

ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE  
CURRITUCK NATIONAL WILDLIFE REFUGE  
PEA ISLAND NATIONAL WILDLIFE REFUGE

Manteo, North Carolina

ANNUAL NARRATIVE REPORT

Calendar Year 1989

Review and Approvals

<u>John Taylor</u>	<u>5/1/90</u>
Submitted By	Date
<u>Bill A. Gabriel</u>	<u>5/9/90</u>
Refuge Supervisor Review	Date
<u>Harold W. Benson</u>	<u>5/9/90</u>
Regional Office Approval	Date

ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE

Manteo, North Carolina

ANNUAL NARRATIVE REPORT

Calendar Year 1989

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

## INTRODUCTION

### 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. Except for approximately 6,000 acres located on the west side of the Alligator River, 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 122,063 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

Page

TABLE OF CONTENTS

i

A. HIGHLIGHTS

1

B. CLIMATIC CONDITIONS

2

C. LAND ACQUISITION

1. Fee Title.....	2
2. Easement....."NTR"	
3. Other....."NTR"	

D. PLANNING

1. Master Planning....."NTR"	
2. Management Plan.....	3
3. Public Participation....."NTR"	
4. Compliance with Environmental and Cultural Resource Mandates.....	3
5. Research and Investigations....."NTR"	
6. Other....."NTR"	

E. ADMINISTRATION

1. Personnel.....	3
2. Youth Programs.....	5
3. Other Manpower Programs....."NTR"	
4. Volunteer Programs.....	7
5. Funding.....	11
6. Safety.....	12
7. Technical Assistance.....	13
8. Other.....	14

F. HABITAT MANAGEMENT

1. General.....	15
2. Wetlands.....	16
3. Forests.....	18
4. Croplands.....	20
5. Grasslands....."NTR"	
6. Other Habitats....."NTR"	
7. Grazing....."NTR"	
8. Haying....."NTR"	

## HABITAT MANAGEMENT (Cont.)

	<u>Page</u>
9. Fire Management.....	21
10. Pest Control.....	"NTR"
11. Water Rights.....	"NTR"
12. Wilderness Areas.....	"NTR"
13. WPA Easement Monitoring.....	"NTR"

### G. WILDLIFE

1. Wildlife Diversity.....	22
2. Endangered and/or Threatened Species.....	22
3. Waterfowl.....	33
4. Marsh and Waterbirds.....	"NTR"
5. Shorebirds, Gulls, Terns and Allied Species.....	"NTR"
6. Raptors.....	"NTR"
7. Other Migratory Birds.....	"NTR"
8. Game Mammals.....	35
9. Marine Mammals.....	"NTR"
10. Other Resident Wildlife.....	"NTR"
11. Fisheries Resources.....	"NTR"
12. Wildlife Propagation and Stocking.....	"NTR"
13. Surplus Animal Disposal.....	"NTR"
14. Scientific Collections.....	"NTR"
15. Animal Control.....	"NTR"
16. Marking and Banding.....	"NTR"
17. Disease Prevention and Control.....	"NTR"

### H. PUBLIC USE

1. General.....	45
2. Outdoor Classrooms - Students.....	47
3. Outdoor Classrooms - Teachers.....	48
4. Interpretive Foot Trails.....	"NTR"
5. Interpretive Tour Routes.....	"NTR"
6. Interpretive Exhibits/Demonstrations.....	48
7. Other Interpretive Programs.....	50
8. Hunting.....	52
9. Fishing.....	54
10. Trapping.....	55
11. Wildlife Observation.....	55
12. Other Wildlife Oriented Recreation.....	"NTR"
13. Camping.....	"NTR"
14. Picnicking.....	"NTR"
15. Off-Road Vehicling.....	"NTR"
16. Other Non-Wildlife Oriented Recreation.....	"NTR"
17. Law Enforcement.....	55
18. Cooperating Associations.....	57
19. Concessions.....	"NTR"

I. EQUIPMENT AND FACILITIES

	<u>Page</u>
1. New Construction.....	58
2. Rehabilitation....."NTR"	
3. Major Maintenance.....	58
4. Equipment Utilization and Replacement.....	59
5. Communications Systems.....	60
6. Computer Systems.....	60
7. Energy Conservation.....	60
8. Other....."NTR"	

J. OTHER ITEMS

1. Cooperative Programs.....	60
2. Other Economic Uses.....	60
3. Items of Interest....."NTR"	
4. Credits.....	61

K. <u>FEEDBACK</u> .....	61
--------------------------	----

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

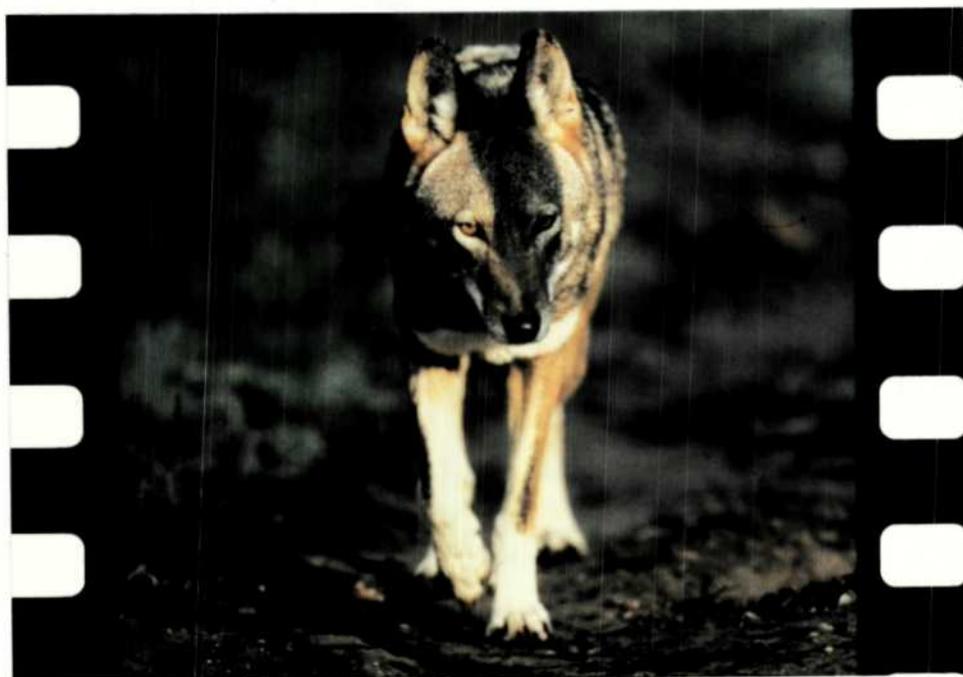
A. HIGHLIGHTS

1. Another banner year for the volunteer Program...(See Section E.4.)



A visit to George and Barbara's backyard for being a National Winner in Take Pride in America. 7/89

2. Third year of Red Wolf Project goes well...(See Section G.2.)



The red wolf....

Unk. 7/89

3. Refuge triples peak waterfowl numbers with development of 1,400 acres of moist soil. (See Section G.3.)
4. Coastal Wildlife Refuge Society formed. (See Section H.18.)

#### B. CLIMATIC CONDITIONS

Wet is the only way to describe 1989. Only the years of 1880 and 1887 were wetter! A total of 90.84 inches of precipitation were recorded during the year, 35.12 inches above the norm. The largest snowfall on record, 13 inches, fell December 23-25th.



A white Christmas is indeed rare.....

12/89

#### C. LAND ACQUISITIONS

##### 1. Fee Title

One fee title acquisition was accomplished during the year. Another 4,254 acres were added to the refuge through a purchase and transfer by The North Carolina Nature Conservancy from Texas Commerce Savings Bank. The tract supports extensive stands of Atlantic white cedar, old-growth swamp black gum, loblolly pine and bald cypress. The land borders about three miles on the southern boundary of the refuge and includes one-half of Swan Creek Lake, a natural peatland lake which contains alligators and a nesting colony of great blue herons

## D. PLANNING

### 2. Management Plan

The annual water management plan was prepared and submitted to the East Coast Biologist. Current development of water control facilities on the farm fields will make this plan a dynamic document for a few more years.

Preliminary work was begun this year on a wildlife inventory plan. As water control and moist soil become more evident on the farm fields this plan will be developed further.

### 4. Compliance with Environmental and Cultural Resource Mandates

Dialogue continued with the Corps of Engineers (COE) and the opinion of our solicitor was sought to resolve the jurisdiction of refuge waters. State/county claims of jurisdiction have delayed the flow of COE permits in the restoration of the historic natural water regimes in the western swamps and have delayed water control development on the farm fields.

One permit has been received from the COE to restore natural hydrology to approximately 6,000 acres of the western swamp.

## E. ADMINISTRATION

### 1. Personnel

#### Permanent Full Time

1. John Taylor, Refuge Manager, GM-13, EOD 01/07/85
2. Alan Schriver, Deputy Project Leader, GS-12, EOD 05/11/85
3. Scott Lanier, Asst. Refuge Manager, GS-07, EOD 09/02/86
4. Bob Noffsinger, Wildlife Biologist, GS-11, EOD 04/13/87
5. Michael Phillips, Wildlife Biologist, GS-11, EOD 06/21/87
6. Bonnie Strawser, Outdoor Rec. Planner, GS-09, EOD 12/31/80
7. Angela Elmore, Refuge Technician, GS-06, EOD 04/19/82
8. James Beasley, Refuge Technician, GS-06, EOD 05/26/85
9. Chris Lucash, Refuge Technician, GS-06, EOD 07/01/88
10. Jonathan Windley, Refuge Technician, GS-05, EOD 02/26/89
11. Beverly Midgett, Office Assistant, GS-06, EOD 10/06/71
12. J. Bruce Creef, Crane Operator, WG-09, EOD 04/21/75
13. Alan Emery, Automotive Worker, WG-08, EOD 05/22/88
14. Jonathan Powers, Maintenance Worker, WG-07, EOD 04/24/88
15. Doak Wilkins, Maintenance Worker, WG-07, EOD 02/28/88

#### Temporary Full Time

16. Michael Morse, Refuge Aid, GS-03, NTE 04/08/90



Front Row: 11, 3, 1, 6  
 Back Row: 13, 2, 12, 14, 15



Front Row: 16, 9, 5, 8  
 Back Row: 10, 7, 4

Jonathan Windley, our Temporary Biological Aid was converted to Career Conditional Appointment on February 26, 1989 as a Range Technician. On December 3, his title was changed to Refuge Technician. Jonathan is with the Red Wolf Program.

Michael Morse EOD April 9, to fill our Temporary Biological Aid position for the Red Wolf Project. His original title changed to Refuge Aid on December 3, 1989.

Maintenance Workers Jonathan Powers and Doak Wilkins were promoted to WG-07 on May 21.

Refuge Manager John Taylor was promoted to GM-13 on July 2.

Biological Technician Michael Phillips was promoted to GS-11 Wildlife Biologist on July 16.

Refuge Technician Chris Lucash was promoted to GS-06 on July 30.

Assistant Refuge Manager Bob Noffsinger was selected to fill the stations new GS-11 Wildlife Biologist position on October 8.

Assistant Refuge Manager Alan Schriver was promoted to GS-12 Deputy Project Leader on December 17.

All Biological Technician positions had a change in their original title of position to Refuge Technician effective December 3, 1989.

## 2. Youth Programs

The 1989 Alligator River YCC program began on June 19, with one female Youth Leader and three male enrollees. The station safety officer 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 11, except for one enrollee who worked an additional week due to starting the program late.

This year, the YCCers were handled somewhat differently than in the past. Several staff members had expressed an interest in utilizing YCCers, one or more at a time, to assist in various projects. Therefore, instead of working the YCCers as an entire group (hence needing a vehicle that would transport the entire group, plus tools, materials, and equipment), much of their work was more independent of the YCC group, as a whole.



1989 YCC: Left to Right: Charlie Cooper, Danny Williams, ??, Amy Etheridge  
BWS 8/89

Alligator River projects included collecting data for the Atlantic White Cedar Study, maintaining gates, signing, plugging V-ditches, 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.



This year, YCCers were "assistants" with many projects.

7/89

#### 4. Volunteer Programs

1989 was another banner year for the Alligator River NWR Volunteer Program. 14,982 hours were donated by 192 individuals. A categorization of volunteer hours for 1989 follows: maintenance 2,905; biological support 7,496; public use 2,181; and administrative 450.

The Red Wolf Project has drawn a number of college students to volunteer blocks of time to the project. 6,546 hours of volunteer time were spent in caretaking positions for the red wolves. Many more hours were spent building wolf houses, box traps, and other structures.



Our volunteers are diverse in every way except in  
dedication to the refuge. BWS 12/89

A continual successful program was the preparation and presentation of wildlife programs. Thirty-five programs were conducted for over 1,200 students in the Dare County Schools. For actual figures see Section H. 7 of this report which includes these same programs conducted for other groups.

The refuge utilized seven student interns. Three worked for the red wolf project, two worked on the Atlantic White Cedar Study, and one worked on the refuge I&R program for 12-16 weeks. One worked two days per week for 12 weeks on the Red-Cockaded Woodpecker Study.

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.

1989 was a big "clean-up" year. A group of versatile volunteers came to be known as the "Friday Work Group" came in to work each Friday for most of the fall and spring doing "clean-up" oriented work. Other projects included Atlantic White Cedar work and sign and gate maintenance.

On July 13, work was begun on a large clean-up project on the refuge for credit as an Eagle Scout Project. Donald Phillips a senior at Manteo High School planned, organized, and implemented the clean-up of two of the old road spurs off Rt. 64 near East Lake. Tons of discarded appliances, building materials, old tires, etc. had been thrown on these old roads. Donald and several other scouts accomplished Phase I during July - the temporary blocking of the entrances to the areas to prevent further dumping. They erected 4 cable gates and posted appropriate refuge signs. Phases II-IV involved area agencies and businesses donating heavy equipment and operators to handle the "big pieces", organizing a group of volunteers to "mop up" by hand, and permanently blocking off the old roads. He also incorporated a campaign to have the landfill open more hours on the weekend and to make the public more aware of the problems associated with dumping.



The first step for the Eagle Scout Project was to block off the areas!  
BWS 7/89

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 1989 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.

Staff and volunteers participated in the Dare County Job Fair, The Manteo High School Volunteer Fair, and the Dare County Volunteer Fair.

The "Take Pride in America" recognition program has given groups more incentive in volunteering their efforts to benefit public lands. ORP Strawser has acted as the County Coordinator for Take Pride in America for several years.

In January 1989, the 1988 Alligator River Volunteer Program was recognized as a State winner in the Take Pride In America Awards Program. Governor Jim Martin presented the award.

On July 14 and 15, RM Taylor, ORP Strawser, Ex-volunteer Mike Morse, and volunteer "Kris" Kritsoffersen traveled to Washington, DC to represent the Alligator River National Wildlife Refuge Volunteers to receive an award as winner in the National Take Pride in America Program. The group was addressed by President George Bush, who was accompanied by Barbara Bush and Dan Quayle. Interior Dept. Secretary Manual Lujan presented the award, a beautiful engraved leaded crystal plaque. The group also received an award in an Interior Dept. ceremony, and attended a private social with John Turner, Director-elect for the USFWS.

During December, we received notification that our volunteers had won four State Honors in the 1989 Take Pride in America Awards program. Donald Phillips received an Honorable Mention for his clean-up efforts on the refuge as his Eagle Scout Project. "Kris" Kristoffersen received an Honorable Mention for his individual efforts as a refuge volunteer. Ken Dyar was chosen as an individual winner of the 1989 State Take Pride in America Award. And, the Alligator River National Wildlife Refuge Volunteer Program again won this award on the State level.

The volunteer program was also named the 1989 Wildlife Organization of the Year. This award was part of the Governor's Conservation Achievement Awards sponsored by the NC and National Wildlife Federations.

On September 27, the annual Awards Ceremony of the Dare Voluntary ACTION Center was held and we received an award as an outstanding volunteer organization.

Cumulative hours through December were as follows:

100+ hour certificate: 12 volunteers and the Dare County Alternative High School; 100+ hour certificate and 250+ hour pin: 3 volunteers; 100+ hour certificate, 250+ hour pin, and 500+ hr pin: 4 volunteers; 1000+ hour pin: 4 volunteers.

In addition to these awards, Ken Dyar, who had reached the 1,500 "career" milestone and Michael Morse who reached a record high of 4,200 hours each received a signed (by RD) copy of Saving America's Wetlands and a framed certificate and volunteer patch.



4,200 volunteer hours and 1,500 volunteer hours respectively.

BWS 12/89

##### 5. Funding

In Fy 89, Alligator River received funding of \$690,200 to cover management of all three refuges. Alligator River received 9.9K for storm damage (construction funds) and 17.3K from the U.S. Air Force to conduct joint wildlife surveys and a black bear study. Pea Island received 12.6K for storm damage.

FOUR YEAR FUNDING COMPARISON

	<u>1989</u>	<u>1988</u>	<u>1987</u>	<u>1986</u>
1230			15.0	
1260			411.2	369.2
1261	349.4	268.4		
1262	135.8	215.1		
1113 (ENDG SP)	160.0	130.0	84.6	
Construction	22.5	98.1	30.6	
YCC	5.2	4.7	4.8	16.6
USAF	17.3			
Total	690.2	716.3	567.2	385.8

6. Safety

The year 1989 brought the first lost time accident in the history of Alligator River, (the first since 1/21/59, if you go back into Pea Island's records). This incident ended our accumulation of 29 years without a lost-time accident. On February 2, RT Beasley injured his back while attempting to manipulate a pipe gate at Alligator River. His work stopped on February 8. He returned to full duty on April 24. On May 9, RT Beasley's refuge truck was rear-ended while returning from a training session. This accident created an exacerbation of symptoms and therefore, represents the second lost-time accident for the year. Beasley returned to work in full duty August 18.

On June 16, MW Wilkins stepped off a utility trailer onto a chain binder and twisted his ankle. After x-rays, the "twist" was found to be a "crack". This resulted in the third time lost time accident of the year, as Wilkins was out for 5 days.

Two other reportable accidents included a pinched finger, and poison ivy. Two vehicle accidents included a cracked windshield and a dented quarter panel. The third was a bit more serious. On May 26, while enroute to Alligator River NWR, RLEO Panz of Mackay Island NWR was towing a trailer loaded with an ATV and truck parts. While stopped at an intersection in Virginia Beach, VA a vehicle struck him from the rear. The trailer and ATV were totalled, the truck parts slightly damaged and the government vehicle suffered a dented tailgate, bumper and broken back window.

Unfortunately, the rear window had been replaced only an hour prior to the accident. GEICO Insurance is handling the claim.

Several of the safety meeting topics for the year covered: the safe use of firearms, safety attitudes on and off duty, Lyme Disease, use of fire extinguisher, herbicide spraying, safety belts, boating safety and fire safety. Staff members participated in numerous hands-on safety meetings. Our cholesterol levels were screened and we learned of ways to reduce cholesterol and control high blood pressure. We had audiogram testing for the entire staff. Numerous volunteers were trained and certified on the ATV. Staff members passed the Step Test for fire fighting. We each participated in vehicle inspections for maintenance and safety needs. We also reviewed the Hurricane Contingency Plan and got to practice it a week later! Thankfully it was a false alarm. "Calamity Ange" presented the annual YCC Safety Orientation and Hand Tool Training. Front-end loader and backhoe training was completed by Creef, Powers, and Wilkins. Creef also completed dragline training.

Once again, ORP Strawser was a winner in the safety slogan contest with her slogan "Safe: Think It, Act It, Be It".

The Station Safety Plan was updated in April. The Annual Safety Inspection Form was completed during August. Unsafe conditions are slowly being corrected. In December, AM Matthews visited the refuge for the Annual Station Inspection. During his visit, he encouraged us to form a Safety Committee to better meet the needs of a growing refuge. This committee will be formed and put to work in the new year.

During the year, staff members tried to track down how and why the removal of asbestos was added to the master projects list for Pea Island. At this point, we think the old ceiling, above the new tile ceiling, is made of asbestos. Kate Benkert (Raleigh, ES) advised us of contractors to call to investigate the situation. We requested money from Regional Office to pay a contractor for an on-site inspection to determine if it needs to be removed or if it is indeed asbestos. We are waiting on RO to make a decision.

#### 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. A joint red-cockaded woodpecker survey and a black bear study were conducted on the refuge and bombing range. Under contract from the Air Force, the refuge conducted waterfowl surveys of the refuge and surrounding waters.

In October, WB Noffsinger met with the N.C. Forest Service and visited several cedar stands on Alligator River. The State is locating stands from seed procurement and progeny testing to develop a source of Atlantic white cedar seedlings at their nursery in Clayton, N.C.

8. Other

In March, DPL Schriver and ARM Lanier and ORP Strawser served as judges for the Science Fair at the Manteo High School.

Also in March, Strawser represented the Service at the annual Dare County Job Fair, and volunteers Kristoffersen and Dyar represented the refuge at the annual Career Day at the College of the Albemarle.

ON April 18, WB Noffsinger attended a meeting with the N.C. Natural Heritage Program, Endangered Species (Raleigh), and the U.S. Air Force to discuss a proposed clearing project and its potential impacts on red-cockaded woodpecker.

In April, RM Taylor, Mattamuskeet Manager Ditto, and East Coat Biologist Florschutz met with the Washington County Board of Commissioners to discuss the proposed Roanoke River Refuge. Unfortunately, the Board did not reverse its earlier opposition to the project.

In May, RM Taylor again participated as an instructor at the Basic Refuge Academy teaching Career Survival Skills.

On June 19, N.C. Governor Martin and Senators Chafee, Helmes, and Sanford visited the Oregon Inlet and the tip of Pea Island Refuge. Regional Director Pulliam, Manger Taylor, and ARM Lanier participated in the tour and briefing.

In order to maintain a better relationship with the Dare County Board of Commissioners, refuge staff conducted an orientation and tour of Alligator River Refuge for the group in September.

In September, DPL Schriver was assigned temporary responsibility for managing 104,000 acres of land purchased from First Colony Farms by the Conservation Fund.

F. HABITAT MANAGEMENT1. 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.



Portions of Whipping Creek lie in the Gum Swamp Unit of the refuge (no motorized boats allowed). Few visitors venture there.

BWS 6/89

## 2. Wetlands

On January 27, 1989, after a full year in the 404 permit application process we received a Corps of Engineers permit needed to begin wetland restoration. About 4,000 acres of hardwood swamps and pocosins on the west side of the refuge near Alligator River and Grassy Patch Road were "restored" in the spring of 1989. The restoration of the past hydrology of the area was accomplished by installing a flash board riser in the major canal draining the area and "plugging" fourteen smaller canals. These were plugged by placing wooden posts across the ditches, attaching welded wire to the post and covering this with filter cloth. These trap leaves and other debris and cut off the water flow out of the ditches. Summer monitoring of the ground water in the "restored" area and a control area showed no apparent difference. A two to four inch higher water level was found in the restored area canal during the summer. During the fall and winter a twelve to eighteen inch greater watered depth was found in the restored area (Measured at the water control structure) than in the unrestored adjacent area. The area will be monitored this spring to see how much longer it holds surface water than adjacent unrestored areas. At present, the drained wetlands do not have surface water long enough to provide wood duck brood habitat.

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.



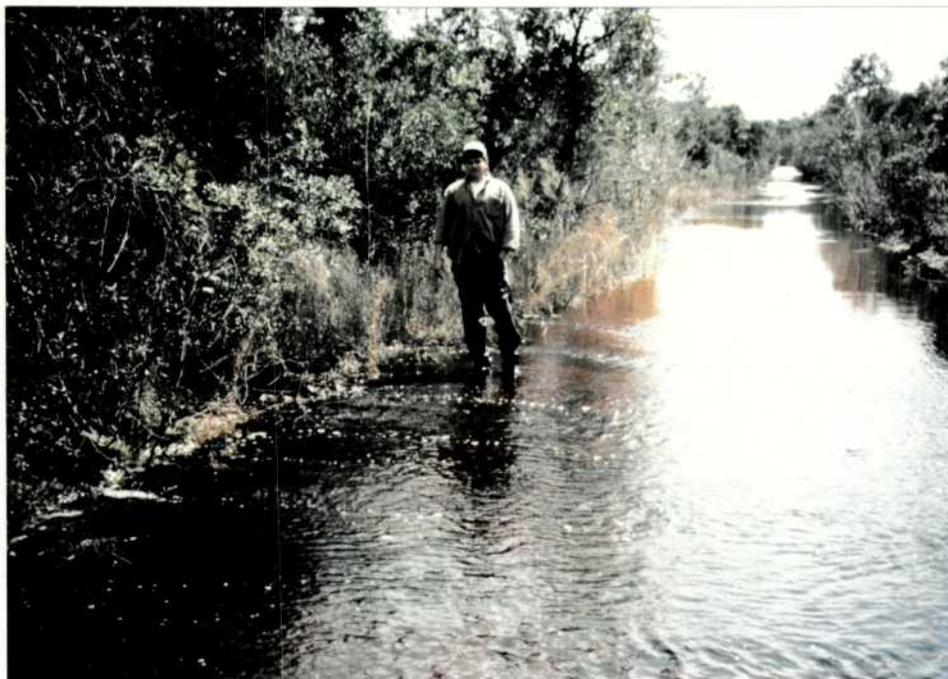
Milltail Creek is more accessible and, therefore, receives more visitation. BWS 8/89

#### Alligator River NWR Habitat Types

Vegetated Wetlands Habitat Type	%	Approximate Acreage			Total
		Dare	Tyrrell	Hyde	
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 similax 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.



Koehring Road during high water.

REN 4/89

### 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.

With the help from refuge volunteers, an intern from ECU did seedling counts on the refuge's cutover cedar stands (about 5,000 acres) to determine how successfully the stands are regenerating. Information on seeding density was gathered from eleven clear-cut tracts. Data have not been analyzed. Hopefully, we will be able to get more volunteer help in 1990, to do at least 20 more tracts. Data analysis is scheduled for 1990.

#### 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 turn the pumps on. Actually the opportunities and options are more complex than that. Along with the purchase came an agreement to honor the leases of six farmers for two years (1989 was the last year of the leases). We have been very successful in restructuring the leases to begin waterfowl management on the areas. We have concentrated our management efforts on the Twiford Unit (1,355 acres) where we have the best water control.



The Cooperative Farming Program is invaluable to wildlife management on Alligator River. BWS 9/89

In 1989, we installed 16 additional water control structures on the Twiford Unit. These along with small cross dikes allowed us to have much better ability to maintain desired water levels on the unit. Last year we had to hold one

water level at the riser on Buffalo City Road for the entire South Twiford Unit, which is three miles long. This year we could hold the desired water level on each of 5 smaller sub units. Waterfowl use was heavier and much more widely distributed. Likewise we had three separate units for the North East Twiford Unit as opposed to a single unit and one water level last year. The Twiford Unit had 984 acres of moist soil and 98 acres of jap millet.

On the Laurel Bay Unit we installed one water control structure which allowed us to flood about 35 acres. Twenty-five acres were planted in millet and the remaining 10 was low area with wetland shrubs and marsh vegetation.



King Rail with beetle in moist soil unit. DMR 7/89

On the Creef Unit we had 54 acres of corn and 131 acres of millet planted, with plans to flood the area in the fall. Unfortunately, equipment breakdowns kept us from installing the structures and rice plow dikes we needed to flood the area. We plan to get water on the area in early 1990.

#### 9. Fire Management

A slight modification to the Refuge Fire Management Plan for prescribed burning will be 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 for the next

three to four years. If any 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.

The N.C. Division of Forest Resources reported one wildfire on the refuge in 1989. About 400 acres of marsh and pocosin was burned along the Long Shoal River on August 7.

## 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. 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 (1.6 alligators observed per mile) and highest population estimated of all routes (27-40 alligators). A good range of sizes occurred along the route. The immature to adult ratio was 62:38. Surveys were not conducted in 1989. They are scheduled for 1990.

Bald Eagle (Endangered) - Refuge staff sighted a mature bald eagle on December 12 near the Twiford Unit. A mature and immature were seen near Milltail and Long Curve Roads on December 17.

Peregrine Falcon (Endangered) - Although no sightings were reported for 1989, 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 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 1988 or 1989. 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 could not identify the original location of the colony on the north side of Chip Road. It appears that the hardwood understory has grown above the cavity that was spotted from the road in 1982. 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.

The Air Force funded us for ground surveys and provided three brief helicopter flights for aerial surveys of the bombing range. Although brief, the helicopter flights gave us enough time to be convinced they can be used effectively on the habitats we have at Alligator River. We easily spotted known cavity trees and found one additional colony site. The site was well away from any roads and would not have been found from the ground. We also located additional cavity trees on the Air Force property by ground surveys. The Air Force appears congenial to developing a joint survey and management plan for the refuge and the range. This will be pursued in 1990.

Red Wolf (Endangered) - 1989 marked the second full year of the red wolf reintroduction program being conducted in the refuge. Since 1987, 21 wolves have been released on 11 occasions. During 1989, 14 wolves were released on five occasions. Additionally, two wolves born in the wild during 1988 were free-ranging throughout 1989.



The red wolf reestablishment program entered its second year during 1989. MKP 10/89

Prior to release, each animal underwent a lengthy acclimation period. Acclimation was designed to increase the wolves' chances of surviving in the wild, and to decrease any tendency toward wide-ranging post-release movements. Thus, for over 6 months human contact was minimized in an attempt to reduce the wolves' tolerance of people, the feeding regime was varied to expose the wolves to "feast or famine", the animals were weaned from dog food and fed an all-meat diet, and they were given the opportunity to hone predatory skills by being given live prey. To learn more about the effect of acclimation duration on post-release movements, two wolves were released after just 7 days in captivity at the refuge. As though they had been acclimated for an extended period, within two weeks these animals restricted their movements to the area near their release site.

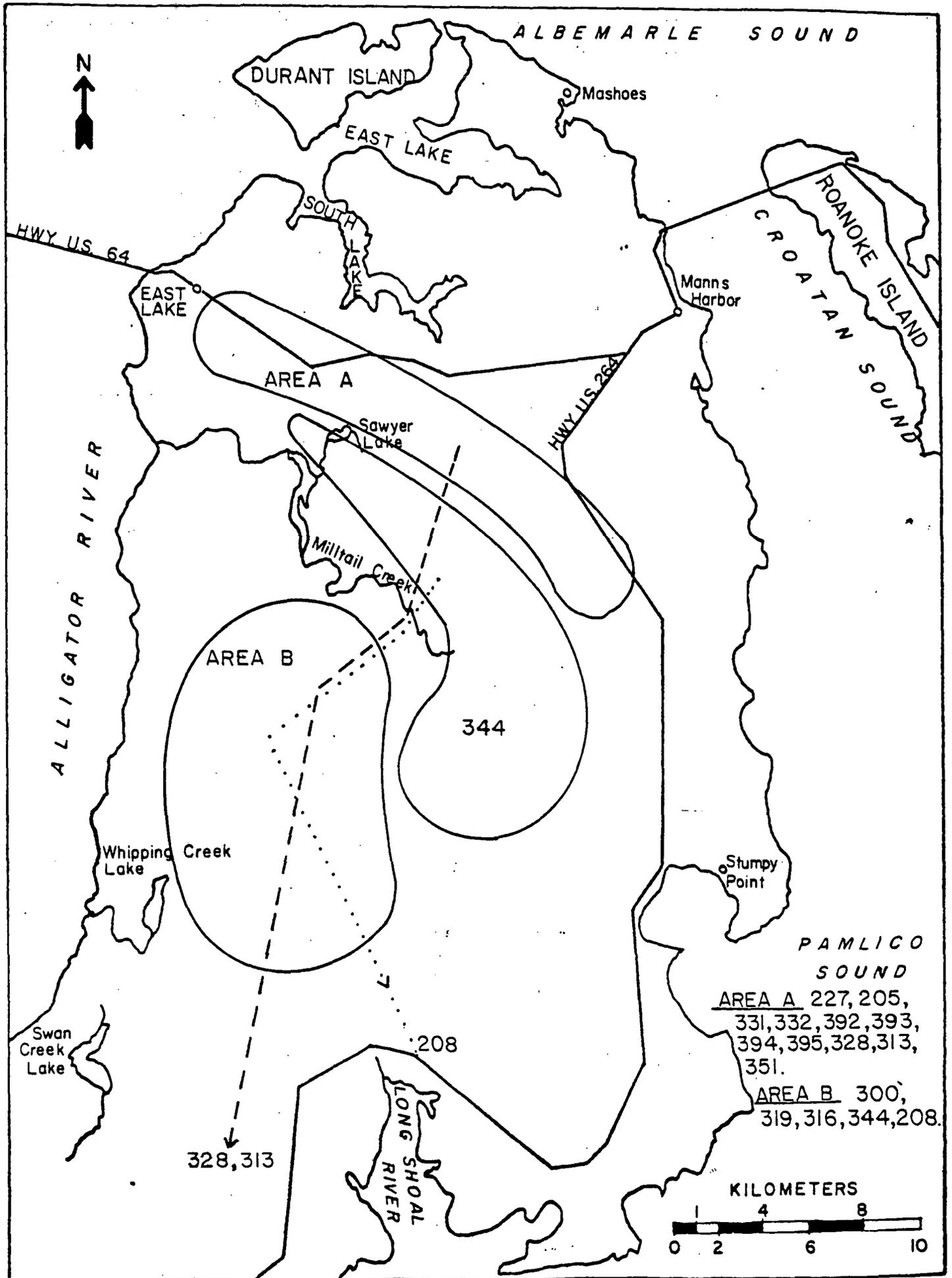


Mike Morse prepares a meal of raccoons for red  
wolves. MKP 11/89

The first release in 1989 occurred on January 25 and involved two 9 month old male siblings (#331 and #332) from Bulls Island. These were the first wolves from an island propagation project released at a mainland site.

When 331 and 332 were released only females 344 and 351 were free-ranging. Soon after release 331 and 332 settled into a home range that included the agricultural area of the refuge (Fig. 1). Although they shared this area with 351, we documented very few interactions between the "Bulls Island Brothers" and 351 during the first 9 months of 1989.

FIGURE 1



PAMLICO  
SOUND

AREA A 227, 205,  
331, 332, 392, 393,  
394, 395, 328, 313,  
351.

AREA B 300,  
319, 316, 344, 208.



Volunteer Art Beyer tracks red wolves... BWS 10/89

During winter and spring, the major field activity concerned capture of 344. This wolf, born in the wild in 1988, had to be captured in order to attach a radio-collar. On April 16, she was captured within a half mile of where she was born a year earlier. She weighed 54 lbs. and was in excellent condition. Both front feet evinced previous trap-related injuries. Her experience with traps partly explained why she was difficult to capture. After a radio-collar was attached, 344 was released. During the next 3 months 344 restricted her movements to the western portion of the refuge (Fig. 1).



#344 (wild born pup) was captured after much effort. CFL 4/89

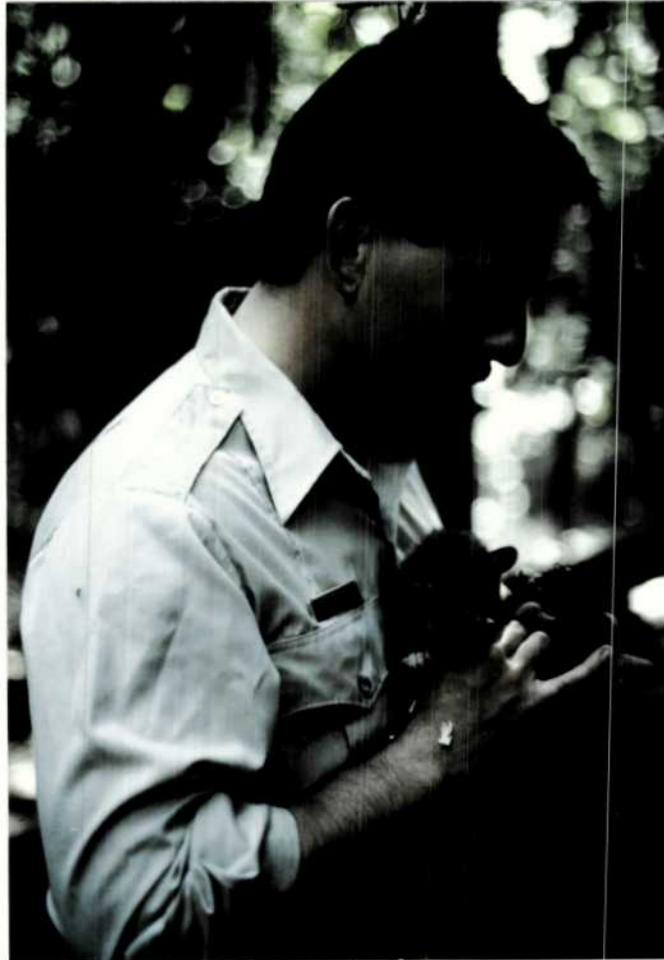
The second release of 1989 involving captive animals (M#208 and F#300) took place on July 3. Female 300 started the year as a free-ranging wolf. On January 8, a trapper captured 300 in a steel leghold trap (#2 Northwoods, 5 3/4" jaw spread). She was in excellent condition after 8 3/4 months in the wild, and did not sustain any serious capture-related injuries. Because she was mateless she was returned to captivity and paired with 208. Although she whelped in late April, no pups survived past two days of age.

Male 208 and female 300 spent very little time together after being released, even though both mostly restricted movements to the western portion of the refuge (Fig. 1). 208 was frequently observed during July; he was very tolerant of people and vehicles. His tolerance was partly anticipated because he had spent 7 years at various captive facilities.

Throughout July, 208 appeared to be having a hard time adjusting to life in the wild. Supplemental feed was provided to assist him with transition. During the last half of July he wandered widely (Fig. 1). On July 31, 208 was hit and killed by a vehicle while traveling along U.S. 264. In retrospect, 208 was a poor candidate for reintroduction.

In response to the presence of 208 and 300, 344 started to shift her home range to the east during July (Fig. 1).

The third release took place on August 1 and involved male #227, female #205, and their four pups (M#392, F#393, F#394, and F#395). Both 227 and 205 were two of the original eight wolves that started the reintroduction program in November 1986; the other six animals died during 1987 and 1988. Female 205 was free-ranging at the start of 1989. However, because she was mateless, she was captured on January 5 and returned to captivity with 227. 205 had adjusted well to life in the wild during her 15 1/4 months of freedom. She produced pups in the wild during 1988, one of which (F#351) is still alive.



Red wolf pups are intensively managed to ensure their survival to a releasable age. CFL 5/89



Red wolf pups are usually not released until twelve weeks of age. This animal has about three weeks to go. CFL 7/89

We had hoped to release three or four families during 1989, but only 227 and 205 reared pups to releasable age. Pups were treated for parasites at 2, 4, 6, and 8 weeks of age; vaccinated for canine parvo-virus, distemper, leptospirosis, parainfluenza, hepatitis, and corona virus at 6, 10, and 12 weeks of age; implanted with abdominal transmitters and vaccinated for rabies at 12 weeks of age; and released at 13 weeks of age with 227 and 205 on August 1.

The family was released in the eastern portion of the farm because this is where 205 established herself during 1987 and raised a pup during 1988. By mid-August we had documented interactions between 331, 332, and the family. The two young males were tolerant of 205 and the pups but were intolerant of 227.

The fourth release of 1989 took place on August 22 and involved 2 year old M#328 and F#313. Although together during the breeding season, they failed to produce pups. These animals were released in the western portion of the farm but had minimal contact with other wolves through the end of the month (Fig. 1).

As August drew to a close, 331 and 332's intolerance of 227 grew. Sometime between September 2 and 3, one or both of these animals killed 227. By this time, 205 and the pup's home range included the central portion of the farm; by December the range extended well to the west (Fig. 1).

On September 3 the last release of the year took place and involved 2 year old M#319 and F#316. Although together during the breeding season, they failed to produce pups. Within about 2 weeks after being released, they established themselves in the western portion of the refuge (Fig. 1).

During late September and early October 328 and 313 left the farm, probably in response to territorial behavior exhibited by 331, 332, and/or 205. Although both animals abandoned the farm they did so singly at different times; 313 left around September 24 and 328 left around October 5. Both animals wandered to the south through the portion of the refuge inhabited by 300, 319, and 316 (Fig. 1). By this time, 344's range shift to the central portion of the refuge was complete (Fig. 1).

Perhaps in an attempt to avoid three resident wolves, 328 and 313 both spent little time in the western portion of the refuge. On October 12, 328 was south of the refuge on private land. He was captured later that day and returned to captivity. On October 17, 313 was south of the refuge on private land near 328's capture site. She was captured on October 18 and returned to captivity with 328. Both animals had to be retrieved from private land to maintain compliance with federal regulations. They are scheduled to be re-released during July 1990.

During November, 316 and 319 began traveling independently. She continued to use the area near where she was released, but from mid-November through December she was usually located alone. By late November 319 had started consorting with 300.

During fall, 351 and 332 also started consorting. By early October 351 and 332 were spending considerable time together in the western portion of the farm. Since 227's death, 331, 205, and the pups spent considerable time together in the eastern portion of the farm. Indeed, since early September 331 spent more time with the pups than 205. Thus, in early November it appeared that three pairs (M319/F300, M332/F351, and M331/F205) would be intact during the 1990 breeding season.

This changed on November 21 as 332 was hit and killed by a vehicle. Necropsy revealed that he was in excellent condition at the time of his death. Within days after his death, 351 began wandering widely. During late November she developed a habit of frequenting the small community of East Lake. On November 24 she was observed near a chicken coop. Concerned that she would eventually cause problems we hazed her from East Lake. Hazing prompted her to leave, but the effect was short-lived as she returned to the area the next day.

In early December we decided to capture 351. We hoped capture-related trauma would be so significant that she would avoid East Lake in the future. Additionally, in early December we initiated efforts to capture the four pups that had been released during August. The pups had to be captured in order to attach radio-collars.

On December 6, male pup 392 and female pup 393 were captured. Both were in excellent condition, and released within two hours of being captured. Neither showed sign of reproductive activity. 351 was captured near the chicken coop on December 7. She was in excellent condition and in proestrus at the time of capture. She was released on December 8 after she tested free of heartworm. She was not located near East Lake through the end of the year.

On December 14 we captured the third pup, female 394. Like her siblings she was in excellent condition. Examination of her vulva indicated that she was probably in proestrus. She was radio-collared and released within two hours after capture. We were unable to attempt to capture the fourth pup before the end of the month.

The year ended on a frustrating note as 316's transmitter malfunctioned around December 20. The failure may have been caused by a storm that brought heavy snow and cold temperatures to the area for 4 days.

Throughout the year, the refuge served as the Service's second largest captive facility for red wolves in the world. The refuge was a valuable staging facility for red wolves being prepared for release, and for wolves moving between captive facilities and free-ranging populations in the southeast.



Red wolf programs are always popular...

BWS

### 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.

Our second year's management of the farm fields has attracted fair numbers of waterfowl. Peak numbers so far are 135 blacks, 245 mallards, 2,675 pintails, 2,700 green-winged teal, 3,400 ring-necked ducks, and 900 wood ducks. We are eagerly anticipating more waterfowl use during the rest of the winter and in coming years as we bring more and

more of the farmland into waterfowl management. The results of this years surveys are given below. The survey route (Sawyer Lake Road) roads 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 <u>4</u>	Jan <u>12</u>	Jan <u>19</u>	Jan <u>26</u>	Feb <u>1</u>	Feb <u>16</u>	Feb <u>24</u>
Mallard	190	250	75	74	65	36	6
Black Duck	74	125	20	30	30	30	21
Pintail		150	40	55	120	40	83
Widgeon						6	
Green-winged Teal	100	200		200	850	1170	
Wood Duck	856	400	150	76	570	261	172
Ring-necked Duck	642	1800	500	80	1300	2080	250
Tundra Swans	0	0	0	0	0	0	0
Other Waterfowl	_____	_____	_____	<u>60</u>	<u>243</u>	<u>10</u>	<u>2</u>
Total	1862	2925	785	575	3179	2649	558

Sawyer Lake Road Waterfowl Survey - South Twiford Unit

	Mar <u>2</u>	Mar <u>8</u>	Mar <u>21</u>	Mar <u>30</u>	Apr <u>6</u>	Oct <u>25</u>	Oct <u>27</u>
Mallard	10	24	10	20	29		
Black Duck	62	64	27	10	2	6	
Pintail	20	62		13		500	800
Widgeon			115	90			
Green-winged Teal	1280	840	300	424	650		
Wood Duck	339	212	194	298	62	149	300
Ring-necked Duck	540	470	544	180	47	2	
Tundra Swans	0	0	0	0	0	0	0
Other Waterfowl	<u>100</u>	_____	<u>220</u>	<u>87</u>	<u>122</u>	<u>50</u>	<u>470</u>
Total	2351	1672	1295	1157	1002	707	1570

Sawyer Lake Road Waterfowl Survey - South Twiford Unit

	Nov <u>2</u>	Nov <u>15</u>	Nov <u>24</u>	Dec <u>12</u>
Mallard		70	134	245
Black Duck	2	54	82	135
Pintail	159	1840	2675	1700
Widgeon	0	0	0	0
Green-winged Teal	790	1400	2200	2700
Wood Duck	100	400	276	570
Ring-necked Duck	2	1050	2250	3400
Tundra Swans			2	8
Other Waterfowl	<u>      </u>	<u>535</u>	<u>951</u>	<u>2310</u>
Total	1073	5351	8570	11068

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 1989.

Five bears were usually located once or twice a week from a fixed-wing aircraft. A total of 387 locations were recorded (Table 1). Using the convex polygon method, overall home ranges varied in size from 51.8 km<sup>2</sup> to 113.5 km<sup>2</sup> with seasonal home ranges substantially smaller (Table 1 and Figure 1). Home ranges were mostly non-overlapping (Figure 1) except in an agricultural area where the bears fed heavily on beans and corn. During summer, nine different bears (none radio-collared) were observed in one bean field.

Although telemetry data are still being analyzed, cursory examination indicates that bears were frequently located in areas characterized by thick vegetation (e.g. medium/high tree pocosin, pine/hardwood) (Tables 2-6). These areas were usually about 600 m and 1800 m from unpaved and paved roads (Table 7).

The radio-collared bears did not hibernate during 1989.

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. During the last 17 years the bear population has apparently increased in size. During January 1990, local politicians rescinded the 1972 ordinance prohibiting

hunting of bears in Dare County. It is expected that the North Carolina Wildlife Resources Commission will recommend a bear season for Dare County.

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 un hunted 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 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.

Table 1. Seasonal home ranges (km<sup>2</sup>) for adult male black bears studied from September 1988 through August 1989 at the Alligator River National Wildlife Refuge, northeastern North Carolina.

		Spring Mar - May	Summer Jun - Aug	Fall Sep - Nov	Winter Dec - Feb	Overall
Bear 1	29.4 17 <sup>A</sup>	54.9 22	39.0 32	36.9 12	79.9 83	
Bear 3	32.5 17	27.3 19	10.2 18	6.0 13	0.3 67	
Bear 5	37.2 16	69.8 21	3.7 28	27.9 17	113.5 82	
Bear 8	20.6 17	38.5 20	26.1 24	9.4 17	51.8 78	
Bear 10	13.7 18	25.8 20	18.7 23	20.1 16	57.8 77	

a - The second value is the number of locations.

Areas used by black bears in the refuge during 1989.

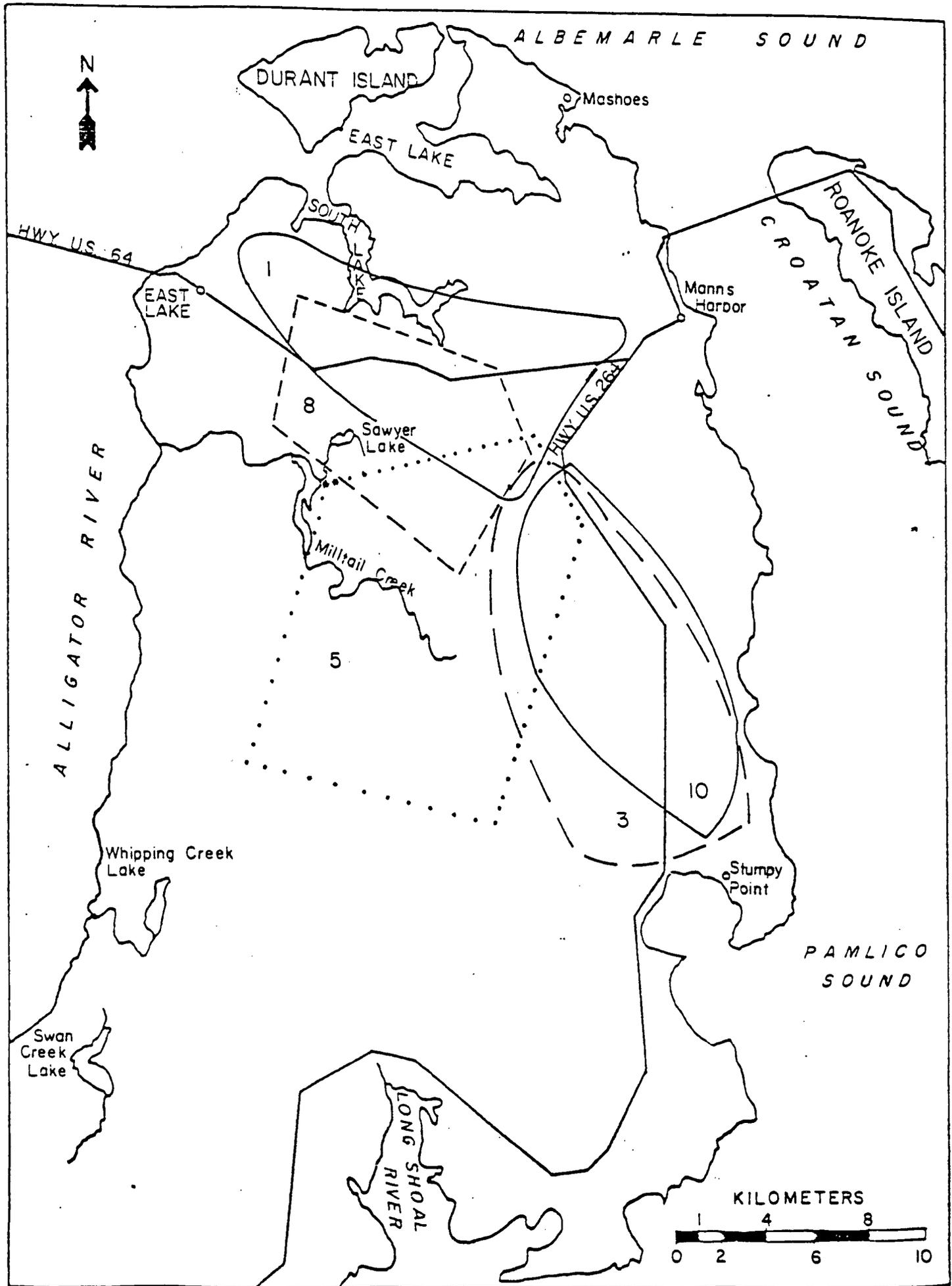


Table 2. Frequency of occurrence of black bear #1 in habitats within the animal's home range in the Alligator River National Wildlife Refuge, northeastern North Carolina.

Habitats	Spring	Summer	Fall	Winter	Overall
	Mar - May	Jun - Aug	Sep - Nov	Dec - Feb	
ag. area	-	-	2	-	2
	-	-	6 <sup>A</sup>	-	2 <sup>B</sup>
disturbed <sup>C</sup>	6	7	1	1	15
	35	32	3	8	18
marsh	1	-	-	-	1
	6	-	-	-	1
med/high	6	3	19	8	36
tree	35	13	59	67	43
pocosin					
pine/hwood	4	12	10	2	28
	24	55	31	17	34
shrub	-	-	-	1	1
pocosin				8	1

A - This value is the percentage of locations occurring in the indicated habitat during the indicated season.

B - This value is the percentage of locations occurring in the indicated habitat during the course of the study.

C - Disturbed habitats consisted mostly of clearcuts in various stages of regeneration.

Table 3. Frequency of occurrence of black bear #3 in habitats within the animal's home range in the Alligator River National Wildlife Refuge, northeastern North Carolina.

Habitats	Spring	Summer	Fall	Winter	Overall
	Mar - May	Jun - Aug	Sep - Nov	Dec - Feb	
ag. area	-	-	8	-	8
	-	-	44 <sup>A</sup>	-	12 <sup>B</sup>
disturbed <sup>C</sup>	1	1	6	3	11
	6	5	33	25	16
hardwood	1	-	-	-	1
	6	-	-	-	2
low tree	3	-	-	-	3
pocosin	18	-	-	-	5
med/high	8	10	4	6	28
tree	47	53	23	50	42
pocosin					
pine/hwood	1	-	-	3	4
	6	-	-	25	6
shrub	3	8	-	-	11
pocosin	17	42	-	-	17

A - This value is the percentage of locations occurring in the indicated habitat during the indicated season.

B - This value is the percentage of locations occurring in the indicated habitat during the course of the study.

C - Disturbed habitat consisted mostly of areas that had been clear-cut and were in various stages of regeneration.

Table 4. Frequency of occurrence of black bear #5 in habitats within the animal's home range in the Alligator River National Wildlife Refuge, northeastern North Carolina.

Habitats	Spring	Summer	Fall	Winter	Overall
	Mar - May	Jun - Aug	Sep - Nov	Dec - Feb	
ag. area	- -	1 5	2 7 <sup>A</sup>	1 6	4 5 <sup>B</sup>
disturbed <sup>C</sup>	1 6	8 40	13 46	4 23	26 32
hardwood	1 6	- -	- -	- -	1 1
med/high tree pocosin	8 50	8 40	11 39	3 17	30 37
pine/hwood	6 38	2 10	1 3	8 47	17 21
shrub pocosin	- -	1 5	1 3	1 6	3 4

A - This value is the percentage of locations occurring in the indicated habitat during the indicated season.

B - This value is the percentage of locations occurring in the indicated habitat during the course of the study.

C - Disturbed habitat consisted mostly of areas that had been clear-cut and were in various stages of regeneration.

Table 5. Frequency of occurrence of black bear #8 in habitats within the animal's home range in the Alligator River National Wildlife Refuge, northeastern North Carolina.

Habitats	Spring	Summer	Fall	Winter	Overall
	Mar - May	Jun - Aug	Sep - Nov	Dec - Feb	
ag. area	2 12	8 40	3 12 <sup>A</sup>	2 12	15 19 <sup>B</sup>
cedar	1 6	1 5	- -	1 6	3 4
disturbed <sup>C</sup>	1 6	4 20	1 4	2 12	8 10
hardwood	1 6	- -	- -	- -	1 1
low tree	-	-	-	1	1
pocosin	-	-	-	6	1
med/high	7	4	17	7	35
tree	41	20	71	41	44
pocosin					
pine/hwood	5 29	3 15	3 12	4 24	15 19

A - This value is the percentage of locations occurring in the indicated habitat during the indicated season.

B - This value is the percentage of locations occurring in the indicated habitat during the course of the study.

C - Disturbed habitat consisted mostly of areas that had been clear-cut and were in various stages of regeneration.

Table 6. Frequency of occurrence of black bear #10 in habitats within the animal's home range in the Alligator River National Wildlife Refuge, northeastern North Carolina.

Habitats	Spring	Summer	Fall	Winter	Overall
	Mar - May	Jun - Aug	Sep - Nov	Dec - Feb	
ag. area	-	-	1	-	1
	-	-	4 <sup>A</sup>	-	1 <sup>B</sup>
disturbed <sup>C</sup>	11	1	4	2	18
	61	5	17	12	23
low tree	1	6	1	4	12
pocosin	6	27	4	25	15
marsh	-	-	2	-	2
	-	-	8	-	2
med/high	6	8	14	7	35
tree	33	36	61	43	44
pocosin					
pine/hwood	-	-	1	-	1
	-	-	4	-	1
shrub	-	7	-	3	10
pocosin	-	32	-	19	13

A - This value is the percentage of locations occurring in the indicated habitat during the indicated season.

B - This value is the percentage of locations occurring in the indicated habitat during the course of the study.

C - Disturbed habitat consisted mostly of areas that had been clear-cut and were in various stages of regeneration.

Table 7. Average distance (in meters) that black bears were from unpaved (up) and paved (pa) roads in the Alligator River National Wildlife Refuge, northeastern North Carolina.

Bear	Spring		Summer		Fall		Winter		Total	
	Mar - May up pa	Jun - Aug up pa	Jun - Aug up pa	Sep - Nov up pa	Sep - Nov up pa	Dec - Feb up pa	Dec - Feb up pa	up pa	up pa	
1	236 <sup>A</sup>	1376	570	2175	372	2238	807	1330	457	1860
	229 <sup>B</sup>	809	1090	1320	360	890	1330	484	807	1079
3	939	1732	1007	1086	156	2099	220	2490	609	1794
	935	932	1921	1153	112	343	164	224	1177	937
5	210	5382	321	4492	392	2542	269	5191	304	4304
	160	2873	195	2491	320	755	207	1896	236	2361
8	266	1281	195	2178	274	1910	173	1982	225	1916
	214	1033	199	1465	210	713	124	561	194	1162
10	1155	2189	1686	1283	1685	1283	1195	1488	2106	2080
	535	786	1356	1106	1255	778	688	503	1083	936

A - First value is the mean distance to the specified road type for the specified season.

B - Second value is the standard deviation of the mean.

H. PUBLIC USE1. 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 1989 were estimated to be 9,841.



Some hunters rarely venture far from their vehicles.

BWS 11/89



Deer hunting with dogs is a popular refuge activity.

BWS 12/89

Administrative offices for the refuge remained in the GSA leased office space in Manteo. A few visitors do locate the office, but most information is disseminated by telephone, correspondence, and through the news media. The staff responded to approximately 3,115 public inquiries and issued 70 news releases. In addition, staff members participated in numerous radio "spots" about the red wolf project, hunting, and other wildlife refuge topics.

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. Column releases were included in the number of new releases during 1989.

On January 6, staff and volunteers erected a large double sided sign with the message "Alligator River National Wildlife Refuge - Acquired largely through the efforts of The North Carolina Nature Conservancy" (NCNC). NCNC Executive Director Katherine Skinner visited the area a few days later. Ms. Skinner told us that each parcel of land the Conservancy negotiates is accompanied by an agreement that such a sign will be erected, ours is the first such sign she has seen.

Alligator River was one of three areas highlighted on Peter Jennings's (ABC News) American Agenda on a special featuring The Nature Conservancy.

March 31, ORP Strawser conducted a program on the Red Wolf Reestablishment Project for the four fourth grade classes at Manteo Elementary School. A feature writer for the Virginia Pilot/Ledger Star accompanied the group to capture children's comments for inclusion in the summer children's features for the paper. One feature will focus on the refuge and the red wolf.

May 16, the Refuge Gift List was completed. The list will be updated regularly.

June 5, RM Taylor was interviewed by American Health Magazine about the Red Wolf Project. Following the interview, the writers toured the refuge and "tagged along" with the wolf crew for a day.

October 24, Margo Price (journalist) visited the wolf project. She is writing a story about endangered species and came to the refuge to see how the restoration project is progressing.

Many other major articles and film segments were produced during 1989, covering ARNWR, especially concerning the Red Wolf Project.

## 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, more recently, 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".

During 1989, a draft was written for publication in the North Carolina Notebook sponsored by the N.C. Wildlife Resources Commission. If published, this activity session will reach about 10,000 teachers and possible hundreds of thousands of students.

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 1989.

6. Interpretive Exhibits/Demonstrations

Several exhibits and demonstrations were presented by refuge staff and volunteers during 1989. Among them were:

March 3, ARM Lanier, DPL Schriver and ORP Strawser judged the Science Fair at the Manteo High School.

March 16, ORP Strawser and WRC Officer Earl Brinkley represented the USFWS and the NCWRC at the annual Dare County Job Fair for approximately 250 students. Recruitment for YCC positions was included in the program.

March 17, volunteers represented the refuge at the annual Career Day at the College of the Albemarle. Approximately 250 students attended.

March 19-25 was National Wildlife Week. A number of significant activities were planned and executed to join in the celebration. Three of the weekly columns "What's Happening with Wildlife?" featured relevant topics. The Coastland Times featured the refuge and the red wolf in its "FOCUS" section. Wildlife programs were offered for the public schools and many classes took advantage of the programs. Programs on mammals, red wolves, and reptiles were conducted for over 400 students by volunteers. Staff conducted slide programs for the Outer Banks Audubon and the First Flight Lion's Club during the week. Approximately 75 people attend these programs.



N.C. Wildlife Officer Earl Brinkley and ORP Strawser discuss "wildlife careers"

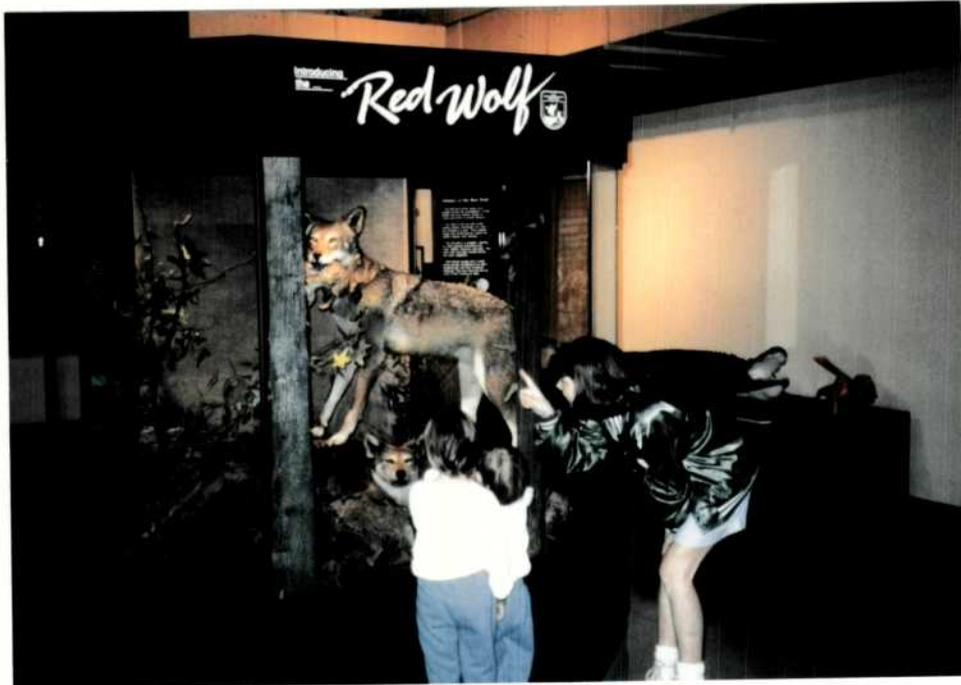
3/89

April 13, the red wolf exhibit was delivered and installed by Wilderness Graphics of Tallahassee, FL. The exhibit is temporarily housed at the NC Aquarium on Roanoke Island. The official opening and ribbon cutting ceremony for the exhibit was held April 15 for approximately 45 people.

April 25, RT Windley and ORP Strawser talked with 140 local junior high school students about the Red Wolf Project. The event was a Conservation Field Day sponsored by the Hertford Soil Conservation Service.

June 16, ORP Strawser and WB Phillips manned an exhibit at a windsurfing expo at Windmill Point in Nags Head. Kitty Hawk Kites donated \$100 from the proceeds of the expo to the Coastal Wildlife Refuge Society to benefit the refuge.

September 13, ORP Strawser and RA Morse manned an exhibit on the red wolf and the refuges at the Oregon Inlet Fishing Center. Approximately 75 people came by to learn more about the wolves and the refuges.



The red wolf exhibit located at the N.C. Aquarium. which hosts 550,000 visitors each year. BWS 4/89

September 16-17, staff and one volunteer manned a booth at the Currituck Wildlife Festival. The booth was designed to provide information about the refuge with an emphasis on the wolf project. Approximately 100 people visited during the 2-day festival.

September 30, staff and one volunteer manned a booth at the 1989 Annual Meeting of the North Carolina Trappers Association. The booth was designed to provide information about capturing and handling red wolves. WB Phillips was the guest speaker and gave a 15 minute talk red wolves and conservation to about 125 people. About 75 people visited the booth over the course of the day.

#### 7. Other Interpretive Programs

A number of other refuge programs were conducted during 1989 by staff and volunteers. Many dealt with the Red Wolf Program; others addressed refuge related topics. A list of programs were as follows:

January 19, a refuge volunteer conducted a red wolf program for 25 Boy Scouts in Kill Devil Hills.

January 20, another red wolf program for approximately 50 members and guests of the Buxton Bird Club was conducted by a refuge volunteer.

February 2, ORP Strawser conducted a slide program on Alligator River NWR for the Roanoke Island Garden Club for approximately 35 people.

March 1, ORP Strawser presented a talk on the Red Wolf Program to 35 inmates at the Creswell Prison and then traveled to Hertford to be the guest speaker at a luncheon for the winners of the Soil Conservation Service's Poster Contest for approximately 80 people.

March 2, WB Phillips gave a talk on red wolves to 300 students at the Lynn Elementary School and during the evening to approximately 100 members of the Wake County Wildlife Club.

March 7, DPL Schriver presented a program on the refuge to a graduate class in Coastal Ecology from N.C. State University of 25 people.

March 10, RM Taylor presented a slide program about the Red Wolf Reestablishment Project for the N.C. Wildlife Society Annual Meeting at Pine Knoll Shores.

March 24, WB Phillips presented a seminar to the faculty and students for the Wildlife and Fisheries Department of Virginia Polytechnic Institute and State University.

April 25, staff talked with 140 local junior high school students about the Red Wolf Project. The event was a Conservation Field Day sponsored by the Hertford Soil Conservation Service.

April 17, RM Taylor gave a red wolf presentation to about 30 graduate students from the University of Tennessee.

April 18, WB Phillips gave a red wolf talk to about 35 members of the North Banks Rotary. A photographer working on the book "One Day in the Life of North Carolina" spent April 21, photographing the wolf project and Alligator River NWR.

August 8, ORP Strawser presented a refuge program for the North Banks Rotary Club for 45 people.

October 28, a group of 25 conservationists from the Piedmont Environmental Center, High Point, N.C. visited the Red Wolf Project. WB Phillips gave a slide show, demonstrated radio-tracking, and led them to a deer that had been killed by a wolf.

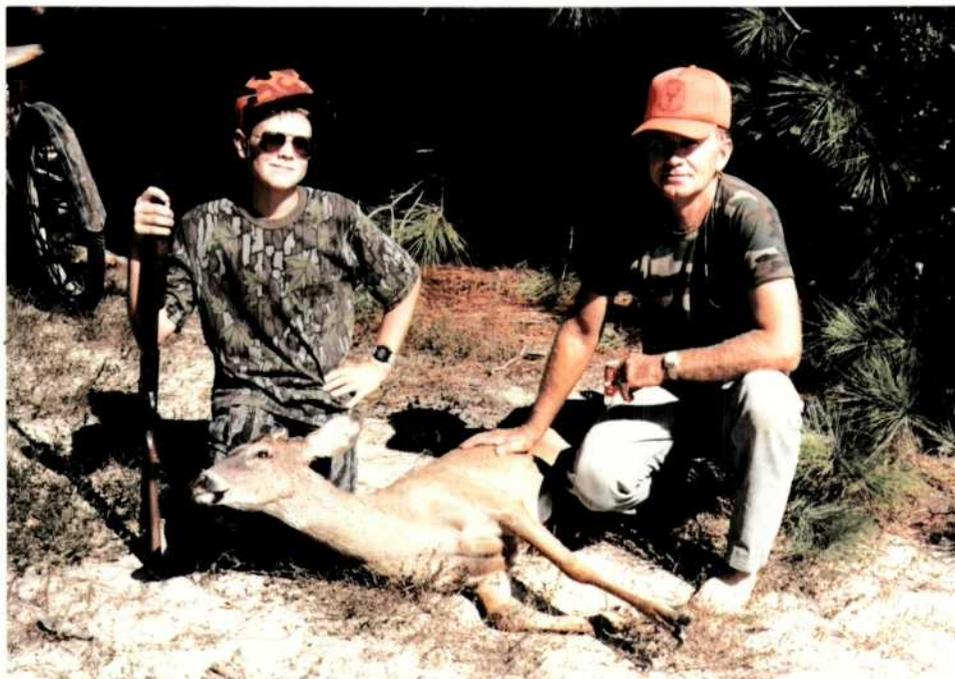
November 4, WB Phillips took a wildlife management class from Warren Wilson College to the refuge for a howling safari. Not only did the students hear wild wolves howl but they also saw an animal as it travelled through a field. In addition to the above programs, more than 35 programs on assorted wildlife topics were given for approximately 1,500 Dare County students by volunteers participating in the refuge school programs.

In addition to the above programs, more than 35 programs on assorted wildlife topics were given for approximately 1,500 Dare County students by volunteers participating in the refuge school programs.

#### 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, 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 50 miles of logging roads, and because many of these roads share junctions with State roads, it is difficult to establish effective hunter check stations. The 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 show 166 bucks and 24 does taken on the refuge in 1989. A more realistic estimate would be a harvest of 261 deer.



A good day for this father and son... CFL 11/89

A congressional inquiry on dog trespass was answered on June 29.

At the request of a county commissioner, RM Taylor attended a meeting on July 19, called by a group of chase dog hunters to discuss the same complaints aired at the meeting on the 5th.

History seems to be repeating itself over and over again with the hunting issue. Whether it's a road closure, road maintenance, dog trespass problems, or dog training restrictions, the chances of the refuge keeping all the hunters happy seem more and more remote as time goes by.

September 5, the annual hunter information meeting was held at the N.C. Aquarium. Approximately 85 people attended. Although there were no significant changes in the refuge regulations this year, there were heated comments on youth hunting regs, waterfowl unit management, road maintenance, areas open to chase dogs, roads open to motorized vehicles, etc. Scott Smith, Forester for the Air Force bombing range, also presented several changes in the range hunting program. These changes drew loud criticisms from many local hunters, as well.

September 11, bow season began along with the usual weekend patrol assignments for refuge officers.

The first week of October was spent putting up new hunt boards at 16 locations on the refuge. Muzzle loader season came in on October 9, a three day duck season occurred October 12-14, and regular gun season started on October 16.

November 1, the farm field gates were closed and locked. Until September, 1990, this area will be closed to all public entry.

A limited amount of waterfowl hunting took place on the refuge, but most occurred over open water in the sounds and in East Lake. The farm fields were open to public use during October, however, this year the area was closed to waterfowl hunting.

Though the new regional hunting policy for youths has been difficult to enforce, the fact that Dare County Schools already had the State Hunter Safety Course as a part of the seventh and eighth grade curriculum certainly helped. 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.

Estimated public hunting activity appears below:

<u>Activity</u>	<u>Visits</u>	<u>AH</u>
Duck	230	1150
Deer (gun)	1500	7500
Deer (bow)	326	1631
Small Game	285	1140
Upland Game Birds	85	255

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 1989, there were an estimated 1,455 fishing visits to the refuge with 5,820 activity hours spent participating in this activity.



A relaxing afternoon in the water.

BWS 6/89

#### 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 were recorded under public use. Five special use permits were filled out for refuge trapping. Special regulations on the permits limited trap size and required that trappers report their take. Five completed "trapping results" forms were received by this office. Of those, three were negative reports; the permits had not been used. Total take from the other two trappers were 23 raccoons, 1 otter, 9 rabbits and 4 bobcats.

#### 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.

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 the adventuresome few who go there.

The following figures represent wildlife/wildlands observation during 1989:

<u>Activity</u>	<u>Visits</u>	<u>AH</u>
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. He provided momentum for the refuge law enforcement program. The N.C. Wildlife Resources Commission officers also conducted patrols and enforced hunting regulations and laws. 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.

The one regulation that appeared to create the most problem again in 1989 was the one prohibiting the transporting of loaded firearms on the refuge while engaged in hunting activity.

The vandalism case reported in December of 1988 resulting in over \$18,000 in damages developed a few leads during 1989. Three youth/young adults had been charged; however the cases extended over into 1990.

We continued to have some gate and sign vandalism during 1990. Problems were sporadic and didn't seem to target any particular regulation or policy.

Refuge officers were scattered in their training during 1989:

ARM Schriver and Refuge LEO Panz attended LE Refresher in Decatur, AL February 13-17. ARM Lanier and ORP Strawser attended the session at Quincy, FL on March 4-11. RM Taylor attended the session in Quincy, FL on March 20-24. ARM Noffsinger and RT Beasley attended the session at Cape Charles, Virginia. They both enjoyed the 2 1/2 hour ride as opposed to the usual 16 hour drive to Quincy.

All refuge officer requalified with their Service revolvers on October 23.

A summary of NOV's for 1989 follows:

Transporting loaded firearms on refuge	12
Operating motor vehicle without state license	1
Littering/abandonment of property	2

18. Cooperating Associations

In April of 1989, a group of refuge volunteers met to initiate the formation of a non-profit support organization for refuge I&R functions. After several months of planning The Coastal Wildlife Refuge Society (CWRS) was formed and an MOU was signed to link the organization with the refuge. By year's end there were 60 members.

As the first fund raising project, the CWRS purchased red wolf "Back to the Wild" tee shirts. The North Carolina Aquarium and the Cape Hatteras National Seashore (Eastern National Monument) agreed to sell the shirts with a portion or all of the profit going to CWRS.



N.C. Aquarium sells red wolf tee shirts for the Coastal Wildlife Refuge Society. BWS 6/89

On September 26, the first annual meeting of the CWRS was held. The group voted to undertake a massive upgrading of the North Pond Trail as their first major project. To begin the project the CWRS offered to raise \$10,000.00 and requested the refuge apply for a matching amount through the Challenge Grant Program. Refuge volunteer Patsy Zoll agreed to head the fund raising efforts for the North Pond trail Project. On November 15 and 21, she conducted two training seminars to orient and train other volunteers for the fund raising effort.

Along with the fund raising and planning for North Pond Trail renovation, other accomplishments for the young organization for 1989 include:

- Donation of 5,000 bird lists for Pea Island.
- Assumption of total responsibility for maintenance of North Pond Trail.
- Donation of a self-propelled rough terrain lawn mower for use on North Pond Trail.

## I. EQUIPMENT AND FACILITIES

### 1. New Construction

Fifteen water control structures were installed in the farm field units this year. Most were within the S. Twiford Unit or in support of water control activities in this unit. These structures enabled us to provide water control on approximately 1,000 acres for moist soil management. In conjunction with these WCS's, approximately one mile of low interior dikes were constructed. These were also limed, fertilized, and seeded to control erosion.

### 3. Major Maintenance

Road maintenance is a continuous problem. With approximately 155 miles of roads and a 90+ inches of rain, were in bad shape as fast or faster than our maintenance efforts. All the roads have been damaged so badly in the past by logging operations, and continue to receive heavy use during hunting seasons that rehabilitation will be necessary before we can expect to see any results of major maintenance.



Maintenance crews have a never ending battle against mud and water! BWS 10/89

4. Equipment Utilization and Replacement



A bedding plow was permanently leased to the refuge for a fee of one dollar by Weyerhaeuser Company. BWS

See Feedback concerning our equipment and utilization replacement.

5. Communication Systems

The station switched from HF to VHF this year. We are still short on radios but are close enough to make the change. Interference (skip) is much less, although we do get some local interference of an electrical nature once in a while. Next year we hope to get a repeater on the air to solve most of our propagation limitations. The multi-channel capabilities are a real asset since most of the agencies in the area are also on VHF.

6. Computer Systems

The wolf crew purchased a laser printer which handles the volume and quality necessary for their administration. The need for more computers is more evident each year as staff find more applications. Word processing alone puts a strain on the two machines we have now. Accounting, biological, and property information data bases are all on line and being refined to the point we are going to need some more machines soon!

7. Energy Conservation

Car pooling is practiced whenever possible. With no heating or cooling at Alligator River we are as energy efficient as we can get in the field.

J. OTHER ITEMS

1. Cooperative Programs

A SUP was issued to the N.C. Aquarium to collect plants for a public education program.

USDA Gypsy Moth traps were monitored on the refuge by APHIS out of Elizabeth City, N.C.

2. Other Economic Uses

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

One SUP to operate 125 bee hives on the refuge.

#### 4. Credits

The Alligator River report was prepared by J. Taylor, A. Schriver, B. Noffsinger, S. Lanier, and B. Strawser; edited by J. Taylor and A. Schriver; typed and compiled by B. Midgett.

The printing of the photographs was donated by Jim's Camera House, Kill Devil Hills, N.C.

In addition to staff photos, the following were included: DMR-Dave Richardson (Co-op) and KCD-Ken Dyar (volunteer)

#### K. FEEDBACK

As the station responsibilities and staff grow, vehicle utilization and replacement is a continuous problem. Like most stations, we started with whatever anyone else was excessing. Then you get a few new ones (usually all at once - which means they will all wear out all at once). Then just when you think you can maybe get 16 staff members and a bunch of volunteers safely spread out over the three stations, four counties, and 140,000+ acres, you have the good fortune to get a YCC crew, fire crew, etc., etc. Then central office decides that all additions to the fleet require their approval! So much for picking up whatever is handy to get you over a few weeks until you find something better, etc., etc.

We have service "standards" for replacement, but no way to support these standards. GSA rentals are upgraded as they meet these standards. We have one GSA vehicle and what we essentially end up doing is getting a new vehicle by trading in one of the best we have in our fleet. With gasoline included in the rental, we decided to try to get a few more, sounded like a good deal: we're on the list.....

Why doesn't the FWS manage their fleet in a similar manner to GSA? The stuff we end up excessing or using for exchange sale really isn't worth the administrative cost of disposal in a lot of cases. By the time we can replace a vehicle it is usually listed "inoperable." Before that time our maintenance costs are very high. After three years (usually at or over replacement mileage) the repairs are major maintenance as often as routine.

CURRITUCK NATIONAL WILDLIFE REFUGE

Manteo, North Carolina

ANNUAL NARRATIVE REPORT

Calendar Year 1989

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

## INTRODUCTION

The Currituck NWR is located in northern Currituck County, North Carolina along the Outer Banks barrier island chain. The Currituck Banks are part of an extensive coastal lowland that stretches from Newfoundland southward to Florida, and westward into the Gulf of Mexico. Along the Currituck Banks, inlets have periodically formed and reformed depending on the occurrence of storms, amount of sedimentation, the tidal heights, and degree of vegetation on the barrier beach.

The Fish and Wildlife Service has long recognized the dynamic and fragile character of coastal barrier islands and has endeavored to represent the national interest in protection of barrier islands in general. The estuaries and sounds that these barrier islands protect are among the richest and most productive ecosystems known to man. They provide nesting and feeding grounds for numerous bird and mammal species in addition to being important nursery and spawning areas for fin and shellfish.

The Outer Banks remained isolated from the mainstream of activity in early America, and those few people who lived there relied heavily on activities associated with the area's natural values for their subsistence. Activity in the Outer Banks/Currituck Sound area reached a peak in the late 1800's when commercial fishing and market hunting were at an all time high. A number of hunting clubs were established for sport hunting of waterfowl and drew much of their membership from affluent northern businessmen and professionals.

The hazards to shipping of shoals near the Outer Banks resulted in numerous wrecks along the coast. Lifesaving stations were established at intervals along the beach and several of these still exist as does the Currituck Lighthouse at Corolla.

Acquisition of Currituck NWR was designed to preserve and protect a portion of the North Carolina Outer Banks, one of the largest undeveloped coastal barrier ecosystems remaining on the East Coast. This area is an important black duck wintering area. Fish and Wildlife Service ownership ensures perpetuation of basic wetland functions including nutrient cycling, floodplain and erosion control, and will help preserve the role of Currituck Sound estuaries as important nursery areas. Ownership of the protective buffer east of the productive marshes bordering the sound protects the marsh from direct pollution sources associated with development.

During 1975 and 1976, The Nature Conservancy (TNC) acquired several parcels of land on the Currituck Outer Banks. The two major tracts of land that came under at least partial control of TNC were being utilized by the Swan Island and Monkey Island Clubs. Funds to purchase these areas were provided by the Melon Foundation, a sponsor of the National Wetlands Project. TNC had committed to a two to one matching of funds.

TNC transferred approximately 500 acres of the Monkey Island tract to the State of North Carolina for inclusion in the National Estuarine Sanctuary System. A narrow strip from sound to sea of approximately 50 acres was retained by TNC.

The Migratory Bird Conservation Commission (MBCC) met to consider the Currituck Refuge on August 2, 1983. The MBCC approved the boundary of the Refuge in two parcels: the Monkey Island tract, which is just north of the village of Corolla, and the Swan Island property some three miles to the north.

Two phases of acquisition resulted in approximately 1,185 acres fee, 166 acres in conservation easement and some hunting blind rights at a cost of \$3.9 million.

INTRODUCTION

Page

TABLE OF CONTENTS

i

A. HIGHLIGHTS

1

B. CLIMATIC CONDITIONS

1

C. LAND ACQUISITION

- 1. Fee Title....."NTR"
- 2. Easement....."NTR"
- 3. Other....."NTR"

D. PLANNING

- 1. Master Planning....."NTR"
- 2. Management Plan....."NTR"
- 3. Public Participation....."NTR"
- 4. Compliance with Environmental and Cultural  
Resource Mandates....."NTR"
- 5. Research and Investigations....."NTR"
- 6. Other....."NTR"

E. ADMINISTRATION

- 1. Personnel..... 1
- 2. Youth Programs..... 1
- 3. Other Manpower Programs....."NTR"
- 4. Volunteer Programs....."NTR"
- 5. Funding..... 1
- 6. Safety....."NTR"
- 7. Technical Assistance..... 1
- 8. Other..... 1

F. HABITAT MANAGEMENT

- 1. General..... 2
- 2. Wetlands..... 2
- 3. Forests....."NTR"
- 4. Croplands....."NTR"
- 5. Grasslands....."NTR"
- 6. Other Habitats....."NTR"
- 7. Grazing....."NTR"
- 8. Haying....."NTR"

HABITAT MANAGEMENT (Cont.)

	<u>Page</u>
9. Fire Management.....	"NTR"
10. Pest Control.....	"NTR"
11. Water Rights.....	"NTR"
12. Wilderness Areas.....	"NTR"
13. WPA Easement Monitoring.....	"NTR"

G. WILDLIFE

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

H. PUBLIC USE

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

I. EQUIPMENT AND FACILITIES

	<u>Page</u>
1. New Construction.....	"NTR"
2. Rehabilitation.....	"NTR"
3. Major Maintenance.....	"NTR"
4. Equipment Utilization and Replacement.....	"NTR"
5. Communications Systems.....	"NTR"
6. Computer Systems.....	"NTR"
7. Energy Conservation.....	"NTR"
8. Other.....	7

J. OTHER ITEMS

1. Cooperative Programs.....	7
2. Other Economic Uses.....	"NTR"
3. Items of Interest.....	"NTR"
4. Credits.....	8

K. FEEDBACK....."NTR"

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

## A. HIGHLIGHTS

1. Piping plover nest documented on refuge. (See Section G.2.)

## B. CLIMATIC CONDITIONS

See Alligator River NWR narrative.

## E. ADMINISTRATION

1. Personnel

See Alligator River NWR narrative.

2. Youth Programs

See Alligator River NWR narrative.

5. Funding

See Alligator River NWR narrative.

6. Technical Assistance

Numerous reports of stranded whales, dolphins, sea turtles and injured birds are handled and/or referred to appropriate agencies from the Alligator River NWR office. Our property on Currituck refuge does not include the land from the Atlantic ocean westward almost to the frontal dune, however, we receive many calls on problems occurring within this area which is under state jurisdiction.

Advice was given to the County of Currituck on the feral horses which have become a problem as development in the area increases. Numerous animals have been hit on the highway and much real concern surfaced this year.

8. Other Items

Preliminary discussions among Associate Managers and Project Leaders concerning the possibility of transferring Currituck NWR to the administrative control of Mackay Island NWR were conducted.

## F. HABITAT MANAGEMENT

### 1. General

Currituck NWR is located on the Currituck Outer Banks barrier island. This island chain was formed when melting glaciers caused a world-wide rise in the sea level. Later when sea level rise slowed, a combination of factors were set in motion to create barrier islands on the shallow shelf. The bays and estuaries that have formed behind these barriers have become shallow, due to sediments received from rivers draining the coastal plain and overwash from storm surges. Currituck Spit and surrounding Outer banks islands are primarily perpetuated by the following processes: long shore currents, tides and tidal currents, wave action, storm surges, and wind action. These dynamic ongoing processes coupled with sea level rise cause shorelines and associated dunes to undergo constant change. The adaptability of these islands to constant physical change is a major part of their natural ecology.

Approximate refuge habitat types are: 18% sand and dune, 43% brush, and 39% marsh.

### 2. Wetlands

The riser installed by the Mackay Island staff last year was used to maintain a moist soil condition during the growing season and allowed flooding of the area in the fall.

Mackay Island staff control burned a portion of the Swan Island Tract on February 10. The area burned was from the north boundary of the tract south to Ferebee Creek.



Riser installed by Mackay Island staff.

MP

#### G. WILDLIFE

##### 1. Wildlife Diversity

No inventories, except for occasional aerial waterfowl counts, and/or management activities have been initiated on Currituck NWR. It is assumed that its species diversity is similar to that of other nearby barrier island.

2. Endangered and Threatened Species

a. Federally Listed Endangered and Threatened Species

Atlantic Loggerhead Sea Turtle (Threatened) -

Although there were no reports of loggerhead turtles nesting on the beaches of the refuge, turtles are known to utilize the area to a limited extent. Development in the area and increased vehicular traffic on the beaches may limit loggerhead use of the refuge. Commercial fishing may also adversely impact sea turtles in the area.

Piping Plovers (Threatened) -

John Fussel visited the refuge as part of his piping plover nesting survey for North Carolina. Two nests were located and additional birds were observed. One nest was on the refuge and the other was on refuge lands. The latter had two eggs when observed by John Fussel. On a return visit John and ORP Strawser observed 4 eggs in the same nest.



Piping plover nest on the Currituck beaches.

KCD 7/89

3. Waterfowl

One aerial waterfowl survey was conducted this year at Currituck NWR. The survey, done on November 19, found 252 tundra swans, 75 Canada geese, 1,150 black ducks, 146 pintails, 50 green-winged teal, and 50 unidentified ducks. On January 25, an evening visit to the impounded area, ECB Florschutz and WB Noffsinger observed approximately 500 ducks utilizing the area. At least 60% of those were black ducks, others were mallards, green-winged teal and pintails.

Human disturbance in the area (hunting, general development etc.) and deteriorating quality of the Currituck Sound are probably important factors in the decline of waterfowl use of this area. Hopefully, studies in the Chesapeake Bay areas will have some application for the Currituck Sound. Refuge contacts with the State and County to establish sanctuaries in the sound areas adjacent to the refuge have drawn little interest and less response.

15. Animal Control

Feral horses or historical Currituck Banks wild horses (depending upon your beliefs and/or source of information) continue to range over the refuge. Stocking rates are probably no greater than one animal per forty acres.

H. PUBLIC USE1. General

Estimates on specific public use activities were made and reported by comparing observed use to past figures and adjusting as deemed appropriate. Alligator River staff made few visits to Currituck NWR during the year. Information was obtained through the NCWRC officers and Refuge LEO Mike Panz (Mackay Island NWR).

<u>Activity</u>	<u># Visits</u>	<u>AH</u>
Wildlife Observation		
Foot	3,065	3,065
Photography	147	588

Total visits to the refuge were 27,520. There were approximately 530 public inquiries.

On October 5 and 6, RLEO Panz posted the dune line of both tracts with 12' steel sign posts. These were driven 7' into the ground; boundary signs were attached to the post.

On October 12, ORP Strawser assisted the N.C. Aquarium with a publicized tour of the refuge that was open to the public. Twelve people participated.

8. Hunting

Currituck Sound and what are now refuge marshes and ponds have traditionally received heavy gunning pressure from waterfowlers. Waterfowl numbers and hunter success in the area surrounding the refuge have been extremely low in recent years. Currituck NWR is currently closed to all hunting and has been since its establishment. Two blinds associated with the Swan Island Hunt Club are located on fee title land. The Swan Island Hunt Club has deeded hunting rights for those two blinds. No problems have arisen due to those deeded rights.

Hunting blind rights in Currituck Sound were acquired with the Monkey Island Tract purchase. Eighteen point blind locations were licensed by the USFWS in 1984 and 1985 to provide some sanctuary in Currituck Sound adjacent to our lands. Hunting from these blinds was not permitted, which in effect, created a 200 yard wide no hunting strip in the sound bordering refuge property. Refuge staff met with the Currituck County Game Commission in 1985, to redistribute the blind locations to effect the same coverage with fewer blind permits. Thirteen locations were utilized and FWS paid \$325.00 for one season's protection of the 200 yard no hunting buffer. Each year since then, the 13 blinds have been leased by the refuge to provide a buffer area along the refuge marsh in Currituck Sound.

17. Law Enforcement

Since becoming a refuge, the random "blitzes" of the Alligator River LE staff patrolling the area, the presence of Mackay Island staff, and the low numbers of waterfowl have reduced the number of waterfowl hunters and violations on the refuge. According to N.C. Wildlife officers and some local residents, the uncertainty in knowing when the "feds" will be around has been a very effective law enforcement tool on the refuge.

Currituck Refuge is more than an hours' drive from the Alligator River office, making enforcement there difficult. Mackay Island NWR has assisted a great deal by patrolling Currituck on occasion. Because four-wheel drive vehicles are allowed on the beaches there, vehicle trespass is a major problem on the refuge. Other common violations include waterfowl poaching, firelighting for deer, littering and dumping, and drug violations. Some local attitudes are not favorable toward government ownership of land there; we see the results of these attitudes primarily in vandalism of refuge signs.

The installation of boundary signs on metal supports should provide information on which explanation is more accurate.

RLEO Panz conducted several LE patrols on Currituck during the year. No cases were made.

#### I. EQUIPMENT AND FACILITIES

##### 8. Other

Plans to move a portable diesel unit and Crissafulli pump to the Swan Island Tract to compliment the water control structure installed last year were formulated. Late breaking news indicated that Mackay Island NWR secured funding from Ducks Unlimited to purchase a floating pump and diesel unit.

Difficulty of access with no roads into the station results in primarily preservation and protection activities. Boundary sign replacement was the predominant maintenance activity undertaken this year.

#### J. OTHER ITEMS

##### 1. Cooperative Programs

An informal cooperative management agreement between Alligator River NWR and Mackay Island NWR was in effect this year. Both Project Leaders, the East Coast Biologist and an assortment of ARM's, biologists, and technicians made a joint visit to evaluate the water management potentials and observe the area.

4. Credits :

The Currituck report was prepared by A. Schriver, B. Noffsinger, and B. Strawser; edited by J. Taylor and A. Schriver; typed and compiled by B. Midgett

PEA ISLAND NATIONAL WILDLIFE REFUGE

Manteo, North Carolina

ANNUAL NARRATIVE REPORT

Calendar Year 1989

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

## 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.

INTRODUCTION

Page

TABLE OF CONTENTS

i

A. HIGHLIGHTS

1

B. CLIMATIC CONDITIONS

1

C. LAND ACQUISITION

1. Fee Title.....	2
2. Easement.....	"NTR"
3. Other.....	"NTR"

D. PLANNING

1. Master Planning.....	"NTR"
2. Management Plan.....	"NTR"
3. Public Participation.....	"NTR"
4. Compliance with Environmental and Cultural Resource Mandates.....	2
5. Research and Investigations.....	4
6. Other.....	4

E. ADMINISTRATION

1. Personnel.....	5
2. Youth Programs.....	5
3. Other Manpower Programs.....	"NTR"
4. Volunteer Programs.....	5
5. Funding.....	5
6. Safety.....	5
7. Technical Assistance.....	5
8. Other.....	6

F. HABITAT MANAGEMENT

1. General.....	6
2. Wetlands.....	6
3. Forests.....	"NTR"
4. Croplands.....	10
5. Grasslands.....	"NTR"
6. Other Habitats.....	10
7. Grazing.....	"NTR"
8. Haying.....	"NTR"

## HABITAT MANAGEMENT (Cont.)

	<u>Page</u>
9. Fire Management.....	11
10. Pest Control.....	12
11. Water Rights.....	"NTR"
12. Wilderness Areas.....	"NTR"
13. WPA Easement Monitoring.....	"NTR"

### G. WILDLIFE

1. Wildlife Diversity.....	12
2. Endangered and/or Threatened Species.....	13
3. Waterfowl.....	18
4. Marsh and Waterbirds.....	20
5. Shorebirds, Gulls, Terns and Allied Species.....	21
6. Raptors.....	23
7. Other Migratory Birds.....	23
8. Game Mammals.....	23
9. Marine Mammals.....	"NTR"
10. Other Resident Wildlife.....	"NTR"
11. Fisheries Resources.....	"NTR"
12. Wildlife Propagation and Stocking.....	"NTR"
13. Surplus Animal Disposal.....	"NTR"
14. Scientific Collections.....	"NTR"
15. Animal Control.....	24
16. Marking and Banding.....	24
17. Disease Prevention and Control.....	"NTR"

### H. PUBLIC USE

1. General.....	24
2. Outdoor Classrooms - Students.....	27
3. Outdoor Classrooms - Teachers.....	"NTR"
4. Interpretive Foot Trails.....	27
5. Interpretive Tour Routes.....	"NTR"
6. Interpretive Exhibits/Demonstrations.....	31
7. Other Interpretive Programs.....	31
8. Hunting.....	"NTR"
9. Fishing.....	32
10. Trapping.....	"NTR"
11. Wildlife Observation.....	32
12. Other Wildlife Oriented Recreation.....	33
13. Camping.....	"NTR"
14. Picnicking.....	"NTR"
15. Off-Road Vehicleng.....	33
16. Other Non-Wildlife Oriented Recreation.....	34
17. Law Enforcement.....	35
18. Cooperating Associations.....	36
19. Concessions.....	"NTR"

I. EQUIPMENT AND FACILITIES

	<u>Page</u>
1. New Construction.....	36
2. Rehabilitation.....	36
3. Major Maintenance.....	36
4. Equipment Utilization and Replacement.....	37
5. Communications Systems.....	37
6. Computer Systems.....	"NTR"
7. Energy Conservation.....	37
8. Other.....	"NTR"

J. OTHER ITEMS

1. Cooperative Programs.....	37
2. Other Economic Uses.....	"NTR"
3. Items of Interest.....	"NTR"
4. Credits.....	38

K. FEEDBACK ..... "NTR"

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

## A. HIGHLIGHTS

1. Groin work begins....(See Section D.4.)



Haul road across N.C. 12 and barge dock completed in preparation for groin construction. RSL 10/89

2. The people keep coming, and coming and coming....(See Section H.
3. North Pond Trail to receive face lift! (See Section H.4.).
4. 1989 rough year for sea turtles. (See Section G.2.).

## B. CLIMATIC CONDITIONS

Rain continuously saturated Pea Island for the summer months. Rainfall for the month of May was 5.36 inches (1.27 above the norm). In June it was 4.12 inches (.1 inch less than norm). Total precipitation for the month of July was 5.16. This was .2 less than norm (1.51 inches of that occurred on the 31st, initiating the wet spell experienced well into August). Precipitation ofr August was 9.07 inches (+2.96 from the norm). The 20.00 inches of rain that fell in September qualified it for the second wettest month on record for Hatteras. The only wetter month was June 1948, when 20.00 inches of rain fell. September was a whopping 14.22 inches above the norm. Annual rainfall is about 54 inches.

### 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 last year. There has been quite a bit of interest in the historic section of the station by the County. The refuge looked at the possibility of utilizing this structure as a VCS. Because of the strict requirements pertaining to historic structures, we opted to "withdraw from the race." 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, a year and numerous meetings later, we have no word as to the disposition of any of this property.

### D. PLANNING

#### 4. Compliance with Environmental and Cultural Resource Mandates

Early in the year Mobil Oil announced its plans to drill for natural gas approximately 40 miles off the coast of Pea Island and Cape Hatteras National Seashore. On February 6, ARM Lanier attended the Mobil Oil Spill Contingency Plan meeting in Raleigh with Kate Benkert (ES, Raleigh). The meeting was hosted by the newly formed North Carolina Outer Continental Shelf Office. Attendees were asked to map areas and resources which would be sensitive to an emergency such as an oil spill; as crude oil is usually associated with natural gas deposits.

Throughout the year, RM Taylor, ARM's Schriver and Lanier and WB Noffsinger attended several meetings with officials from N.C. Department of Transportation (NCDOT), U.S. Army Corps of Engineers (COE) and numerous county, state, and federal politicians concerning plans to protect the quickly eroding southern approach of the Herbert C. Bonner Bridge at Oregon Inlet. The Service and the Department of Interior has long maintained that the spoil dredged from Oregon Inlet by the COE should be placed on the north point of the refuge, thus slowing the erosion of the north Point of the refuge and protecting the southern approach of the bridge. On March 13, a special use permit was issued to NCDOT to perform beach nourishment on the north end of the refuge to slow erosion as an interim protection measure of the Bonner Bridge. Delays plagued the dredging operation and very little spoil was deposited on the north end. After Governor Martin met with Secretary of Interior Lujan, the refuge

received a request from the NCDOT for a permit to build a 3,200 foot long groin and revetment on the north end of the refuge to stabilize the south approach of Bonner Bridge.



The first rocks of the groin were hard. RSL 10/89



Photograph from groin as it extends past end of Pea Island. RSL

After reviewing NCDOT's Environmental Assessment and Finding of No Significant Impact written by the COE, the refuge staff contacted several coastal engineering experts, Dr. Robert Dolan, University of Virginia; Dr. Douglas Inman Scripps Institute of Oceanography; Dr. Dave Aubrey, Woods Hole Oceanographic Institute; among others; and formulated a preferred option which consisted of a rubble revetment constructed around the contour of the north point of the refuge coupled with a beach nourishment program. In the meantime, despite much local support for the groin project, the refuge found NCDOT's original proposal of a terminal groin and revetment incompatible on the basis that a long jetty-like structure extending into the ocean could significantly increase erosion rates further south along the refuge beach threatened loggerhead sea turtle nesting areas and shorebird nesting and foraging habitat would be negatively impacted. NCDOT, in turn, rejected the Service's proposal of a revetment and beach nourishment. Following additional meeting with the Service's coastal experts and NCDOT officials a compromise was reached which allows NCDOT to construct the terminal groin and revetment, but NCDOT is required to nourish the refuge beach should any accelerated erosion occur. After NCDOT agreed to mitigate for any erosion losses which may occur due to the groin, a right-of-way permit was issued by the Service and the project was on its way.

#### 5. Research and Investigations

In April, Dr. David Webster, University of North Carolina at Wilmington (UNCW) collected small mammal specimens for the vertebrate collection of UNCW at Pea Island. Dr. Webster trapped two house mice (Mus musculus), one meadow vole (Microtus pennsylvanicus), and eight rice rats (Oryzomys palustris).

In November, Bill Nethery, a graduate student in Forestry from N.C. State University collected specimens of wax myrtle (Myrica cerifera). Mr. Nethery's thesis involves the cultivation of Myrica.

#### 6. Other

Once again the refuge participated in the Atlantic Flyway Canada Goose Study. This year, however, no banding or collaring of the geese was required, instead, efforts were made to observe and record as many neck collars as possible. RT Elmore was quite successful observing and recording 59 collars. All observation and collaring efforts are coordinated with Dr. Richard Malecki of Cornell University.

## E. ADMINISTRATION

### 1. Personnel

See Alligator River narrative.

### 2. Youth Programs

Pea Island's YCC program was a facet of the Alligator River program. One enrollee spent 5 weeks at Pea Island scraping and painting buildings, kiosks, flagpoles, etc.; cleaning the storage building; 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 2 of the Alligator River narrative.

### 4. Volunteer Programs

See Alligator River narrative.

### 5. Funding

See Alligator River narrative.

### 6. Safety

See Alligator River narrative.

### 7. Technical Assistance

ARM Lanier and WB Noffsinger answered numerous requests for information from the COE concerning Pea Island NWR. This information was used in the Environmental Assessment/Find of No Significant Impact which the COE drafted for NCDOT for the construction of the terminal groin and revetment.

ARM's Schriver, Lanier, WB Noffsinger, and RM Taylor participated in the development of the beach erosion monitoring plan for the terminal groin and revetment along with NCDOT representative Dr. John Fisher and USFWS representative Robert Dolan.

ARM Lanier and WB Noffsinger selected a site at Pea Island for the creation of a small pond near the terminal groin and revetment construction site. This pond will be created by NCDOT to mitigate wetland losses incurred while constructing the groin.

During the summer, refuge personnel assisted John Weske of the Smithsonian Institute in banding 1,094 brown pelicans just off the refuge. The tern colonies were not present this year. It is possible that they did not return to the spoil islands because of disturbance. These islands have become popular as camping sites and stop over areas for fishermen and boaters in Oregon Inlet.

#### 8. Other

On June 19, Governor Jim Martin and U.S. Senators John Chafee (RI), Jesse Helms (NC), and Terry Sanford (NC) visited Oregon Inlet. RD Pulliam, RM Taylor, and ARM Lanier participated in a tour of the inlet and a briefing on the Jetty Project. This visit was arranged by the Oregon Inlet Users Commission and other proponents of the Jetty Project to convince these policy makers that jetties at Oregon Inlet would solve the navigational problems associated with the inlet. This project has been stopped in Congress and by President Reagan 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 interest 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, three brackish water impoundments totalling 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.

#### 2. Wetlands

Refuge wetlands consist of irregularly flooded salt flats and impoundments. The sizes of the impoundments are as follows: North Pond 461 acres, New Field 266 acres, and South Pond 223 acres.

Pea Island received 90.84 inches of precipitation in 1989; up dramatically from the 24.40 inches which fell last year. This year's figure is the third highest ever recorded for Dare County. We also experienced our first white Christmas

since 1811. The majority of the rainfall occurred during the late summer and above normal amounts continued to fall until December. This increased rainfall aided in the production of submergent waterfowl foods in North Pond and New Field; however, it hindered the efforts to draw down South Pond.

The refuge staff attempted to draw South Pond down in spring and summer of 1989. This was the first time since 1984. It was hoped that the draw down would encourage production of emergent waterfowl foods. However, as previously mentioned, record amounts of rainfall hindered the efforts to draw down South Pond. The portions of the impoundment that did remain dry throughout the summer produced some beneficial emergent plant species such as water hyssop (Bacopa sp.) and wild millet (Echinocloa sp.), although much of the impoundment was periodically covered with 1/2-1 inch of water throughout the summer. While this water level allowed for the production of a good invertebrate crop, it hampered the production of emergent and submergent waterfowl foods. The portions of South Pond which maintained a depth of at least 5-6 inches of water continued to produce stands of widgeon grass (Ruppia maritima) and muskgrass (Chara sp.), see Table 1. While the attempted draw down did not produce the crop of emergent foods that was hoped for, it did provide excellent foraging and brooding habitat for most of the shorebirds. Black-necked stilts, yellowlegs, and variety of plovers and sandpipers could be found throughout the summer and fall. South Pond was also frequently visited by the rare curlew sandpiper.

Because of the record amounts of rainfall throughout the summer and fall, South Pond pump was not operated and this year. The pump station still suffers from erosional problems associated with the bulkheading. After a site visit last year and numerous phone calls, Engineering finally submitted plans to repair the station. As of this date the materials have been ordered, but due to delays from Engineering the job has yet to be contracted out.

North Pond has been managed as a permanent pool to favor the growth of submergent vegetation. Like South Pond, due to high levels of rainfall throughout the year North Pond pump was not operated in 1989. Water control structure gates had to be opened to allow water to flow out because water levels were exceeding full pool. Strong northeast winds coupled with high water levels caused increased erosion on North Pond's dikes and service road during the late fall and early winter. Submergent waterfowl foods responded favorable to the high water levels. Species such as muskgrass and widgeon grass flourished and the percentage of bare areas located along the vegetation transect decreased to just 2%

(see Table 1). Waterfowl have fed extensively on the submergents produced in North Pond. Swans and a wide variety of dabbling ducks use North Pond throughout the fall and winter.

1989 was a good year for New Field Impoundment. Thanks to Mattamuskeet NWR supplying a diesel engine, pumping capabilities were reinstated for the first time since Hurricane Gloria destroyed New Field's pumping station and dike in 1985. Again, pumping was not necessary due to high levels of rainfall experienced throughout the year. In fact, as with North Pond, water levels had to be lowered throughout the year to stay near target levels.

Widgeon grass and muskgrasses continued to respond favorably to the increased water levels. Widgeon grass occurrence on the vegetation transect rose from 3% in 1988, its first reappearance since Hurricane Gloria, to 39.6% this year. The percentage of bare ground also dropped from 18.5% in 1988 to just 9.1% this year (see Table 1). Shrub species such as wax myrtle continued to die due to high water levels.

Waterfowl used New Field extensively in '89. They responded favorably to the good production submergent and emergent foods. Shovelers, pintail, gadwall, and snow geese fed heavily on emergent growth found along the impoundment fringe adjacent to the planted field. Diving ducks fed on new widgeon grass beds in the deeper portions of the impoundment.

The tidal area north of North Pond known as the Salt Flats, continues to remain relatively unchanged. Salt marsh cordgrass (Spartina alterniflora) continues to decline and glasswort (Salicornia spp.) still predominates. Snow geese frequent Salt Flats because of the large amounts of glasswort present. During the '89 vegetation transect a few small pockets of spike rush (Eleocharis spp.) were found. This beneficial waterfowl food could possibly be enhanced by plowing small ridges in areas where it is found to hold the freshwater run-off, thus promoting its growth.

Table 1  
 Summary of Vegetation Transect Line Sampling  
 Pea Island NWR 1989

Line	Feet	Sample	Sampling	%	%	Plants
Salt Falts	Sampled	Steps	Points	Vegetated	Bare	per
						Point
						Sample
North Pond	1200	40	200	98	2.0	1.07
South Pond	1500	50	250	85.1	14.9	1.08
New Field	1980	66	330	90.0	9.1	1.11
Salt Flats	1500	50	250	65.3	34.7	0.78
Total	6180	206	1030			
Average	1545	51.5	257.5	84.8	15.2	1.17

Combined Food Values:

Good - 45.7% \*(15.7%)  
 Fair - 29.7% \*(59.6%)  
 Non - 24.6% \*(24.7%)

Major Plants Combined:

Widgeon grass - 46.7% \*(7.1%)  
 Muskgrasses - 31.7% \*(32.3%)  
 Glasswort - 15.8% \*(15.8%)  
 Seaoxeye - 5.7% \*(1.8%)

Major Plants:

North Pond - Widgeon grass 86% \*(9.2%)  
 Muskgrasses 42% \*(77.4%)  
 South Pond - Widgeon grass 55.4% \*(14%)  
 Muskgrasses 25% \*(67%)  
 New Field - Widgeon grass 39.6% \*(3.6%)  
 Saltmeadow cordgrass 29% \*(28.3%)  
 Salt Flats - Glasswort 32.79% \*(44.6%)  
 Seaoxeye 11.8% \*(5.6%)

\* 1988 figures in parenthesis.

The two small ponds created by NCDOT as mitigation for wetlands filled due to highway relocation were monitored for vegetation production and waterfowl use this year. As expected, vegetation in and around both ponds was sparse. The smallest pond did produce some small stands of Bacopa spp., Scirpus spp. and Cyperus spp. The larger pond also produced a few small stands of Bacopa spp. and Cyperus spp. Waterfowl use on the ponds was moderate. The birds seemed to use the ponds more when winds made the adjacent sound waters rough. Emergent vegetation growth will probably increase as the ponds silt in and achieve a more gradual water depth slope.

#### 4. Croplands

The farming regimen for New Field was changed once again in '89. Cooperative farmer Ernie Wynne plowed and planted approximately 25 acres of wheat, oats, and rye. A third of the field was planted with one of these grains. Soil sample test results from N.C. State University indicated that due to the poor cation exchange in New Fields soil the fertilizer that was applied by a spreader was not taken up by the plant. At cooperative farmer Wynne's suggestion an aerial foiliant fertilizer was used after the plants sprouted. The fertilizer application was late, however, and the growth was marginal. The grains were also shaded out by quick growing native species. This may be avoided in the future by initially plowing the field with a larger, deeper cutting plow.

Despite the marginal growth of the grains, they were fed upon heavily by snow geese and Canada geese. Better results can be obtained in the future by more initial plowing and applying the fertilizer quickly after the plants have sprouted.

A small 10 acre field was created on the southern portion of the refuge. This field was planted with wheat and oats. An aerial foiliant fertilizer was used here also. Growth on this field was better than that of New Field, especially in the wetter portions of the field. Waterfowl use, however, was more infrequent. Canada geese, snow geese, and black ducks used this field primarily when sound waters were rough or frozen.

#### 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 relocated 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. Erosional 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 would monitor the effects of NCDOT's terminal groin and revetment on the north end of the refuge. It would also trigger any necessary beach nourishment (see Section D. 4).

#### 9. Fire Management

Two controlled burns were conducted in October at Pea Island this year. Both burns were attempted around the South Pond area with mixed results. Shrub species in the immediate area of South Pond did not burn very well; however, the Juncus spp. - Spartina spp. marsh south of the impoundment burned well. Both areas "greened up" nicely after each burn. These were the first controlled burns attempted at Pea Island in 5 years.

One wildfire occurred at Pea Island in '89 on July 18. The fire started on the road side in the Salt Flats area. Head winds quickly spread the fire throughout the Salt Flats. Before it was extinguished by RT Elmore and ARM Lanier, approximately 100 acres had burned. Although the fire was not planned, its effects were beneficial, burning undesirable shrub species such as was myrtle and yaupon. The fire named "Sufer Girl" by RT Elmore was believed to have been started by arson.



NPS and FWS cooperative effort squelched the "Surfer Girl" fire. We always wear the white hats.

AJE

#### 10. Pest Control

Although the public trapping program at Pea Island was disbanded due to the lack of interest, the red wolf project trapped nutria and muskrat in New Field impoundment to supply prey items for the wolves. 51 nutria and one muskrat were trapped. Nutria and muskrat are capable of extensive damage to refuge impoundment dikes due to their burrowing activities.

Pea Island is 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. Nine cats were trapped this year.

### 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.



Drawdowns encourage water birds.

DMR 8/89

## 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. This year the refuge staff reported a record number of eagle sightings. Six adults and eight immatures were spotted throughout the year. Although some of these sightings most likely consisted of the same birds, the number of eagles using the refuge was definitely up. On several occasions an immature eagle bearing an orange wing patch with the number 64 on it was observed on the refuge and throughout the local area. This particular eagle even survived getting hit by a pickup truck on Cape Hatteras National Seashore as it was attempting to fly across the road towards some scrap fish which park rangers had placed for it. The bird appeared unfazed and later flew south towards Ocracoke.

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 22 peregrines from their banding station in early fall (see G.6.) BT Elmore and ARM Lanier witnessed a peregrine feeding on an adult oystercatcher which it had taken off its nest on the New Field dike road. Three other peregrine sightings were made by the refuge staff through the year.

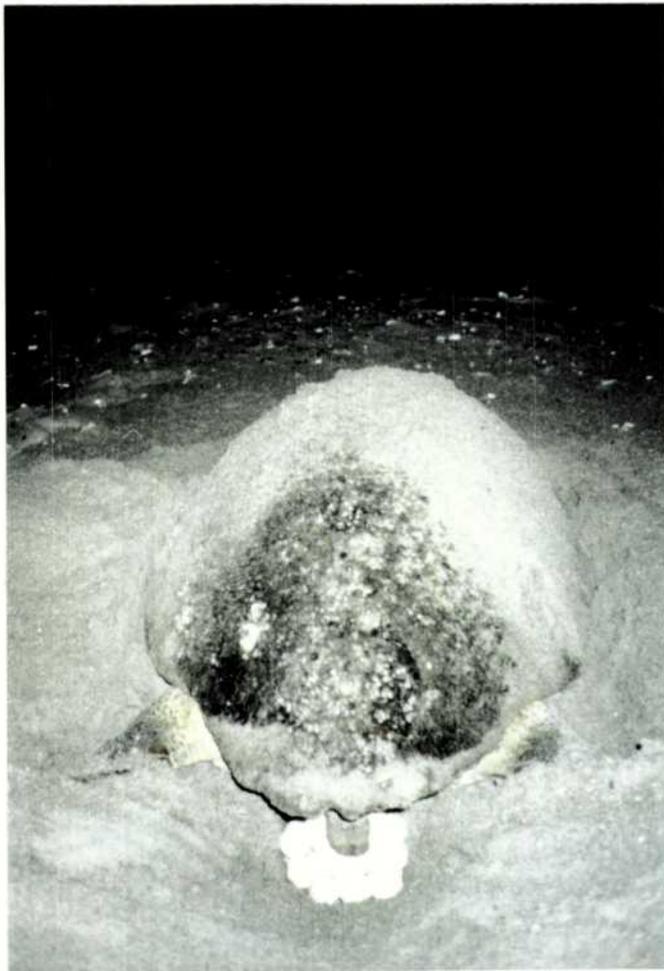
Piping Plover (Threatened) - No piping plovers were sighted on the refuge shorebird surveys this year; however, several sightings were made just across Oregon Inlet to the north on Cape Hatteras National Seashore lands.

Atlantic Loggerhead Sea Turtle (Threatened) - In comparison to previous seasons, the survival percentages for sea turtles were very low. Factors affecting nesting may have been record breaking rainfall, overwash, and the erosion of beach and dunes. If the erosion trend continues, it is safe to assume that conditions for nesting loggerheads on Pea Island will only get worse.

As if the rain was not enough, the great Atlantic Ocean rolled "out of bounds" numerous times during the turtle season. Only twice did it actually wash completely over the dunes but it reached the dune base on many occasions often depositing sand on top of existing turtle nests. For three days in June we had extremely elevated tides, possible spring tide. Severe or major overwash was recorded for 11 days beginning June 26 thru August 19. Three hurricanes also sent ocean water crashing into the dunes. Although hurricanes Dean and Gabriel passed near the Bermuda Triangle, their influence was felt as high tides covered our beaches on August 6-7, and September 7-9. Hurricane Hugo caused major overwash and erosion on September 20-21. Rainfall, in combination with frequent tidal overwash resulted in the saturation of beach and dune areas. It is possible that the combined effects of these two natural occurrences, influenced the hatching decrease and inhibited development of the embryos of the turtle eggs.

Erosion was another factor that influenced the hatching decrease on Pea Island. The man-made dune line is constantly being eroded away by the ocean. Storm surge pounds against the dune and removes large quantities of sand. Since no overwash occurs, the sand is lost to the ocean or shifted to form a new beach profile. Although the beach profile is constantly changing, most stretches

of beach are easily accessible by turtles. However, a major portion of our beach is too narrow at high water to allow successful nesting. The slightest tide above normal, washes over the nests. Most beaches are backed by vertical eroded dunes impossible for a turtle to climb.



Loggerhead turtle laying eggs.

KCD 7/89

Loggerheads used Pea Island beach even though the area is vulnerable to ocean overwash and erosion. A daily beach survey was performed from Memorial Day until Labor Day to locate nests. Trained refuge volunteers conducted most of the surveys. Any nest found in an area subject to overwash and erosion was relocated and marked by experienced staff members. Once the nests had incubated for approximately 80 days, they were checked. If hatchlings had already escaped the self-releasing nests, the nest was excavated.



Each operator of the ATC is required to pass a qualifying course conducted by Safety Officer Elmore.

BWS 5/89

This year 15 nests were found on Pea Island beaches. The first nest was discovered June 6, and the last on July 30. Eight of these nests were relocated. We were unable to collect hatch information from five of these nests. Of the 10 nests that we did excavate, only four nests hatched successfully.

We have no idea if this year was just a freak high water, high erosion year or if the trend will continue to next year. If it continues, we will have to develop a new management plan for turtles on Pea Island. Hopefully the beach conditions will improve, but it is more likely to deteriorate if we consider the possibility of negative effects caused by the terminal groin/revetment and beach nourishment project currently under construction on the north end of the refuge.

Four sea turtle strandings were recorded on Pea Island beaches. All sea turtle strandings were coordinated through the North Carolina Sea Turtle Stranding and Salvage Network.

On July 3, Debbie Crouse (ES, Raleigh) visited the refuge to gather information about sea turtle nesting and shoreline erosion to be considered in evaluating the groin/jetty proposal. ARM Lanier and BT Elmore assisted in taking measurements.

During August, ARM Lanier and BT Elmore compiled a map with locations for all turtle nests for the past three years.

On December 19, a cold, stunned loggerhead turtle was picked up by refuge personnel and was taken to the N.C. Aquarium for treatment.

On December 22, NPS employees found a live Kemps Ridley turtle walking on their beach. It lived approximately 2 hours and was delivered to USFWS after its death. This was an extremely unusual turtle for our area.

b. State Listed Endangered and/or Threatened Species

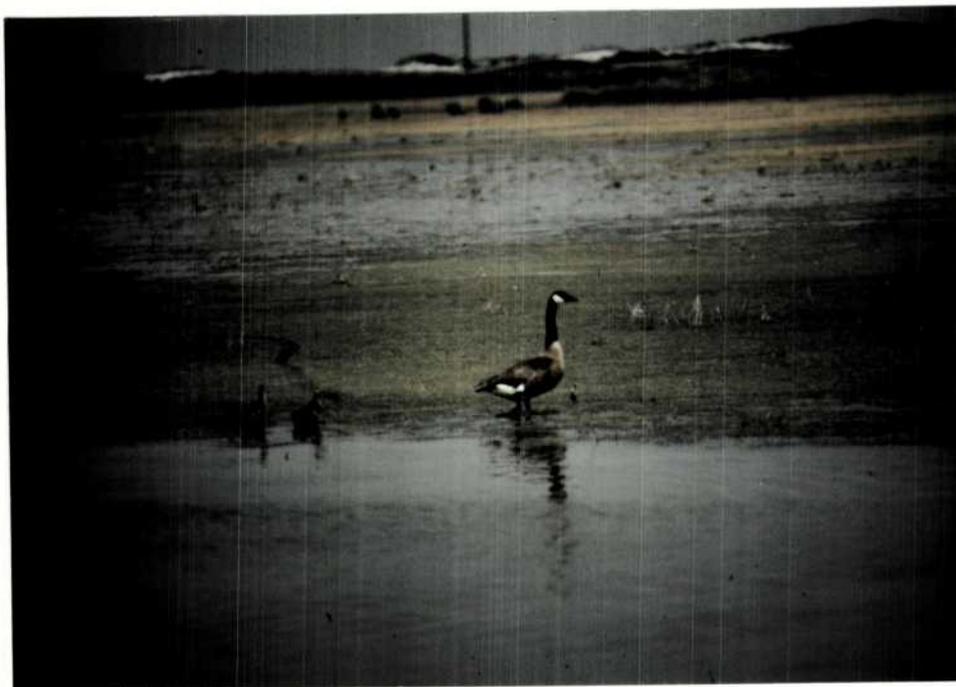
Of the other species that occur on the refuge, the State of North Carolina lists seven as threatened and 26 as species of special concern. Although the refuge is not being managed for all these species, they do benefit from present practices. The species specifically managed for are:

Osprey (Special Concern) - Again, two pairs of ospreys used the platforms constructed in North Pond for nesting. The pair at the south platform produced three young and the pair at the north platform produced two. No nesting activity was observed at the New Inlet platform. One pair displayed nesting activity on the Navy microwave tower, but the nest was not completed and no eggs were laid. Next year more platforms will probably be constructed and installed.

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 refuge beach in the past several years until this year. This year one least tern nest was found in the low dune area near the south refuge boundary. This is the first least tern nest documented on the refuge in several years. The dredge spoil islands just north of the refuge in Oregon Inlet have proved 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 '88-'89 season was up nearly one million use days from last years record low. This increase brought the refuge total use days up to less than half a million of the past 10-year average. The combined peak of just under 20,000 waterfowl was highest of the past three years, but was also the third lowest in the past 21 years.



Resident Canada geese have finally hit the refuge. Five broods were recorded during 1989. DMR 8/89

Swan use more than doubled from last year's 10-year low and was near the past 10-year average once again. This year's peak population rose nearly 3,000 swans and was 300 birds above last year's average.

The Canada goose use rebounded slightly, up 24,000 use days, from last year's 23-year refuge low. The peak was 600 Canada's, and was the highest peak on the refuge in 3 years. However, it was the third lowest peak for the refuge in at least the past 24 years.

The greater snow goose picture was also brighter than last year's. Snow goose use on Pea Island was more than double over last year's 23-year record low. However, this is still considerably under the past 10 year average for the area. The peak of 4,000 was the highest in four years, but was still 2,200 under the previous 10-year average.

Duck use at Pea Island once again continued to improve increasing over three-quarters, 680,000 use days, from last year to the highest in eight years. The peak, however, increased only slightly and remained the third lowest duck peak on the refuge in at least the past 24 years.

Coot use increased only slightly over 1987-88's refuge record low and was second lowest of the past 24 years. The coot peak of 1,000 was also only a little above last year's refuge record low coot peak of 900.

An abundant crop of submergent waterfowl foods coupled with an extremely dry summer and early fall which caused a dry-up of several natural ponds around and adjacent to the refuge helped in bringing up refuge waterfowl populations. The repair of the New Field dike break which allowed rainfall to be captured in the impoundment also contributed to the increase in waterfowl use. See Table 2 for comparisons.

Table 2

Composition of Wintering Waterfowl on Pea Island NWR  
1988-89

<u>Group</u>	<u>Percent</u>	<u>Number of Use Days</u>	<u>% Diff. from 1987-88</u>	<u>Peak Number</u>
Tundra Swans	7.2	143,185	+123.3	2,700
Canada Geese	3.2	65,009	+55.0	1,700
Snow (& Blue) Geese	11.7	234,087	+124.8	4,000
Ducks	75.7	1,516,822	+77.3	14,000
Coots	2.2	43,239	+4.7	1,000
All Waterfowl	100.0	2,002,042	+81.0	19,900

Brood counts were conducted on Pea Island again this year. A total of six counts were made, two of them were aerial counts. A total of 172 broods were counted; again the majority were black duck broods. No mallard broods were seen this year, however, ten Canada goose broods were seen on the refuge for the first time in many years. It is believed, however, that these geese were probably released by the N.C. Wildlife Resources Commission in order to establish a resident flock in North Carolina. It was estimated that Pea Island produced 336 ducks which reached flight stage. See Table 3 for details.

Table 3

## Pea Island NWR Brood Count Totals for 1989

## # of Broods Seen

<u>Species</u>	<u>South Pond</u>	<u>New Field</u>	<u>North Pond</u>	<u>Sound Edge</u>	<u>Species Total</u>	<u>Species % of Total</u>
Black Duck	17	34	39	7	113	66%
Gadwall	4	6	17	0	48	27%
Canada Goose	1	8	1	0	10	6%
Common Moorhen	1	0	0	0	1	1%
<u>Area Total</u>	<u>23</u>	<u>48</u>	<u>57</u>	<u>7</u>		
Area % of Total	13%	28%	33%	4%		

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. Monthly censuses were resumed this year for the first time in several years. A peak of 325 herons, egrets, and other associated water birds were counted in July. 98 snowy egrets were counted making them the most numerous species of marsh and water birds.

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.

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 slightly over 1,000 active nests in the pelican colony were observed. 1,093 juvenile pelicans and one adult were banded.



White ibis (Eudocimus albus).

DMR 8/89

5. Shorebirds, Gulls, Terns, and Allied Species

Shorebird surveys were conducted from April until September; the peak population occurred in late May when 11,084 gulls, terns, and shorebirds were sighted. This peak is a dramatic increase from last year's peak of 3,626 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. A small tern colony was found on the refuge in New Field impoundment, and as previously mentioned one least tern nest was found on the south refuge beach. See Table 4 for details of tern, gulls, and allied species production.

Table 4

Pea Island NWR  
Shorebirds, Gulls, Terns, and Allied Species Production

# of Nests Seen

<u>Species</u>	<u>New Field</u>	<u>South Pond</u>	<u>Refuge South Beach</u>
Oystercatcher	2	2	1
Black-necked Stilts		4	
Gull-billed Tern	16		
Common Tern	2		
Least Tern			1
Total	20	6	2



Black-necked stilts (Himantopus mexicanus). 8/89



Black skimmer (Rynchops nigra).

DMR 8/89

6. Raptors

The Carolina Raptor Center (CRC) again requested permission to band raptors on Pea Island this year. After thoughtful consideration a special use permit was issued to them to do so. Because the time which they spent in their blind was limited they only managed to band one merlin and one sharp-shinned hawk.

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.

Ring-necked pheasant are seen in the salt marsh, brushland, the browse area in New Field, and in the dunes. Sightings of pheasants have dropped significantly in recent years. No pheasants were seen on the Christmas Bird Count.

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.

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. See Section F.10. for details.

16. Marking and Banding

For the first time in years no waterfowl banding was attempted at Pea Island. The decision to stop post season duck banding on Region 4 refuges greatly disappointed the Pea Island staff which over the years put forth a super effort in meeting the assigned quotas.

H. PUBLIC USE

1. General

Based on the National Park Service vehicle counter at Bodie Island, estimated visitation to Pea Island NWR during 1989 was 1,782,387. The Host/Hostess program continued to provide visitor information at the visitor contact station from April-October.

YCC and volunteer provided manpower for a revamping of the sign program, minor trail maintenance, and general clean-up in visitor areas.

BT Elmore repainted the entrance signs on Pea Island. These signs have needed replacing for a number of years; however, the long-ago-promised "new sign manual" has yet to be received.

On July 10, volunteers installed the "North American Waterfowl Management Plan" interpretive panel near the trail head for the North Pond Trail.



Volunteers and YCCers worked together to install a new sign and sign base at Pea Island. BWS 6/89

Public Lands Day was celebrated at Pea Island by a North Pond Trail Face-Lift. Approximately 12 volunteers worked clearing viewing areas, sweeping the sidewalk, trimming vegetation, mowing grass, and hauling limbs.

The Statewide "Big Sweep" scheduled for September 23 was postponed one week due to the approach of Hurricane Hugo. ORP Strawser served as the Zone Coordinator for the Pea Island beach. Over 85 large bags of trash were collected, as well as a truck load of "unbaggage" stuff by approximately 50 people.

On February 16, a film crew for the Pamlico Esturine Study filmed a public service announcement. On April 28, Metromedia Communications, which produces "Outer Banks Panorama", filmed on Pea Island.



Beach Sweep-1989 - "The Big Sweep".

BWS 9/89

Several birders from the Raleigh/Durham/Chapel Hill area expressed dissatisfaction with the closure of the South Pond area. Rumors (confirmed) that curlew sandpipers were in the pond brought "life-listers" in droves. LEO Panz warned several trespassers that an NOV would be issued if they trespassed again. We received requests for SUP's, but we denied these requests. Finally we arranged for special bird walks to be scheduled when requested in advance by 6 or more people. These walks were led by volunteers and seemed to be the solution to the problem.

A close look was taken at the Oregon Inlet Coast Guard Station for its potential use by the refuge. Because of the historic designation of the old part of the station, the refuge continues in its "lack of interest" in accepting that structure. Our interest continues in the newer part of the facility, the out buildings, and the land.

Public demand for beach access increases yearly and the amount of undeveloped beach frontage property decreases yearly. 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 will be aimed at improving the quality of the visit.

Groin construction and bridge stabilization closed much of the north end of the refuge to public use for a good portion of 1989.

## 2. Outdoor Classrooms - Students

The emphasis on non-staff conducted activities continued in 1989. 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 to for loan from the VCS.

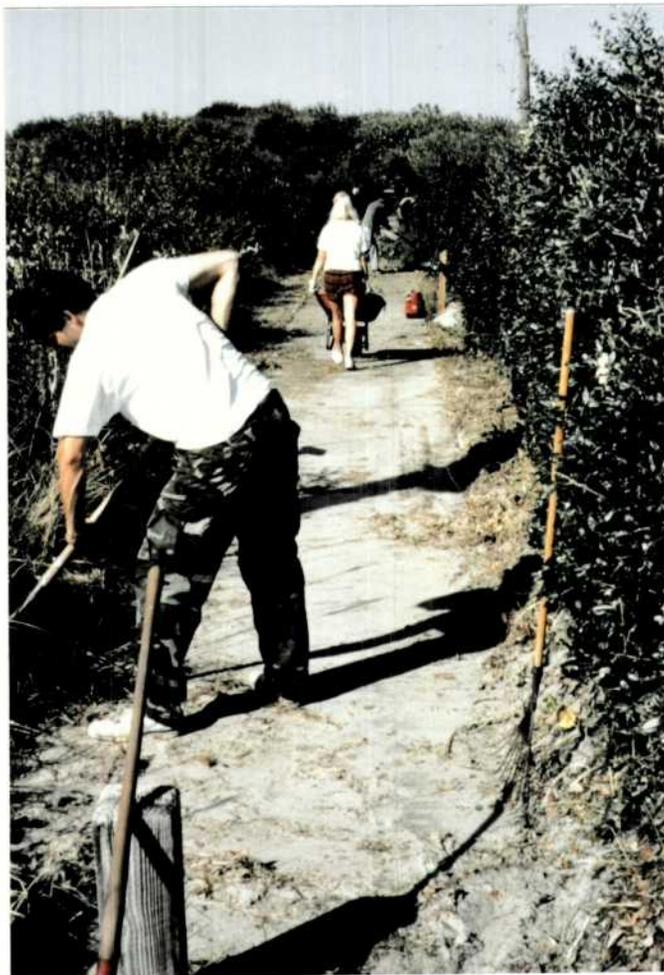
Since no registration is required for the use of outdoor classrooms, we have no record of the actual number of such uses that occurred. The N.C. Aquarium utilized Pea Island marshes for a number of conducted slat marsh studies.

## 4. Interpretive Foot Trails

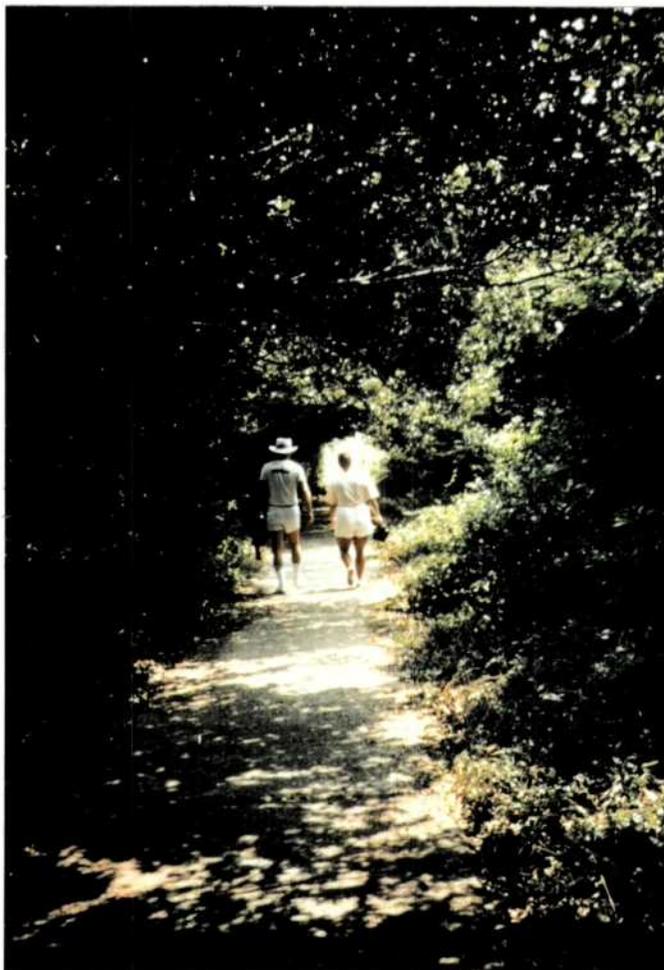
North Pond Trail, the only trail on Pea Island received an additional five interpretive plaques during 1989, bringing the total to eleven.

In May, the Coastal Wildlife Refuge Society (CWRS) assumed the responsibility for maintenance on the North Pond Trail. As interest in the trail grew, the CWRS began planning a total "face lift" for the trail. These plans (see Figure 1) included the complete renovation and upgrade of the existing structure on the trail and the design and construction of three additional structures. All structures (with the exception of the upper levels of the tower) will be fully handicap accessible. Three of the structures will feature permanently mounted, weather and vandal-proof binocular spotting scopes. The total cost for the project is estimated to be \$30,00-40,000.

Approximately 147,069 visitors (294,138 AH) utilized the interpretive foot trail (self guided). In addition, 1,283 (2,566 AH) people participation in conducted trail walks.

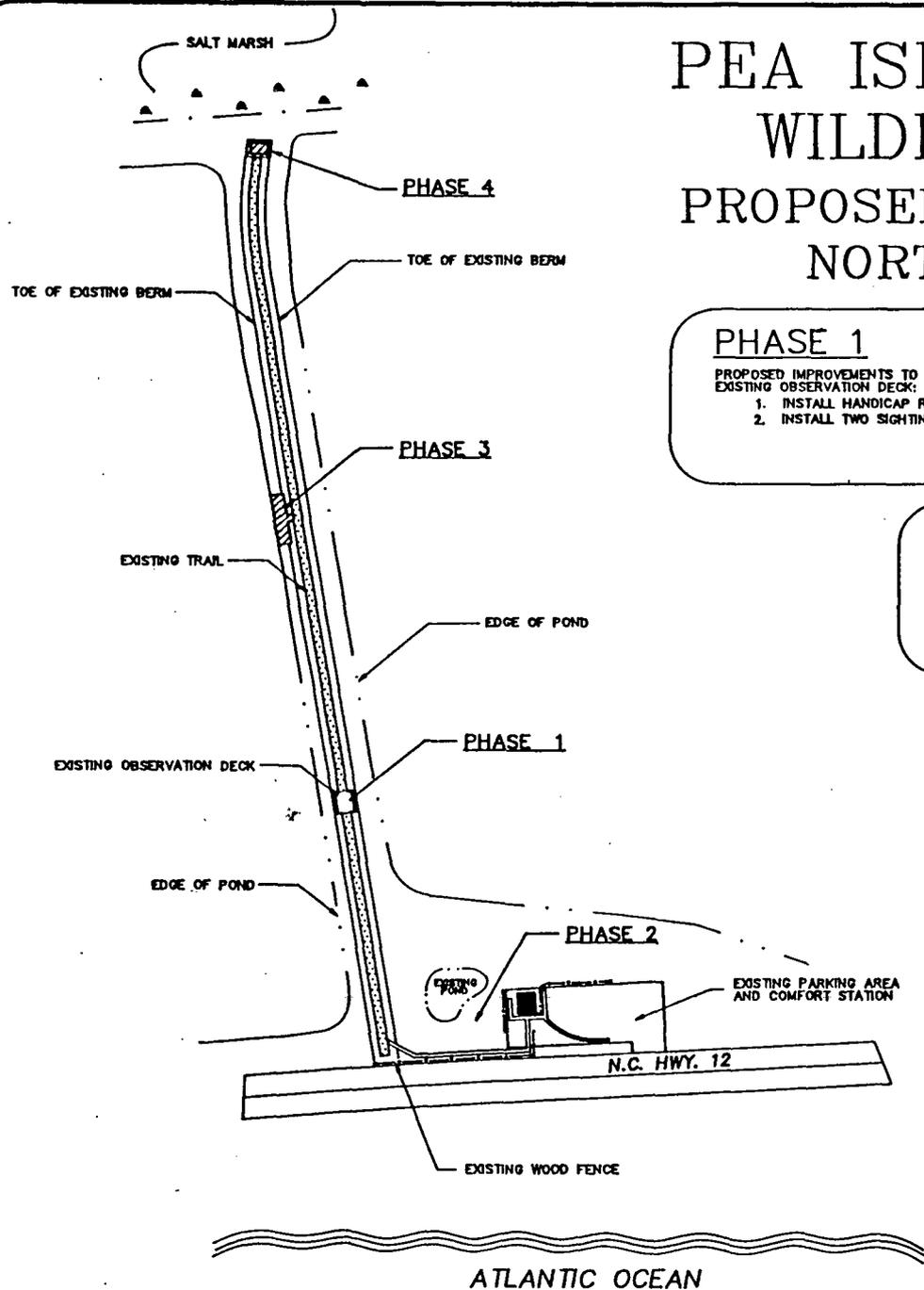


Volunteers planned several "trail parties" during  
the year. BWS 4/89



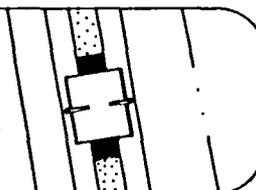
Some parts of North Pond Trail just don't need a  
face lift! BWS 8/89

# PEA ISLAND NATIONAL WILDLIFE REFUGE PROPOSED IMPROVEMENTS TO NORTH POND TRAIL



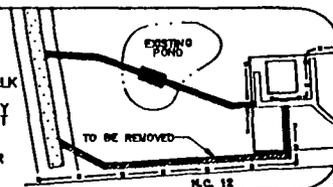
## PHASE 1

- PROPOSED IMPROVEMENTS TO EXISTING OBSERVATION DECK:
1. INSTALL HANDICAP RAMP.
  2. INSTALL TWO SIGHTING SCOPES.



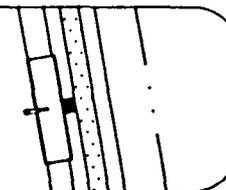
## PHASE 2

- 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.



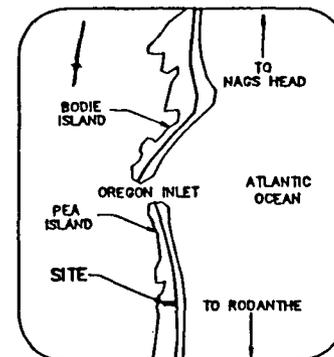
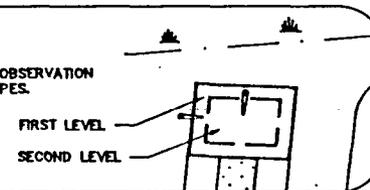
## PHASE 3

- 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.



6. Interpretive Exhibits/Demonstrations

The two interpretive kiosks and the exhibits displayed in the VCS have been popular with refuge visitors. A possible solution to our need for a place to greet the public and provide visitor information may be the newer part of the abandoned Coast Guard Station.

During 1989, 80,202 visits (20,050 AH) and 5,200 visits (1,300 AH) were spent at the kiosk and VCS, respectively.

7. Other Interpretive Programs

Summer interpretive programs were conducted at Pea Island by the volunteer program.



Volunteer Ken Dyar's "Children's Wildlife Discovery" program was always a big attraction.

BWS 6/89

Four bird walks and one Children's Wildlife Discovery Program were scheduled each week during June, July, and August. Participation during the 1989 summer follows: Bird Walk - 55 programs and 862 participants; Children's Wildlife Discovery - 22 programs and 314 participants. Ten fall bird walks were conducted on Saturdays during October, November, and December for a total of 100 participants.

Special programs were conducted on the refuge as follows:

January 6, volunteers conducted a Bird Walk for 40 students from Hertford High School and on March 8 for ten Advanced Biology students from Wilson Christian Academy.

May 24, ORP Strawser provided a brief orientation session for the seasonal NPS employees.

June 8, ORP Strawser and BT Elmore conducted beach and pond programs for 60 kindergardeners from Manteo Elementary School.

June 29, ARM Lanier conducted a tour of the refuge for ECB Florschutz and the group participating in the WHM Workshop.

July 24, volunteers conducted a marsh program for thirty-seven 4-H members from Chesapeake, VA.

September 17, volunteers conducted a special bird walk into South Pond for approximately 16 people.

October 19-26, two special bird walks were conducted in the South Pond area for a total of 24 people.

November 4, BT Elmore lead a tour of the refuge for a class of 17 wildlife management students from Warren Wilson College.

November 13, BT Elmore gave a wildlife management talk for 10 students from the Christopher Newport College.

December 3, volunteers conducted a bird walk for the 19 members of the FENC Club from Charlottesville, VA.

#### 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 1,124,540 AH (28,135 visits) were spent fishing.

#### 11. Wildlife Observation

Pea Island continues to be a "birders paradise". Though numbers of some species, waterfowl in particular have declined in recent years, the rich diversity continues to draw crowds to 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 boundary sign posts for resting and hunting. As estimated 1,164,314 visitors spent time in association with vehicular wildlife observation.



Birding is the most popular form of non-consumptive recreation on the refuge. BWS 8/89

Refuge trails and other access points are located to make wildlife observation (on foot) easy and enjoyable. Refuge visitors spent approximately 519,727 AH (293,830 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 24,748 AH (6,187 visits) were spent with photography.

#### 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 important to gulls, terns, shorebirds, and allied bird species. It is evident 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 1,156,883 AH (388,528 visits) were spent in non-wildlife oriented recreation.



Biking gets more and more popular every year. BWS/5/89

## 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 1989 helped the situation immensely; however, there is still an obvious need for more LE presence on the refuge. 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.

The following violations occurred:

Vehicular trespass	4
General trespass	3
Driving excess speed	3
Careless & reckless driving	1
Fishing in area closed to fishing	1
Operating vehicle with expired inspection	1
Operating vehicle with expired tags	1
Dog off lease	1
Possession of controlled substance	3
No duck stamp (Bodie Island)	1

Noteworthy incidents included:

ARM Lanier went to court on February 2, for three men who were found fishing in a closed area on the north end of the refuge back in November, 1988. Though they had written numerous letters containing photographs and proposed legal action, they failed to appear in court and were found guilty.

On February 9, ARM Lanier stopped at a convenience store in Rodanthe. As he left the vehicle, he noticed feathers in the floor board of the truck parked behind him.

Investigation revealed a pintail, two blue-winged teal, and a merganser. The owner of the truck (also the store owner) denied any knowledge of the birds. The case was turned over to the N.C. Wildlife Office Earl Brinkley. The owner was charged with possession of freshly killed waterfowl out of season.

May 20, a seventeen year old boy was lost and presume drowned at Oregon Inlet (Bodie Island side). Refuge staff patrolled the refuge beach 4 times per day to look for the body. To our knowledge the body was not recovered.

September 8, a loggerhead sea turtle skull was seized from a house in Avon by the Dare County Sherriff's Department while performing a warranted search. The skull, with appropriate background information, was signed over to the refuge. ORP

Strawser questioned the man from whom the skull wa seized. He admitted having "found the skull on the beach 6 1/2 years ago." Prosecution of the violation is pending.

RLEO Panz and BT Beasley attended a drug training workshop sponsored by a local police department on May 8.

18. Cooperating Associations

See Section H.18. of Alligator River NWR narrative.

I. EQUIPMENT AND FACILITIES

1. New Construction

Construction began in November on NCDOT's terminal groin and revetment at the north end of Pea Island. As previously mentioned in Section D.4. this project was undertaken to protect the Herbert C. Bonner Bridge from severe erosion. See Section D.4. for details.

2. Rehabilitation

New Field pump station was completed this year. The pump station at North Pond still lacks a cover shed and so far no repairs have been attempted on the South Pond pump station which suffers from an eroding foundation. It is hoped by next year efforts will be made to correct these problems.

3. Major Maintenance

No major maintenance projects were attempted on the Pea Island headquarters this year, although buildings and

storage facilities are in dire need of repair. Doors, eaves, and windows are all in disrepair.

The storm damaged South Pond pump is still unrepaired. The Request for Engineering Services has apparently been lost in EN since it was submitted in 1987. In August 1989, after an on site visit by EN we finally managed to get a list of needed materials and a acquisition request in.

Another acquisition for labor to put the bulkheading in was stalled again this year as no one could locate the RES in engineering. We have made so many copies of that RES that we may wear it out before the job is completed.

The New Field pump faired much better with the pump in operation by August.

#### 4. Equipment Utilization and Replacement

Problems associated with equipment stored and/or used in a coastal environment plague Pea Island. Limited covered storage at Pea Island prompted transfer of equipment to the mainland for storage at Alligator River. Our hauling capabilities were greatly enhanced when Alligator River acquired a new truck tractor and lowboy. Now equipment required for jobs at Pea Island is brought over on an as needed basis.

#### 5. Communications Systems

A request by the U.S. Navy to relocate their navigation tower to the location occupied by our low band antenna and tower was granted. The Navy contractor relocated enough of the tower sections beside the office to facilitate our VHF antenna. We expect to be completely converted from HF to VHF in the near future.

#### 7. Energy Conservation

Car pooling of travel and trips to Pea Island and the other units of Alligator River NWR is practiced whenever possible.

### 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 special use and right-of-way permit was issued to NCDOT for the construction of a terminal groin and revetment on

the north end of Pea Island in order to protect the Herbert C. Bonner Bridge from severe erosion. NCDOT also agreed to help monitor the refuge beach for any erosional changes which may occur

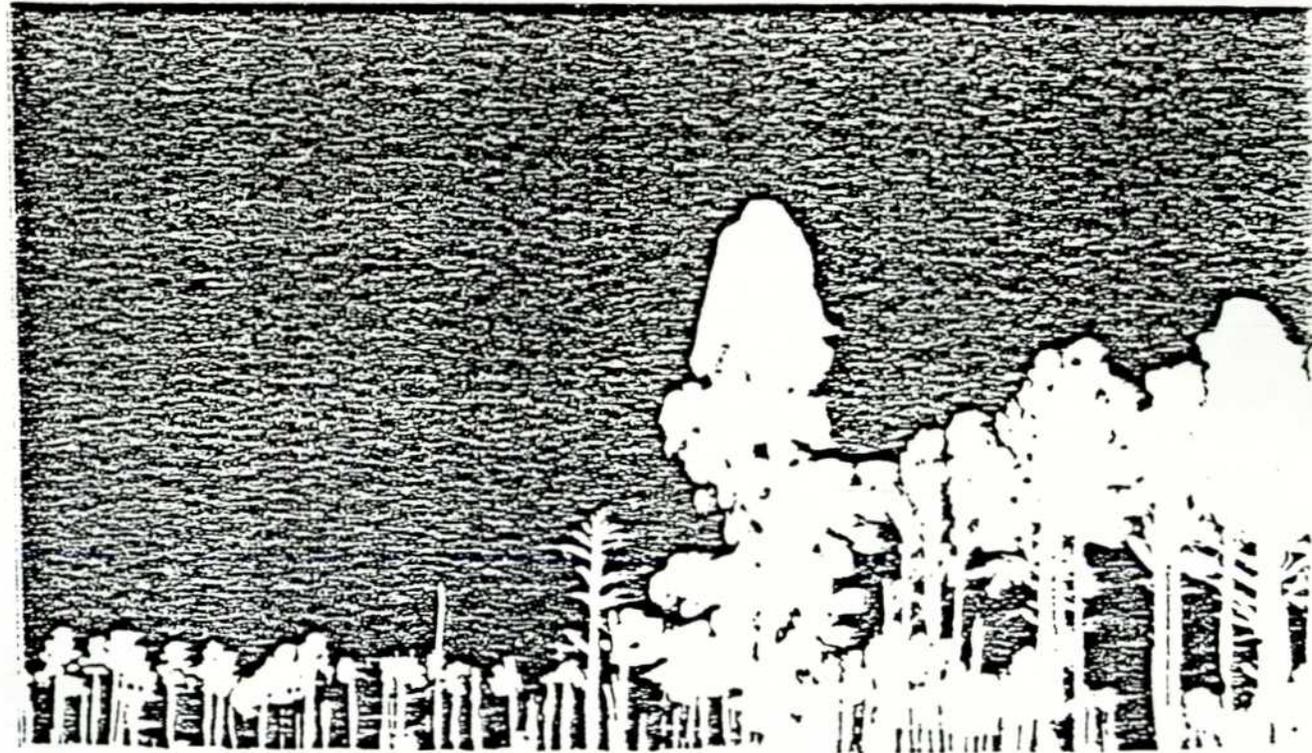
A SUP was issued to Dr. James Parnell to set a trap line on the refuge to sample small mammals of the refuge marsh.

A SUP was also issued to Ms. Dee Sarver to conduct a survey of marsh and wading bird rookery sites on the refuge.

4. Credits

The Pea Island report was prepared by A. Schriver, J. Taylor, B. Noffsinger, S. Lanier, A. Elmore, and B. Strawser; edited by J. Taylor and A. Schriver; typed and compiled by B. Midgett.

# ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE



Department of the Interior  
U.S. Fish and Wildlife Service

ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE  
GENERAL INFORMATION

Alligator River National Wildlife Refuge was established in 1984 and comprises approximately 141,200 acres on the mainland portion of coastal North Carolina. Located in Dare, Tyrrell, and Hyde Counties, Alligator River was set aside to protect unique pocosin habitat and to manage, maintain, and preserve the wildlife associated with this habitat. In addition to the pocosin habitat, Alligator River has fresh and brackish water marshes, hardwood/pine forests, hardwood/cypress hardwood swamps, and white cedar swamps.

Alligator River's wildlife populations are as diverse as its habitats. Though waterfowl have not been numerous on the refuge historically, current management of the newly acquired farmlands is expected to increase waterfowl use dramatically. In the past, wood ducks have lived and reproduced on the refuge. Other waterfowl had been seen on the refuge occasionally, and it was not uncommon for large rafts of ducks, geese, and swans to rest and feed in the sound waters surrounding the refuge.

Other birds, ranging from many species of warblers to raptors and wading birds, are also present. Alligator River lies in the Atlantic Flyway, a major migration route. Refuge lands and waters provide valuable resting and feeding areas for these migrating birds.

The refuge also provides a home for mammals, reptiles, and amphibians. Alligator River contains what is believed to be one of the largest and last remaining concentrations of black bear found along the mid-Atlantic coast. Other mammals include white-tailed deer, mink, otter, bobcat, gray and red fox, muskrat, and raccoon.

Reptiles are numerous on the refuge around permanent or semi-permanent water. Amphibians, of course, must have a moist environment to survive. Some of the more common species in these classes include brown, banded, and plain-bellied water snakes; common snapping, red-bellied, spotted, and eastern painted turtles; the southern leopard frog; and the venomous canebrake and cottonmouth moccasin.

Endangered and threatened species on the refuge include the American bald eagle, peregrine falcon, red cockaded woodpecker, and American alligator. Currently, the refuge is undertaking a special project to reestablish the red wolf. Eight red wolves were released into the wild in 1987, and more in 1988, on Alligator River National Wildlife Refuge in an effort to establish a breeding population. Captive released wolves successfully produced and raised pups in the wild in 1988. The red wolf had been declared extinct in the wild in 1980.

Alligator River is a relatively new refuge. No development for public use has occurred and little is planned on the refuge in the future. The refuge is traversed by more than 250 miles of old logging roads. Many of these roads are open for public use; however, a four wheel drive vehicle is recommended for travel on them. Parts of the refuge are closed to motorized boats and vehicles. Other parts are closed to all entry during certain months of the year.

The refuge is open for hunting of most game species during the regular state seasons. Refuge specific regulations may change from time to time; therefore, we encourage hunters to request current regulations from the refuge office prior to each hunting season. Fishing is allowed during the regular state season.

For further information, please contact:

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

TAKE PRIDE IN AMERICA'S WILDLIFE RESOURCES!!

JOIN  
REFUGE WATCH



(Contact the Refuge Office for more information.)

refuge. While "acclimating" the wolves were gradually weaned off commercial dog food and switched to a diet of live native prey. Similarly, they were conditioned to a feast/famine feeding regime and isolated from human contact to increase their survival chances.

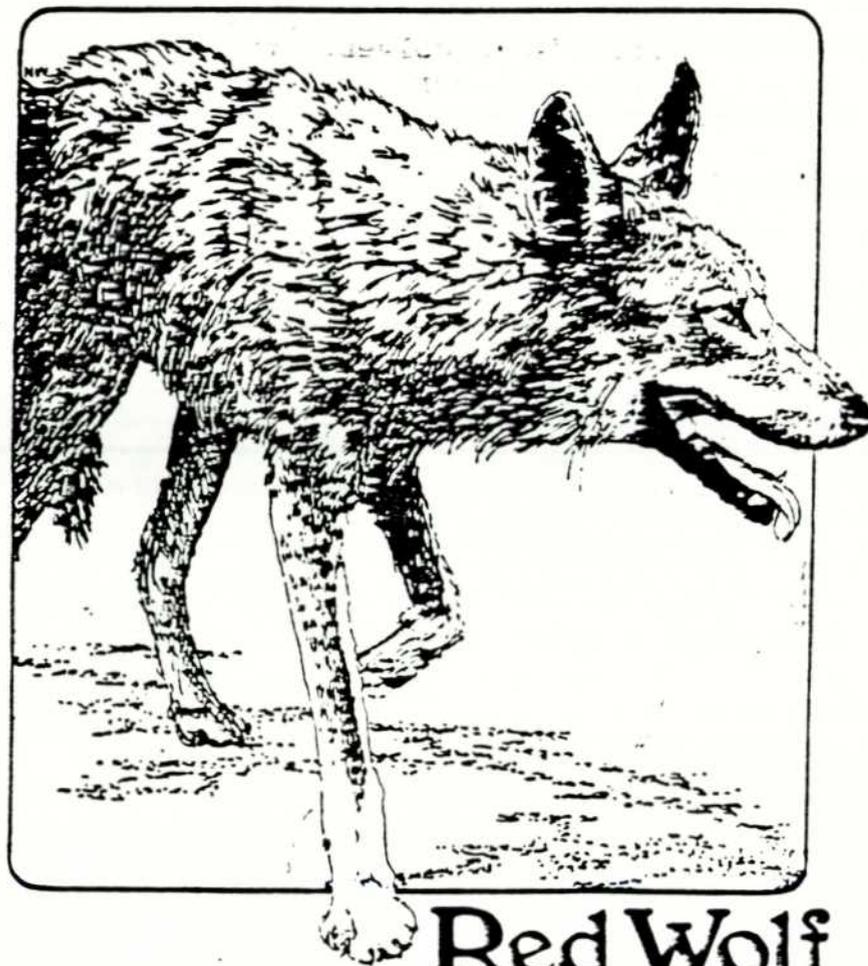
On September 14, 1987, a pair of red wolves roamed free for the first time in over a decade. Two weeks later, the other three pair were released.

The first year of the Alligator River Red Wolf Reestablishment Project was deemed a success by most standards. The wolves learned to feed themselves, avoid people, and find cover when they needed it. Two female wolves died. One died due to natural causes, and one was euthanized as a result of injuries sustained during a territorial dispute with another pair of wolves.

In January 1988, eight additional wolves were brought to the refuge and placed in acclimation pens. During April, two of the females were released with the two males that had previously lost their mates. The other six wolves are considered replacements for the animals currently running free.

Refuge biologists determined that two pairs of red wolves, free ranging since the fall of 1987, produced pups during the spring of 1988. These two litters represent the future of the red wolf in Alligator River and are positive proof that captive-born-and-reared adult red wolves can make the transition from captivity to life in the wild.

TAKE PRIDE IN AMERICA'S WILDLIFE RESOURCES



**Red Wolf**  
ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE

The red wolf (Canis rufus) is a little-known North American canid. It once ranged over the southeastern United States, from the Atlantic Coast to central Texas and from the Gulf Coast to central Missouri and southern Illinois.

There are three large wild canids native to the United States. Two of these are termed wolves: the gray wolf (timber) and the red wolf. The coyote is the third member of this group.

The red wolf is larger and more robust than the coyote with a broader head and almond-shaped eyes. Compared to the gray wolf, the red wolf is smaller and more lanky in appearance. The color of the red wolf is highly variable, but most individuals are cinnamon to gray in color. The weight ranges from 40 to 80 pounds with males being slightly heavier than females.

Very little is known about the social structure of the red wolf. The family structure is not as complex as the pack system of the gray wolf but probably more structured than the coyote.

Like all canids, the red wolf is a predator feeding on a wide range of prey species, such as mice, rats, rabbits, muskrats, raccoons, squirrels, opossum, deer, and birds. It is probably accurately described as an opportunistic feeder whose diet may also include carrion and vegetation. A wolf's feeding habits, as with most predators, usually do not seriously impact any group of animals and pose no threat to man.

#### History

Expanding human populations and extensive land clearing in the South affected the red wolf in two ways. First, these animals, along with other large predators, were killed in great numbers. Second, the extensive clearing of forests and hardwood bottomlands eliminated prime red wolf habitat. The last wild population existed in extreme southwest Louisiana and southeast

Texas, a five-county area made up of coastal marsh and prairie. On this marginal habitat, the few remaining animals had fallen prey to severe infestations of heartworms, hookworms, and sarcoptic mange. At this time another factor promoted red wolf hybridization with coyotes. As red wolf numbers dropped, surviving individuals rarely found mates. The adaptable coyote, expanding its range at this time, was an appropriate substitute. Concern for the species' survival was brought to light in the early 1960's, and by 1975 Service biologists concluded that it was no longer feasible to preserve the red wolf as a pure genetic population in this limited range. This conclusion resulted in the decision to capture as many red wolves as possible and to preserve the species in captivity.

Seventeen pure red wolves were captured in the late 1970's and comprise the founding stock for all red wolves alive today. The survival of the species was then assured through captive breeding. Preliminary experiments at Cape Romain National Wildlife Refuge in South Carolina indicated that red wolves can be successfully translocated. The next step involved finding a suitable site within the historic range. Very few large expanses of suitable land exist in the Southeast. Several locations were considered, then rejected due to various conflicts or inadequacies.

#### The Reestablishment Of Red Wolves On Alligator River Refuge

When the 137,000 acre Alligator River National Wildlife Refuge was established in 1984, Fish and Wildlife biologists began to study it as a potential reestablishment site. By 1986, a 5-year experiment to reestablish the red wolf on the refuge had been approved and work begun.

On November 14, 1986, four pairs of red wolves were transported to Alligator River National Wildlife Refuge. For 10 months, the wolves were held in 50' X 50' acclimation pens located in remote areas of the

---

## CALENDAR OF WILDLIFE EVENTS

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

**JANUARY.** . . High concentrations of ducks and geese. Ducks are best observed in North Pond. Geese can easily be seen from Highway 12 in New Field. Marsh hawks and kestrels are fairly common. Herons, egrets, ibis and several species of shorebirds can be seen easily in the pond and salt flat areas. Barn owls can be seen searching the marsh for food at dusk.

**FEBRUARY.** Waterfowl populations continue to be high. Likewise, the January trends with raptors, waders, and shorebirds continue.

**MARCH** . . . Spring shorebird migration causes numbers to increase. Brown pelicans congregate in the sound. Osprey are usually evident and begin nesting activity.

**APRIL** . . . . Shorebird migration continues in full force. Wading birds begin to establish rookery sites. The bounties of surf fishing include big blues, big croakers, trout, and an occasional red drum. Warm weather activities begin, including yellow-bellied sliders sunning themselves on pond banks, and mullet jumping in the ponds. Diamondback terrapins can be seen in the ponds as they surface to breathe.

**MAY** . . . . . A variety of terns return to the refuge and begin courtship and nesting activities. Of the many gulls, the laughing gull's courtship display is the most easily observed. Willets nest in dunes and high beach areas. Osprey hatching occurs. The first broods of black ducks and gadwalls appear, usually in the ponds. Occasionally, swallow-tailed kites can be seen. Surf fishing produces big blues, croakers, trout, flounder, sea mullet, and drum.

**JUNE** . . . . . Duck broods are abundant in North Pond area. Black-necked stilts feign injury to lure intruders from their nests. Least terns, oystercatchers, black skimmers, and other shorebirds nest in colonies on the beach and on islands in North Pond. Surf fishing continues to yield blues, flounder, and croaker, and spots begin to show up. Crabbing begins to pick up. Loggerhead sea turtle nesting begins.

**JULY** . . . . . Osprey fledglings leave the nest. Duck broods continue to be seen in North Pond. Surf fishing drops off with only smaller fish being caught. Fishing from the Bonner Bridge over Oregon Inlet at night produces large gray trout. Crabbing is excellent. Sea turtle nesting continues.

---

**AUGUST.** . . . Brown pelican young (produced south of the refuge) begin to learn to fish and are evident off the beach and around Oregon Inlet. Bridge fishing continues to yield gray trout and small blues. Spanish mackerel and pompano begin to appear. Crabbing continues to be excellent. Sea turtle nesting drops off this month.

**SEPTEMBER.** Warbler and sparrow fall migrations begin with dikes providing the best observation areas. Raptor migration is evident with peregrine falcons being observed frequently. Teal migration begins through the refuge. Crabbing continues.

**OCTOBER.** . . Songbird, teal, and raptor migrations continue. Trout begin to get larger. Blue fish, puppy drum, and larger drum can be expected. Canada and snow goose migration becomes evident. Clamming becomes quite good, especially at low tide after a strong northeaster. Large number of cormorants can be observed this month and next.

**NOVEMBER.** Winter populations of gulls are highest now. Black-bellied plovers and willets may be seen on the beach. Peregrine falcons and other migratory raptors including kestrels, merlins, and sharp-shinned hawks frequent the refuge. The peak of swan migration occurs now. Numbers of ducks, geese, and coots are increasing. Lucky fishermen catch big blues, drum, or an occasional flounder.

**DECEMBER.** Pelagic birds can be seen off the beach, especially after strong northeast winds. Barn owls are seen frequently over the marsh at dusk. Waterfowl numbers grow by leaps and bounds. Whistling swans, Canada and snow geese, and approximately 25 species of ducks congregate and settle in for the winter.

### YEAR-ROUND ON THE REFUGE

Muskrats, nutria, and otter can be seen scurrying over the dikes or swimming in the ponds. Colorful pheasants are abundant and can be seen almost anywhere on the refuge.

Beach combing is particularly productive after large storms and/or strong northeast winds.



---

## VISITOR INFORMATION

Headquarters for Pea Island National Wildlife Refuge is located 6½ miles south of Oregon Inlet on N.C. Highway 12. Refuge staff is usually available from 8 - 4:30 weekdays to answer visitor questions or give refuge information. The refuge offers a wide variety of quality outdoor experiences.

We invite you to enjoy Pea Island. In order to ensure that the refuge is protected for future generations to enjoy, we ask that you obey the following regulations:

- Drive only on designated roads. Refuge beaches are closed to vehicles.
- Camping is prohibited.
- Firearms are prohibited.
- Please do not litter.

Ask about the following opportunities:

- Wildlife photography/observation.
- Outdoor classrooms.
- Conducted programs.

**WARNING:** Insects are abundant during the months of May through September, and appear throughout the year following a warm rain. Insect repellent and appropriate protective clothing are recommended.

For more information contact the Refuge Manager, Pea Island National Wildlife Refuge, P.O. Box 150, Rodanthe, N.C. 27968 or call (919) 987-2394.

## NOTES

*DON'T LITTER, HELP KEEP OUR WILD AREAS CLEAN.*

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

---

---

# Calendar of Wildlife Events



Pea Island  
National Wildlife Refuge

---

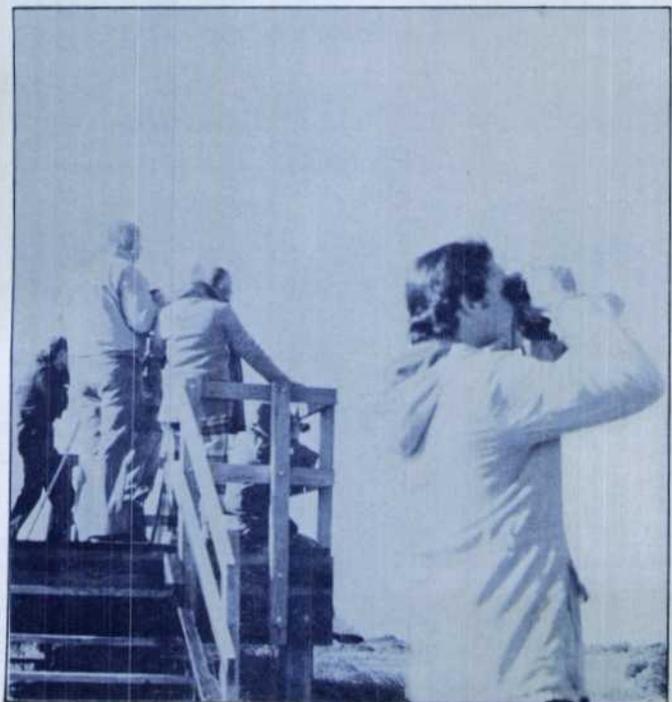
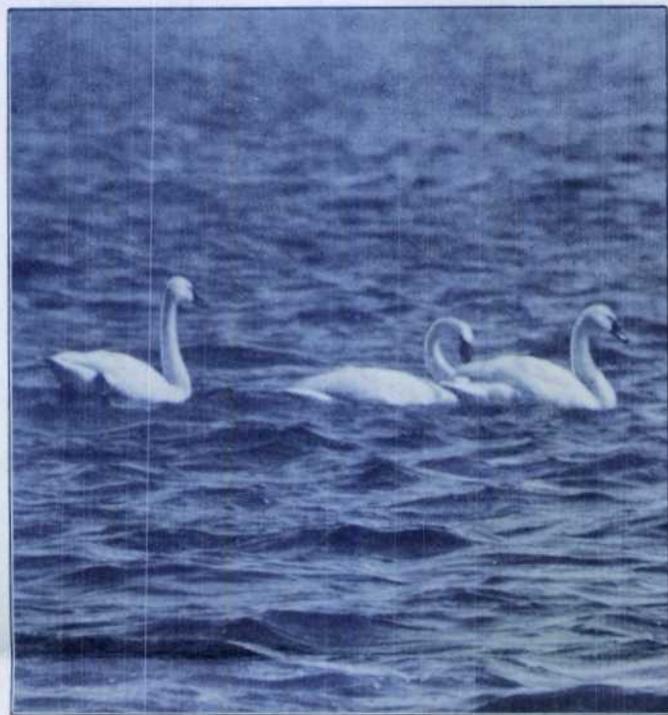
Pea Island National Wildlife Refuge is administered by the Fish and Wildlife Service on Cape Hatteras National Seashore. Pea Island is composed of 5,915 acres of coastal barrier island extending over 12 miles along North Carolina's "Outer Banks" from Oregon Inlet southward to the village of Rodanthe.

Pea Island and an adjacent 25,700 acres of Pamlico Sound waters on its western boundary was established in 1938 by Congressional Act and Presidential Proclamation. The island was named for dune peas which grow in the dunes. This area was set aside to provide safe wintering habitat for greater snow geese and other migratory waterfowl. Civilian Conservation Corps workers improved the low sandy island by the construction of barrier dunes to protect inland portions from storms. The CCC also built dikes and ponds for waterfowl and fields to grow wildlife foods. Pea Island's basic mission is the same today, providing a quality environment for wildlife.

#### WILDLIFE

Thousands of snow and Canada geese, whistling swans and 25 different species of ducks winter on the refuge each year.

Although the waterfowl numbers are greatest in January, a greater variety of birdlife may be observed in October and November during the fall migrations. The refuge's abundant bird life lists 265 species that occur with regularity and 50 species which are accidental visitors.



During the spring and summer months, several species of shore and wading birds nest on the refuge. Least terns, willets, black skimmers and oystercatchers raise their young in the dune and beach zone. Ibises, egrets, and herons find safety and suitable nesting cover in the impoundment and marsh areas on the Pamlico Sound side of the refuge.

Suitable habitat for several endangered species is found on the islands. Peregrine falcons are frequently observed as they move along the coast on their north and south migrations. Eastern brown pelicans feed in the impoundments and the waters offshore during the summer and fall. Bald eagles occasionally visit the refuge during warmer months. Loggerhead sea turtles lumber ashore on dark summer nights to lay their eggs in the warm beach sand.

Resident species such as the otter, create paths or slides between the fresh water impoundments and salt marsh. Muskrats and nutria build lodges or mounds of grass in the marshes. Colorful ring-necked pheasants feed along the dikes and highway.

Many species of aquatic life live in the marshes and tide flats along the sound. Speckled trout (weakfish), croaker, spot, menhaden, and flounder all spawn and spend their early stages of life in the protected creeks and bays of the refuge. Blue crabs, oysters, and clams also find this area ideal.

Along with the loggerhead sea turtle, reptiles such as the diamondback terrapin, common snapping turtle, hognosed snake, black racer and banded water snake make their homes on the refuge. There has never been a verified report of a poisonous snake on Pea Island.

#### MANAGEMENT

The harmonious blending of man's technical know-how and nature's processes is sought to provide natural cover and foods. The barrier dune system is no longer rebuilt to prevent overwash, but the potential overwash areas are identified and plans made to provide proper drainage. Grain crops are no longer planted but fields are sown with perennial grasses which will replenish themselves with minimal need for management.

The freshwater ponds are manipulated using the natural dry and wet seasons coupled with timely opening and closing of water control structures. Controlled burning removes the less desirable brush and allows the more productive grasses to dominate. However, many areas are left untouched to provide habitat diversity for all species of wildlife.

Endangered species utilization and critical habitat protection add a new dimension to present management. The refuge monitors the loggerhead sea turtle nesting population and provides a nursery for the safe hatching of young turtles.

Censusing and banding of waterfowl aids the entire Atlantic flyway in its management. Pea Island's data is compiled with that obtained from other refuges to determine the most effective approach for enhancing and protecting our waterfowl populations.

Law enforcement patrols are conducted to ensure the protection and safety of the refuge's natural resources.

#### RECREATIONAL OPPORTUNITIES

Bird watching, nature study, and photography are the most popular activities associated with wildlife on the refuge. Low observation platforms located on the dikes of North Pond provide excellent sites for observing waterfowl and other wildlife. The refuge is open to foot traffic and an interesting four mile walk may be taken around the North Pond Impoundment. However, portions of the refuge may be closed in the spring due to nesting birds. All pets are prohibited in the impoundment areas, but may be taken elsewhere on the refuge, if kept on a leash.

In the fall and winter, driving along Highway 12 can provide a chance to see many wildlife species. Care should be exercised in pulling off Highway 12 due to deep sand. Walking in the spring and fall is a good way to observe wildlife, but in the summer months populations of biting flies and mosquitoes make foot travel difficult.

The 12.2 miles of pristine beach provides 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 most sought after species. Swimmers, sunbathers, beachcombers, and surfers all find plenty of sea and sand.

The best opportunity for crabbing is the shore along Oregon Inlet.

Recreation vehicles are not allowed off the designated roadways on Pea Island. Beach driving is not allowed.

#### REGULATIONS

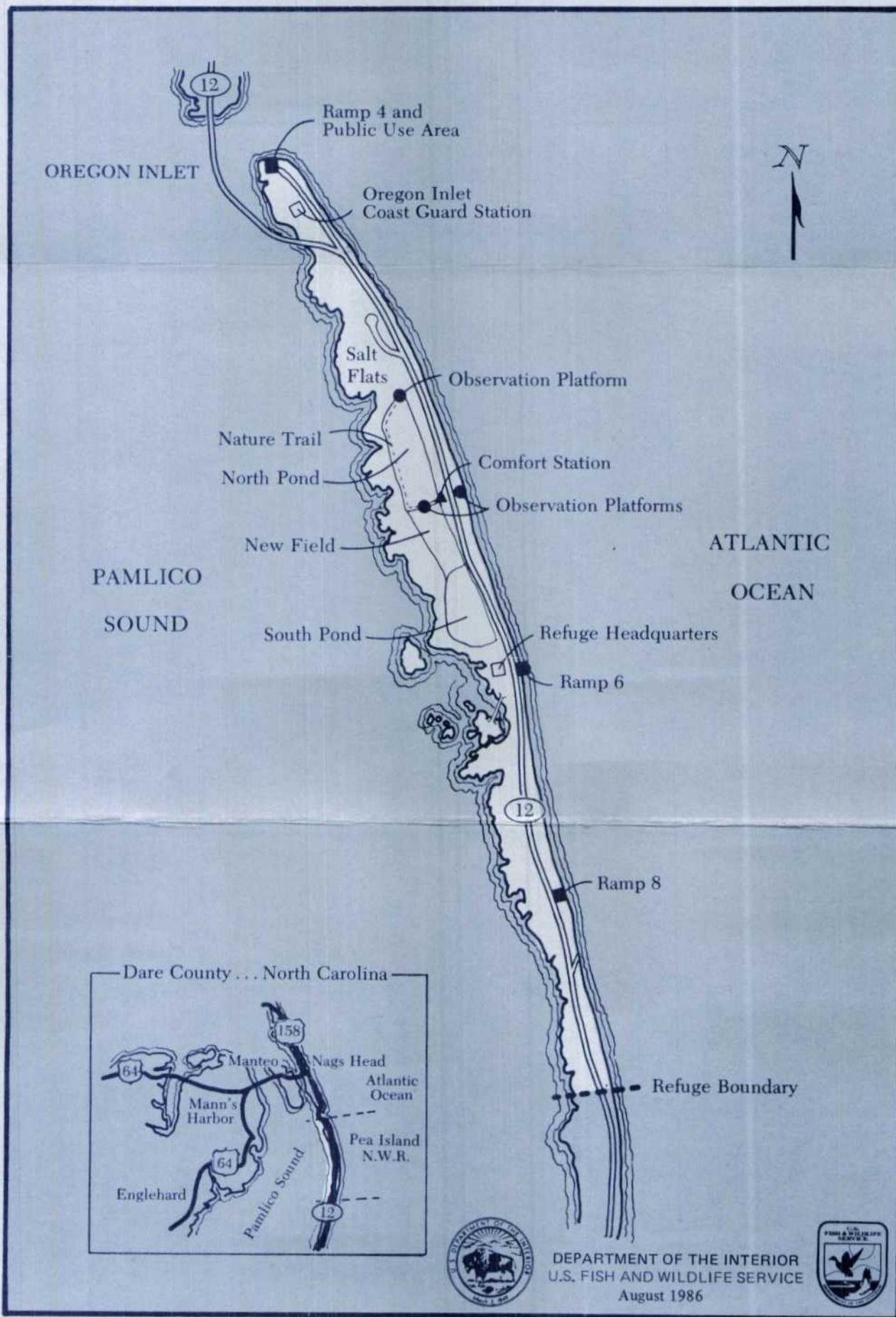
Visitors are requested to obey refuge signs to ensure that wildlife has a place to grow and survive for future generations to enjoy. It will be beneficial to inquire at the Refuge Office as to whether a specific activity is permitted or prohibited. Inquiries concerning the refuge should be directed to the:

Refuge Manager  
Pea Island National Wildlife Refuge  
P.O. Box 150  
Rodanthe, North Carolina 27968  
Telephone: 919-987-2394

The following list indicates some of the restricted activities on the refuge:

Fishing is allowed on the beach, not in the ponds.  
Camping is prohibited. Check NPS camping areas on Bodie Island.  
Fires are prohibited.  
Pets on a leash are allowed on the beach. Pets are not allowed around the ponds.

Hunting is prohibited.  
Weapons are prohibited.  
Vehicles are allowed only in parking areas and on Highway 12.



# Pea Island National Wildlife Refuge



## General

Pea Island National Wildlife Refuge, located in Dare County, North Carolina, is one of over 400 national wildlife refuges nationwide administered by the U.S. Fish and Wildlife Service. Though each refuge was established to provide habitat for certain primary species, each is managed to provide for a diversity of wildlife and opportunities for public enjoyment of these natural resources. Wildlife observation is a popular pastime for millions of people each year. This publication is designed to help refuge visitors observe and identify the wildlife of Pea Island National Wildlife Refuge.

Established in 1938 as a wintering sanctuary for waterfowl, Pea Island contains 5,915 acres of coastal barrier island and 25,700 acres of Proclamation Boundary Waters in the Pamlico Sound. Management of the refuge provides diverse habitat types including beach, dunes, salt marsh, fresh and brackish water ponds and salt flats.

—	Scissor-tailed Flycatcher . . . . .			
—	Horned Lark . . . . .	r	r	r
—	Purple Martin . . . . .	u	u	c
—	Tree Swallow . . . . .	c	u	a u
—	Northern Rough-winged Swallow (Rough winged). . . . .	r	r	
—	Bank Swallow . . . . .	o	u	
—	Cliff Swallow . . . . .		r	
—	*Barn Swallow . . . . .	a	a	a
—	Blue Jay . . . . .	r	r	r
—	American Crow (Common) . . . . .	u	u	u u
—	*Fish Crow . . . . .	c	c	c c
—	*Carolina Chickadee . . . . .	u	u	u u
—	Red-breasted Nuthatch . . . . .	c	c	
—	White-breasted Nuthatch . . . . .	r	r	
—	Brown Creeper . . . . .	o	c	u
—	*Carolina Wren . . . . .	c	c	c c
—	House Wren . . . . .	u	c	u
—	Winter Wren . . . . .	o	u	o
—	Sedge Wren (Short-billed Marsh Wren) . . . . .	c	c	c
—	*Marsh Wren (Long-billed Marsh Wren) . . . . .	c	c	c c
—	Golden-crowned Kinglet . . . . .	u	c	u
—	Ruby-crowned Kinglet . . . . .	c	c	c
—	Blue-gray Gnatcatcher . . . . .	o	u	
—	Veery . . . . .	u	u	
—	Gray-cheeked Thrush . . . . .	o	u	
—	Swainson's Thrush . . . . .	o	c	
—	Hermit Thrush . . . . .	o	c	o
—	Wood Thrush . . . . .		r	
—	American Robin . . . . .	u	u	c c
—	*Gray Catbird (Catbird) . . . . .	a	a	a c
—	*Northern Mockingbird (Mockingbird) . . . . .	u	u	u u
—	*Brown Thrasher . . . . .	u	u	u u
—	Water Pipit . . . . .	u	u	u
—	Sprague's Pipit . . . . .			
—	Cedar Waxwing . . . . .	u	u	c
—	Loggerhead Shrike . . . . .		r	r
—	*European Starling (Starling) . . . . .	c	c	c a
—	*White-eyed Vireo . . . . .	u	c	c
—	Philadelphia Vireo . . . . .		o	
—	*Red-eyed Vireo . . . . .	u	u	u
—	Blue-winged Warbler . . . . .			
—	Tennessee Warbler . . . . .	r	u	
—	Orange-crowned Warbler . . . . .	u	u	c
—	Nashville Warbler . . . . .		u	
—	Northern Parula (Parula Warbler) . . . . .	c	c	
—	*Yellow Warbler . . . . .	u	c	c
—	Chestnut-sided Warbler . . . . .		r	
—	Magnolia Warbler . . . . .		c	
—	Cape May Warbler . . . . .		c	
—	Black-throated Blue Warbler . . . . .	u	c	
—	Yellow-rumped Warbler (Myrtle) . . . . .	a	a	a
—	Black-throated Green Warbler . . . . .		u	
—	Blackburnian Warbler . . . . .		r	
—	Yellow-throated Warbler . . . . .		r	
—	Pine Warbler . . . . .		u	
—	*Prairie Warbler . . . . .	u	a	a



	S	S	F	W
— Palm Warbler . . . . .	c		a	c
— Bay-breasted Warbler . . . . .			r	
— Blackpoll Warbler . . . . .	c		c	
— Black-and-white Warbler . . . . .	u		c	
— American Redstart . . . . .	c		a	
— Prothonotary Warbler . . . . .	o		o	
— Ovenbird . . . . .	r		r	
— Northern Waterthrush . . . . .	o		c	
— Louisiana Waterthrush . . . . .	u		u	
— Connecticut Warbler . . . . .			r	
*Common Yellowthroat . . . . .	c	c	a	u
— Hooded Warbler . . . . .			r	
— Wilson's Warbler . . . . .			r	
— Canada Warbler . . . . .			r	
*Yellow-breasted Chat . . . . .	o	o	u	o
— Summer Tanager . . . . .	o		r	
— Scarlet Tanager . . . . .			r	
*Northern Cardinal (Cardinal) . . . . .	c	c	c	c
— Rose-breasted Grosbeak . . . . .			u	
— Blue Grosbeak . . . . .			u	
— Indigo Bunting . . . . .	o		u	
— Dickcissel . . . . .			u	
*Rufous-sided Towhee . . . . .	a	a	a	a
— American Tree Sparrow (Tree Sparrow) . . . . .			r	r
— Chipping Sparrow . . . . .	o		c	o
— Clay-colored Sparrow . . . . .			u	
*Field Sparrow . . . . .	u	u	c	u
— Vesper Sparrow . . . . .			c	u
— Lark Sparrow . . . . .		u	c	u
— Lark Bunting . . . . .				
— Savannah Sparrow (Ipswich) . . . . .	a		a	a
— Grasshopper Sparrow . . . . .			u	o
— Sharp-tailed Sparrow . . . . .	a		a	a
*Seaside Sparrow . . . . .	a	c	a	a
— Fox Sparrow . . . . .	o		u	o
*Song Sparrow . . . . .	a	a	a	a
— Lincoln's Sparrow . . . . .			u	
— Swamp Sparrow . . . . .	o		a	a
— White-throated Sparrow . . . . .	u		a	u
— White-crowned Sparrow . . . . .			c	o
— Dark-eyed Junco (Slate-colored) . . . . .	u		u	u
— Lapland Longspur . . . . .				
— Snow Bunting . . . . .	o		o	o
— Bobolink . . . . .	c		c	
*Red-winged Blackbird . . . . .	a	a	a	a
*Eastern Meadowlark . . . . .	c	c	c	a
— Western Meadowlark . . . . .				
— Rusty Blackbird . . . . .			r	
*Boat-tailed Grackle . . . . .	a	a	a	a
*Common Grackle . . . . .	r	r	r	r
— Brown-headed Cowbird . . . . .	c		c	c
*Orchard Oriole . . . . .	u	u		
— Northern Oriole (Baltimore) . . . . .			a	
— Purple Finch . . . . .			u	u
— Common Redpoll . . . . .				
— Pine Siskin . . . . .			u	u
— American Goldfinch . . . . .	u		c	u
— Evening Grosbeak . . . . .			r	
*House Sparrow . . . . .	u	u	u	u

## Amphibians

Toads, frogs and salamanders belong to the class Amphibia, derived from the Greek "amphibious" meaning "living a double life". Most members are aquatic and breath with gills as larvae; adults usually have lungs. Even adults, however, have thin, wet skin and must live in moist surroundings. Freshwater ponds, bogs and damp forest floors are ideal spots for amphibians. Such environments do not exist on this refuge. Few amphibians survive the salty environment of Pea Island; none thrive there.

—	Yellow Rail . . . . .				
—	Black Rail . . . . .	r	r	r	r
—	*Clapper Rail . . . . .	c	c	c	c
—	*King Rail . . . . .	c	c	c	c
—	Virginia Rail . . . . .	u	o	u	u
—	Sora . . . . .	c	u	a	u
—	*Purple Gallinule . . . . .	r	r	r	
—	*Common Moorhen . . . . .	u	u	u	r
—	American Coot . . . . .	a	r	a	a
—	Black-bellied Plover . . . . .	a	u	a	c
—	Lesser Golden Plover . . . . .	r		o	r
—	*Wilson's Plover . . . . .	u	o	u	u
—	Semipalmated Plover . . . . .	c	u	c	u
—	*Piping Plover . . . . .	u	u	u	u
—	*Killdeer . . . . .	u	u	u	u
—	*American Oystercatcher . . . . .	c	u	u	r
—	*Black-necked Stilt . . . . .	u	c	c	
—	*American Avocet . . . . .	u	u	u	r
—	Greater Yellowlegs . . . . .	a	c	a	c
—	Lesser Yellowlegs . . . . .	a	c	a	u
—	Solitary Sandpiper . . . . .	u	o	u	o
—	*Willet . . . . .	c	c	c	u
—	Spotted Sandpiper . . . . .	c	u	c	o
—	Upland Sandpiper (Plover) . . . . .	o	o	o	
—	Whimbrel . . . . .	c	r	c	o
—	Long-billed Curlew . . . . .				u
—	Hudsonian Godwit . . . . .	r	r		u
—	Bar-tailed Godwit . . . . .				
—	Marbled Godwit . . . . .	o	u	c	u
—	Ruddy Turnstone . . . . .	a	u	a	u
—	Red Knot (Knot) . . . . .	c	u	c	u
—	Sanderling . . . . .	a	c	a	a
—	Semipalmated Sandpiper . . . . .	a	c	a	u
—	Western Sandpiper . . . . .	c	u	a	c
—	Least Sandpiper . . . . .	a	c	a	u
—	White-rumped Sandpiper . . . . .	o	r		c
—	Baird's Sandpiper . . . . .		u	u	
—	Pectoral Sandpiper . . . . .	u		c	r
—	Purple Sandpiper . . . . .				
—	Dunlin . . . . .	a	u	a	c
—	Curlew Sandpiper . . . . .				
—	Buff-breaster Sandpiper . . . . .				r
—	Ruff . . . . .				
—	Short-billed Dowitcher . . . . .	c	c	a	u
—	Long-billed Dowitcher . . . . .	u	r	c	u
—	Common Snipe . . . . .	a	r	c	a
—	American Woodcock . . . . .	r		r	r
—	Wilson's Phalarope . . . . .	r	r		u
—	+Red-necked Phalarope (Northern) . . . . .	c		c	
—	+Red Phalarope . . . . .	c		c	r
—	+Pomerine Jaeger . . . . .	u	u	c	r
—	+Parasitic Jaeger . . . . .	r	u		u
—	+Long-tailed Jaeger . . . . .	u			u
—	*Laughing Gull . . . . .	a	a	a	u

	S	S	F	W
— Little Gull . . . . .				
— Common Black-headed Gull . . . . .				
— Bonaparte's Gull . . . . .	c		u	c
— Ring-billed Gull . . . . .	a	c	a	a
— *Herring Gull . . . . .	a	c	a	a
— Iceland Gull . . . . .				
— Lesser Black-backed Gull . . . . .				u
— Glaucous Gull . . . . .	r			r
— *Great Black-backed Gull . . . . .	c	c	c	a
— +Black-legged Kittiwake . . . . .		r	u	c
— *Gull-billed Tern . . . . .	c	c	u	
— *Caspian Tern . . . . .	u	u	c	o
— *Royal Tern . . . . .	c	c	c	u
— *Sandwich Tern . . . . .	c	c	c	
— Roseate Tern . . . . .	r	r	r	
— *Common Tern . . . . .	c	c	c	r
— Forster's Tern . . . . .	a	c	r	a
— *Least Tern . . . . .	c	c	c	
— +Bridled Tern . . . . .		c	u	
— Black Tern . . . . .	u	c	a	
— *Black Skimmer . . . . .	c	c	c	u
— Dovekie . . . . .	r		r	r
— Thick-billed Murre . . . . .				
— Razorbill . . . . .				r
— White-winged Dove . . . . .				
— *Mourning Dove . . . . .	u	u	u	u
— Black-billed Cuckoo . . . . .	r		r	
— *Yellow-billed Cuckoo . . . . .	u	u	c	
— *Common Barn-Owl . . . . .	o	o	o	o
— Snowy Owl . . . . .				
— Short-eared Owl . . . . .	o		u	u
— Northern Saw-whet Owl . . . . .				
— *Common Nighthawk . . . . .	o	o	o	
— Chuck-will's Widow . . . . .	r	r	r	
— Chimney Swift . . . . .	o	o	o	
— Ruby-throated Hummingbird . . . . .	o	u	u	
— Belted Kingfisher . . . . .	u	u	c	c
— Red-headed Woodpecker . . . . .				o
— Yellow-bellied Sapsucker . . . . .	u		c	u
— *Downy Woodpecker . . . . .	u	u	u	u
— Hairy Woodpecker . . . . .	r		r	r
— *Northern Flicker (Common, yellow-shafted) . . . . .	u	u	a	c
— Olive-sided Flycatcher . . . . .			r	
— Eastern Wood-Pewee . . . . .	u	u	u	
— Yellow-bellied Flycatcher . . . . .			r	
— Acadian Flycatcher . . . . .			r	
— Eastern Phoebe . . . . .	u		u	u
— *Great Crested Flycatcher . . . . .	u	u	u	
— Western Kingbird . . . . .				u
— Eastern Kingbird . . . . .	c	c	c	
— Gray Kingbird . . . . .				

In observing the wildlife populations here, remember the dynamic nature of a barrier island. Over the years inlets open and close. The ocean overwashed intermittently during frequent winter storms. Sometimes all surface water is salty. Animal populations here generally have more limiting factors than other places. On an island the mere existence of a species may depend solely on its ability to swim or fly. Survival largely relates to its ability to tolerate the harsh salt environment. Is it any wonder that our richest diversity of wildlife is among the avian populations and our least diverse, the amphibians, who would dehydrate in salt water? Ponder these environmental factors as you observe refuge wildlife.

Wildlife observation can be very enjoyable. Field guides and binoculars might make the experience more rewarding. We encourage visitors to report any rare or unusual sightings to the refuge headquarters.

## • General Information

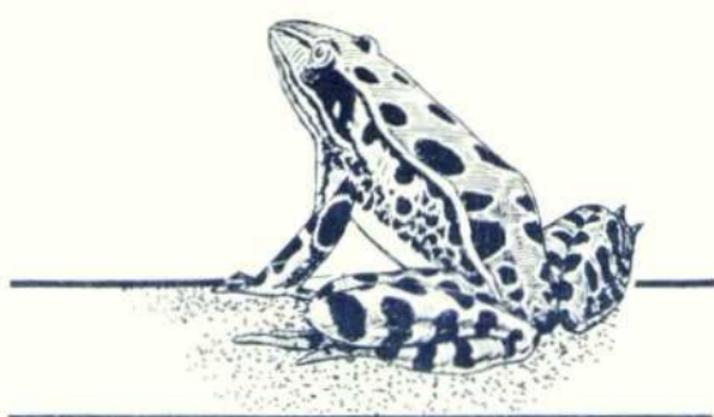
## Reptiles

Many reptiles are as at home in water as they are on land. All are covered with scales or plates. Besides protecting these animals from injury and disease, this adaptation is an effective means of preventing water loss. Consequently, many reptiles live and thrive in the salty refuge environment.

Reptiles are also cold-blooded and utilize their surroundings to adjust their body temperatures. Basking in the sun is a class habit during cold weather; burrowing or staying submerged in water helps reptiles avoid extreme heat. On Pea Island you are most likely to observe reptiles on cool, sunny days.

Common Name	Status*
Turtles	
— Common Snapping Turtle	D
— Eastern Mud Turtle	D
— Diamondback Terrapin	D
— Yellowbelly Slider	D
— Loggerhead	D
— Atlantic Green Turtle	D
— Atlantic Hawksbill	D
— Atlantic Ridley	D
— Leatherback	D
	S S F W
— Red-throated Loon . . . . .	c c a
— Common Loon . . . . .	c r c c
— Pied-billed Grebe . . . . .	c o c a
— Horned Grebe . . . . .	c u a
— Red-necked Grebe . . . . .	r
— Eared Grebe . . . . .	
— Western Grebe . . . . .	
— +Northern Fulmar . . . . .	a o a c
— +Cory's Shearwater . . . . .	u u u
— +Greater Shearwater . . . . .	c c
— +Sooty Shearwater . . . . .	r u r
— +Audubon's Shearwater . . . . .	a a
— +Wilson's Storm-Petrel . . . . .	r a a
— White-faced Storm-Petrel . . . . .	
— +Leach's Storm-Petrel . . . . .	r r r
— White-tailed Tropicbird . . . . .	
— Northern Gannet . . . . .	c r c a
— American White Pelican . . . . .	
— Brown Pelican . . . . .	c c c u
— Great Cormorant . . . . .	o
— Double-crested Cormorant . . . . .	a r c c
— Anhinga . . . . .	
— Magnificent Frigatebird . . . . .	
— American Bittern . . . . .	c o c c
— *Least Bittern . . . . .	u u o
— Great Blue Heron . . . . .	u u u u
— Great Blue Heron (White Morph) . . . . .	
— Great Egret (Common) . . . . .	c c c c
— *Snowy Egret . . . . .	c c c u
— *Little Blue Heron . . . . .	c c c u
— *Tri-colored Heron (Louisiana) . . . . .	c c c u
— Reddish Egret . . . . .	
— *Cattle Egret . . . . .	u c c r
— *Green-backed Heron (Green Heron) . . . . .	u u u o
— *Black-crowned Night Heron . . . . .	c c c u
— *Yellow-crowned Night-Heron . . . . .	r u u r
— *White Ibis . . . . .	o o r
— *Glossy Ibis . . . . .	c c c r
— Wood Stork . . . . .	
— Greater Flamingo . . . . .	

	S	S	F	W
— Fulvous Whistling Duck (Fulvous Tree Duck)	r		r	u
— Tundra Swan (Whistling Swan)	c	r	c	c
— Greater White-fronted Goose	r			r
— Snow Goose	a	r	a	a
— Ross' Goose				r
— Brant			r	r
— Barnacle Goose			r	r
— Canada Goose	a	r	a	a
— Wood Duck	r		r	r
— *Green-winged Teal	a	r	a	a
— *American Black Duck	a	u	a	a
— *Mallard	u	o	u	u
— Northern Pintail	c		a	a
— *Blue-winged Teal	a	o	a	r
— Northern Shoveler	c		c	c
— *Gadwall	c	c	c	u
— Eurasian Wigeon (European Wigeon)				r
— American Wigeon	c		c	a
— Canvasback	u		u	c
— Redhead	u		c	c
— Ring-necked Duck	c		c	c
— Greater Scaup	c	r	u	c
— Lesser Scaup	c		u	c
— Common Eider				r
— King Eider				
— Oldsquaw	u		r	u
— Black Scoter (Common)	c		u	c
— Surf Scoter	c		u	a
— White-winged Scoter	u		u	u
— Common Goldeneye	r		r	o
— Bufflehead	c	r	c	c
— Hooded Merganser	u		u	c
— Common Merganser	u		u	u
— Red-breaster Merganser	a	r	c	a
— Ruddy Duck	c	r	c	c
— Black Vulture	r	r	r	r
— Turkey Vulture	r	r	r	r
— *Osprey	u	u	c	
— American Swallow-tailed Kite				
— Bald Eagle	r	r	r	r
— Northern Harrier (Marsh Hawk)	c		c	c
— Sharp-shinned Hawk	o		a	u
— Cooper's Hawk	r		r	r
— Red-shouldered Hawk	r		r	r
— Swainson's Hawk				
— Red-tailed Hawk	r		r	r
— Rough-legged Hawk				
— Golden Eagle				
— American Kestrel (Sparrow Hawk)	c		a	a
— Merlin (Pigeon Hawk)	u		c	u
— Peregrine Falcon	u		c	u
— *Ring-necked Pheasant	c	c	c	c



Common Name	Status*
— Fowler's Toad	D
— Green Treefrog	D
— Squirrel Treefrog	D
— Bullfrog	E
— Southern Leopard Frog	D

\* Documented - actual observations on the refuge are recorded.

Expected - species exist north and/or south of Pea Island; however, no documented observations on the refuge have been recorded.

## • Amphibians

## Mammals

Mammals are often secretive and wary of humans, so you're not apt to see many of these individuals on a casual visit to the refuge. Try looking for animal signs: tracks, trails, scats, the remains of dinner, or their homes. Field guides that describe these signs are available in most book stores and are quite helpful in identifying mammals.

This checklist is divided into characteristic categories for your convenience. Notice that many typical mammalian species are absent here. As the barrier islands connect and disconnect and as the environment changes through the years, the species makeup will also change. What predictions can you make about these changes?



Order	Common Name	Status*
MARSUPIALIA: (Pouched Mammals)		
___	Opossum	D
INSECTIVORA: (Shrews and Moles)		
___	Southeastern Shrew	D
___	Least Shrew	E
___	Eastern Mole	E
CHIROPTERA: (Bats)		
___	Silver-haired Bat	D
___	Eastern Pipistrelle	E
___	Red Bat	E
___	Hoary Bat	E
___	Evening Bat	E
LAGOMORPHA: (Rabbits)		
___	Eastern Cottontail	D
___	Marsh Rabbit	D
RODENTIA: (Rodents)		
___	Rice Rat	D
___	Eastern Harvest Mouse	E
___	Hispid Cotton Rat	E
___	Meadow Vole	D
___	Muskrat	D
___	Norway Rat	D
___	House Mouse	D
___	Nutria	D
CARNIVORA: (Meat Eating Mammals)		
___	Gray Fox	E
___	Raccoon	D
___	Mink	D
___	River Otter	D

\* Documented - actual observations on the refuge are recorded.

Expected - species exist north and/or south of Pea Island; however, no documented observations on the refuge have been recorded.

## Birds

The diversity and abundance of birdlife on Pea Island explains its reputation of being a "birder's paradise". The refuge is an important wintering ground for tundra swans, snow geese, Canada geese and over 25 species of ducks. Many other interesting species can be found here during the winter months and the spring and fall migrations. During the summer months several species of herons, egrets and terns along with American avocets, willets, black-necked stilts and a few species of ducks nest on the refuge. Oceanic species can be expected during most any season offshore but are most common from late summer through the fall into late winter. Following storms many unusual species for this area have been observed.

This bird list is in accordance with the sixth A.O.U. Check-List. New names are used with the former name in parenthesis.

The seasonal occurrence and abundance of these avian species are coded as follows:

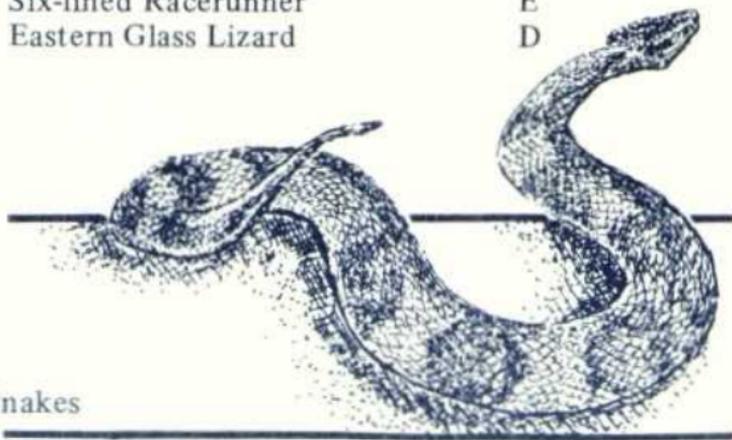
- |                |  |
|----------------|--|
| a - abundant   | a common species that is numerous.           |
| c - common     | probable to be seen in suitable habitat.     |
| u - uncommon   | usually present, but not certain to be seen. |
| o - occasional | seen only a few times during a season.       |
| r - rare       | seen at intervals of 2 to 5 years.           |

Note: Accidental species (seen 1-3 times at Pea Island) are included but are listed as having no relative abundance.

- |     |   |
|-----|---|
| S - | March-May   |
| S - | June-August   |
| F - | September-November  |
| W - | December-February   |
| *   | - nests locally   |
| +   | - seasonal abundance refers to frequency offshore. Birds are occasionally observed on refuge, especially after a storm and/or strong winds. |

## Lizards

- |   |                      |   |
|---|----------------------|---|
| — | Five Lined Skink     | E |
| — | Ground Skink         | E |
| — | Six-lined Racerunner | E |
| — | Eastern Glass Lizard | D |



## Snakes

- |   |                                 |   |
|---|---------------------------------|---|
| — | Racer                           | D |
| — | Corn Snake                      | D |
| — | Rat Snake                       | E |
| — | Eastern Hognose                 | D |
| — | Eastern Kingsnake               | E |
| — | Carolina Salt Marsh Snake       | D |
| — | Rough Green Snake               | E |
| — | Brown Snake                     | D |
| — | Eastern Ribbon Snake            | E |
| — | Eastern Garter Snake            | E |
| — | Eastern Cottonmouth (poisonous) | E |

\* Documented - actual observations on the refuge are recorded.

Expected - species exist north and/or south of Pea Island; however, no documented observations on the refuge have been recorded.

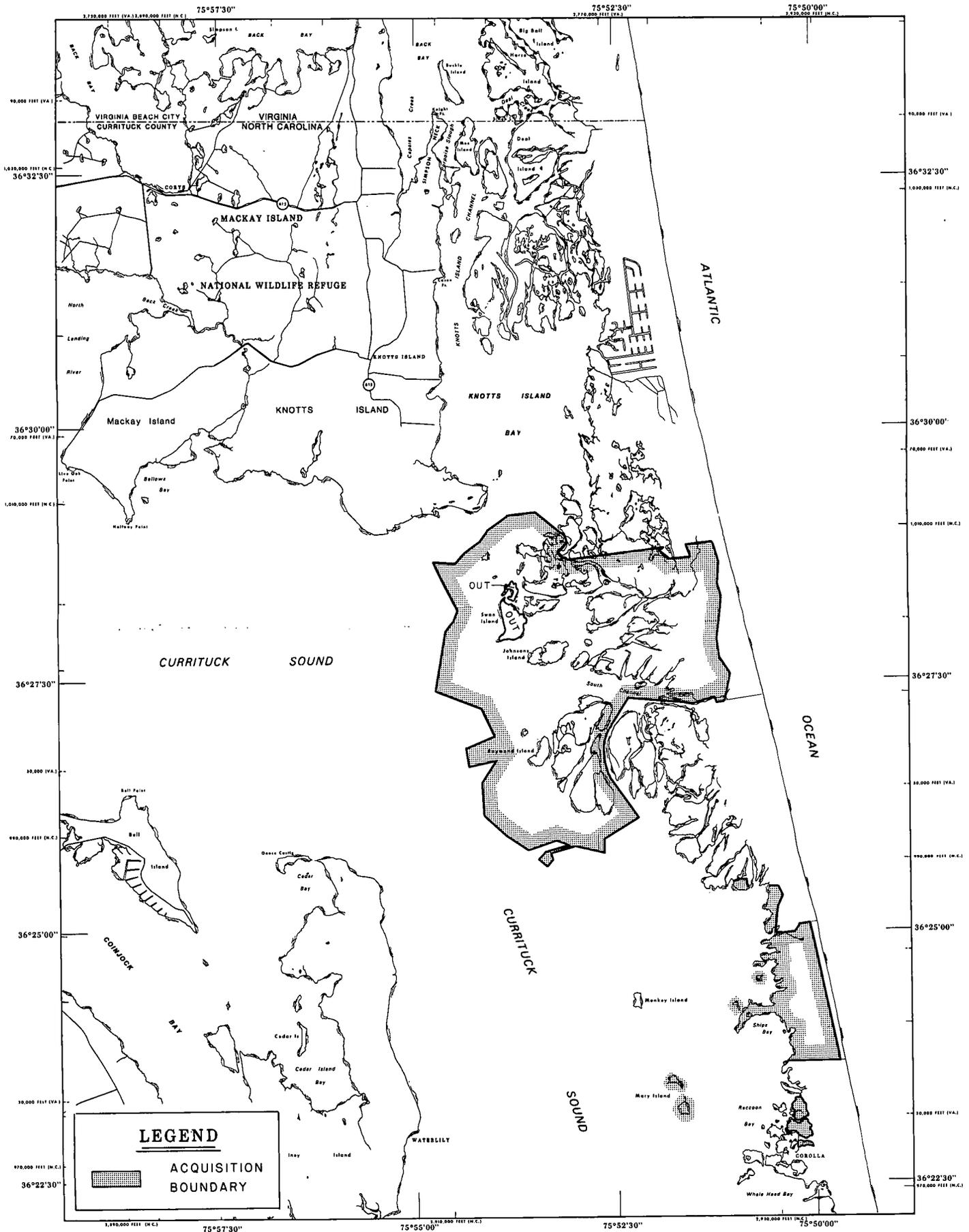
## • Reptiles

# CURRITUCK NATIONAL WILDLIFE REFUGE

VIRGINIA BEACH CITY, VIRGINIA & CURRITUCK COUNTY, NORTH CAROLINA

UNITED STATES  
DEPARTMENT OF THE INTERIOR

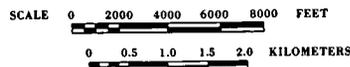
UNITED STATES  
FISH AND WILDLIFE SERVICE



COMPILED IN THE OFFICE OF REALTY  
FROM ORTHOPHOTOQUADS AND AERIAL PHOTOGRAPHS

ATLANTA, GEORGIA  
REVISED: 4/90

JULY, 1983



MEAN  
DECLINATION  
1971