's volunteer program officially began fewer than 10 years ago. We never dreamed the program would grow to be so valuable to refuge operations. Since our meager beginnings so few years ago, the refuge volunteer program has grown in number of volunteers, in hours contributed, and, more importantly, in value to the refuge and the resource. It hasn't just grown; it has literally exploded. There's almost no facet of refuge work that is not enhanced by our superior volunteer program.

Though there are several special publicized projects each year (beach sweeps, tern banding trips, etc.) that draw one-time volunteers (over 200, in all), most of the refuge volunteer program involves fewer than 50 "regulars." These folks are from all walks of life. Some are retired; some are students. Some folks prefer to volunteer in their own area of expertise; others choose to branch off and start something entirely different, just for the fun of it, and just to help out in any way they can.

Some volunteers donate 40 to 60 hours a week; others come in 4 hours a week. Some come in only once or twice a year. There is no minimum requirement in the overall program; however, several of the projects for which we utilize volunteers require a specific time commitment. For example, folks who man the Pea Island National Wildlife Refuge Information Desk commit to a day or half day each week for the entire summer. They answer the telephone, relay messages on the radio, give out refuge information to visitors, and answer questions. Similarly, volunteers who participate in the "turtle patrol" commit to one morning each week all summer. These folks ride a 4-wheeler the entire 13 miles of refuge beach in search of nests of the threatened loggerhead sea turtle. Since Pea Island National Wildlife Refuge is on the edge of the range for this species, these nests are very important for their survival. It's an important job; volunteers have never let us down on it.

The red wolf project has received international acclaim. At Alligator River, volunteers deserve much of the credit for the success of the program to date. Student interns (volunteers) literally live on the refuge with these endangered wolves, providing security in the pen area and constant data as to their habits. Volunteers follow the movements of the free roaming wolves, helping to establish a base of information about these animals for which so little is known.

Several refuge volunteers are trained and available to go into local classrooms to provide wildlife programs. Programs on birds, mammals, invertebrates, fish, reptiles, amphibians, red wolves, and migration are offered, each including a slide presentation, question and answer session, and a hands-on activity. These volunteers are dedicated to teaching tomorrow's leaders to take care of America.

Refuge volunteers lead bird walks, band ducks, build wolf traps, pick up trash, write newspaper columns, install signs, and run errands. They teach children, and they vacuum floors. The list goes on, and on, and on.... Whatever the refuge needs, there's a volunteer somewhere in the program who is eager to give his/her best effort to provide for it.

A newsletter provides a list of needs; our faithful volunteers have never failed to respond to those needs. For short-notice projects, a few phone calls is all it takes. There's a place in the program for anyone who wants to become involved. Volunteer involvement is limited only by the energy and abilities of the volunteers themselves. Most of our recent recruitment has been by current volunteers, eager to share their experiences with others.

Why do they do it? Sometimes, I think they must be crazy to give, give, and continue to give. They aren't interested in recognition, even though they richly deserve it. One of our volunteers summed it up concisely. "We want to give something back. Life's been good to us. Now we have time and energy to return." Where else but America? The Alligator River National Wildlife Refuge volunteers demonstrate Pride in America with each hour they give. They are deeply dedicated to the refuges and to the resources they protect. They are committed to do their part to ensure that America's wildlife heritage continues to be filled with richness and diversity for generations to come.

Yearly, Alligator River and Pea Island National Wildlife Refuges benefit from over 14,000 donated hours of volunteer service. For this service to America, the refuge volunteer program has been named as a National Winner in the "Take Pride in America Awards Program" for several consecutive years. In salaries alone, the program has saved over $250,000. That's your tax money being saved!!

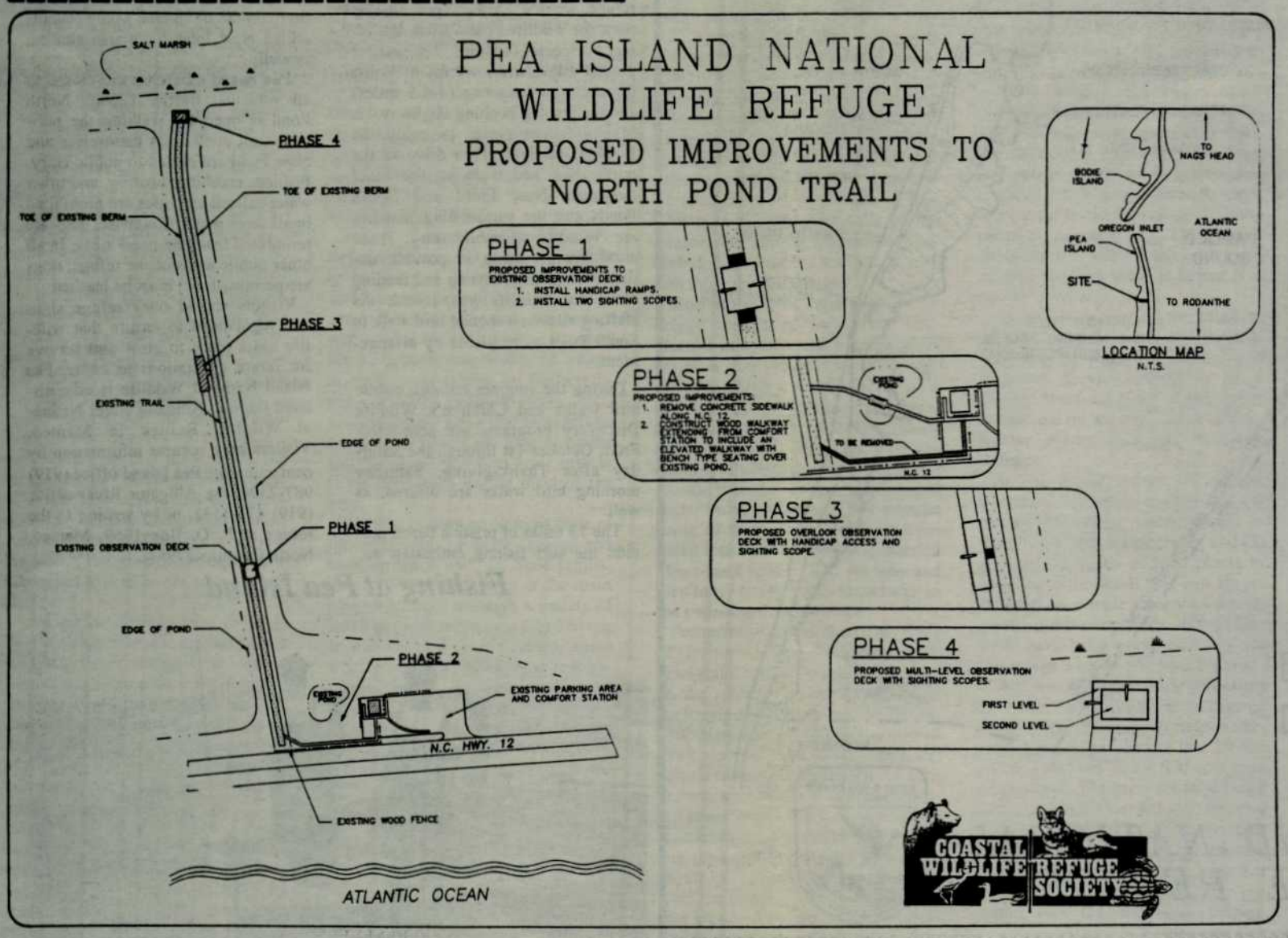
If you visit one or both of the refuges, you may have an opportunity to chat with one of our many dedicated refuge volunteers. If you do, be sure to let them know how much you appreciate what they do.

If you're interested in joining in on the fun and satisfaction of being a refuge volunteer, contact the refuge office.

Important Events to Remember

March —	Arbor Day
April —	* National Wildlife Week
	* Volunteer Week
	* Earth Day
	**Red Wolf Howling Safaris
May —	* Take Pride in America Month
June —	* National Fishing Week
Summer —	**Pea Island Bird Walks
	**Children's Wildlife Discovery Program
September —	* Big Sweep
	National Hunting & Fishing Day
	* Coast Week
	* Public Lands Day/Federal Lands Cleanup Day
Fall —	**Saturday Pea Island Bird Walks
December —	* Christmas Bird Counts

*Local Activities Usually Planned
**Special Refuge Programs — Contact the refuge for details.



COASTAL WILDLIFE REFUGE SOCIETY

THANK YOU

We'd like to thank the following supporters of the **North Pond Trail and Renovation Project:**

Animal Hospital of Nags Head
Beach Travel on the Outer Banks
Brindley and Brindley Realtors
Carolina Telephone Company
Coastal Animal Hospital
CDR Richard E. Curtis, USN Ret.
Donetta Donetta on the Waterfront
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Jemco
Michael and Debbie Martin
Outer Banks Community Foundation
Outer Banks Insurance
Roanoke Island Properties
Trimpi, Thompson, & Nash
Waterway Survey and Engineering

Pea Island National Wildlife Refuge Beginnings

Located on the northernmost thirteen miles of Hatteras Island on the Outer Banks of North Carolina, Pea Island National Wildlife Refuge is one of over 400 refuges nationwide administered by the U. S. Fish and Wildlife Service. Though it falls within the boundaries of Cape Hatteras National Seashore, the refuge is not managed as a part of the National Seashore. By a Memorandum of Understanding, National Park Service rangers patrol Pea Island to assist in enforcing regulations. Refuge, Seashore, State, and local regulations apply on Pea Island.

This 5,915 acre refuge and an adjacent 25,700 acres of Pamlico Sound waters on its western boundary were established in 1937 by Congressional Act and Presidential Proclamation. The island was named for the dune peas which grow there and was set aside to provide safe wintering habitat for greater snow geese and other migratory waterfowl.

Shortly after the establishment of the refuge, Civilian Conservation Corps (CCC) workers, in an effort to "improve" the low sandy island, constructed barrier dunes to protect the inland portions from storms. Over the years, other dunes were constructed by the U. S. Army Corps of Engineers and the Interior Department, as well. The last "dune building" was completed in the late '50s.

The CCCs also built dikes creating impoundments for waterfowl and fields to grow wildlife foods. Though methods and technology have changed over the years, Pea Island's basic mission is the same today: providing a quality environment for wildlife.

"It's For The Birds"

Ask any birder to identify the "birders paradise" of the East Coast; Pea Island will be one of the first places to come to mind. Since this refuge lies midway on the Atlantic Flyway, thousands of waterfowl winter on or migrate through Pea Island each year. Species include snow and Canada geese, tundra swans, and 25 species of ducks. During spring and especially fall migrations, the diversity of bird life is phenomenal. The refuge bird list boasts an impressive 314 species.

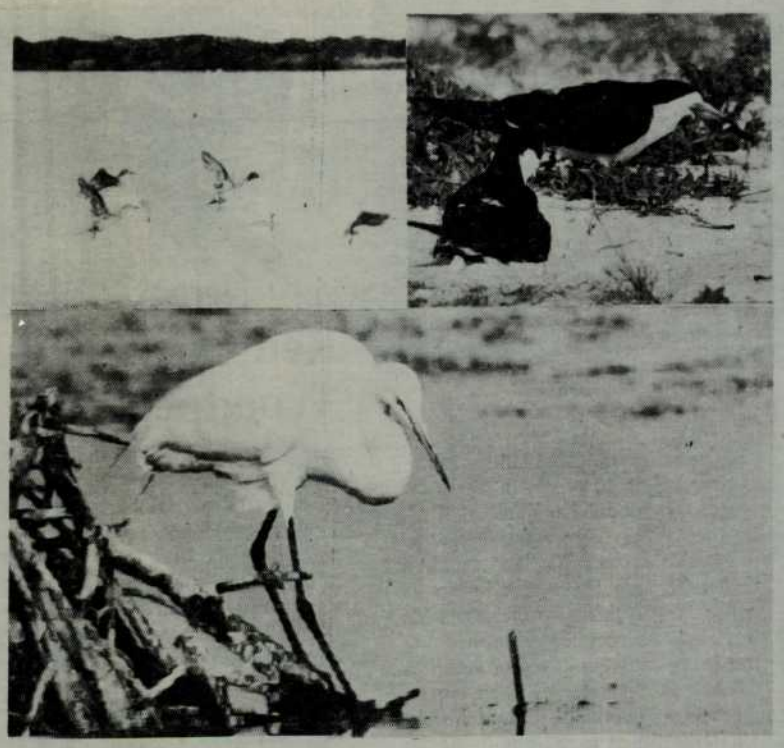
During the spring and summer months, many species of wading and shorebirds nest on the refuge. Least terns, willets, black skimmers, and oystercatchers raise their young primarily in the beach and dune zone. Ibises, egrets, herons, black ducks, gadwall, and some songbirds often find safety and suitable nesting cover in the impoundment or marsh areas on the sound side of the refuge.

Suitable habitat for several threatened species is found on the barrier islands. Peregrine falcons are frequently observed as they move along the flyway on their north and south migrations. Endangered bald eagles occasionally visit the refuge, usually during the warmer months. Piping plovers inhabit the refuge beach and dune areas. And the threatened loggerhead sea turtles lumber ashore on dark summer nights to lay their eggs on the refuge beaches.

Resident river otters create paths or slides between the impoundments and the salt marsh. Muskrats and nutria build their grass mound homes in the marshy areas. Raccoons, opossums, minks, and both cottontail and marsh rabbits find that the refuge meets all their needs. Colorful ring-necked pheasants can occasionally be seen feeding along the dikes or highway.

Many species of aquatic wildlife live in the marshes, tidal flats, and tidal creeks along the edge of the Pamlico Sound. Speckled trout (weakfish), croaker, spot, menhaden, and flounder all spawn and spend their early stages of life in the protected soundside of the barrier islands. Blue crabs, oysters, and clams also find this area ideal.

Besides the loggerhead sea turtle, reptiles such as diamondback terrapins, yellow bellied sliders, common snapping turtles, black racers, and banded water snakes make their homes on the refuge. Though no poisonous snakes have ever been documented on the refuge, cottonmouth moccasins are common further south on Hatteras Island, and the refuge offers prime habitat for them. Few amphibians can tolerate the harsh salt environment.



Safety in Numbers

In the summer, many species of wading and shore birds nest in large groups on the barrier islands, on small spoil islands in the sounds, or on the fringe areas of the mainland. Royal, sandwich, common, and least terns; black skimmers; a variety of herons, egrets, and ibises; and brown pelicans are among the most common of these colony nesters.

Terns and skimmers prefer bare to almost bare sand for their nesting sites. Nests are merely a "scrape" in the sand. The eggs blend in easily with the broken shells and natural beach litter. Because the nests are essentially "invisible", it's entirely possible for an unsuspecting visitor to wander through a colony and even step on the nests, while totally unaware of the damage that results. For this reason, every effort is made to sign nest areas appropriately so they are protected from unintentional, as well as intentional, disturbance.

Many visitors fail to realize that exposure of the nests to even ten or fifteen minutes of summer sun can literally cook the eggs. Adult birds protect their nests from this intense heat by providing shade. A careless beachcomber or free-roaming pooch who keeps the parents from returning to their nest can do immeasurable damage without ever even knowing....

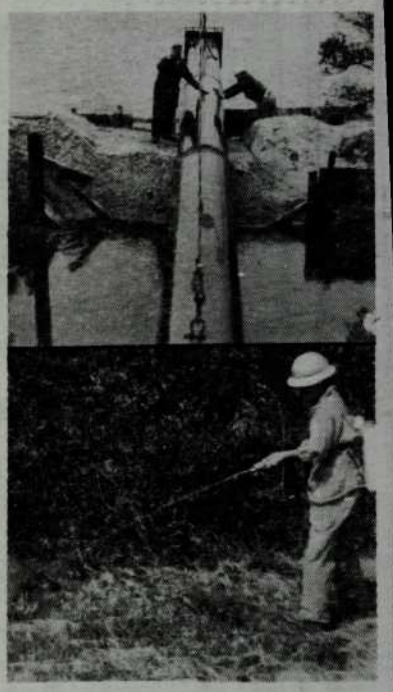
Wading birds tend to nest in clusters in trees or shrubs. Usually, many species nest together, but for some, a single species rookery is the norm.

Brown pelicans, one of the "happy ever after" stories of this century, have made a great come back on the Outer Banks. Being at the top of the same food chain as eagles and osprey, pelicans were almost lost as a species due to the use of the pesticide DDT. Though DDT caused no noticeable physical problems for the adult birds, it caused insurmountable problems with reproduction. Eggs from these birds had paper-thin shells. When the parent bird attempted to set the eggs, they were destroyed by her weight.

Less than a decade ago, a small group of "pilgrim" pelicans built a colony of three nests on a spoil island near Oregon Inlet. The following year, there were 90 nests. From there, the numbers have grown and grown, until they now reach four digits! Pelicans nest on the ground, on small clumps of vegetation, in low shrubs, or in trees.

All these colonial nesting birds need areas of absolute isolation because the nests are extremely vulnerable. Things that seem harmless can be catastrophic — setting up a camera on a tripod to photograph the young birds, allowing your dog to exercise for 20 minutes on the beach while "no one's looking," going behind a "closed area" sign because you don't see any reason for the area to be closed....

Please be aware. And, spread the word. Spaces for these colonial nesters are fewer and fewer each year. The destruction of a single colony can have a tremendous effect on the entire population. Remember, they were here first, and this is their home. We're the guests, so use your best "company" manners.



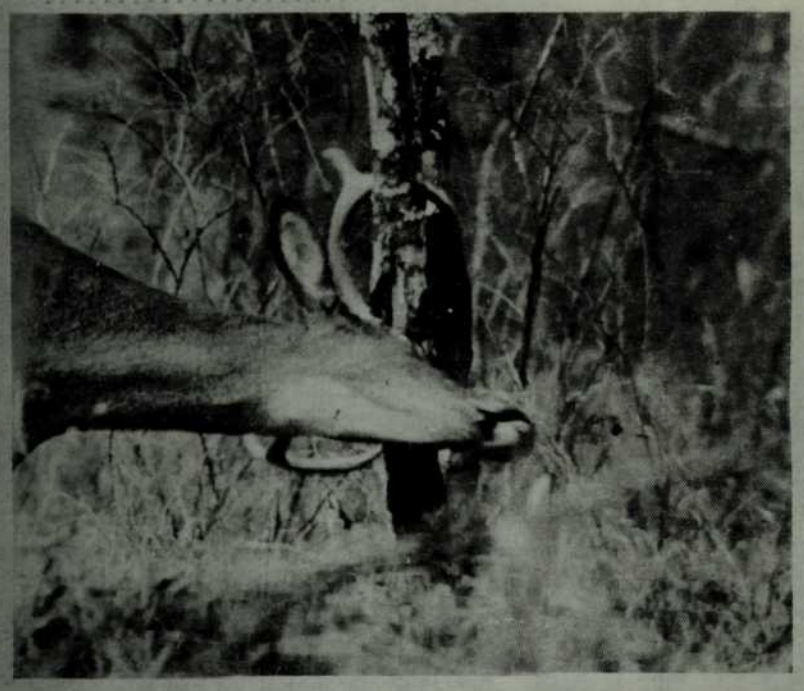
"Management Is The Key"

On Pea Island Refuge, the harmonious blending of man's technical know-how and nature's processes is sought to provide natural cover and foods for wildlife. The barrier dunes, once constructed to "preserve" the fragile ecosystems of the island, are no longer rebuilt to prevent overwash. Instead, potential overwash areas are identified and plans are made to provide drainage. Grain crops are not planted, but small fields are planted with perennial grasses which will replenish themselves with minimal need for additional management.

The fresh/brackish water ponds are manipulated, supplementing, precipitation with timely operation of 30 inch pumps that transfer water from the Pamlico Sound into the ponds. During the spring and early summer, some of the ponds are drawn down to allow emergent plant growth. In the fall, the areas are flooded to provide easy access for waterfowl to feed on both these emergents and the submergents that grow naturally in the more permanently flooded areas. Both vegetative types are important for waterfowl that utilize the refuge for a migration stop-over or wintering area.

Controlled burning is utilized on portions of the refuge and is usually accomplished on a three-year rotation. High marsh areas that have grown into shrub thickets are burned to encourage grasses, which are preferred by most wildlife species. Some areas of the refuge are left untouched to provide diversity of habitat for all refuge wildlife species.

Periodic Controlled Burn



Recreational Opportunities at Alligator River

Alligator River National Wildlife Refuge isn't your typical "let's ride over and look at the refuge" refuge!! Though it's literally teeming with wildlife, most of the refuge is inaccessible and its vastness makes wildlife observation a "hit or miss" activity. When visitors to the Outer Banks call to ask where they should go to "see the refuge," it's a very difficult question to answer.

The entire refuge is traversed by over 200 miles of old logging roads. Most of these roads (all except the ones in the Gum Swamp Unit and around or near the farm fields) are open to the public year round. That statement may be terribly misleading for someone who isn't familiar with the refuge or its roads.

Visitor accessibility can change drastically from one day to the next. A hard rain or a long wet spell can make the roads impossible to drive on, even for specially equipped four-wheel drive vehicles. Even when

weather would otherwise allow access, staff time and money restraints prohibit the refuge from maintaining most of the roads most of the time.

Many of the things people want to see — a stand of Atlantic white cedar, red wolves, alligators, bears, etc. — aren't easily within the realm of possibility. They're certainly possible, but require a real investment of time and effort on the part of the visitor and a lot of good old fashioned luck.

There are several state roads that run through the refuge. These roads, of course, are maintained year round. US 264 and 64 roughly divide the refuge into thirds. Buffalo City Road, just outside the community of East Lake, provides easy access to Milltail Creek, several units of the farm fields, and the remains of "Buffalo City" — a historic old logging town. No "trails" exist; however, there are several old roads that depart from Buffalo City Road and can be walked semi-comfortably for a short distance.

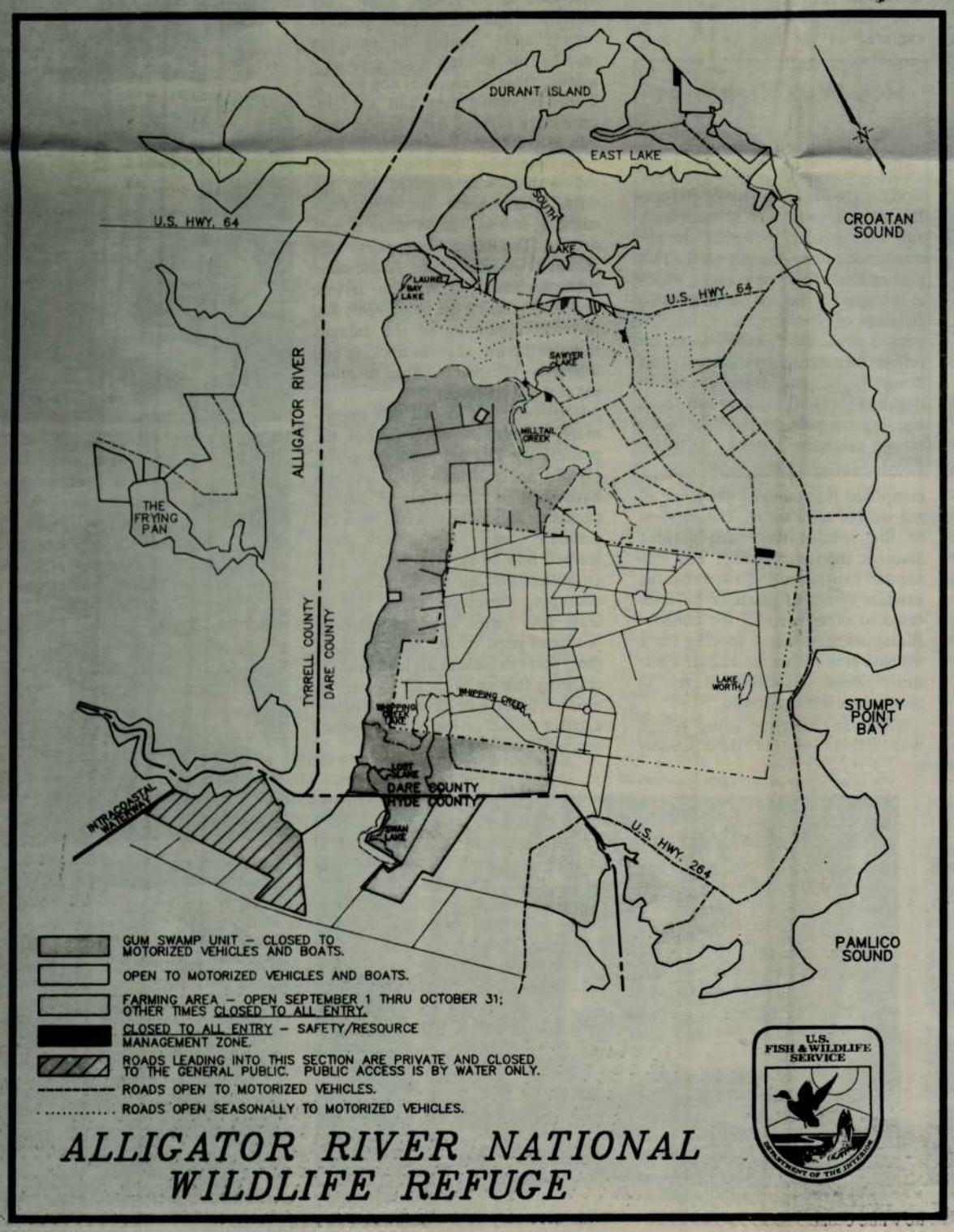
Milltail Creek is open for boating — both motorized and nonmotorized. Prothonotary warblers, other passerines, a variety of raptors, and several other species of birds have been observed in this area. Alligators and a variety of snakes (including the poisonous cottonmouth water moccasin) live in Milltail Creek but shy away from visitors if they hear them coming. (During most of the year, its advisable to watch carefully for snakes wherever you are on the refuge!) Whitetail deer, black bear, and other smaller mammals are possibilities, as well. Unfortunately for visitors (but fortunately for wildlife), because of the vastness of the refuge, most exciting observations are infrequent and are made by only the very persistent refuge visitors.

Alligator River is open to hunting and fishing during the regular State seasons. Hunters should contact the refuge for specific hunting information prior to participating in a hunt on the refuge. Fishermen are reminded that the creeks, canals, and lakes of the) refuge are classified as freshwater; State regulations apply.

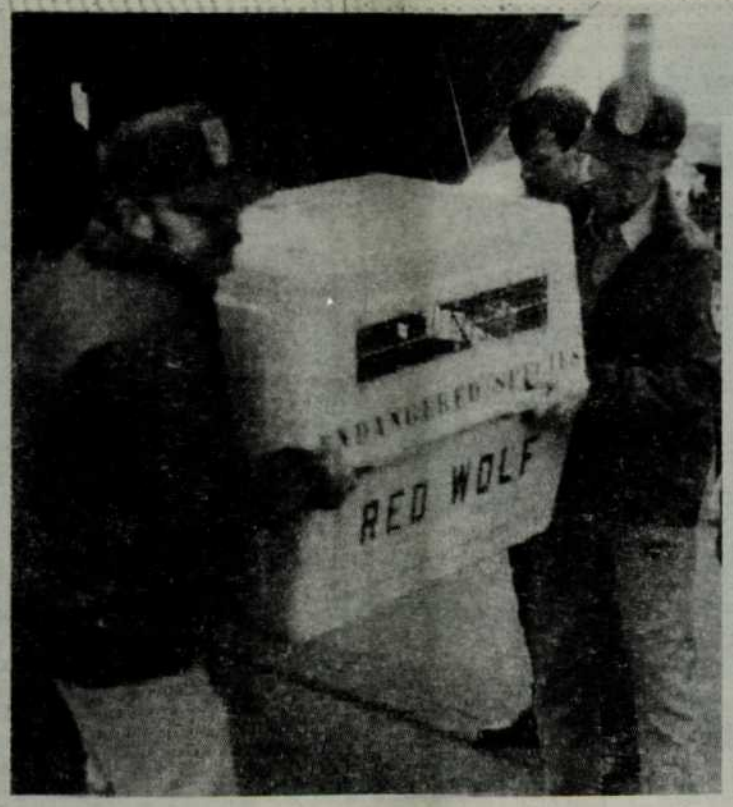
The vast majority of the refuge is open to the public year round. Visitors are advised to utilize information contained on the refuge map in this publication to determine whether or not they may visit a particular area of the refuge. Contact the refuge office for clarification or questions.

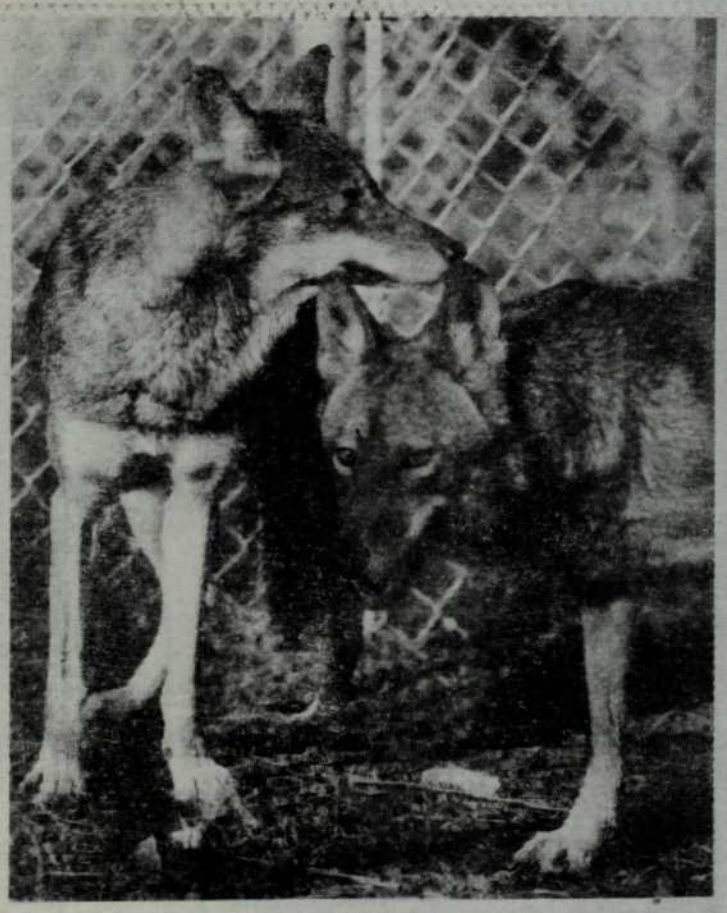
For visitors who merely want to lose themselves in the quiet wildness of the place, paddle through a swamp creek, or just get away from the hurry of life, the opportunities are limited only by physical access. Since this limited access for people provides a reduced stress environment for wildlife, there are no current plans for public access development on the refuge.

The process has begun to acquire land and build an office and Visitor Center for Alligator River National Wildlife Refuge on Roanoke Island. Since the refuge itself is a difficult one to visit, this Center will allow Outer Banks visitors a first hand look at refuge habitats, wildlife, and activities. Besides having "state-of-the-art" exhibits inside, the Center plans to offer an interpreted nature trail and an exhibit with live red wolves. This project is a "first" in several ways. Besides the idea of a live exhibit, the proposal for this facility involves building it with private funds obtained through a national fundraising campaign. If you know of a corporation or individual who might be interested in helping us achieve this ambitious project, please contact the refuge office.



ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE





Red Wolf . . .

Many visitors to the Outer Banks don't realize that only a few miles away from their beach vacationing activities, wild wolves are roaming free — right here in Dare County! But that fact is not nearly as fearsome as some might think. Only a small number of these shy and elusive creatures are involved, and they are the subject of a carefully-controlled scientific project to see whether a nearly extinct species of canid (dog-like mammal) can successfully be reintroduced into the wild. The experiment, the first of its kind in the world, offers hope of averting the otherwise certain disappearance of this native American species, and it is a source of pride to many Dare County residents, as well as to wildlife specialists around the world.

The red wolf (Canis rufus) is one of three wild canids native to the United States, the others being the gray (timber) wolf and the coyote. Smaller and lankier than the gray wolf but larger than the coyote, the red wolf is usually cinnamon to gray in color. Adults may weigh from 42 to 80 pounds.

Like all canids, the red wolf is a predator and usually feeds on a wide range of wild animals and birds (although its diet may include carrion and vegetation as well). Usually these feeding activities pose no threat to man or domestic animals.

The red wolf once roamed throughout the southeastern and south-central portions of the United States, but as the human population of these regions expanded over the last two or three centuries, habitat suitable for the animal disappeared and the numbers of red wolves dwindled. By the 1960s, only a handful of animals were left and their range had shrunk to a few counties along the Texas-Louisiana border. Concern grew that the species would soon be lost altogether because of disease and interbreeding with coyotes. Biologists decided to capture as many genetically-pure red wolves as possible and preserve them in captivity.

Seventeen pure red wolves were captured in the late 1970's; they comprised the founding stock for all red wolves alive today. The survival of the species was then assured through captive breeding, and subsequent experiments showed that the animals could successfully be relocated to other parts of the country. Biologists then began looking for a suitable area within the animal's historic range in which to try to reintroduce it into the wild.

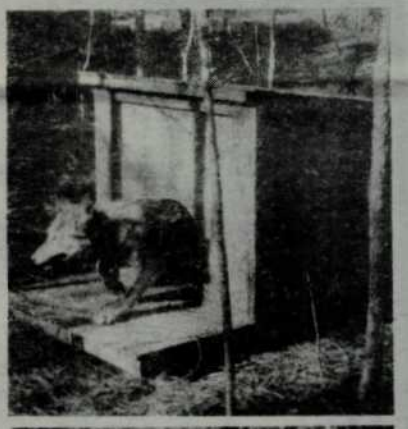
When the Alligator River refuge was created on the Dare County mainland in 1984, the U.S. Fish and Wildlife Service began to study it as a possible red wolf reestablishment site. By 1986 the decision to go ahead was made, and a five-year experiment to rebuild a viable, self-sustaining red wolf population in the wild began. On November 14, 1986 four pairs of red wolves were delivered to the refuge, where they were put into acclimation pens in remote areas. During the next ten months, the animals were gradually weaned from commercial dog food to a diet of native prey and were increasingly isolated from human contact.

On September 14, 1987, a pair of red wolves was released into the wild. These were the first free-roaming red wolves in more than a decade. The other three pairs were released two weeks later. At the same time, the Fish and Wildlife Service began monitoring the movements and physical condition of the animals through the use of radio tracking and telemetry equipment. This monitoring activity continues.

It is too early to call this experiment a complete success, but the preliminary data are mostly positive. (While several individual animals have died as the result of natural causes or accidents, this had been expected.) Clearly the animals have learned how to survive in their new environment. An even more encouraging development is that at least four pairs have successfully produced pups in the wild. In time, then, perhaps we can all take pride in realizing that an event all too rare in modern times will have taken place: a native animal on the edge of extinction will have been saved.

Red Wolf Sightings

Because they are extremely shy animals that shun contact with humans, you are not likely to see a red wolf in the Alligator River Refuge. But major highways cross the refuge, and occasionally motorists do encounter one on or near the road. (This is most likely to occur at night, which is the animals' normal hunting time.) Because of this possibility, we ask you to drive carefully while in the refuge (especially after dark), slow down if you should see a wolf or dog-like animal, and report such sightings as soon as possible to the refuge office in Manteo (tel. (919) 473-1131).



American Alligator

Imagine paddling through the thick swamps of northeastern North Carolina and you will not likely picture an alligator as part of the scenery. But, as the name suggests, the Alligator River National Wildlife Refuge is home to a population of these threatened species. Excellent habitat and ample area for the alligators is found in the refuge but the population remains delicately balanced against the occasional harshness of the local climate. As a cold-blooded animal, they are susceptible to extreme freezing temperatures and occur no farther north than the coastal plain of NC.

To monitor the population, biologists conduct a survey every year where they count the number of alligators along representative routes. They also collect size and location data to ensure that the alligator is continuing to thrive in the area. Alligators are susceptible to human disturbances and should not be interfered with if encountered. Their persistence in the wetlands around Alligator River attests to the quality of the habitat and success of the refuge. We can be proud that the species remains a part of North Carolina's natural world.

Youth in Action Hope for the Future

It was a motley looking crew that slopped down the muddy road toward the wolf pens. Several of the red wolf biological team were there; however, the assistants were the surprising part of the group. A fifteen-year-old rising sophomore from Manteo High School walked along carrying a snatch pole. Two other high school sophomores carried shovels and the medical kit. Two sixteen-year-olds chatted with the others about what to expect. These two were returning for their second experience with the red wolves. Someone asked why we needed shovels. Mike Phillips, the red wolf biologist, explained. "They dig dens that run up under the roots of trees. Sometimes the puppies can be 10-15 feet back from the entrance and, we can't reach them. In that case, we have to dig them out. It's imperative that the pups be inoculated and given a health check at this point. Whatever we must do to accomplish that, we'll do."

Other than the wide-eyed amazement on their faces and their obvious youthfulness, these teens appeared no different than others working in the pen. Bits and pieces of conversation told part of the story: "We need to keep the adult wolves out of the box. Hold this net over the door" "Get a muzzle on that snout, and do it fast!" "Can you read the scale? We need an accurate weight." "Hold him tightly; the rope is slipping!" "Can you pinch the sides of his mouth so I can get the medication between his teeth? "

The project for the day was the processing of four ten-week old captive red wolf puppies on Alligator River National Wildlife Refuge. The main "processors" were the biological team hired by the USFWS to plan and implement the reestablishment program. The assistants for the day were members of the Youth Conservation Corps (YCC).

YCC began as a pilot program almost two decades ago. The two primary program objectives are 1) to provide a meaningful work and learning experience for high school aged youth and 2) to accomplish needed conservation work on public lands. Alligator River's program usually involves from 4-10 enrollees, depending on funding, staffing, the availability of vehicles, and the importance of the scheduled projects.

Many YCC projects are labor intensive, requiring many long, hot, sweaty hours of hard work under not-so-comfortable circumstances. Clearing the understory from a red cockaded woodpecker colony might sound like a "glamorous" wildlife job until you start to work! First, the work can't begin until the chicks have fledged. That means YCC have to save this project for the hottest part of the summer. Couple the heat with the humidity and the biting flies and mosquitoes. Then add the fact that OSHA allows minors to utilize hand tools ONLY. What you have is a long, hard project! Fortunately, most YCC enrollees realize the value to this endangered species and try to keep their complaining to a minimum!

YCC provide manpower and energy to band brown pelicans and a variety of shorebirds. In one recent trip, over 1300 pre-flight pelicans were banded. On another day, almost 2,000 royal and sandwich terns received similar shiny bracelets!

Not all the YCC jobs are as fun to do or write about as the ones already mentioned. Mentioning soil samples around the work area of the refuge causes enrollees to hide behind their lunch boxes. Talk about spreading hay to mulch the dikes and the groans become audible. Point to a sandbag and the expression on their faces turn to horror!

But through it all, they get the job done. They get a few blisters, and they get dirtier than they ever thought possible, but they go home each night with a sense of accomplishment.

And there's more. After spending a day or two picking up roadside trash, you can bet these young people won't absentmindedly toss trash out the car window. After cleaning black paint from a red wolf crossing sign, I'd feel sorry for the poor soul who admitted to one of these kids that they spray painted the signs!! Work like this helps folks see both sides of issues! In the YCC program, there's an awfully lot of growing up accomplished in a short eight to ten week period.

Ask them what they think....Well it depends on when you ask them! Many enrollees would like to return for a second summer. Of course, that's not possible for most. But, they leave the summer with a little better appreciation for the refuge and for wildlife and for hard work. Their lives will never be the same.

Red Cockaded Woodpecker

Did you know that in addition to the red wolf, another wild creature on the brink of extinction is living here in Dare County? No, we're not talking about native Outer Bankers of the human kind, but rather about a bold little (about 8 inches long) member of the woodpecker family called the red-cockaded woodpecker. (RCW).

This mostly black and white bird (the male's red tufts just behind the eye are very hard to see) was once common in the southeast. As have many other species, it has come upon hard times lately, mainly because of habitat loss. The red-cockaded is quite fussy about where it will nest; only a tall living pine afflicted with heartwood disease will do. There are few areas where such trees exist in large enough numbers to support colonies of these birds. But one area where the birds can live in safety is right here in the Alligator River National Wildlife Refuge.

Four colonies of red-cockadeds have been reported as nesting within the boundaries of the refuge, but a couple of these reports predated the creation of the refuge. Within the last two years, only two colonies have been positively identified there. This does not mean that other colonies do not exist, however. It does indicate that we don't have a good handle on how many colonies there are because of the difficulty of surveying the entire 150,000 acres of the refuge.

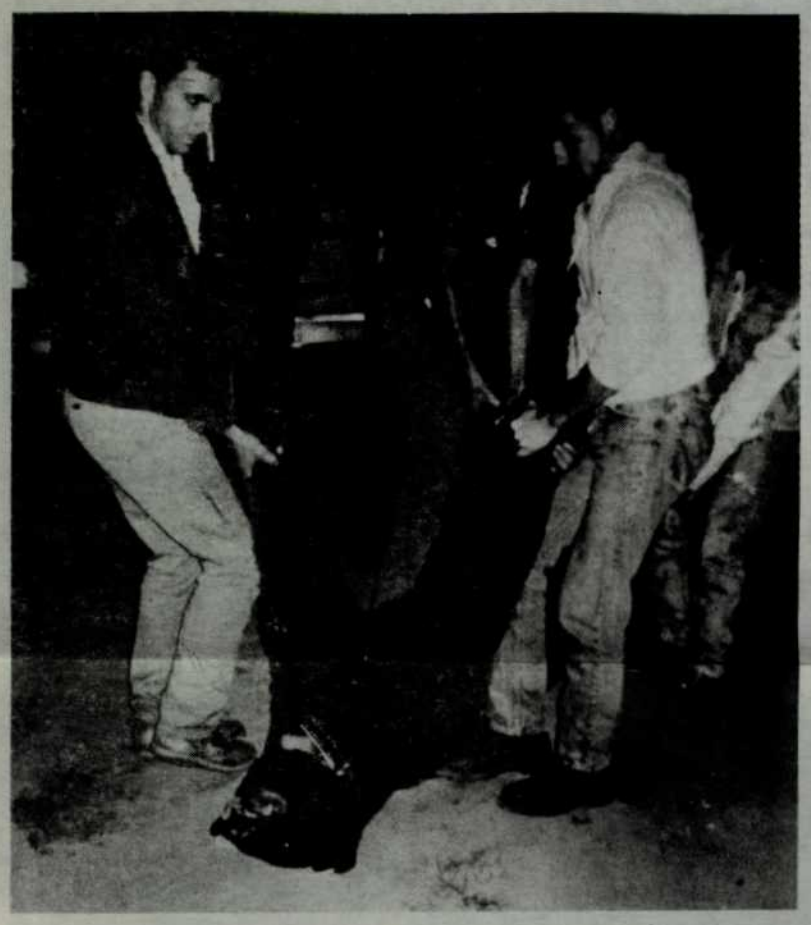
Ground surveys are impractical on this particular refuge because the understory (brush and vegetation from 3 to 10 feet high) is so thick that walking in the woods without cutting a trail is impossible. Even if trails were cut, visibility from such a trail would be sharply limited. Surveys by helicopter may fill the bill, and these, of course, are quite expensive.

Thus far in the refuge's young life, the Fish and Wildlife Service, assisted by youngsters of the Youth Conservation Corps (YCC) have been able to clear away many young-to-mature hardwood trees in the vicinity of one of the colonies, thereby helping perpetuate it. RCWs are known to abandon sites if hardwood understories reach the level of their cavities. This clearing also needs to be done around the other known colonies, as well. Again, this is a costly proposition because it requires a long, hard effort on the part of many individuals (about 1400 work hours for the one site cleared so far). An alternative clearing method — a limited and carefully controlled burning operation around each colony nesting area — is feasible, but this, too, would be costly. Prescribed burning in peat soils certainly is not without risks.

Clearly, further work and investigation needs to be (and will be) done to find the best and most practical way to help the red-cockaded woodpecker survive. And many of us who care about wildlife will be cheered by the knowledge that some of that work is going on right here on our own doorstep in the Alligator River refuge.

Six Point Buck

Sedated Bear is Transported



Black Bears

Alligator River National Wildlife Refuge is one of the few refuges in the history of the U.S. Fish and Wildlife Service to have as one of its primary objectives the protection and management of a resident game species. Fortunately, biologists and managers realized the value of the remnant population of black bear for which the refuge provided critical habitat.

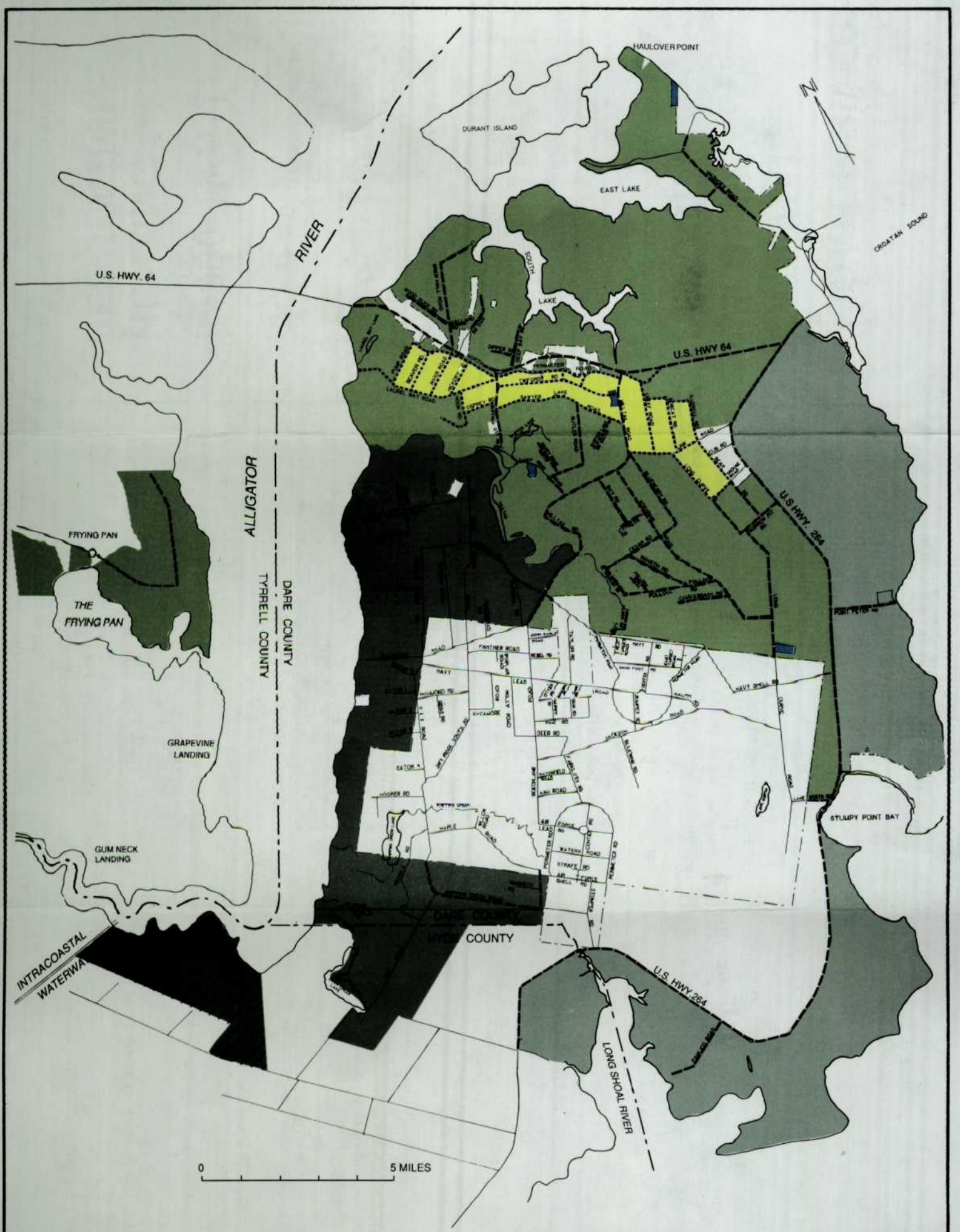
Black Bear in eastern North Carolina have been the topic of great concern in recent years. In 1988, the U.S. Fish and Wildlife Service, in cooperation with the Department of Defence, began a study to learn more about black bears in eastern North Carolina. Specifically, the study is designed to determine more about black bear movements and habitat in Dare County.

Five bears were outfitted with telemetric collars similar to those used in the red wolf project. Movements of those bears are monitored on a regular basis. Though it is too early to form definite conclusions as a result of this work, several statements can be made concerning the bears.

First, the bears tend to frequently be located in areas characterized by thick vegetation and relatively isolated from both paved and unpaved roads. Second, the bears did not hibernate during 1989.

Significant controversy surrounds black bear populations in the southeastern Atlantic Coastal Plain, including Dare County. Habitat modification resulting from peat mining, forestry, and agriculture has effectively fragmented bear habitat throughout the region. Mainland Dare County is an excellent example. Here, tracts of pocosins and associated coastal plains habitats are surrounded by extensive acreage of cleared lands. Dare County black bears effectively live on an island of suitable habitat surrounded by inhospitable environs.

The potential of the unhunted population in Dare County to act as a reservoir for black bear reproduction and dispersal in the Atlantic Coastal Plain is unknown. However, research done at the Great Dismal Swamp National Wildlife Refuge indicates the refuge there does function in that manner. In recent years, development of land in and around Dare County has accelerated. This, along with the initiation of a bear season in both Hyde and Tyrrell Counties, makes Dare County a vital sanctuary for bears. The U. S. Fish and Wildlife Service will maintain the prohibition on bear hunting on the refuge until data are available to design a harvest strategy that ensures the continued existence of the population.



Gum Swamp Unit - Hunting allowed; dogs prohibited.

Hunting allowed; the use of dogs is restricted to bird hunting with retrieving dogs.

Hunting with dogs allowed.

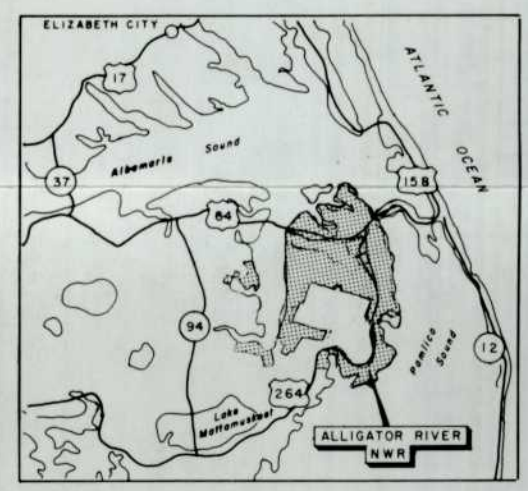
Farming Area-Open September 1-October 31 (dogs allowed); other times CLOSED TO ALL ENTRY. Closed year round to waterfowl hunting.

No Hunting - Safety/Resource Management Zone.

Roads leading into this section are private and closed to the general public. Public access is by water only.

Roads open to motorized vehicles.

Roads open seasonally to motorized vehicles.



VICINITY MAP

SCALE 0 10 20 30 MILES

All REFUGE ROADS ARE CLOSED TO MOTORIZED VEHICLES UNLESS DESIGNATED AS OPEN; WATERWAYS IN THE GUM SWAMP UNIT ARE CLOSED TO MOTORBOATS.

ALLIGATOR RIVER

NATIONAL WILDLIFE REFUGE

ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE

Regulations

- The refuge is open daylight hours only. Hunter access is allowed from one hour before until one hour after legal shooting hours.
- Firearms are prohibited on the refuge unless they are unloaded and dismantled or encased. When participating in a hunting activity firearms are permitted but must be unloaded while being transported by a vehicle or boat under power.
- The use of artificial lights (including car headlights) to locate, observe, or take wildlife is prohibited.
- The use of dogs is restricted to designated areas.
- Vehicular access is restricted to designated areas.
- Camping is prohibited.
- Wood gathering is by permit only.
- No commercial guiding is permitted.
- The construction and use of permanent blinds, platforms, and ladders is prohibited. Blinds and tree stands must be removed from the refuge after each day's hunt.
- The training of dogs is permitted only during the corresponding hunting seasons.
- When unarmed, hunters may walk on closed roads in the farming area to retrieve their stray hunting dogs.
- Hunters utilizing the refuge are subject to inspections of licenses, hunting equipment, bag limits, vehicles and their contents during compliance checks by Refuge or State officers.

- Youth hunters (ages 15 and under) must have successfully passed a state-approved hunter edu cation course and must carry proof of certification. Youth hunters must be directly supervised by an adult (21 or over). For small game hunts, an adult may supervise up to two youth hunters; for big game, an adult may supervise only one youth hunter.

Only the following may be hunted:
mourning doves, geese, swans, ducks, snipe, woodcock, squirrels, rabbits, quail, raccoons, opossums, and deer.

The farming area is closed to waterfowl hunting year round.

In addition to these, all State and County regulations and Title 50 of the Code of Federal Regulations apply.

IF YOU HAVE ANY QUESTION AS TO THE ADVISABILITY OR LEGALITY OF ANY ACTIVITY,CONSULT THE REFUGE MANAGER BEFORE PARTICIPATING IN THAT ACTIVITY.

(See map for information on the use of dogs and vehicles)

Alligator River National Wildlife Refuge
P.O Box 1969
Manteo, North Carolina 27954
(919) 473-1131

TAKE PRIDE IN AMERICA'S WILDLIFE RESOURCES

REPORT WILDLIFE VIOLATIONS.
1-800-662-7137

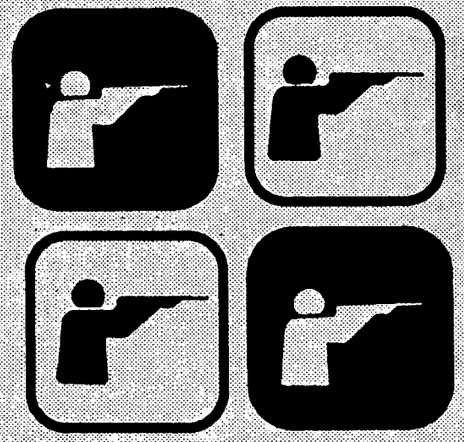
Help protect our refuges and wildlife resources.
Join Refuge Watch.

REFUGE WATCH

Contact the refuge office for more information.
(919) 473-1131

DEPARTMENT OF THE INTERIOR
U.S. Fish and Wildlife Service
4-RF-41630-August 1990

ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE



1990-1991

HUNTING REGULATIONS