

ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE  
CURRITUCK NATIONAL WILDLIFE REFUGE  
PEA ISLAND NATIONAL WILDLIFE REFUGE  
Manteo, North Carolina

ANNUAL NARRATIVE REPORT

Calendar Year 1988

Review and Approvals

Submitted By



4/6/89  
Date

Associate Manager



4/14/89  
Date

Regional Office Approval



5/10/89  
Date

**Alligator River National Wildlife Refuge  
Manteo, North Carolina**

**ANNUAL NARRATIVE REPORT  
Calendar Year 1988**

**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 intercoastal 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.



#1 - Home of black bears, white cedars, red wolves, bluejays, green herons.... 8/88 BWS

### 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

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A. HIGHLIGHTS

Volunteer program rates out top in region with almost 14,000 hours contributed! (See Section E.4)



#2 - From beach sweeps to turtle patrols,...from  
bird walks to receptionist. Faithful  
volunteers donated 13,974 hours during 1988.

12/88 BWS

Red wolves produce and thrive. (See Section G.2)



#3 - Yearling wolves....

1/88 CFL

Refuge lands 5,100 acre moist soil/cropland "turn key" operation.  
(See Section F.4)

Administrative office moves twice during one year. (See Section E.8)

#### B. CLIMATIC CONDITIONS

Temperatures were typical throughout most of the year. However, three record low daily maximum temperatures of 55, 56, and 60F were recorded in July and three highs of 89, 90, and 93F were established in August. Precipitation remained normal through May and then fell off sharply with only August above average. Total for the year was 42.27 inches, a -11.41 departure from the norm.

#### C. LAND ACQUISITIONS

##### 1. Fee Title

One fee title acquisition was accomplished during the year. The Refuge's largest inholding of approximately 10,000 acres was purchased by the North Carolina Nature Conservancy and

then sold to the Service in a matter of weeks. The U.S. Navy was interested in the tract and was willing to pay the appraised value of 5 million for the land. The Conservancy, however, employed some shrewd negotiations and behind the scene tactics to achieve excellent support of the congressional delegation. This resulted in the Conservancy, and in turn the Service, being able to pick up the land for 3.5 million.

Notwithstanding obvious access and resident wildlife values, the tract has excellent waterfowl management potential through moist soil and cropland management. Approximately half of the acreage is farm fields drained by a large network of canals and dikes. Two pumping stations with a total pumping capacity of 12 million gallons per hour draw down the water level for farming. When higher water levels are needed, we only have to let water in from outside the perimeter dike. A turn-key waterfowl unit!



#4 - Twin 48" pumps.

11/88 BWS

#### D. PLANNING

##### 1. Master Plan

The master plan received regional approval April 1, 1988.

## 2. Management Plan

The draft sign plan was written and submitted to the refuge manager.

## 4. Compliance with Environmental and Cultural Resource Mandates

Strong hydrogen sulfide odors along with color changes in canal water (reds and greens) occurred this year at several locations. Numerous complaints of various side effects including passing out, bloody noses, respiratory problems, and nausea were received from the public sector. Most problems were encountered in the canal parallel to highway 264 on the western side of the road. Approximately 75% of the canal water was located on Dare County land with the remainder extending into Refuge property. County, State, and USFWS personnel were contacted. FWS contaminant response person Kate Benkert monitored the area and arranged for samples to be collected. County and State personnel didn't really want to hear about the problem and county emergency management coordinators refused to post warnings on their land and were upset that FWS issued a press release advising people traveling through the area to be very careful. Occurrences were intermittent throughout the first quarter and appears to have lessened with decreasing temperatures.

Assistance was provided to ES Raleigh by collecting snapping turtles for baseline information in relationship to the proposed county landfill site.

A county permit to place an "impediment to flow" in canals on the west side of the Refuge was applied for. After presentation before the county commissioners and a period for public comment the permit was issued. This information has been passed on to the U.S. Army Corps of Engineers to facilitate the issuance of their permit. It seems paradoxical that as much permitting is necessary to restore wetlands to "before man" conditions as it does to alter natural ones.

## E. ADMINISTRATION

### 1. Personnel



#5 - First Row: 12, 5, 7, 9, 15, 6  
Second Row: 2, 10, 1, 13, 8, 14  
Third Row: 4, 3

### PERSONNEL

#### Permanent Full Time

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

#### Temporary Full Time

15. Jonathan Windley , Biological Aid, GS-03, NTE 05/23/88

Alligator River NWR added 5 new positions to the staff this year:

Our Maintenance Worker position was filled by Doak Wilkins who transferred from the National Park Service here in Manteo on February 2.

Another Maintenance Worker position was filled by Jonathan Powers on April 24. Jonathan worked previously with us as a Tractor Operator, TFT, NTE one year appointment.

Alan Emery filled the Automotive Worker position on May 22. Mr. Emery came to us from Florida while working with NPS as a temporary employee.

Jonathan Windley filled the Biological-Aid position on May 23. This is a TFT, NTE one year appointment. Jonathan will be helping with the red wolf project.

The Biological Technician position was filled by Chris Lucash on July 17. Chris was a Bio-Aid, TFT, NTE one year appointment prior to his new position. This position is also with the red wolf project.

The following employees received promotions:

Secretary (Typist) Beverly Midgett was promoted to a GS-06 Office Assistant on April 10.

Biological-Technician Jim Beasley was promoted to a GS-06 on June 19.

Biological Technician Mike Phillips was promoted to a GS-09 Wildlife Biologist on July 3. Mike works with the red wolf project.

## 2. Youth Programs

Because the 1988 national YCC budget paralleled the 1987 budget, Alligator River's YCC program again involved four enrollees. As in 1987, there was no funding for a labor foreman. The Regional Office approved the hiring of two youth leaders for 1988. Recruitment for the other two enrollee positions began in March.

The YCC application deadline was April 15. The drawing was held on April 18. Two returning enrollees (Alfred Jackson and Kenny Bland) served as Youth Leaders for the program. They came on board on June 13. Early arrival gave them an opportunity to prepare tools and supplies needed for the program and to assist maintenance and biological staff at

Pea Island with a variety of projects.

The remaining two enrollee slots were filled by Amy Etheridge of Manteo and David Clatterbuck of Stumpy Point. The program began officially on June 20.



#6 - 1988 YCC crew.

Kneeling: Kenny Bland, Amy Etheridge

Standing: Alfred Jackson, David Clatterbuck

8/88 BWS

The first morning was spent with orientation, safety meeting, and paperwork.

All four enrollees proved to be responsible, hard working kids who were a pleasure to have around. We lucked out again!

Our first project was to construct a 100x200' holding pen for a flock of 100 Canada geese. The geese, transported by the N.C. Wildlife Resources Commission from Pennsylvania,

were planned to be a decoy flock to lure in migrating birds that might fly above the farm fields enroute to other areas. They arrived on June 24. The birds were pinioned immediately before their arrival, but needed "re-clipping" by the end of their first week here. On June 30, YCCer's, BT Beasley, ORP Strawser, and Volunteers Morse and Royce obliged, giving the geese good reason to hand around for another few weeks!! See Section G. 3 of this report for more details.

On June 23, the traditional tern banding trip with John Weske (Smithsonian Institute) was done. YCCers, volunteers, and staff joined Weske to band 1,403 royal terns and 331 sandwich terns. Like last year, nesting was not synchronized, which made the banding schedule more difficult. Evidence of "abuse" was found in the colony (many broken eggs, a pile of dead birds-both adults and chicks. See Section H. 17 of this report for details.)

YCCers were busy at Alligator River and Pea Island NWRs during July. At Pea Island, the sign system was revamped; old, faded signs were replaced, and new signs were added, as needed. Photographs were taken of one-of-a-kind and interpretive signs to be used in the Pea Island Sign Plan. Lots of cleaning, organizing, and clearing work was accomplished around the office/shop, the seed house, and the pole shed. The goose/duck holding pen was re-wired. A brick walkway was laid behind the residence, and the pump heads, flag pole, and capstan were scraped and painted.

At Alligator River, work continued on the signing, the Canada geese were clipped on a 7-10 day rotation, wood duck boxes were installed, and a number of v-ditches were filled. In some of the v-ditches, flex-pipe was installed in order to allow water level manipulation, if needed.

On July 14, YCCers and 27 refuge volunteers joined John Weske of the Smithsonian Institute in banding 700+ pre-flight brown pelicans.

The few YCC days in August were spent completing water management projects around the farm fields and wrapping up other projects. On August 12, the YCC program officially ended for the summer. Two enrollees signed up as volunteers and assisted with several refuge projects before school started.

By all measures that come to mind, the 1988 YCC Program was most successful. Enrollee morale was high throughout the summer. Work accomplishments were many in number and high in quality. There were no YCC accidents this year!

#### 4. Volunteer Programs

Each year has its special role in the Alligator River NWR Volunteer Program: 1984 (and previous years) was "as luck would have it", 1985 was the year for organization and expansion, and 1986 has proved to be the year for diversification. 1987 meshed the two previous years' methods and proved notable for both expansion and diversification. Each year, we have wondered how we could possibly improve the program or increase the numbers for the following year. Well, the 1988 program knocked our socks off!!

During 1988, 13,974 volunteer hours were contributed to Alligator River, Currituck, and Pea Island NWRs by 282 volunteers. This represents a 166% increase in volunteer numbers and a 158% increase in hours contributed. These huge increases are due to several causes. First, there are a number of on-going special projects on the Refuge which lend themselves to volunteers. For example, the red wolf project has drawn a number of college students to volunteer blocks of time to the project. In 1988, a whopping 9108 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 for the wolf project.

Much of the increase in Refuge volunteerism can be attributed to an overall staff realization of the potential and capabilities of volunteers. "Can you get a volunteer to ...?" has become a familiar phrase at staff meetings and discussions about particular projects. Volunteers have proved themselves to be both capable of undertaking, and willing to undertake, most refuge projects.

One particularly successful program was the preparation and presentation of wildlife programs for school classes. Volunteers were trained to conduct programs on the red wolf, birds, mammals, amphibians, reptiles, fish, and animals without backbones. Each program included an audio-visual presentation, an interaction session (usually hands on) and questions/answers. During 1988, 25 program were conducted for over 900 students in the Dare County Schools. This number doesn't count these same programs conducted for other similar groups. (For actual figures, see Section H. 7 of this report.)

April 27-May 3 was National Volunteer Week. Again this year, the Dare Voluntary Action Center sponsored a "Red V" campaign. To help the public in identifying volunteers, each was encouraged to wear a red ribbon "V" throughout the week. On the Refuge, the weekly column, "What's Happening

with Wildlife", featured Refuge volunteers and their accomplishments.

Recruitment activities for 1988 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 and the Dare County Volunteer Fair.

As in the past, several activities were planned as incentives for volunteers. Among them, on Feb. 9, ORP Strawser and 13 volunteers ventured to Mattamuskeet NWR to participate in swan banding with the Johns Hopkins University staff. Fifty-five birds were banded. The group was given an impromtu tour of the refuge by Intern Jonathan Windley.

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. During 1987, the Refuge nominated the Dare County Alternative High School for the Take Pride in America Award for work accomplished on the Refuge. This group won the district and State level awards in 1987. ORP Strawser and representatives from the Dare County Alternative High School were honored at a luncheon in Raleigh in January of 1988. They received the Award from Governor James Martin. In July, the group received the National Take Pride in America award in a ceremony on the South Lawn of the White House.

For the 1988 Take Pride in America Awards Program, the Refuge Volunteer Program was nominated. In December, we were advised that we had won on the State level and were invited to attend a luncheon in our honor in Raleigh. Again, the award comes from Governor James Martin. Perhaps history is repeating itself?? We'll have to wait and see what the National competition brings!!

Three long-term, full time intern positions were utilized at Alligator River during 1988 and filled by volunteers. Jonathan Windley, a Senior at East Carolina University in Greenville, began a twelve week program in January. His time was divided between the red wolf project at Alligator River and the waterfowl banding program at Pea Island.

In the summer, Mike Morse, also a Senior at ECU, and Karen Royce, a graduate student at The University of North Carolina in Wilmington, assisted with YCC, summer interpretive programs, turtle patrol, signing and other

Refuge work.



#7 - Volunteer Mike Morse does his share of scat analysis. The wolf associated with this one dined on white-tail deer. 9/88 BWS

In two separate groups, 16 students participating in the Wildlands Research Program (San Francisco State University) volunteered full time for three weeks. This program contributed 1,920 man hours to the refuge; most of their time was spent with the red wolf project.

During February, Emily Carter, Susan McGill, and Vanessa Williamson from St. Anne's Belfield School in Charlottesville, VA reported for two weeks of volunteer work with Alligator River NWR.

Volunteers also wrote five articles for the weekly Refuge column "What's Happening with Wildlife".

During February, 50 wood duck boxes were mounted on posts with predator guards and installed in the farm fields area of the Refuge by volunteers.

On February 22-25, Volunteer Dyar attended the "Beginning Interpreter's Training" sponsored by the NPS.

On June 7, ORP Strawser attended a workshop on "Managing Volunteer Programs" sponsored by the Dare Voluntary Action Center.

On June 14, volunteers joined the staff in a CPR refresher course and recertified for another year.

On October 13, ten volunteers assisted ORP Strawser in a "wild goose chase." The decoy flock of Canada geese had ventured over to the road shoulders of U.S. Rt. 64 in East Lake. Our attempt to chase the birds back into the farm fields was unsuccessful. Soon after, staff observed several groups of Canada's in the farm fields. The recently harvested corn offered some incentive for them to stay.

Volunteers Davis and Kristoffersen completed six new hunt information boards during October. These boards were extras, ready to replace vandalized signs, as needed.

October 28, marked the beginning of a two-month series of clean-up activities on Alligator River. Volunteers banded together to clean up the public "dumps" located throughout the Refuge. On the 28th, we cleaned Creef's Cut. In addition to four dump truck and four pick-up loads of building materials, we filled over 50 large garbage bags. Dare County provided a flatbed dump truck and driver for the project.

November 1-3, a cooperative effort involving the Refuge, the N.C. Forest Service, and Tideland Electric Company cleaned up the worst dump on the Refuge. At our request, Tideland cabled the area off to prevent future dumping.

On November 4th, six volunteers cleaned a dump area west of Rt. 264 on the Refuge. On November 18, the "Friday Work Crew" (as we've come to call them!) accomplished a long list of jobs ranging from stuffing brochure boxes to replacing broken plexiglass on hunt boards.



#8 - Our volunteer attitudes are: "First we scope out the problem." 11/88 KD



#9 - "Then we solve it."

11/88 KD

On December 14, eight volunteers from the Dare County Alternative High School assisted ARM Noffsinger and ORP Strawser in planting portions of Little Field in Water Oaks.

The annual Volunteer Awards Ceremony/Pot Luck Dinner was held on December 9. Approximately 80 staff, volunteers, and families participated in the dinner. At the ceremony, 44 "official" awards were given to Refuge volunteers who had reached "mile marks" in their volunteer service. Among them, Glen Savage and Mike Morse each received the "Friend of the Refuge" plaque for donating 3,600 and 2,200 hours, respectively. Overall, awards were given to the following for the service indicated:

100+ hours- certificate: Karen Royce, Mike Morse, Jerry Scheck, Carrie Eastman, Glen Savage, Ken Dyar, Jan DeBlieu, Bill Perkinson, Bob Pitcher, Herman Wortman, Elva Wortman, Jonathan Windley, Ritchie Buckingham, Margaret Burns, Archer Bush, Jessie Bush, Warren Davis.

250+ hours- volunteer pin: Karen Royce, Mike Morse, Jerry Scheck, Carrie Eastman, Glen Savage, Ken Dyar, Warren Johnson, Jan DeBlieu, Bob Pitcher, Jonathan Windley, Margaret Burns, Victor Kristoffersen, Archer Bush, Jessie Bush, Warren Davis.

500+ hours- volunteer pin with rocker: Victor Kristoffersen, Mike Morse, Jerry Scheck, Carrie Eastman, Jonathan Windley, Glen Savage, Ritchie Buckingham, Ken Dyar, Bill Perkinson.

1,000+ hours- volunteer pin with rocker: Mike Morse, Jerry Scheck, Carrie Eastman, Glen Savage.

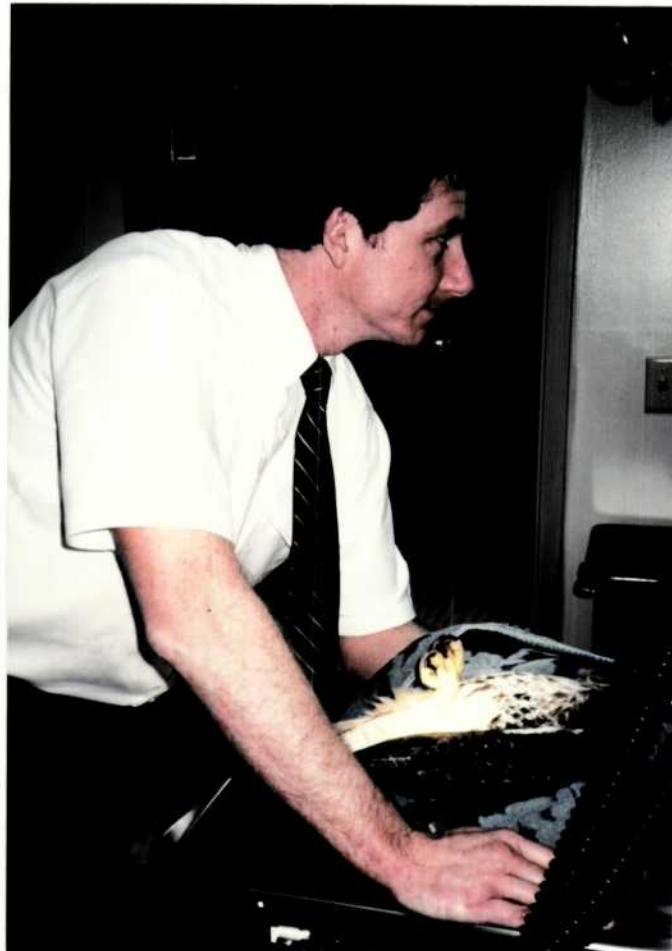
1,500+ hours- Friend of the Refuge placque: Mike Morse, Glen Savage.

During 1988, 13,974 volunteer hours were logged at Alligator River, Pea Island, and Currituck NWR's. Actually, these are the documented hours; many hours are missed in the constant battle to keep accurate records on the volunteer program.

A categorization of volunteer hours for 1988 follows: construction 427; general maintenance 600; info/vcs manning 960; conducting tours 205; trail maintenance 1505; AV productions 58; volunteer program coordination 136; fish/wildlife censusing 400; education 100; YCC supervision 320; red wolf project 9,108; litter pick-up 1500.

With volunteers contributing over 6 1/2 man years to the

Refuge during 1988, many staff hours were saved, allowing paid staff to work on other projects. We owe a debt of gratitude to our dedicated and capable Refuge volunteers.



#10 - Veterinarian Barry Welch has volunteered  
many hours treating injured birds for the  
refuge.  
11/88 BWS

## 5. Funding

In FY 88, Alligator River received funding of \$716,300 to cover management of all three Refuges. Alligator River received RPRP monies of \$10k for water level restoration, \$7.5k for a contaminant study, and \$9.9k for storm damage (Construction funds). Pea Island received RPRP monies of \$10k for black duck habitat and \$88.2k for storm damage.

### FOUR YEAR FUNDING COMPARISON

	<u>1988</u>	<u>1987</u>	<u>1986</u>	<u>1985</u>
1230		15.0		
1260		411.2	369.2	120.0
1261	268.4			
1262	215.1			
1113 (ENDG SP)	130.0	84.6		
Construction	98.1	30.6		
YCC	4.7	4.8	16.6	
Total	716.3	567.2	385.8	120.0

## 6. Safety

Safety equals another year with zero time loss accidents! Congratulations to a safety conscious staff who advanced our total to 299,737 hours.

Even though time was not lost, we did have numerous reportable accidents:

- On May 16, Maintenance Worker Jonathan Powers twisted his left ankle while pursuing a red wolf through a thick wooded swamp near Alligator River NWR. He was advised to be more attentive to footing.

- On June 21, RM John Taylor was walking on Long Curve bridge when a board under his right leg gave way and broke. His right leg went through the bridge up to his hip and in doing so, twisted and bruised his left knee. Refuge staff members were cautioned to be more attentive of bridge conditions. The rotten planks were replaced.

- On July 5, Volunteer Michael Morse backed the crew cab into a Toyota truck causing approximately \$45.00 damage. A discussion was held with the volunteer on the importance of safe operation of vehicles.

- Around July 14, a U.S. Navy A-4 fighter plane crashed while a test flight was in progress. The pilot was killed.

The United States Navy removed the wreckage from Alligator River NWR lands.

- On July 19, ARM Schriver stooped down to move boxes at Alligator River headquarters. As he lifted one box and swung it to the right, a sharp pain was experienced in his lower back as he released the box. He was reminded to follow proper lifting techniques.

- On August 14, a man was pronounced dead from drowning. He threw his raft out into the Coast Guard basin off the northend of Pea Island. The man went after the raft, went down, and never came up. The area has been posted closed for a number of years, but tourists fail to see the dangers of dredged channels and strong currents.

- On November 28, ARM Schriver was driving at approximately 15 mph when a car pulled out from a stop sign into his path. Schriver applied the brakes but was unable to stop before a collision. The Manteo Police Department investigated and found the other driver at fault.

The monthly safety meetings this year covered a variety of topics with several "hands on" demonstrations. Topics such as: blaze orange, hurricanes, PFD's, Lyme's disease, AIDS, heavy equipment safety, and hypothermia were discussed. Also we had "hands on" training with: deployment of fire shelters, proper use of hand tools, and the safe use of rocket net systems.

Some staff members and volunteers participated and were certified in the following courses: CPR and Basic First Aid, USFWS ATV Training, Basic Fire Training Classes 130 and 190, Advanced Equipment Operator School, Hunter Safety Course, L.E. Refresher Course, and the step test for firefighters.

#### 7. Technical Assistance

Under a cooperative agreement with the U.S. Air Force, the Refuge provided considerable technical assistance to the Dare County Bombing Range on wildlife management. Joint alligator surveys and a black bear study were conducted, an Atlantic white cedar study initiated, and coordination of road shoulder plantings discussed.

#### 8. Other

In May, RM Taylor participated as an instructor at the Basic Refuge Manager Academy. He taught a course on "Survival Skills in the NWRS."

RM Taylor met several times during the year with U.S. Navy

and Air Force personnel about the Refuge's management for waterfowl within the farm unit. The Air Force has a major problem with our enhancing bird populations ten miles from their target area. Although our unit lies outside the restricted air space of the bombing range, the Air Force is concerned about potential bird strikes with their aircraft. A November meeting in the Regional Office with the ARD Benson resulted in a compromise. WE agreed during the next year to not expand our management of the unit beyond its present level, and to jointly study the increased waterfowl utilization of the area as a result of our management. During the same period, the Air Force will assess the risk to their aircraft from our management.

Noteworthy visitors during the year included several Regional Office personnel, Whitney Tilt (National Fish and Wildlife Foundation), Phil Kiko (DOI Legislative Affairs), and Don Knowles (Senate Appropriations Committee).

On June 3, 6, and 8, ORP Strawser presented Revenue Sharing checks to Currituck (\$28,055), Dare (\$236,337), and Tyrrell (\$9,088) Counties.

#### F. HABITAT MANAGEMENT

##### 1. General

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



#11 - You know what they say about edges? Well,  
we've got lots of edges! 11/88 CL

## 2. Wetlands

Our plans to restore the natural hydrology of wooded swamps on the west side of the Refuge along Alligator River and Milltail Creek ran into some unexpected snags. On January 11, 1988, we applied to the Wilmington Corps of Engineers for permits to plug 14 drainage ditches and install two water control structures in large canals. This would restore approximately 6,000 acres of wooded swamp. The Corps had told us that it supported our proposal but that we would need a permit. Dare County commented on the Corps Public Notice and objected on the grounds that our plan would produce mosquito-breeding habitat. The county also informed the Corps that a county permit was required for such work by N.C.G.S. 156-139. We discussed the project with N.C. Mosquito Control personnel, and the county withdrew its objections. We read N.C.G.S. 156-139, and it made no mention of the need for a permit, but, the Corps would not act on our application until we obtained one. We asked the county to document the need for a permit in March. We contacted the county attorney's office on a weekly basis after that. The county attorney never returned our calls, but we were always told by his staff that he "was going to

get on it soon." Meanwhile, the Corps retired our application. We received a letter from the county on July 8, stating that it had passed an ordinance requiring a permit to restrict flow in any drainage ditch or water course. We requested a solicitor's opinion on the legality of this and applied for the county permit. After many hassles, we obtained the county permit on November 7, 1988 and on November 8, 1988, requested that the Corps reopen our application. We finally received our Corps permit on January 27, 1989. We have yet to receive a written solicitor's opinion. We will soon be applying for permits for additional restoration projects. We need a solicitor's opinion and a thrust by the Service to get the Corps moving on a general permit for wetland restoration efforts.

Wetland types present on the Refuge are described as follows:

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

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

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

### Alligator River NWR Habitat Types

Vegetated Wetlands Habitat Type	% 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 often so dense that walking through it is impossible. Shrub-dominated areas are known as short or low pocosin. These areas are usually found over deeper peat deposits and experience long hydroperiods. Tree or tall pocosins contain more trees than shrub pocosins but lack the grasses, sedges, and herbaceous plants in the understory. Cane pocosins are dominated by a switch cane understory.

### 3. Forest

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

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

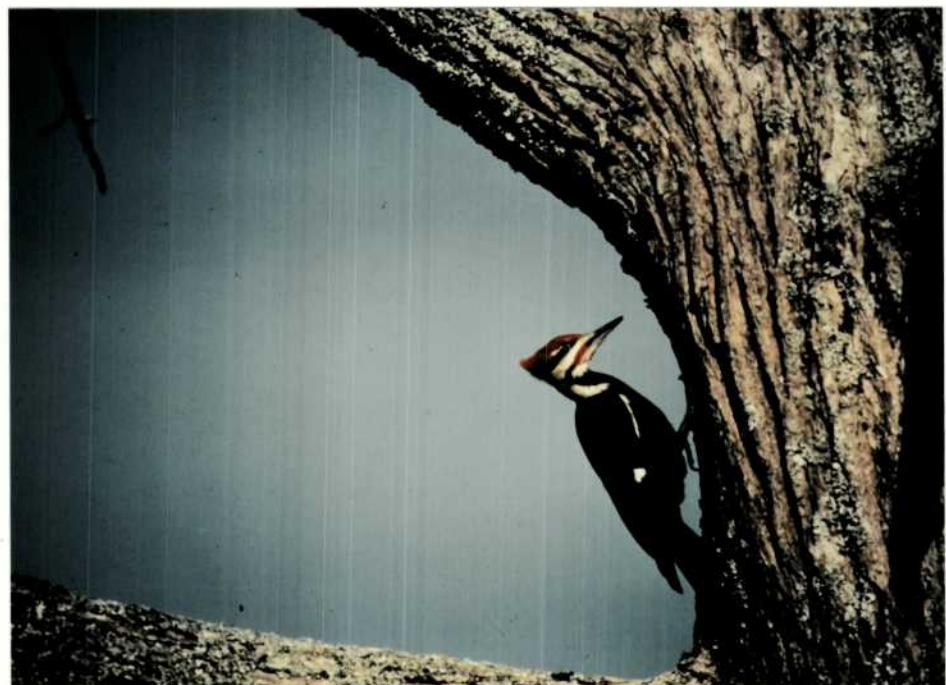
Hardwood Swamp - Hardwood swamps are restricted to the western half of the refuge. They are characterized by red maple, black gum, and red bay as the dominant species with red bay and fetterbush comprising the understory. Very

little herbaceous vegetation is present. Pockets of lizards tail and arrow arum are found in more open areas when the swamp floor receives more sunlight. Scattered old growth bald cypress is present particularly in stands bordering the Alligator River and Milltail Creek.



#12 - Screech Owl

7/88 MKP



#13 - Pileated woodpecker doing what it does best!  
8/88 KD

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 soils 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 for harvesting acorns from one of the larger "stands" of water oaks found along Milltail Creek in 1987. Approximately 3,000 acorns were collected by 12 students working from boats in a half-day effort. This years plans for additional collection were a bust. Practically no acorn production occurred in the stands along Milltail Creek. On December 14, seven volunteers from the Alternative High

School planted approximately 15 acres with water oak acorns on a 15'x15' spacing. The planting was done on a 90 acre tract of agricultural land near the Air Force Bombing Range.

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.

Atlantic Forest Products forfeited the right to cut timber on a 30 acre stand of old mature Atlantic White Cedar to compensate us for timber it illegally cut on a young 21-acre stand of cedar not covered in the leases. The replacement stand is located on Nichols Road near the south end of Whipping Creek Lake. Although its leases run through 1996, Atlantic Forest Products has finished cutting and closed down its cedar mill in Edenton.

With the help from Refuge volunteers, an intern from ECU is doing seedling counts on the Refuge's cutover cedar stands (about 5,000 acres) to determine how successfully the stands are regenerating. This information coupled with a study being undertaken by a graduate student from ECU on the hydrological characteristics in a selection of stands should shed some light on why some stands have successfully regenerated to cedars while other have not. Hopefully, these two volunteer efforts will provide us with some ideas on how to manage the poorly regenerating stands to improve cedar regeneration on them.



#14 - Believe it or not, we are getting some  
natural regeneration of Atlantic White  
Cedar after this! 10/88 BWS



#15 - In 1988, we saw a lot of "timber cruising"  
8/88 BWS

#### 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 larger 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. 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 this year. Eight water control structures were put in place which gave us the capability to hold water on the entire unit. Six hundred acres were plowed for moist soil, 100 acres of corn stubble were left fallow for moist soil, 90 acres of land idle for last year were left for moist soil, 162 acres of millet, 52 acres of corn, and 46 acres of milo were planted. The corn and milo were drained while water was held just out of the ditch banks on the other areas to keep them moist. The entire area was flooded in mid-October. Four water control structures were installed on the Laurel Bay Unit, but no active management for waterfowl was done this year. No water control structures were installed in the Creef Unit. 85 acres of corn were flooded in the unit using a rice plow/laser plane and portable pump. Approximately 2,000 acres of winter wheat were available throughout the three units.



#16 - Moist Soil Management. Our 5,131 acre turn key operation (before flooding)! 7/88 CL



#17 - This was "after" we turned the key on 1,200 acres. 10/88 CL

## 9. Fire Management

The Refuge Fire Management Plan was written and approved during 1986. Slight modification to the 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 no wildfires on the Refuge in 1988. This was not a typical fire year.

## 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. 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 estimate of all routes (27-40 alligators). A good range of sizes occurred along the route. The immature to adult ratio was 62:38.

Bald Eagle (Endangered) - Refuge staff sighted an immature bald eagle on December 20 near the Twiford Unit.

Peregrine Falcon (Endangered) - Although no sightings were reported for 1988, peregrine falcons are known to move through the refuge during migration.

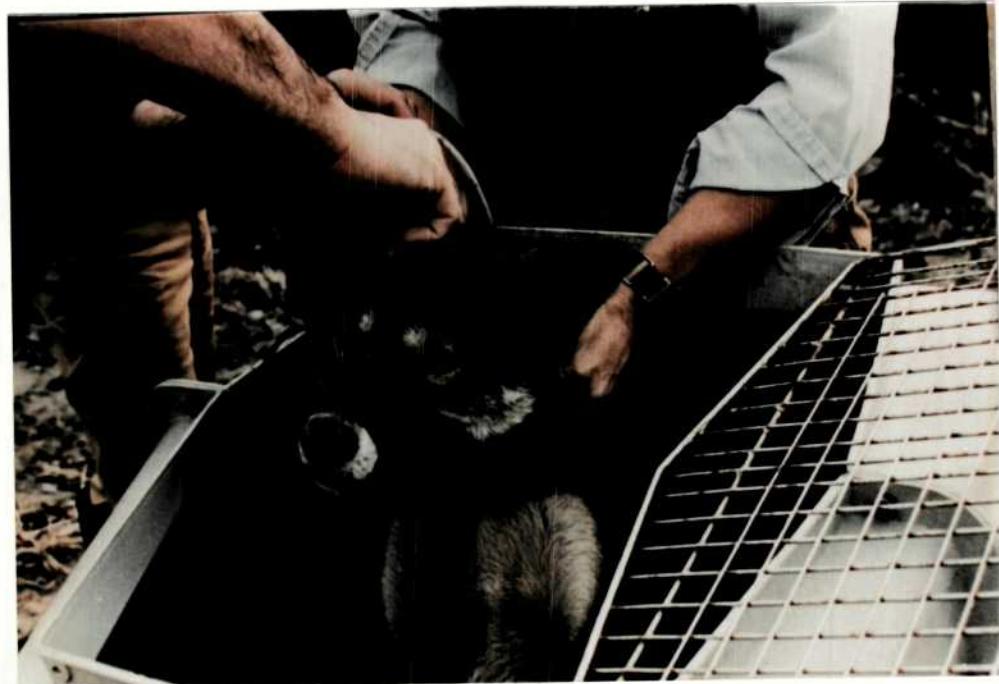
Red-cockaded Woodpecker (Endangered) - There have been four reported sightings of active red-cockaded woodpecker colony sites. Two have been reported along Whipping Creek Road, one near the intersection of Cedar and Koehring and one along Chip Road. These were all reported from 1981 to 1983 before the 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 is also in need of understory removal, but we were unable to accomplish this in 1988. 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 bole to check for cavities. Ground surveys are not very practical on Alligator River. Helicopter surveys are needed to try to locate the two reported sites we haven't found and to check other promising areas, especially in areas remote from roads.

Red Wolf (Endangered) - At the beginning of the year there were five free-ranging red wolves in the refuge. Because of the death of two females, two of the original males were paired with new females in late January. The acclimation period for these new females lasted 3 3/4

months. They were released with their "experienced" mates in April.

A "hard-release" technique was used for the two wolves released at 1545 hours on April 12. Before releasing these animals we placed them in individual shipping crates and transported them away from their acclimation pen to a remote site on ARNWR. A deer carcass was placed nearby. Some future releases will probably be conducted in this manner because captive animals at ARNWR are now held in pens at Sandy Ridge (Fig. 1).

A "soft-release" technique was used for the two wolves released at 1202 hours on April 14. Before releasing these animals, we placed a deer carcass near their acclimation site, threw food into the pen to mimic a normal feeding event, and then locked the gate open. At that point the wolves were free to come and go as they pleased. We released the wolves in pairs, hoping that the animals would travel together, breed, and raise offspring.



#18 - off we go!

1/89 CA

Radio tracking was the dominant field activity during 1988; we collected 1195 locations. About 55% of these were collected from the air ( $n = 637$ ) and about 45% were collected from the ground ( $n = 558$ ) (Table 1). Summaries of the movements of each pair follow.

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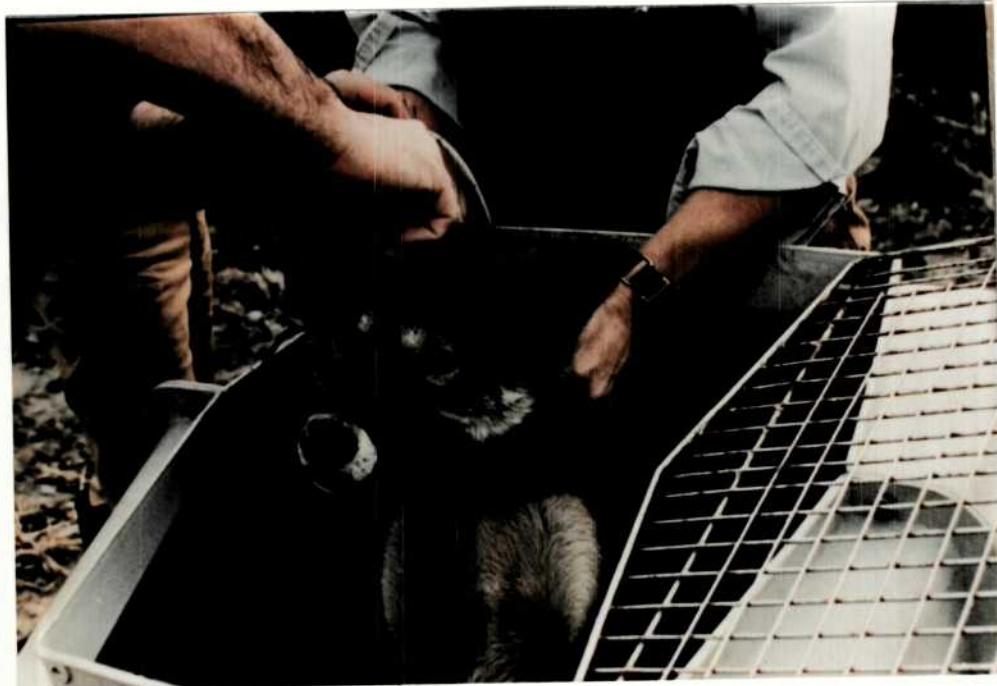
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FIGURE 1  
AREA USED BY RED WOLVES DURING 1988

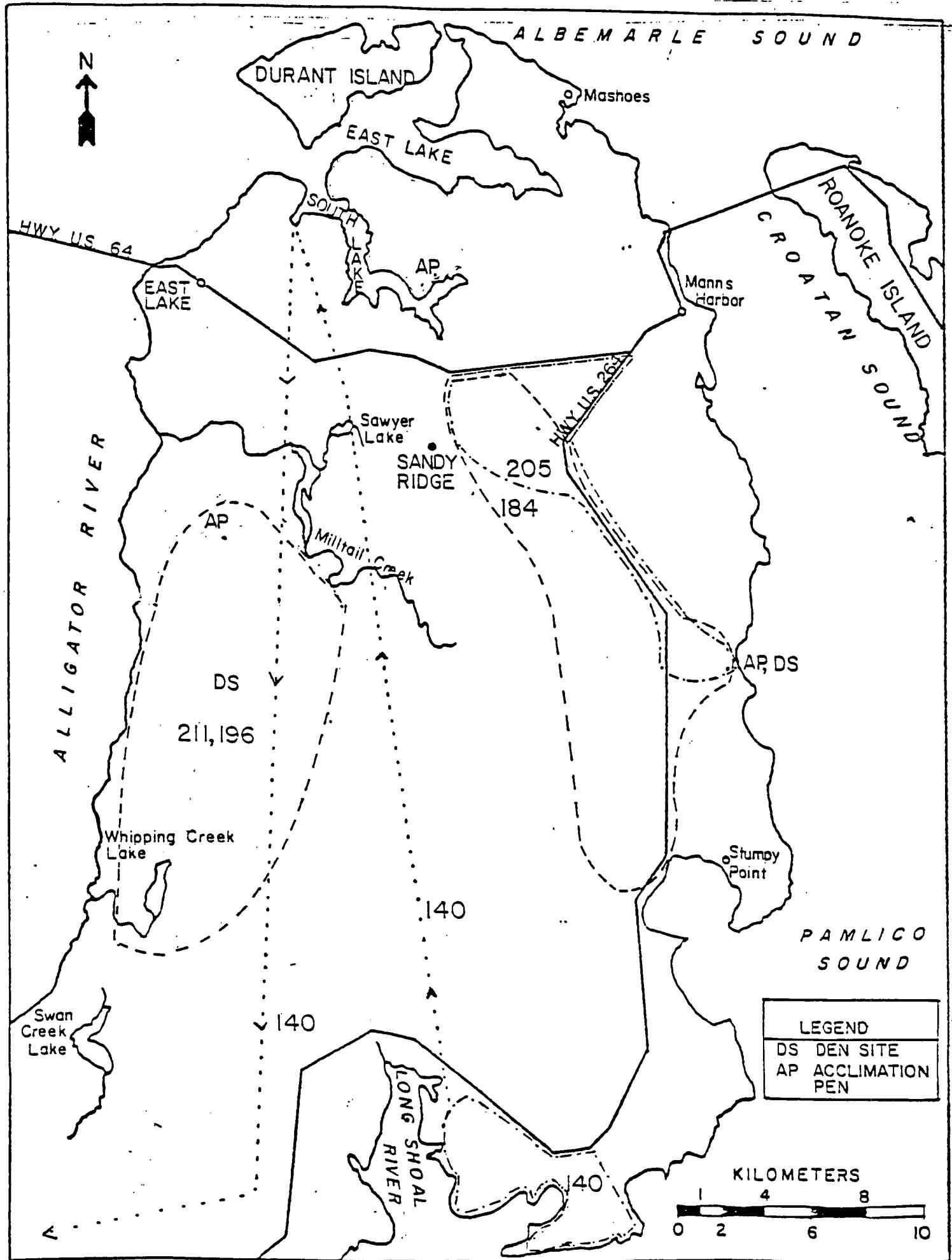


Table 1. Sex and age of wolves released in ARNWR, periods of time they spent in the wild during 1988, and results of radio-tracking from January 1 to December 31, 1988.

Wolf	Age <sup>a</sup>	Period in the wild	No. Days in the wild	<u>No. Locations</u>	
				ground	aerial
140M	8.0	01/01/88-01/30/88	30		
		04/12/88-06/15/88 <sup>b</sup>	65		
		Totals	95	20	49
300F	2.5	04/12/88-12/31/88	263		
		Totals	263	46	112
184M	7.0	01/01/88-05/29/88 <sup>b</sup>	150		
		Totals	150	92	67
205F	6.5	01/11/88-02/05/88	26		
		02/07/88-12/31/88	328		
		Totals	354	178	136
351F	0.6	05/01/88-12/31/88	96		
		Totals	96	32	6
211M	6.5	01/01/88-01/08/88	8		
		01/11/88-12/27/88 <sup>b</sup>	352		
		Totals	360	86	135
196F	7.0	01/01/88-01/07/88	7		
		01/11/88-06/25/88 <sup>b</sup>	167		
		Totals	174	49	75
227M	5.0	04/14/88-05/15/88 <sup>c</sup>	32		
		Totals	32	25	16
322F	1.0	04/14/88-06/05/88 <sup>c</sup>	53		
		Totals	53	30	41

a - Age was calculated relative to the last day in the wild and rounded to the nearest half-year.

b - The wolf died or was found dead on this day.

c - Animal was recaptured on this date and put back in captivity.

Male 211 and Female 196: Within two months after being released in October 1987, 211 and 196 established a home range that covered about 100 km<sup>2</sup> and included their acclimation site (Fig. 1). These animals routinely traveled together until the whelping season at which time 196 spent extended periods of time near the den while 211 continued to travel throughout the home range.

Their home range could be considered a territory since they advertised their presence through scent-marking and defended the area against other wolves. For example, they almost killed 227 who frequented the area. They also fought with 194 and inflicted serious injuries to her left front leg.

After displacing 227 and 194, 211 and 196 continued to regularly mark their territory until early March. The scent-marking hiatus ended in early May when 140 and 300 wandered through the area.

Male 140 and Female 300: Male 140 was free-ranging throughout the month of January. During this period he exhibited wide-ranging movements that covered most of ARNWR (Fig. 1). From 19 to 31 January, he traveled a minimum of 100 km. On the 31st, he was located about 5 km south of the refuge. This forced us to recapture him.

After being recaptured, 140 was placed in an acclimation pen with 300 and held for 72 days; they were released on 12 April. They stayed near the release site, which was located about 6 km west of their acclimation pen at Sandy Ridge, for about 12 days before exhibiting wide-ranging, unpredictable movements that covered most of the western portion of the refuge.

From 0655 hours on April 25 through 1837 hours on the 27th, they traveled a minimum of 16 km south along the Alligator River to Whipping Creek Lake. They were still at this location at 0651 h on the 28th. During the next 48 hours they traveled a minimum of 18 km to the north; at 0650 hours on April 30 we located them in the northwestern corner of 211 and 196's home range.

During the next 24 hours, they traveled a minimum of 22 km south through 211 and 196's territory. By 0700 hours on May 2, they had traveled north to the center of 211 and 196's home range. At this time, 140 was

only 1.4 km southwest of 211 and 196's den, while 300 was 1.6 km southeast of the den. At 0655 hours, 211 was seen traveling away from the general area where these two wolves were located. By 0710 hours 211 was located at the den. At 1530 hours 140 was observed traveling south away from his early morning location. He was limping at this time. He may have had an encounter with 211 and suffered injury. We noticed many scent marks in 211 and 196's territory during the period that 140 and 300 frequented the area.

From May 3 to 13, 140 and 300 restricted their movements to the southern edge of 211 and 196's territory. On May 14, they were near the east-central border of this area, about 3.3 km from the den. This was the last time we located 140 and 300 together. During the next 24 hours, 140 moved to the southern edge of the territory. He stayed in this area for five days before beginning wide-ranging movements that covered most of the central, southeastern, and eastern portions of ARNWR before he was killed on June 15 by a vehicle.

At 0641 hours on May 15, 300 was still near the east-central portion of 211 and 196's territory. During the next week she continued to travel through this area. Although she was well north of their home range during late May and early June, she did spend the second week of June traveling through the territory. On the 29th, a few days after 196 died, 300 was located in the southern portion of 211 and 196's territory. She used this area for about five days before moving to the center of the territory. We did not locate her outside of this area through the end of the year.

Male 211 and Female 300: From July through December, 211 and 300 used the same area and were located together on 17 occasions. During late summer and fall they mostly restricted their movements to the central portion of the home range. Their movements were influenced by the habits of pup 344. Fieldwork revealed that 344 probably spent most of its time at the south end of a logging road in the center of 211's home range. Telemetry data indicated that 211 and 300 returned to this area, probably to tend the pup, about every 24 to 48 h.

On October 18, 211, 300, and 344 were observed from the air traveling north on the logging road. During the observation 344 seemed "nervous" and spent more time than the adults traveling near the vegetated

road-shoulder. As 211 and 300 approached within about 70 m of the north end of the road, 344 stopped and turned back to the south. The adults traveled to the west while 344 traveled to the south and disappeared in a clearcut. This logging road is the only place where we consistently found tracks of 344; these tracks were usually accompanied by tracks of 211 and/or 300. Thus, we concluded that 344 spent little time traveling alone on the roads. The pup's infrequent use of roads from September to December was in sharp contrast to its extensive use of roads during summer when it traveled throughout the home range with its parents.

Male 184 and Female 205: Within three months after being released in October 1987, 184 and 205 established a home range that covered about 50 km<sup>2</sup> and included their acclimation site (Fig. 1).

Male 184 wandered more widely than 205, and he was frequently observed traveling along highway 264. 205's movements were very restricted and usually centered around their acclimation site or an area of farm fields about 10 km to the northwest. However, from mid-August through the end of the month, she traveled in a wide-ranging, unpredictable manner. During this period, she routinely used 264 as a travel route and was frequently observed by motorists and radio-trackers. The pup that she gave birth to in the spring (wolf 351) was never seen with her during the forays. The change in her movement patterns may have been caused by the need to feed the pup.

Based on tracks, by the time 351 was captured she was spending most of her time in an agricultural field (corn and beans) about 1.6 km NW of the area she was raised. Based on 205's movements, we believe that 351 moved to the agricultural field during mid-September. Although 205 regularly visited this area, she commonly spent the daylight hours elsewhere. Thus, it seems likely that 351 spent much time alone. Although 351 was captured in the agricultural field, she had moved back to the rearing area within 3 to 4 hours after being released; 205 was at the rearing site when 351 arrived. Through the end of the year we located 351 away from this area on only one occasion: on 4 December 351 and 205 were seen from the air about 3.0 km WNW of the rearing area. The pup's lack of movement was probably due to a sore foot (she suffered a minor injury during capture) and the three deer carcasses we placed near her from 12

November through 6 December.

Male 227 and Female 322: On 23 January, about one month after his original mate was euthanized, 227 was placed in the South Lake acclimation pen with 322 (Fig. 1). They were released 83 days later. These two wolves did not travel together, and on 16 May (33 days after being released) 227 wandered into Manns Harbor and had to be recaptured.

About one week after being released, 322 traveled south from the acclimation area and began to exhibit wide-ranging movements that covered about 50% of the refuge. On 31 May (45 days after being released) we located her in the community of East Lake. We monitored her intensively during the next week and determined that she was visiting East Lake almost nightly. Because of this, we recaptured her on 6 June and placed her back in the pen with 227.

During the year we conducted seven recapture attempts. All but one of these were successful.

Using pulleys, rope, and deer meat as bait, we modified 211 and 196's acclimation pen to act as a trap. They were recaptured in early January and their faulty radiocollars replaced.

On January 31, 140 was located about five km south of ARNWR; a dart pistol was used to recapture him.

On February 6, 205 was accidentally captured in a #1 1/2 coil spring foothold trap legally set for bobcats. The trapper, who was very concerned about the welfare of the wolf, immediately reported the accident to the USFWS. Fortunately, the trap only caused a small laceration (1 cm long) across the dorsal surface of the right front foot. There was no sign of the necrosis that developed on this foot after she was captured in a Braun foothold trap on December 22, 1987.

On May 16, 227 was located in the community of Manns Harbor; a dart rifle was used to recapture him.

From June 2 to 6, we attempted to recapture 322 because she was visiting the community of East Lake almost nightly. After unsuccessful attempts to dart her on June 2 and 3, we set eight foothold traps (Victor #3 Soft-Catch) and one box trap. Because she showed no interest in the traps, we used a dart rifle

to recapture her on June 6. The dart penetrated to the bone and the wound became infected by June 16. She was treated with antibiotics and the wound had healed by August 18.

On October 13 we attempted to net 351 by flushing 205 from a v-ditch in an agricultural field where we found pup tracks. Unfortunately, we only saw 205 and concluded that either we walked past 351 or she was elsewhere. Three #1 1/2 soft-catch foothold traps set that night failed to catch 351. Uncertain about the habits of 351, we initiated attempts to capture 344.

By 1800 hours on 14 October, we had set three #1 1/2 soft-catch traps. At 2000 hours, 344 got in and out of one of the traps. The trap line was pulled the next morning. A new trap line was established on the afternoon of the 18th. During the evening, 344 uncovered a trail set. This line was pulled on the 19th. A third trap line, this one consisting of #3 soft-catch foothold traps, was set on the 23rd. A larger trap was used because we thought this would increase our chances of holding the pup, who by this time was the size of a very large coyote (the #3 is a standard coyote trap).

At 2115 hours on October 25, 211 was captured in one of these traps. The trap did not cause noticeable damage to his left-front foot. After processing, we decided to use 211 as bait by placing him in a sky kennel in the trapping area. The next day we moved 211 to a small pen constructed in the area, and set three more traps. Between the evening of the 26th and the morning of the 28th, 344 uncovered another trail set. Tracks on the road indicated that the pup was reluctant to investigate the pen where his father was being kept. We pulled the trap line on the 28th and released 211. Because of the activity associated with the capture and release of 211 we decided to concentrate our efforts on 351. In all, 67 trap-nights and 304 man-hours (the trap lines were monitored 24 hours per day) were expended attempting to capture 344.

On November 8, after searching for sign of 351 for seven days, we set four #3 soft-catch traps on trails leading to a deer carcass in the agricultural field where we had tried to catch her on October 13. During the first evening one of the traps was sprung; small canid tracks were nearby. The next day, we reset the trap and added an additional dirt-hole set;

351 was captured later that evening. Although 351 could have been in the trap for as long as 9.25 hours (the automatic monitoring system failed), the trap did minimal damage to her right front foot. There was a laceration (about 0.25 cm wide and 1.0 cm long) across the surface of the two middle pads and a laceration (about 0.25 cm wide and 1.0 cm long) across the heel pad.



#19 - Telemetry transmitters were attached to wolf leg-hold traps by a trip wire to immediately signal us a trap was sprung - thus minimizing trap injury. 11/88 MKP

To help 351 recover from the injuries, we administered 960 mg of the oral antibiotic "bactrim" (800 mg sulfamethoxazole, 160 mg trimethoprim) daily from November 18 to 28. The 960 mg were divided between two small pieces of meat placed on a road near 351. Tracks indicated that many of the pieces were eaten by 205.

After capturing 351 we again turned our attention to 344. From mid-November through mid-December, we looked for, but infrequently found, sign of 344.

Because we were uncertain of the animal's habits, we did not attempt another capture.

Although the wolves maintained healthy weights, four animals did die during 1988.

Two males were killed by vehicles while traveling along U.S. 264; 184 was killed at 2130 hours on May 29 and 140 was killed at 2100 hours on June 15. The drivers of the cars involved in the collisions immediately reported the accidents to the USFWS.

Female 196 was found dead at her acclimation site at 0716 hours on June 25. The necropsy revealed that the causes of death were a uterine infection and kidney failure. The uterine infection was probably a complication of the birth of pups in late April.

Female 322 was anemic when recaptured on June 6. By the 16th the anemia had worsened, and the dart wound had become infected. She was sent to the project vet's office for treatment. She returned to ARNWR on June 27. The cause of the anemia is unclear, but parasites (hookworms and ticks) may have been involved.

Female 351 was about 6 1/2 months old and weighed 16.5 kg when captured. Five pups born and raised at the refuge's captive facility had a mean weight of 19.5 kg ( $sd = 4.5$  kg) at about 6 1/2 months of age. Thus, 351 was only 13% lighter in weight than the average captive pup. Furthermore, she was only 5% lighter in weight than the smallest pup from the captive colony, which was also a female.

When captured, 351 harbored a hookworm infection (stool sample contained about 2100 hookworm eggs/gram of fecal material). However, we only found two ticks on her and the blood sample was negative for heartworms.

Wolf 211, who was originally released on October 1, 1987, was in excellent condition when recaptured on October 25, 1988: he weighed 32.7 kg (which was his approximate captive weight), harbored only a few to a moderate number of ticks, and did not have a heartworm infection. Although a stool sample was not collected during processing, scats dropped by 211 on the road ( $n = 2$ ) during October and November were negative for common intestinal parasites (hookworms, roundworms, and whipworms). Of an additional 24 scats collected that could have been dropped by 211,

only three were positive for hookworms and/or roundworms. We have been administering ivermectin as a prophylactic (50 micrograms/kilogram estimated body weight) since May.

The year ended on a sad note as 211 was found dead on December 27; he suffocated after a raccoon kidney became lodged in his trachea. The death of 211 was a major setback for the project. Not only had he adjusted to life in the wild, he had clearly formed an association with adult female 300. We were very optimistic about the chances of 211 and 300 producing a litter of pups in 1989.

211 was a successful reintroduction. Not only did he keep himself alive, but he also sired a litter and raised one pup to at least seven months of age. 211 is positive proof that captive-born-and-reared red wolves can make the transition from captivity to life in the wild.

During 1988, we collected 28 blood samples. When collecting, we usually obtained 35 cc of blood and placed a portion of this in tubes containing EDTA (an anticoagulant). These tubes, along with prepared microscope slides, were sent to U.S. Seal for hematology analysis (Veterans Administration Hospital, Minneapolis, MN). The remainder of the blood was centrifuged to separate the serum. The serum was also sent to the V.A. Hospital and tested for blood chemistries. Dr. Seal is currently analyzing the data and preparing the results for publication.

Few supplements were provided during the first part of 1988 because the free-ranging animals had learned to secure food on their own, and we provided very few supplements to 140 and 227 after they were re-released in April because they had already spent time in the wild. We did try to supplement the diet of the two inexperienced females released in April. Although we were able to provide nine supplements to 300 from April 14 to July 26, we were largely unsuccessful at supplementing 322 because of her wide-ranging, unpredictable movements.

After 184 and 196 died, 205 and 211 each faced the problem of raising a single pup without assistance. We decided to supplement their diets through summer hoping to increase the chances of the pups surviving to an age where they could begin to hunt small mammals (i.e. about 16 weeks).



#20 - "Processing" included blood work, weight, check for external parasites, temperature check, etc.

1/88 MKP

From May 30 to July 31, 205 received about 4.5 to 6.5 kg of meat every 2 1/2 days. In early August, we started to wean 205 and the pup from the supplements by decreasing the frequency of feedings to about every sixth day. Because 211 was probably a more proficient hunter than 205 and because 196 did not die until June 23 to 24, we only supplemented his diet with 4.5 to 8.0 kg of meat about every fifth day from late June through August.

Although the supplemental feeding program helped insure the survival of the pups, it also probably caused an increase in 205's, and to a lesser extent 211's, tolerance of vehicles and people. For future long-term supplemental feeding programs, food should be dropped from the air. If aerial drops are not possible, supplements should be placed when the wolf of concern is away from the feeding area.

From September 1, through the end of the year, supplemental feedings mostly consisted of small quantities of food that were provided in an attempt to document the presence and restrict the movements of the wild-born pups. Exceptions to this included

the 7.5 kg of meat provided to 211 during his stay in a small pen at the end of Gibbs Road and the three deer carcasses (about 105 kg total) provided to 205 and 351 from November 11 to December 6. These carcasses were provided to help 351 recover from injuries sustained during capture.

Although we did supplement some of the animals' diets during 1988, gross examination of the 1000 scats collected during 1988 and interpretation of "sign" revealed that deer, raccoons, and marsh rabbits were important food items. Rodents, turtles, snakes, birds, and frogs were also eaten.

The radioactive content of 670 of the scats has been determined; scats can be assigned to individuals about 70% of the time.



#21 - The lab area at our new office has really come in handy! Before fecal analysis were done on the lunch table! 11/88 BWS

To better understand red wolf food habits, feeding trials were conducted during October. The objectives of the trials were to relate scat contents to prey consumed and to develop criteria for distinguishing red wolf scats from other carnivore scats. Currently the data are being analyzed.

Two pairs of wolves, 211/196 and 184/205, produced litters during 1988. Each pair is discussed separately.

211 and 196: Prior to early April, 211 and 196 regularly traveled throughout their home range. However, by the middle of the month they began to restrict their movements to a den area which was situated in the center of the home range about 6 km south of their acclimation pen.

The restriction of movements, which was more pronounced for 196 than for 211, continued until the middle of May. On the 21st, when the den was abandoned, the adults and one pup were observed about 1.2 km from the den. Previous observations of 196 indicated that she whelped around late April. Thus, the pup was 3 to 4 weeks old when seen on the 21st. The pup was observed on 12 other occasions through August 31. We never saw more than one pup.

After the wolves abandoned the den, which was located in the center of their home range (Fig. 1), we inspected the area on foot and found a few shallow depressions that the wolves had used. These depressions were located beneath a thick understory of cane and an overstory of pine. 196 may have used one of these depressions as a whelping site. It is unlikely that she dug a den because the water table in this area is very high.

The pup traveled throughout the home range with 196 until her death around June 24. After this, the pup often traveled with 211. Successive observations of the pup were an average of 3.2 km apart (range 0.0 to 10.8 km).

Although 196 did not die until June 23 or 24, her illness probably caused her to stop lactating 7 to 10 days before her death. Thus, the pup was weaned when 7 to 8 weeks old.



#22 - Six week old red wolf pup born to 213 and  
245. Young pups had patches of hair  
clipped for ID.

6/88 MKP



#23 - 10 wks....

7/88 MKP

Although the number of pups produced by 196 is unknown, the necropsy revealed eight placental scars; it is likely that she gave birth to an average-sized litter (about five pups) and only one pup survived to 3 to 4 weeks of age.

The necropsy on June 28 revealed that 196 was infected with hookworms. She probably was infected prior to parturition. Hookworms, which are capable of transplacental and transmammary migrations, may have caused the death of some of the pups.

184 and 205: About 2 months prior to the whelping season, 184 and 205 restricted their movements to an area of agricultural fields about 8.0 km northwest of their acclimation site at the Point Peter impoundment. Between 1810 hours on April 27 and 0716 hours on April 28, 205 moved from the farm to the impoundment to den. We rarely located her away from the impoundment between late April and June 11. From late April until his death on May 29, 184 routinely traveled between the farm and the den.

Within 24 hours of 184's death, 205 began to show an increase in activity although she continued to restrict her movements to the impoundment for the next 10 days. Between 1838 hours on May 29 and 1922 hours on May 30, male 140 traveled through the Point Peter area. He returned to the impoundment on June 4 and continued to use the area near 205's den until the afternoon of June 15.

At 1000 hours and 1015 hours on June 11, motorists saw 205 and one 5 to 6 week old pup traveling north on highway 264 about 4.8 km from the den. From 2000 hours to 2130 hours USFWS personnel escorted 205 and the pup north along 264. Motorists that were stopped willingly cooperated. 205 and the pup traveled along the highway until they came to the first dirt road that led to the farm. At 2130 hours, they disappeared down this road. By 2245 hours they had reached the area of the farm that 205 had used extensively prior to the whelping season. This area became known as the "rearing site".

After 205 abandoned the den, which was located in the southeastern corner of her home range, we inspected the area and found a few shallow depressions that the wolves had used. These depressions were located beneath a thick overstory of myrtle. 205 may have used one of these depressions as a whelping site. It is unlikely that she dug a den because the water

table in this area is high.

205 exhibited localized movements around the rearing site from 12 June through mid-August. Likewise, the pup was never seen ( $n = 7$ ) more than 1.0 km from this area. These restricted movements were probably a function of the supplemental feedings we placed near the rearing site.

Although the number of pups produced by 205 is unknown, she probably gave birth to an average-sized litter, and only one pup survived to 5 to 6 weeks.

On April 25, we collected a scat from 184 that contained hookworms. 205 may also have harbored a hookworm infection at this time. Hookworms may have caused the death of some of 205's pups. Since being released, the wolves have been sighted 295 times. Most observations (93%) were turned in by radio-trackers or motorists ( $n = 184$  and 89) (Table 1). Wolves were seen 87 times while radio-tracking from the ground and 97 times while radiotracking from the air. Wolves were seen more frequently by motorists on paved roads than on unpaved roads. Hunters reported seeing wolves on seven occasions. Seven observations were reported by people engaged in miscellaneous activities. Sightings were distributed throughout ARNWR.

Almost 15% of the sightings ( $n = 42$ ) occurred during the first 45 days after the wolves were released. The large number of sightings was probably due to canals and thick vegetation that hindered movements, and the wolves' inexperience with vehicles. Over 50% of the sightings ( $n = 152$ ) occurred from 12 April to 31 August. Most of these sightings (70%) were turned in by radio-trackers. The large number of sightings during this period resulted from an intensive monitoring effort and because 211 and 205 were relatively easy to see due to increased activity. The increase was probably due to the need to feed the two pups.

Most observations by hunters (42.9%) occurred during the 1987 muzzle-loading season (October 5 to 10). The last sighting by a hunter during the 1987 - 1988 season was on November 28, despite the fact that the gun season lasted until January 1. The lack of sightings after November 28 was probably due to a decrease in hunter effort toward the end of the season, and an improvement in the wolves' ability to avoid hunters. The lack of sightings during the 1988

-1989 season was due to the ability of the wolves to avoid the hunters and the fact that there were only five free-ranging in the refuge during the season; two of these were wild-born pups that spent very little time traveling on roads.

All the wolves were seen at least three times (Table 1). However, 24% ( $n = 70$ ) of the sightings involved 184. This male was frequently observed because his movements were wide-ranging, he routinely traveled on highway 264, and he was tolerant of vehicles. On May 29 he was killed by a vehicle.

Other wolves also exhibited a tolerance for vehicles, and sightings by motorists were not uncommon (Table 2).

Wolves often responded to vehicles by running down the middle of the road until the car or truck was close, then they moved off and disappeared in the vegetation or stood at the side of the road and waited for the vehicle to pass.

Because of the animals' tolerance of people and vehicles, on 32 occasions we tried to haze them away from areas. Hazings involved people, cracker shells, trucks, lights, horns, and rock-salt delivered from a 12 gauge shotgun. The 32 attempts provided mixed results. For the most part, we were unable to effect long-term changes in wolf movements. Usually they moved around the hazers and stayed out of sight but rarely left the general area. However, we did have out successes.

Table 2. Sightings of specific wolves by type of observer from 14 September 1987 to 31 December 1988. The second value for each wolf per observer type represents the percentage of the total number of sightings for that animal. Percentages were rounded to whole numbers.

Wolf	140	231	300	211	196	344	227	194	322	184	205	351
Type of Observer												
ground tracker	8	3	2	18	3	3	5	2	8	10	30	5
	38	100	18	32	12	20	100	66	50	14	52	42
aerial tracker	6	-	7	29	15	11	-	-	4	9	12	4
	28	-	64	51	62	73	-	-	25	12	21	33
motorist	5	-	2	7	3	1	-	-	3	49 <sup>b</sup>	16	3
	24	-	18	12	12	7	-	-	19	70	27	25
hunter	-	-	-	3	3	-	-	1	-	-	-	-
	-	-	-	5	12	-	-	33	-	-	-	-
misc. <sup>a</sup>	2	-	-	-	-	-	-	-	1	2	-	-
	9	-	-	-	-	-	-	-	6	3	-	-
Totals	21	3	11	57	24	15	5	3	16	70	58	12
Percent of total observ.	7	1	4	19	8	5	2	1	5	24	20	4

a - This category pertains to individuals that were engaged in miscellaneous activities when they observed a wolf.

b - Thirty-two of these sightings are from instances when the identity of the wolf was not known for certain. Based on behavioral and physical characteristics I believe these 32 reports were of 184.



#24 - Female #194.

11/87 MKP

In early August, 205 began exhibiting wide-ranging movements, routinely used 264 as a travel route, and was frequently observed by motorists. This trend continued into September. Concerned that 205 would be killed if she continued to exhibit such behavior, we conducted an intensive hazing program from August 15 to September 4. During this period we encountered 205 on nine occasions; three of these encounters took place in September. Most of the attempts involved cracker shells, yelling/running at her, and driving a vehicle at her. The final hazing attempt was initiated on October 13 because of the need to capture 351. 205 moved well and was very intolerant of our presence.

Apparently the hazing attempts brought about the desired effect. From September 13 to December 31, 205 rarely used 264 as a travel route, and she was only observed four times from the ground; three of these observations were very short in duration and resulted from the attempt to capture 351. The final ground observation was reported on November 2 by a motorist who just got a glimpse of 205.

Eight hazings were carried out in order to keep 211 and 300 away from traps set for 344. These hazing attempts simply consisted of spot-lighting the wolves with the headlights of the truck and/or a q-beam; we were trying to maintain a low profile because of the trap line. Nonetheless, we were moderately successful at keeping 211 and 300 away from the trap line on 2 and 6 nights, respectively. 211 was captured on the third evening that the third trap line was out. Although we tried to haze him from the area, he traveled around us through a clearcut and got caught in one of the traps. We were able to keep 300 out of the area for five consecutive nights. Throughout the year the ARNWR was the second largest captive facility for red wolves in the world. For the most part, there were 13 wolves (three adults, five two-year olds, and five pups) in five pens at the captive facility located at Sandy Ridge.

During the year, the Alligator River Refuge project illustrated its value as a staging facility for red wolves being prepared for release and for wolves moving between captive facilities, from captivity to other free-ranging populations in the southeast, and from one free-ranging population to another.

Currently there are eight animals at Sandy Ridge being prepared for release during early summer 1988.



#25 - Typical "slinking" of Red Wolf. 4/88 MKP

On 7 December, three pups were shipped from ARNWR to the main captive holding facility at Graham, Washington. On this same day, male 280 arrived from the Audubon Park Zoo, New Orleans, Louisiana. This animal was taken to Sandy Ridge and paired with female 245. They are currently being prepared for release on Horn Island; they will be shipped to Mississippi in January 1989.

As indicated earlier, males 331 and 332 (pups from Cape Romain National Wildlife Refuge) will be released in ARNWR during January 1989; they will not undergo an acclimation process.

### 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 first year's management of the farm fields has attracted fair numbers of waterfowl. Peak numbers so far are 200 blacks, 400 mallards, 1,000 green-winged teal, 800 ring-necked ducks, and 1,200 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 our first seven surveys, which began shortly after flooding the moist soil units, are given below. The survey route (Sawyer Lake Road) runs along the southern edge of the South Twiford Unit which covers about two thirds of the acreage flooded this year.

Sawyer Lake Road Waterfowl Survey - South Twiford Unit

	Oct 31	Nov 15	Nov 30	Dec 06	Dec 10	Dec 21	Dec 29
Mallard				50	82	8	400
Black Duck		30	85	200	59	17	177
Pintail	23						
Wigeon	70		60				
Green-winged Teal	2	75	85	750	820	75	999
Wood Duck		300	595	1200	1103	563	892
Ring-necked Duck		25	320	50	769	250	135
Coots					5	2	
Unidentified Ducks			25		45		77
Total	95	430	1170	2250	2883	915	2680

We are also expecting increased wood duck production as we achieve restoration of past water levels in the swamps on the west side of the Refuge where we are plugging old drainage ditches.

4. Marsh and Water Birds

On August 17, we confirmed anhinga reproduction on the Refuge. This is an extension for the North American Breeding Range. BT Lucash had seen adult anhingas on the south end of Whipping Creek Lake during early summer near the heron rookery there. Twenty-five great blue heron nests with young were counted at the heron rookery. ARM Noffsinger and BT Beasley also observed 2 anhinga young in a nest there on the 17th during an alligator nest survey with Scott Smith and Mike Surrette of the Bombing Range. Formerly, the northernmost breeding record was Brunswick County, N.C. Reproduction was also documented along the Roanoke River this year by Merle Lynch, a biologist for TNC.



#26 - Adult anhingas are a rarity at Alligator



#27 - But anhinga chicks were unheard of!

8/88 SS

#### 8. Game Mammals

Alligator River NWR continued to support a healthy herd of white-tailed deer along with substantial small game populations. Annual hunts continue to keep the populations in check.

In 1988 the refuge in cooperation with the Department of Defense initiated a study of black bear movements and habitat use in Dare County. The study grew out of controversy surrounding black bear populations in the southeastern Atlantic Coastal Plain. Habitat modification resulting from peat mining, forestry, and agriculture has effectively fragmented black bear habitat throughout the region.

Due to habitat fragmentation, many southeastern black bear populations exist in "islands" of suitable habitat, effectively separated from other bear populations. These island populations are susceptible to loss of genetic variability from inbreeding and genetic drift. Loss of genetic variability can lead to decreased natality and survival, and ultimately an increase in the probability of population extinction.

Baseline data concerning black bears provide the manager a foundation upon which to build a program designed to benefit the species. For example, prescribed burns, small permanent clearings (< 5 ha), and 10m-wide roadstrips, along with maintenance of shrub-pocosins, cypress-gum communities, and areas free from human disturbance may prove beneficial to the species. Proper management can help insure the continued existence of the black bear population in mainland Dare County.

The objectives of the study are to:

1. Determine the influence of sex and age on the seasonal and annual home ranges of black bears in Dare County.
2. Determine habitat use patterns by black bears and the effect of human activities on these patterns.
3. Determine the chronology of denning and physical characteristics of dens.
4. Determine the extent of egress and ingress of black bears in the study area.
5. Determine the survivability of young black bears in the study area.

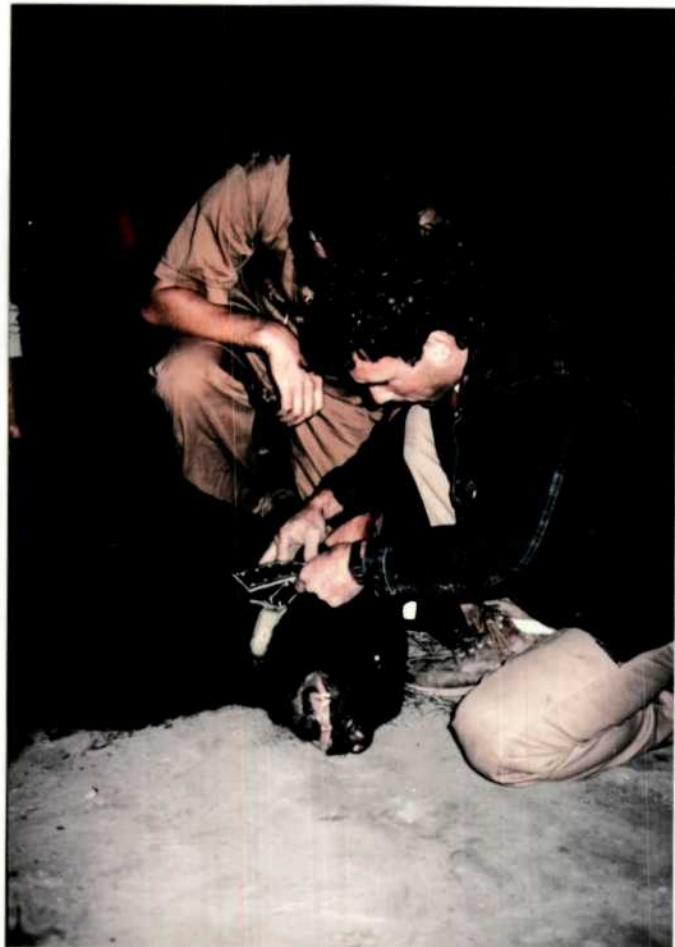
Refuge personnel captured 11 bears in Aldrich foot snares in about 200 trap-nights of effort from late August through September. All the animals were captured near the farm fields. Prior to processing, bears were immobilized with a 2.0:0.7 mixture of ketamine hydrochloride (Ketaset) and xylazine hydrochloride (Rompun) at a concentration of 265 mg/ml. Initial dosage was 8.0 mg/kg estimated body weight. Drugs were administered by dart pistol, jabstick, and by hand.

All the animals were males that ranged in age from young of the year to mature adults (Table 3). A first premolar was extracted and will be used to refine age estimates to year class. The average weight and chest girth of the mature animals was 119.5 kg and 108 cm, respectively. Blood and tissue samples were taken to determine physiological condition and genetic vigor. These samples have not yet been processed. Numbered plastic tags were placed in the ears of each bear. Antibiotics were administered to each animal to assist recovery from capture-induced injuries.

Eight bears were outfitted with activity/mortality sensing radiocollars (Telonics Inc., Mesa, AZ) in the 165 MHz range. These collars contain a variable-pulse activity switch and

an inverse mortality switch. Three bears removed the collars shortly after being released. Three animals were not collared because of small body size. Thus, we ended the 1988 capture-phase of the program with five bears "on the air".

Animals were radiotracked from a fixed-wing aircraft during scheduled flights to locate red wolves. A total of 109 locations were recorded (Table 3). Since the number of locations per bear is small and the tracking period short (three to four months), only minimum estimates of the size of the home ranges can be made. Areas used by the bears ranged in size from 78.9 km<sup>2</sup> to 21.5 km<sup>2</sup> (Table 3). There was substantial overlap between the home ranges of the bears (Fig. 2). The area of overlap consisted primarily of corn fields that received frequent use until late fall, at which time the bears moved to areas dominated by tree pocosins.



#28 - In cooperation with the U.S. Air Force,  
Refuge staff collared eight black bears.

11/88 BWS

Table 3. Characteristics of black bears captured in the refuge in and results of radiotracking during from September 1988 to Janaury 1989.

Age	Sex	Bear #	Date of Capture	Weight (kg)	Chest Girth (cm)	Radiocollar Attached	Number of Locations	Home Range (km <sup>2</sup> )
imm	M	1	8/29	59	75	yes	25	68.3
mat	M	2	9/01	104	102	yes	--	----
mat	M	3	9/01	127	107	yes	25	21.5
mat	M	4	9/05	145	121	yes	--	----
mat	M	5	9/06	125	104	yes	24	35.5
imm	M	6	9/15	82	---	no	--	----
mat	M	7	9/21	103	105	yes	--	----
mat	M	8	9/23	127	110	yes	18	37.6
imm	M	9	9/23	77	86	no	--	----
mat	M	10	9/23	106	---	yes	17	77.9
imm	M	11	9/23	23	---	no	--	----

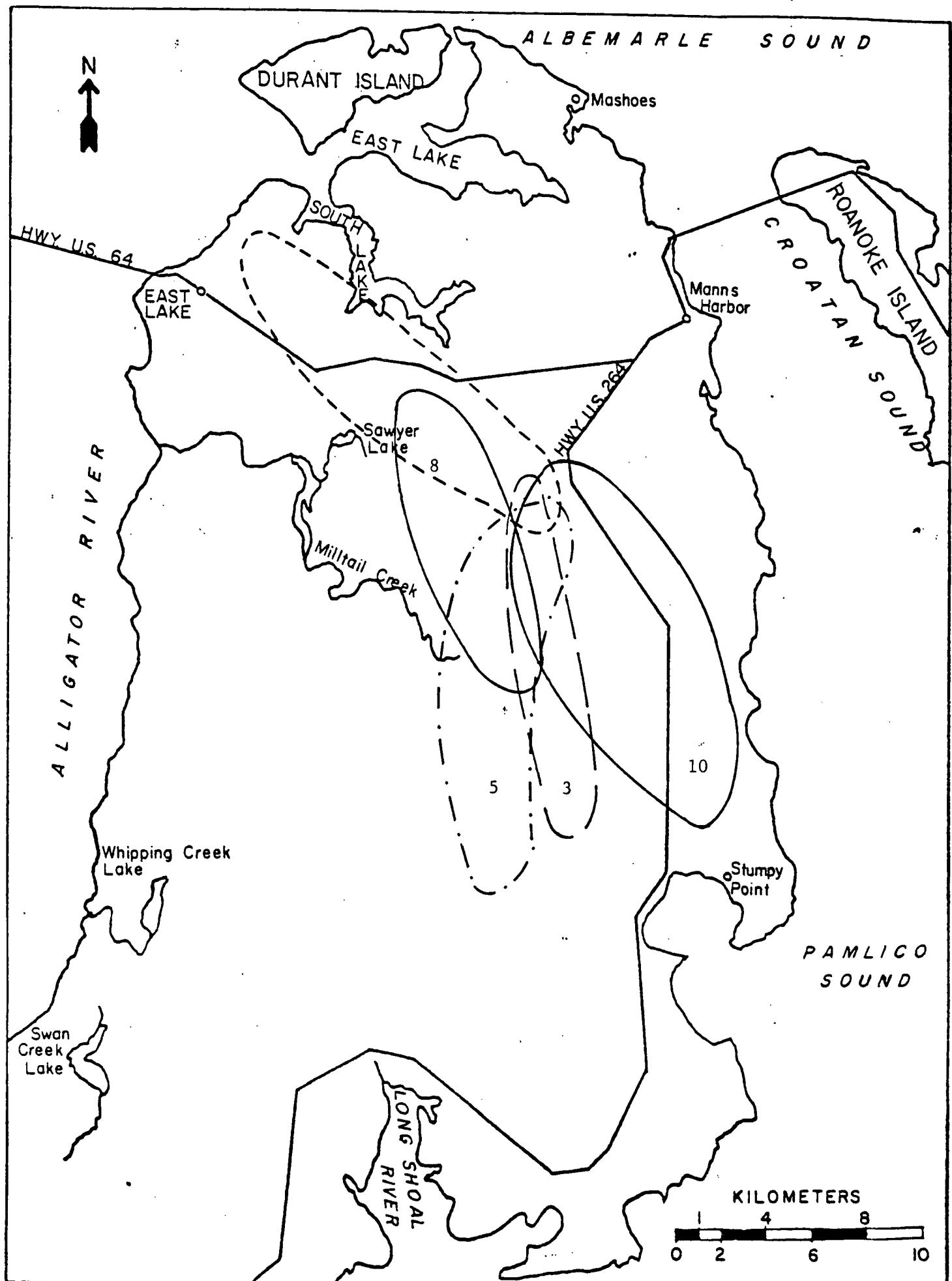
a - Animals were aged as immature (imm) or mature (mat) based on weight and chest girth. Age estimates will be refined to year class as soon as the premolars are sectioned and annuli counted.

b - This is a minimum estimate of weight.

c - Chest girth was not measured.

Figure 2. Areas used by black bears in the refuge during 1988.

57



## H. PUBLIC USE

### 1. General

Hunting is the major public use activity on Alligator River NWR. Since Alligator River is not noted for waterfowl or as a "birder's paradise", little non-consumptive public use occurs. In actuality, non-consumptive public use is not expected to increase significantly in the foreseeable future. Total visits to the Refuge in 1988 were estimated to be 9,271.

Administrative offices for the Refuge were relocated twice during 1988. After moving from the lab section of the North Carolina Aquarium on Roanoke Island in March to temporary GSA office space in the Waterfront Building in Manteo, we moved again in December to more "permanent" (three to five year lease) GSA office space. Though adequate for administrative purposes, the offices at the Aquarium and the Waterfront Building left much to be desired for the visiting public. Our current offices are nicer to "look at" and function well for administrative purposes, but the public was obviously not included in the overall plan. We do have a "reception area" with a brochure rack and small display. We have initiated a volunteer "host/hostess" program for this office to assist with answering the telephone, greeting the public, answering questions, etc.

A few visitors actually do locate the office, even after all the moves, but most information is disseminated by telephone, correspondence, and through the news media. During 1988, the Refuge staff responded to approximately 2890 public inquiries and issued 59 news releases directly related to Alligator River NWR. 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", which was begun late in 1986 has been well received by the public. It 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 news releases during 1988.

During October 24-28, Alligator River observed "Drug Free America" week. Each Refuge employee wore a red ribbon on his/her uniform for the entire week. Each Refuge vehicle displayed a red streamer from its antenna, and the front door of the office displayed a large, red bow with "drug free" lettered on a streamer. The Coastland Times' Thursday edition had a front-page photo of our fleet of Refuge and personal vehicles sporting red streamers!

## 2. Outdoor Classrooms - Students

Dare County and other local schools have a keen interest in environmental education. Unfortunately, their teachers lack much of the needed expertise (and, more importantly, the confidence) to conduct field activities with their students. The school system also lacks transportation for on-refuge activities.

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".



#29 - Volunteers conduct wildlife programs throughout the county. Through volunteers, we can literally be many places at once.

4/88 Unknown

To encourage contact between the classes and the Refuge and to ensure a reasonable level of "wildlife literacy" in the local public schools, a core group of volunteers have prepared and stand ready to present in classroom programs on assorted wildlife and refuge topics. During 1988, programs on the Red Wolf, Birds, Mammals, Amphibians, Reptiles, Fish, and Animals without Backbones were available. Since these

programs do not qualify as "environmental education", figures are included in Section H.7 of this report. We contend that this sort of "environmental literacy" is what environmental education is all about.

### 3. Outdoor Classrooms - Teachers

On September 16, ORP Strawser presented a "training" program for 15 students in the Interpretation class from East Carolina University. The students in this program are strong potential interns for Alligator River; recruiting was affected simultaneously.

### 6. Interpretive Exhibits/Demonstrations

Several exhibits and demonstrations were presented by Refuge staff during 1988. Among them were:

On March 18, ORP Strawser and Volunteer Dyar represented the USFWS at the College of the Albemarle Career Day in Elizabeth City.

Also on March 26, ORP Strawser and Volunteers Davis, Dyar, and Bush manned an exhibit at the annual Dare County Volunteer Fair.

In June, the Refuge had a manned exhibit at the annual Dare Day celebration in downtown Manteo. This year, the exhibit focused on the red wolf project and was manned by ORP Strawser, BT Phillips, and Volunteers Royce and Morse.

On September 17-18, ORP Strawser, BT Lucash, WB Phillips, and BA Windley manned a Refuge display at the Currituck Wildlife Festival. The exhibit featured the Red Wolf Project and other activities on the three refuges. Reports indicated 1,000 people attended.

### 7. Other Interpretive Programs

A number of other Refuge programs were conducted during 1988. Many dealt with the Red Wolf Program; others addressed refuge related topics. A list of programs, a brief description of each, and information on participants follow:

On January 19, RM Taylor conducted a program on the red wolf for 35 participants of the Pamlico Citizens Advisory Committee of the Albemarle-Pamlico Estuarine Study. Later the same day, ORP Strawser gave a Pea Island talk and bird walk for 11 participants.

On February 5, Volunteer Davis conducted a red wolf program

for approximately 45 members of the Wildlife Club at the Manteo Middle School.

On March 9, Volunteer Bush presented a program on reptiles to the Mt. Olivet Preschool. Twenty-two three and four year olds attended.

On March 25, ORP Strawser presented a 30 minute program on wildlife careers for the Science Club at the Manteo Middle School. Approximately 35 students attended.

On April 23, RM Taylor gave a tour of the Refuge and talk on the farm field management plans and the Red Wolf Project for the N.C. Wildlife Resources Commission. On the 24th, Taylor attended the fish fry with the same group.

On May 10, Volunteer Dyar conducted a red wolf program for eight students and two adults from the Pungo Christian Academy.

Manager Taylor flew to Atlanta on June 9, to present a talk on the Red Wolf program at Alligator River to the Staff of Refuges and Wildlife.

In June, WB Phillips presented a red wolf program to approximately 30 people at the N.C. Aquarium.

On July 11, ARM Noffsinger conducted a program and field activity for the group of students participating in the Wildlands Research Program explaining pocosins and other wetland habitats. On July 13, ORP Strawser continued their "processing" with a discussion on public use on refuges. On July 18, RM Taylor spoke to the same group about the NWRS and moist soil management.

On August 15, ARM Schriver presented a program on the Refuge System and habitat management for the second group of Wildlands Research students who were volunteering with the Red Wolf Project.

During August, WB Phillips presented a second red wolf program to visitors at the N.C. Aquarium. Approximately 35 people attended.

The last week in September, WB Phillips presented a Red Wolf program for the American Association of Zoological Parks and Aquaria in Milwaukee, Wisconsin. Approximately 150 people attended.

During the second week in October, WB Phillips presented a red wolf program to the 5th World Conference on Breeding Endangered Species in Captivity in Cincinnati, Ohio.

Approximately 250 people attended.

On October 15, RM Taylor gave a talk and tour of Alligator River for the N.C. Nature Conservancy. They visited the waterfowl management unit, Milltail Creek, and the Sandy Ridge Wolf pens.

On November 18, ORP Strawser conducted two public programs on "Bird Banding and Marking". One program was at the N.C. Aquarium with six people attending. The other was at the Buxton Birding Club meeting with approximately 35 people in attendance.

In addition to the above programs, more than 25 programs on assorted wildlife topics were given for approximately 920 Dare County students by volunteers participating in the Refuge school programs. A majority of these programs were conducted by Arch Bush, Warren Davis, Bill Perkinson, and Ken Dyar.

#### 8. Hunting

Very soon after Prudential's donated lands became a new Refuge, the decision was made to adopt N.C. State hunting seasons and regulations until the master plan was completed and approved. This was the most logical course of action to minimize confusion and to effect as smooth a transition as possible from private to public ownership and control.

The Alligator River Master Plan was officially approved on April 1, 1988. This document divided the Refuge 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 1).

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 250 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 135 bucks and 10 does taken on the Refuge in 1988. A more realistic estimate would be a harvest of 242 deer.

A limited amount of waterfowl hunting took place on the

## ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE

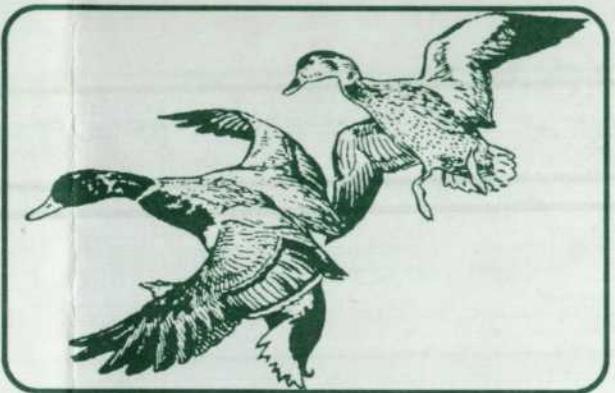
### Regulations

- The refuge is open daylight hours only. Hunter access is allowed from one hour before until one hour after legal shooting hours.
- Firearms are prohibited on the refuge unless they are unloaded and dismantled or encased. When participating in a hunting activity firearms are permitted but must be unloaded while being transported by a vehicle or boat under power.
- The use of artificial lights (including car headlights) to locate, observe, or take wildlife is prohibited.
- The use of dogs is restricted to designated areas.
- Vehicular access is restricted to designated areas.
- Camping is prohibited.
- Wood gathering is by permit only.
- No commercial guiding is permitted.
- The construction and use of permanent blinds, platforms, and ladders is prohibited. Blinds and tree stands must be removed from the refuge after each day's hunt.

—Hunters utilizing the refuge are subject to inspections of licenses, hunting equipment, bag limits, vehicles and their contents during compliance checks by Refuge or State officers.

Only the following may be hunted:

mourning doves, geese, swans, ducks, snipe, woodcock, squirrels, rabbits, quail, raccoons, opossums, and deer.



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

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

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

Map for information on the use of dogs (vehicles)

TAKE PRIDE IN AMERICA'S WILDLIFE RESOURCES.

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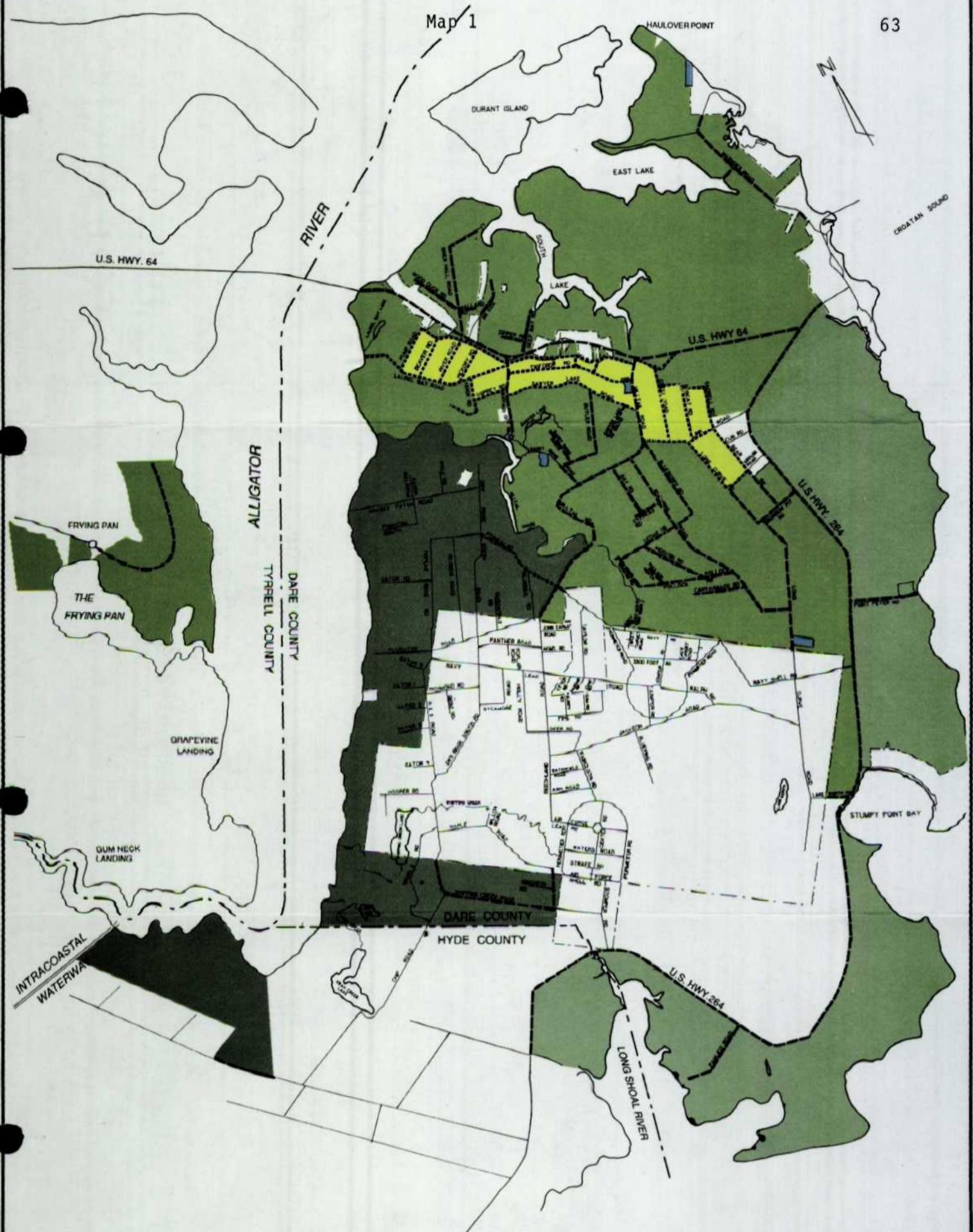


DEPARTMENT OF THE INTERIOR  
U.S. Fish and Wildlife Service  
4-RF-41630-August 1988

## ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE



## HUNTING REGULATIONS



- Gum Swamp Unit - Hunting allowed; dogs prohibited.**
- Hunting allowed; the use of dogs is restricted to bird hunting with retrieving dogs.**
- Hunting with dogs allowed.**
- Farming Area-Open September 1-October 31 (dogs allowed); other times CLOSED TO ALL ENTRY.**
- No Hunting - Safety/Resource Management Zone.**
- Roads open to motorized vehicles.**
- Roads open seasonally to motorized vehicles.**

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

## ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE

Refuge, but most occurred over open water in the sounds and in East Lake. Since the farm fields were open to public use during October, waterfowl hunters were allowed to hunt there during the first three day season (October 14-16).

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.

On September 8, Refuge staff and NCWRC Officer Brinkley held a Hunter Information meeting at the Community Center in Manns Harbor. Many questions were asked about current regulations, both State and Federal. The new policy on Refuge hunting by youths was also discussed. Of major interest to the crowd was information about the newly acquired farm fields. Approximately 60 people attended.



#30 - Hunt information boards are located at all sixteen major entrances to the Refuge.  
These boards are updated yearly. 1/89 BWS

Estimated public hunting activity appears below:

<u>Activity</u>	<u>Visits</u>	<u>AH</u>
Duck	205	820
Deer (gun)	1,500	9,000
Deer (bow)	411	2,466
Small Game	400	1,600
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 of the Refuge is for striped bass 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. The most popular fishing areas on the Refuge are East Lake Canal, Milltail Creek Lake, and two areas of South Lake. Angling for bluegill, crappie, chain pickerel, channel catfish, flier, largemouth bass, and yellow and white perch is considered good.



#32 - A leisurely afternoon on the shoulder  
of NC Rt. 64.

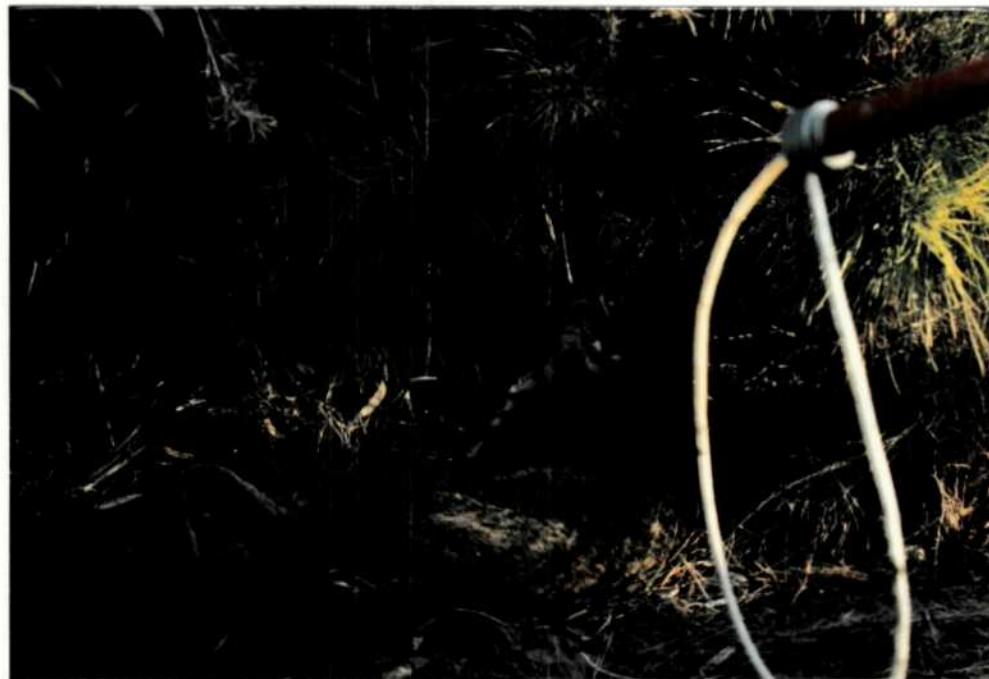
9/99 BWS

Several folks were regularly observed fishing in canals along Rt. 64, sometimes by boat, other times from the bank. Though the number of individuals involved was small, they were steady users, and seemed to think the quality of their experience was quite high.

During 1988, there were an estimated 1,185 fishing visits to the Refuge with 3,555 activity hours spent participating in this activity.

#### 10. Trapping

Furbearer trapping was allowed under North Carolina regulations. Since trapping is considered a commercial use of the Refuge, neither visits nor activity hours spent participating in this activity were recorded under public use. Special use permits were required for Refuge trapping; eleven were issued. Special regulations on the permits limited trap size and required that trappers report their take. Four completed "trapping results" forms were received by this office. Of those, one was a negative report; the permit had not been used. Total take from the other two trappers was 44 raccoons, 3 otters, 2 mink, and 6 bobcats.



#33 - Oops! This is not red wolf #311! (We might add that this bobcat was released immediately after this photo was taken).

11/87 CL

### 11. Wildlife Observation

Alligator River NWR attracts few visitors for any form of non-consumptive public use. Canoeists enjoy paddling on Milltail and Whipping Creeks and observing an occasional alligator, wood duck brood, or other wildlife in the area. The serenity is probably the most appealing aspect of the trip.

Wildlife photographers utilize the Refuge to some extent for a chance at bear, deer, or any number of birds and other animals that may be wandering by. General habitat scenes are popular for the adventuresome few who go there.

The following figures represent wildlife/wildlands observation on Alligator River NWR during 1988:

<u>Activity</u>	<u>Visits</u>	<u>AH</u>
Foot	1,875	3,750
Vehicle	4,750	9,500
Boat	675	2,700
Photography	160	640

### 17. Law Enforcement

1988 was the third year for enforcing specific regulations on Alligator River. Staff officers conducted regularly scheduled weekend patrols beginning with the opening of the deer season. Mike Panz, Refuge LEO for Mackay Island NWR, was assigned half-time duty for Alligator River beginning in 1988. Panz 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 during the 1986 season was the one prohibiting the transporting of loaded firearms on the Refuge while engaged in hunting activity. For the 1987 season, the wording of the regulation was clarified. This, along with a year's experience for local hunters in dealing with federal regulations, made the 1987 season a less complicated one for law enforcement officers.

1988 brought with it the farm fields, which (as described earlier) were designated as open to all authorized public

uses during the months of September and October and closed to all entry all other times for wildlife management. Some hunters viewed the closing of the farm fields as "taking the land away from them". Old promises of "allowing hunting on the refuge" were twisted and dug up from their graves where they had been painfully put to rest at the completion of the master plan. The fields had never been open to public use while in federal ownership. Prior to federal ownership, the land was leased by a private hunt club and was open only for members' use. The fact that, of the 9,000 acres of newly acquired land, 5,000 acres was opened to hunting (even with dogs) did not pacify the few complaining hunters. They wanted it all.



#34 - The closing of the farm fields drew some negative response. 11/88 BWS

Unfortunately, this attitude caused many problems throughout the year. Newly installed gates and hunter information boards bearing the "bad news" were the targets in many cases. Refuge signs and brochure boxes received extra attention, too.

The culmination came late in the year. On December 22, unknown people broke into a closed area of the refuge, hot-wired the White tractor (on loan from Mattamuskeet NWR) and proceeded to "attack" a number of refuge gates. Enroute to

and from these gates, a porta-john, a 20' fiberglass ski barge, two sections of hose for the Crissafulli pump, and a number of other assorted pieces of refuge property were demolished. Damage from this act of vandalism is estimated to be at least \$30,000. At this writing, there are no obvious leads on this case.

We're confident that the closing of the farm fields for management will be mulled over, digested, eventually accepted. Time is on our side; unfortunately, the budget doesn't cover these sorts of "growing pains" very well.



#35 - This ski barge developed a leak as a result of vandalism. We haven't found a functional patch kit yet. 12/88 CL

In addition to vandalism, several other "law enforcement" related items warrant mentioning:

On January 15, ARM's Noffsinger and Lanier left for ten weeks of Basic Law Enforcement Training at FLETC in Glynnco, GA.

May 7-14, Refuge Officers traveled to Tallahassee, Florida for the annual LE Refresher. All six officers qualified

with both hand guns and shot guns.

On Saturday, June 11, officers from the Oregon Inlet Coast Guard Station observed people harassing terns, throwing eggs, throwing shells at birds, etc. in the tern colony near Oregon Inlet. On the following Monday, they reported the incident to the Refuge. An agreement has been made that the Station will keep an eye on the colony and either act on such activity or notify Refuge officers immediately. They also offered to transport officers to the island to enforce the Migratory Bird Treaty Act and prevent further harm to the colony. As far as we know, there was no reoccurrence.

On Thursday, June 30, a runner using the Manteo High School track heard a shot and saw an osprey fall to the ground from a nest on the light pole. The following day, another runner observed three dead osprey on the ground near the nest. NCWRC Wildlife Officer Brinkley received a report the following day. The investigation on the incident was inconclusive.

On July 4, an injured, immature bald eagle was reported to NPS rangers in Frisco. Refuge staff arranged for the rangers to transport the bird to Manteo where a local veterinarian accepted the bird for evaluation. The bird was judged to be non-rehabable and injured by something other than gunshot. Several days later, SA Ted Curtis arranged for the bird to be evaluated by Dr. Eddings in Washington, NC. He determined that the bird had been shot and advised that it probably could be rehabed. It was transported to the N.C. Raptor Rehab Center in Charlotte for treatment. Since then, we have made arrangements to utilize the services of a new local veterinarian, Dr. Barry Welch, who has considerable experience in working with birds. He has agreed to treat injured birds, free of charge, and is in the process of gaining the necessary permits to do so. The Refuge evaluates birds that are to go to Dr. Welch so as not to abuse his willingness to help by bombarding him with seagulls, loons, and other "expendable" species. We feel it's better for "nature to take it's course" with these birds.

August 17-24, ORP Strawser assisted LE and participated in the "take-down" for Operation Smokey.

On September 8, all Refuge officers and NCWR officer Brinkley met to discuss and review Refuge and State regulations for the up-coming seasons.

On September 9, a letter was sent to RO Givens, a local sign company owner, notifying him of a sign trespass on the Refuge. Mr. Givens advised us in a telephone conversation

that he had erected the sign at the request of a local businessman and would like to leave the sign there. He was given until September 23 to remove the sign. He later requested a week's extension, which was approved. The sign was removed the first week in October.

October 1, started our regular Saturday and holiday law enforcement patrols. These continued through the end of hunting season.

During waterfowl season, several extra weekend patrols were scheduled and carried out to check hunters in the sounds just off the Refuge.

On October 6, a concerned mother called a staffer at home at 7 p.m. to report that her son and his friend had not returned home from the refuge at the expected time. Two staff members went to the Refuge to investigate; the boys had gotten stuck and walked out. A family in East Lake had helped them get their car out.

On October 18, Alligator River hosted the semi-annual firearms qualification for Refuge officers, special agents, and State Wildlife officers in our area. All Alligator River officers received qualifying scores. After qualifications, all participants and other Alligator River staffers enjoyed a shrimp boil.

The following violations were reported at Alligator River National Wildlife Refuge during 1988:

4 - Firelighting (State charge); 1 - \$300 fine & \$40 cost of court, 2 - \$250 fine & \$97 cost of court, 1 - unknown whereabouts.

3 - Transporting loaded firearms (2 - \$50 (forfeiture of collateral), 1 - \$100 (forfeiture of collateral).

10 - Fishing without a State license (State charge); 8 nonresident @ \$20 fine and \$60 cost of court, 2 resident @ \$10 fine and \$50 cost of court.

2 - Taking bear in closed season (State charge); 1 - juvenile - \$500 replacement, 1 - \$500 fine and \$535 replacement cost.

4 - Hunting deer without blaze orange (State charge); (classified as an "infraction") \$25 penalty each.

1 - Vehicle trespass; \$50 (forfeiture of collateral).

2 - Littering; \$50 each (forfeiture of collateral).

4 - Transporting loaded firearms; \$50 each (forfeiture of collateral).

1 - Possession of a controlled substance; \$200 fine.

2 - Hunting with the aid of a vehicle; (State charge); \$250 plus cost of court, plus loss of hunting privileges for 1 year.

1 - Possession of a firearm on a NWR; \$100 (forfeiture of collateral).

1 - Hunting on NWR w/o State license; \$50 (forfeiture of collateral).

1 - Collecting w/o permit; \$25 (forfeiture of collateral). (A Lacey Act Violation is being considered by a FWS Special Agent in Virginia pending further investigation).

Special Agent Ted Curtis (Washington, N.C.) utilized bear parts for undercover sales in Operation Smokey. These parts were taken from road killed or poached bears donated to the Refuge by the N.C. Wildlife Resources Commission for the red wolf project.

#### I. EQUIPMENT AND FACILITIES

##### 1. New Construction

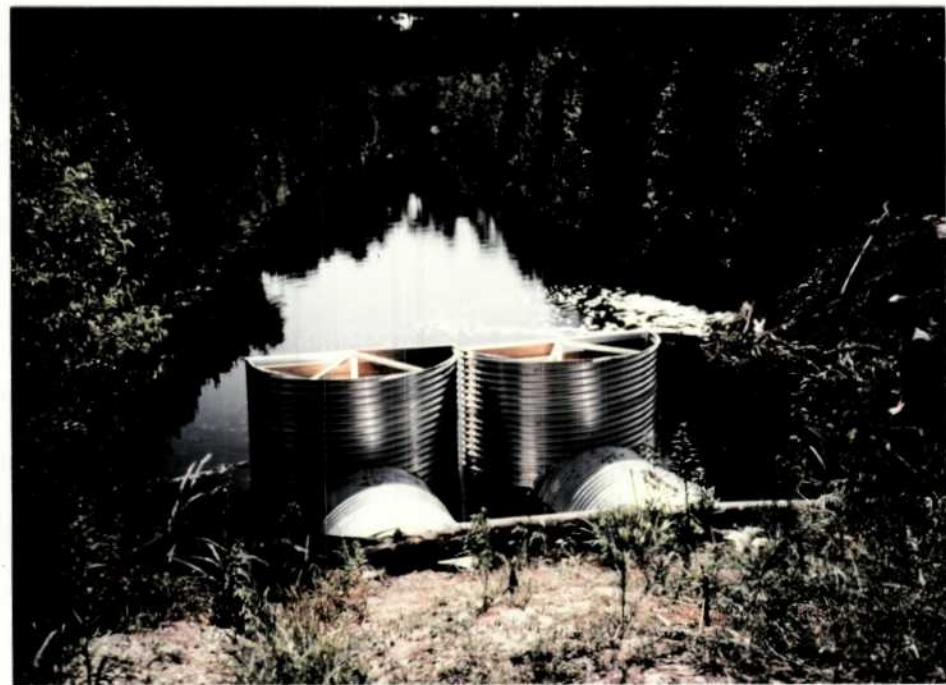
New construction this year was primarily directed at wolf pen construction. Four new pens were contracted out at the Sandy Ridge red wolf acclimation center. One release pen was assembled by the wolf crew on Hook road.

Staff and YCC put up a holding pen for NCWRC "decoy" Canada geese near the red shed.

The first riser/culvert was installed at the new farm unit. This pipe will permit water to flow into the system from the canal along Buffalo City Road with the water source at Milltail Creek.

##### 2. Rehabilitation

In July, two existing flow thru pipes under Buffalo City Road were fitted with risers. This will permit holding water in the Twiford unit of the farm fields. Moist soil management is finally underway!



#36 - Risers were added to the flow thru pipes  
under Buffalo City Road. 9/88 BWS



#37 - This is pretty typical, considering we have  
more than 750 miles of canals on the  
Refuge! 8/88 BWS

By November, Atlantic Forest Products had completed road rehabilitation in accordance with their permits to haul timber over Refuge roads.

### 3. Major Maintenance

In October, the maintenance reality of a pumping operation as large as we acquired was manifested. One pump in the Creel Unit pumping station was pulled and transported to Richmond, Virginia for overhaul.

### 4. Equipment Utilization and Replacement

Upgrading and replacement is our fondest dream. The Alligator River "complex" has grown rather rapidly. Demanding programs involving: one million visits at Pea Island, the red wolf reestablishment project, probably the largest co-op farm in the region, basic land area in excess of 140,000 acres, etc. all confound equipment utilization. We cannot keep pace with our present programs without using excess property to supplement our limited capabilities to acquire new.



#38 - Did somebody say Pump Road was this direction?

7/88 AE

Just moving things around is a major effort. On December 27, a new truck tractor arrived. This truck was ordered in 1987. The only reason it is here now is the STAN program

(Standard Trucks Available Now). After GSA lost our original order in Washington, we found out that it would take an additional year, at least, to reorder the truck. Therefore, we opted for STAN - didn't get anything close to what we originally ordered through GSA, just got it quicker. Now we will have to add hydraulics, install a sliding fifth wheel and hope the road truck we got will become the equipment hauler we ordered. We needed that truck before we ordered it! Had to wait for funding, had to wait for GSA to lose the order, had to settle for less than what we needed, have to rework it to be able to use it. Something isn't working real well with this system!

Three new pickups were delivered this year, one excess property pickup and one excess property station wagon made up the fleet additions. Winches were installed on the pickups. A new backhoe/loader was purchased. Various small items have been acquired from excess. With no facilities on the Alligator River or Currituck units, maintenance is a serious problem. The Pea Island facility is over 50 miles away and about all it has over any other location is the ability to get a automobile and/or light truck inside to work. As a result, lots of maintenance is performed on site.



39 - The infamous "Red Shed" is a hub for field activities at ARNWR. 11/88 REN

## 5. Communication Systems

Seven high band (163 Mhz range) were ordered this year. A cooperative effort with Mattamuskeet NWR on a repeater purchase was also initiated. Our proposed repeated site is currently being used by the National Park Service and their coverage is very similar to the combined areas of Mattamuskeet, Pea Island, Cedar Island, Alligator River and the surrounding area. Autopatch capabilities have also been ordered to provide the means to contact someone if radio response is negative. Communications with the NPS, NCWRC, NCFS, USCG, and various local agencies will be possible.

Electronic telephones were installed in the new office space in Manteo.

## 6. Computer Systems

The old IBM keeps cranking away. The wolf project purchased a Dell 220 system. As more and more staff members realize the potentials available, finding time to use the system becomes harder. Wordprocessing is very popular. Red wolf data and capitalized property and communications are currently up and running. Waterfowl data, vegetation, water management, crop histories, and financial information are in various stages of development. Available time on the machine is the major limiting factor.

Taylor, Schriver, and Midgett attended Multiplan Training during the year.

Schrive expanded his Local Support Person outreach effort by assisting Mattamuskeet NWR in assembling and installing their new Dell system.

## 7. Energy Conservation

Several fleet vehicles are being stored at Alligator River to conserve transit fuel.

## J. OTHER ITEMS

### 1. Cooperative Programs

A SUP was issued to Dr. Mark Brinson of East Carolina University to study fringe swamp sediments and vegetation.

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

A SUP was issued to NCDOT to place rip rap on the south end

of the Bonner bridge across Oregon Inlet.

Nature plant collection by the Elizabethan Gardens and the N.C. Aquarium was permitted again this year.

Red wolves were provided for a co-op animal exchange involving Audubon Park Zoo, New Orleans; Cape Romain NWR; and the red wolf breeding facility at Graham, Washington.

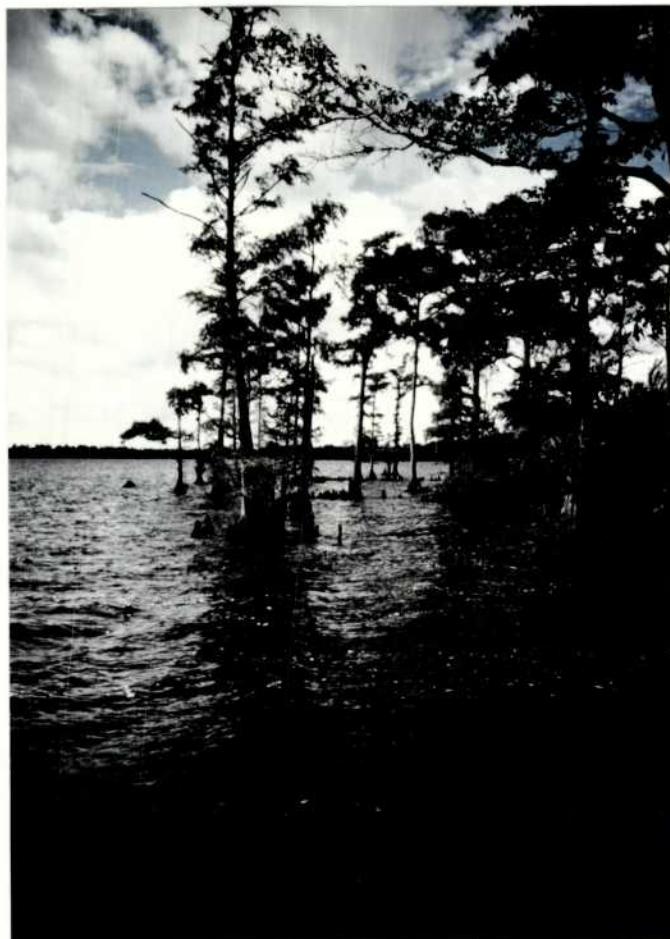
2. Other Economic Uses

A SUP with Dare County was written to provide drainage of county farm land adjacent to Refuge fields.

One SUP to operate 6 bee hives on the Refuge was issued.

4. Credits

This narrative was a joint effort by all the Refuge staff with special kudos to ORP Strawser and Office Assistant Midgett.



#40 - Frying Pan Lake, Tyrrell County. 8/88 BWS



#41 Our Pride and Joy... female #351 - one of the two  
wild born and raised red wolves in the world!!

11/88 MKP

#### K. Feedback

I am always a little reluctant to use this section to just bitch about some problem we're having with the Regional Office. I usually find it more productive to work through my supervisor to solve such problems. Lord knows our supervisor and Deputy ARD have tried to do what they can, but with little success. So, if for no other reason than to get this off my chest, here is our problem.

#### PAYROLL ERRORS!

If there is one thing that sinks the morale and efficiency of a staff, it is don't pay them what they earned. To then kick them when they're down, don't correct the error for months. This has been the case here at Alligator River during the past year. Bear with me while I relate some horror stories.

In June, wage grade employees received a raise. When one of our employees didn't receive his raise, we immediately called to inform Personnel. Each time we called they informed us that the paper work had been submitted to Denver and that it would be on the next check. Each pay period we called to ask why this employee had still not received his raise, and each time they assured us that it would be on the next check. Finally, after talking with Personnel Officer Westfield on 11/18/88 we were informed that the paperwork had never been done and it was just now being processed! It was still not received on the following checks. It seemed every time we called nobody was at their desk and our calls were never returned, so we called our Acting Refuge Supervisor and he went to personnel to find out what the problem was. He was informed it was just put in the computer. The employee received his raise 12/03/88 six months late! In August the same employee was given a step increase he was not due. We called this to the attention of Personnel and of course, Personnel informed us they would correct the error, but as of this date no correction has been made.

Another employee should have received a within grade in December and we had to inform Personnel that this employee should be getting one. It took over a month for the employee to get his within grade. This same employee received a little over \$200 more in his last check of the year than he was suppose to. We called Personnel and asked what it was for because his Leave and Earnings Statement for that pay period was blank. They informed us it was money that he should have received at some time or other during that year. They said at the end of the year they go back and see if they owe anyone money and pay them. Never have I ever heard of this as SOP.

Another employee was paid the same overtime on three different

pay periods.

A new employee came on board in May and was receiving 4 hours annual leave. We informed Personnel that this employee had 4 years military service and should be in a 6 hours leave category. As of this date, February 17, 1989 the employee is still receiving only 4 hours leave.

During the recent open season, two employees changed their health benefits. On the first pay period the health benefits went into effect the changes had not been made. We called Personnel and they informed us the paperwork was received in Personnel in plenty of time, but they did not get all the changes into the computer. It would definitely be straightened out on the following check. One employee's change was corrected. The other employee is still having \$100 taken out each pay period because of the wrong health plan.

One other time we had to call Personnel to question why an employee had not had their health plan changed. The employee had gotten married and wanted his wife put on his health plan. Personnel said that he could not add his wife until the next open season. We had to tell them to look on the back of the form where it says you can. They finally agreed, and made the change.

It seems every time we call personnel and ask for someone they are away from their desk. Then when we leave a message to have a call returned to us, 9 times out of 10 they never call back. When you ask if there is anyone else that could help us we are told everyone is away from their desks. We are beginning to wonder if they have desks in Personnel.

I wish this was an isolated case, but it appears most Refugees in Region IV are having similar problems. What's going on in there!? It's not the field's responsibility to tell Personnel their regs or whether someone is to get a step or not. What about the interest those affected employees have to pay on late bills they can't meet due to payroll errors? What about the interest they could have earned for those months the government held their hard-earned money instead of it being in their savings account? And what about the morale of the staff? How can they be expected to give 100% and support the Service when their supervisor and Regional Office tells them things are corrected, and months later their pay check is still short.

I can appreciate that personnel turnovers and volume of work can affect the quality of work. We all deal with those problems. What I can't appreciate is false commitments of correcting errors and returning calls as promised. Perhaps someone of authority should remind Personnel that they are a support office!

Another area of concern: Seems like there are a lot of people in

government who get paid to count things. Every time we acquire a vehicle or piece of equipment someone counts it for use. Then we hear how many more we have than we are supposed to have. The real world dictates that Refuge people need vehicles for transportation, patrol, surveys, safety, etc. If we can't get to the job we can't do it. If we don't have the money to buy good stuff we have to make do with what we can find. We live on excess property. Take it away and we won't be able to get the job done. While we are developing, expanding, hoping to get a reasonable budget, etc., we will have to continue to operate with the throw aways of more fortunate agencies. Please quit counting our stuff. If we didn't need it we wouldn't be getting it. Maybe I do have a spare pickup, but the other one is 12 years old with 80,000 miles, neither has ever seen a paved road. I got it because I need it. Those who count should direct their efforts at getting us more money so we may approach replacement under those mythical service replacement standards. Or help us out by screening this stuff at the various military bases so we won't be on the road so much chasing down the next spare. Another usable resource is the trade ins from the more established stations. Instead of getting \$1,000 for the general fund from a GSA Sale, let it go out to the folks who really need that spare, or just need another vehicle but lack the funds. There's more out here than just a 3:1 employee vehicle ratio and a TID.

**Currituck National Wildlife Refuge**

**Manteo, North Carolina**

**ANNUAL NARRATIVE REPORT**

**Calendar Year 1988**

**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.

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#### A. HIGHLIGHTS

Mackay Island staff execute replacement of water control structure on Swan Island Tract. (see Section F.2)

Long term waterfowl violators caught by Special Agents. (see Section H.17)

#### B. CLIMATIC CONDITIONS

See Alligator River narrative.

#### C. LAND ACQUISITION

##### 1. Fee Title

Negotiations were finally completed during the year on a land exchange with Currituck County. In exchange for 55 acres of marsh adjacent to the Refuge, the Service transferred Monkey, Mary Islands, and the dock area in Water Lillie to the County. Except for a rookery located on Monkey Island, the islands have little wildlife value. Transfer of Monkey Island also eliminated a vandalism/historic preservation problem of an old waterfowl hunting lodge found there.

#### D. PLANNING

##### 2. Management Plan

The draft sign plan was written and submitted to the refuge manager.

#### E. ADMINISTRATION

##### 4. Volunteer Programs

Little volunteer activity occurred on Currituck NWR during 1988. In October, Volunteer Ken Dyar provided transportation for and assisted Alan Weakley (botanist, NC Natural Heritage Program) with a Status Survey for Seabeach amaranthus (Amaranthus pumulus). Currently being considered for listing by the USFWS, this plant has been extirpated from much of its former range. One specimen was found in Currituck. This specimen was the northernmost documentation for the species in recent years.



#1 - The Seabeach amaranthus, currently being considered for listing with the USFWS, was found on Currituck NWR this year. 10/89 KD

For more information about the general Refuge volunteer program, see Section E.4 of the Alligator River NWR narrative.

#### F. HABITAT MANAGEMENT

##### 1. General

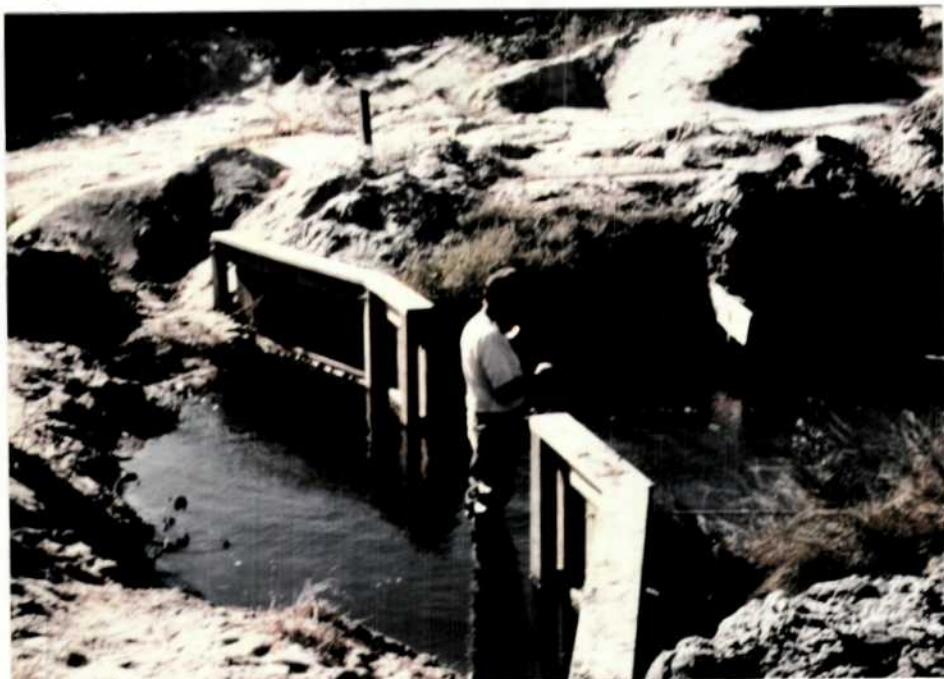
Currituck NWR is located on the Currituck Outer Banks barrier island. This island chain was formed when melting glaciers caused a world-wide rise in the sea level. Later when sea level rise slowed, a combination of factors were set in motion to create barrier islands on the shallow shelf. The bays and estuaries that have formed behind these barriers have become shallow, due to sediments received from rivers draining the costal 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.

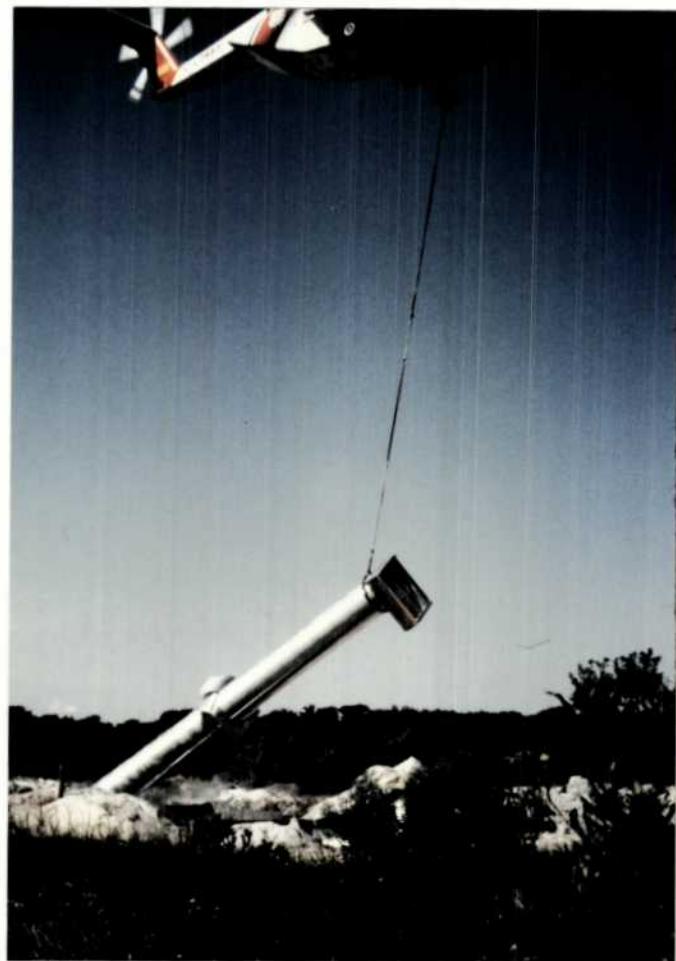
Approximate Refuge habitat types are: 18% sand and dune, 43% brush, and 39% marsh.

2. Wetlands

In September two 48" flash board risers were installed at the Swan Island Tract impoundments by the Mackay Island NWR staff. We have had no capability for water level management or holding water in the impoundment since the old structure was washed out in February, 1988. The Coast Guard flew in the structures, one of which was donated by Back Bay Restoration Foundation. Back Bay NWR provided a front end loader for the work, and the Swan Island Hunt Club assisted in the bulkhead construction.



#2 - James Pittman (Mackay Island NWR) stands  
ready... 9/88 WHH



#3 - As usual, we get by with a little help from  
our friends.  
9/88 WHH



#4 - The finished product!

9/88 WHH

#### 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 islands.

##### 2. Endangered and Threatened Species

###### a. Federally Listed and Threatened Species

Atlantic Loggerhead Sea Turtle (Threatened) - Although there were no reports of loggerhead turtles 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) - None reported this year.

### 3. Waterfowl

One aerial waterfowl survey was conducted this year at Currituck NWR. The survey, done on November 4, found only 79 swans and 43 black ducks.

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

Two trespass cattle were observed and the owner was notified to expedite removal.

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 USE

### 1. 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	2,850	2,850
Vehicular	25,400	12,700
Photography	128	512

Total visits to the Refuge were 25,400. There were approximately 490 public inquiries.

During 1987, YCCers and LEO Panz, reposted the entire dune line on both tracts of Currituck. The corners were posted by sinking 6", heavy-walled, galvanized pipe that were sunk into the ground 6 feet and filled with sand. A number of efforts had been made to remove these corner posts and their

attached signs. Fortunately, these efforts met with limited success. During 1988, most of those corner posts were left alone by vandals. Only one sign among them had to be replaced.

The new Carsonite curv-flex posts with decals were utilized in several locations and were being watched and evaluated for effectiveness. Unfortunately, few of the posts survived the year. Current plans are to utilize 12' metal sign posts (or 2" galvanized pipe, if available) and standard metal boundary signs for posting the dune and marsh lines of the refuge.

#### 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

The waterfowler's paradise of northeastern North Carolina has recently become a "waterfowler's nightmare" for some hunters. In years and generations past, waterfowlers have had their way in hunting and hunting methods. Now things are different for the hunters.

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 hour's 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. Less evidence of vandalism of this sort in 1988 may indicate an acquiescence to the federal presence; however, it may simply indicate that the vandalism must be "easy" if it's to be accomplished. The installation of boundary signs on metal supports should provide information on which explanation is more accurate.

Refuge LEO Panz made two cases on Currituck NWR in 1988. Both were motor vehicle trespasses; one received a written warning, the other received an NOV and \$50 forfeiture of collateral.

Special Agents and NCWRC Officer were also active on Currituck NWR during 1988. A number of significant cases were made by these officers. In December, three Dare County residents were caught hunting. They had 45 ducks among them. Violations included:

- 3 - over limit black ducks
- 3 - possession of lead shot
- 1 - hunting without State license
- 1 - no federal duck stamp
- 1 - no state duck stamp

Each was fined \$1,000 and forfeited his hunting license for one year.

#### I. Equipment and Facilities

##### 2. Rehabilitation

A cooperative effort with Mackay Island NWR coordinating and implementing replacement of a water control structure was completed. (See Section F.2).

J. OTHER ITEMS3. Items of Interest

One of two lifesaving stations which had been relocated to the 2.85 acre inholding to be used as residences was completely destroyed by fire in May.



#5 - Two historic lifesaving stations were purchased and moved to a Refuge inholding.  
4/88 MKP



#6 - Shortly after, one mysteriously burned to  
the ground. 6/88 MKP

#### 4. Credits

This narrative was a joint effort by all the Refuge staff with special kudos to ORP Strawser and Office Assistant Midgett.

#### K. Feedback

Thanks to Bill Hegge and the crew at Mackay Island NWR for providing lots of assistance on Currituck NWR throughout the year. Currituck NWR is a real logistical problem from any direction and Bill has saved us many long trips by screening problems at Currituck and responding as needed.

**Pea Island National Wildlife Refuge  
Manteo, North Carolina**

**ANNUAL NARRATIVE REPORT**

**Calendar Year 1988**

**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.



#1 - Pea Island was established as a wintering ground for the greater snow goose and other migratory waterfowl. 11/88 JTT

Pea Island's climate is generally moderated by the ocean, thus being cooler in the summer and warmer in the winter than the North Carolina mainland. The average daily maximum temperature is 69 degrees and the minimum is 56 degrees. Due to heavy and prolonged storms, the average rainfall is 55.6 inches, most of

which occurs during the winter and summer. It is frequently windy during both day and night with 11 mph as the annual mean wind speed. The prevailing summer wind is from the southwest and from the northeast in the winter.

The diversity and abundance of birdlife on Pea Island explain its reputation of being a "birder's paradise". The refuge is an important wintering ground for tundra swans, Canada geese, snow geese, and over 25 species of ducks. Many other interesting species can be found at Pea Island during the winter months and the spring and fall migrations. During the summer months, several species of herons, egrets, ibises, terns, gulls, along with American avocets, willets, black-necked stilts, other wading and shore birds and a few species of ducks nest on the Refuge.

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

#### A. HIGHLIGHTS

Erosion of North Point causes evacuation of Oregon Inlet Coast Guard Station. (see Section C.1)

Infamous "S curves" finally overtaken by Atlantic and moved to the west. (see Section E.7)



#2 - The "S-curves" at Pea Island were replaced with a new section of road due to the ocean's encroachment. 12/88 SL

Cars, people, and trash.... Sometimes we wonder about these folks!! (see Sections H. 9 and 16)

Hurricane Gloria's damages at New Field begin on the road to recovery. (see Section F.2)

#### B. CLIMATIC CONDITIONS

See Alligator River narrative.

#### C. LAND ACQUISITION

##### 1. Fee Title

Due to severe erosion at the North Point of the refuge, the Oregon Inlet Coast Guard Station vacated its facility in early winter. There has been quite a bit of interest in historic

section of the station by the National Park Service, the County, and the Historic Society. 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, we have no word as to the disposition of any of this property.



#3 - The Oregon Inlet Coast Guard Station was vacated because of rapid erosion. 9/88 BWS

#### D. PLANNING

##### 2. Management Plan

A station sign plan was drafted and submitted.

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

Once again numerous meeting and site visits took place concerning road work mitigation required of N.C. Department of Transportation (DOT). Acreage required for relocating a section of N.C. 12 on Pea Island and acreage covering road work on National Park Service land on Ocracoke Island were mitigated by the creation of two ponds on Pea Island. After many meetings and much struggle with DOT, the ponds were

finally completed in late November and the asphalt was removed from the old road bed. The ponds are 1.7 and 3.1 acres in size. DOT was also required to reseed the old roadbed with bahia, bermuda, and rye grass. We hope that in the future our breeding black ducks and gadwalls will use the ponds, and that the snow geese will forage in the old roadbed area.



#4 - Mitigation for wetlands loss during the relocation included the construction of two shallow ponds.  
12/88 SL

##### 5. Research and Investigations

In June, Dr. J.D. Rising from the University of Toronto collected five seaside sparrows from the Refuge. These birds were part of Dr. Rising's research on the systematics of sharp-tailed sparrows (genus Ammodramus) and on the geographic variation of the sharp-tailed sparrow (A. caudacutus). Dr. Rising found no sharp-tailed sparrows on Pea Island.

##### 6. Other

The Refuge participated again this year in the Atlantic Flyway Canada Goose Study (see Section G.16)

## E. ADMINISTRATION

### 1. Personnel

See Alligator River narrative.

### 2. Youth Programs

Approximately 15% of the enrollee hours for the Alligator River YCC Program were spent performing work projects on Pea Island NWR. Enrollees executed the annual clearing and maintenance on North Pond Trail. Other Pea Island work included revamping the sign system; old, faded, or missing signs were replaced; new signs were added, as needed. Photographs were taken of one-of-a-kind signs and interpretive signs to be used in the Pea Island Sign Plan. Much cleaning, clearing and organizing work was accomplished around the office/shop, the seed house, and the pole shed. The goose/duck holding pen was re-wired. A brick walk-way was laid behind the residence, and the pump heads, flag pole, and capstan were scraped and painted.

For more details of the 1988 YCC Program, see Section E.2 of the Alligator River NWR narrative.

### 4. Volunteer Program

Again in 1988, most volunteer time at Pea Island involved the Host/Hostess Program. From mid-April through October 31, hosts and hostesses manned the visitor contact station, greeted visitors, gave out Refuge and Service information, answered the phone, and relayed radio messages. As in 1987, volunteers also assisted with office work, minor construction, and rehab projects, conducted summer public interpretive programs and supervised YCC projects.

During 1988, interpretive programs shifted a bit. The 10 "winter" bird walks from early 1988 became the 10 fall bird walks for late 1988, so we got a double dose this year. In the end, we found the switch was a positive one. Attendance was up; the weather was beautiful.

Again this year, volunteers conducted the daily loggerhead sea turtle nesting patrols at Pea Island. Volunteers were trained on the safe operation of four-wheeled ATV's and on locating turtle nests. This year, we decided to provide staff experience for relocating nests. From June 1-August 31, each volunteer committed to one day each week; he/she arrived at the Refuge at no later than 7:30 a.m., conducted the "turtle patrol", cleaned the ATV, recorded all necessary

information, and was usually ready to leave by 11:00. This program saved countless staff hours this year and proved to be an acceptable way to conduct the turtle nesting program.

Besides these programs, litter pick up was the most time consuming volunteer project at Pea Island during 1988. Two organized "beach sweeps" were held. The first was planned as a part of the 50th Anniversary Celebration.

On February 23, ORP Strawser was a guest on the morning radio program on WOBR in Wanchese. The program lasted four hours and was designed to promote the beach sweep and the associated slogan contest.

On March 7, the Pea Island Beach Sweep Slogan Contest was judged. The contest received 149 entries; the winning entry, "Groom a Dune", was being used to promote the Beach Sweep, scheduled for April 9. Planter's Bank in Manteo donated a \$50 savings bond to the winner who, in turn, donated it to the Outer Banks Audubon for their on-going involvement with Pea Island.



#5 - The April Beach Sweep involved 200  
volunteers and netted over 600 bags of trash!  
4/88 BWS

The Pea Island Beach Sweep was a big success despite cold temperatures and blowing wind on the 9th. Approximately 200 volunteers showed up to brave the cold and "Groom a Dune!"

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The recent north east winds had washed a good deal of the trash to sea, however, sweepers moved into the dunes and along N.C. 12 to pick up trash, as well.

On April 27, a group of 9 people from the Manteo ADAP program (retarded adults) completed a 4 mile section of trash pick up on N.C. 12.

On September 24, Pea Island participated in the Statewide Beach Sweep. Sixty-one volunteers collected over 200 bags of trash weighing approximately 4,000 pounds.

For more information on the overall volunteer program, see Section E.4 of the Alligator River narrative.

5. Funding

See Alligator River narrative.

6. Safety

See Alligator River narrative.

7. Technical Assistance

Assistant Managers Lanier and Noffsinger worked closely with engineers from N.C. Department of Transportation (DOT) and Outer Banks Contractors during the construction of the new mitigation ponds (see Section D.4.) and the relocation of Highway N.C. 12. DOT was very reluctant to follow through with the conditions of the Refuge Special Use Permit.

During the summer, Refuge personnel assisted John Weske of the Smithsonian Institute in banding over 2,000 brown pelicans, sandwich and royal terns just off refuge. (See Section E.4. of the Alligator River narrative for details.

8. Other

On April 14, RM Taylor accompanied North Carolina Governor Jim Martin, et. al, on a tour of recent erosion of the north end of Pea Island. In May, the Governor met with President Reagan to push for the construction of the Oregon Inlet Jetty Project to be built on Refuge and adjacent National Park Service lands. To our delight, the President later rejected the Governor's request.

## 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 950 acres. Beach and dune acreages have changed since the survey. Hurricanes combined with intense northeast storms have caused severe erosion along the beach and dunes. A nine-acre freshwater pond near the beach was overwashed and breached by high tides in late December.

### 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 24.40 inches of precipitation in 1988; up from last year's low of 17 inches. This year's figure is still 30.6 inches below the annual mean and 12.60 inches below 1986's low of 37 inches. Unlike last year, the Refuge experienced a relatively wet spring and summer. Several inches of rainfall fell each month during these growing seasons. This timely rainfall aided the production of submergent waterfowl foods in the impoundments. Also, both South Pond and North Pond pumps were in working condition allowing the staff to pump water into the ponds during dry periods.

South Pond was dewatered in the spring of 1983 and 1984 to encourage production of desirable emergent waterfowl food. From 1965 up to this year, however, South Pond has been at full capacity to promote the growth of submergent waterfowl foods. This year, due to a light increase in rainfall, the number of pumping hours was reduced to 131.5. 24.5 hours less than in 1987. Pumping from June until October once again resulted in good submergent waterfowl food growth. Although the production of sago pondweed (Potamogeton pectinatus) and widgeon grass (Ruppia maritima) was down large beds of musk grasses (Chara sp.) were found on the annual vegetation transect runs (see Table 1). Although adequate water levels were maintained throughout most of the year, the pumping rate had to be reduced again this year due to the erosion of the ground from underneath the pump house and its bulkheading. Assistance from Engineering has been

requested as to how to alleviate this problem; after a site visit, numerous phone calls, photos and sketches, no plans have yet been received.

North Pond has been managed as a permanent pool to favor the growth of submergent vegetation. In June 1985, North Pond pump was destroyed by Hurricane Gloria and remained inoperative until July 1987. This year the pump was in full operation pumping a total of 246 hours. Pumping began in June and continued to October. Adequate water levels were maintained throughout the year and the percentage of bare ground found on the vegetation transect dropped. The percentages of muskgrasses, sago pondweed, and widgeon grass changed only slightly from last year, however, when much of North Pond was dry and bottom areas were exposed. Once again, muskgrass was the dominant species (see Table 1).

Throughout the remainder of 1985 and until July 1986, the water level ebbed and flowed with each tide. In late July of 1986, a coffer dam was built and the tidal fluctuation was halted. A dry growing season in 1987 left most of New Field dry. This year, however, spring and summer rains coupled with the use of the old flap gate water control structure enabled the staff to flood a major portion of the impoundment. The first gauge reading since 1985 was recorded in April, and widgeon grass made it's reappearance in the vegetation transect this year. It had not been recorded since 1986; its disappearance was due to tidal fluctuation caused by damage from Hurricane Gloria. Also, in October of this year a pump platform was constructed for New Field and a pump head was installed. Mattamuskeet NWR loaned an engine for the pump and water was pumped into New Field for the first time. The staff is currently trying to get our own engine for New Field pumping station.

A vegetation transect was run this year for the tidal area north of North Pond known as the "salt flats". Once again the results indicated that this area has not changed significantly in the past 19 years. For some unknown reason, however, saltmarsh cordgrass (Spartina alterniflora) has been declining while saltmeadow cordgrass (Spartina patens) has been increasing. Glassworts (Salicornia spp.) were still the dominant species (see Table 1). This area is frequented by snow geese because of the large amounts of glasswort present.

Table 1

Summary of Vegetation Transect Line Sampling  
Pea Island NWR  
1988

Line	Feet Sampled	Sample Stops	Sampling Points	Percent Vegetated	Percent Bare	Plants per Point Sample
North Pond	1500	50	250	93.8	6.2	1.096
South Pond	1500	50	250	98.2	1.8	1.372
New Field	3090	103	515	81.5	18.5	1.089
Salt Flats	2580	86	430	41.5	36.6	0.637
Totals and Averages	8670 (4710)	289 (160)	1445 (800)	83.0 (83.8)	17.0 (16.2)	1.0485 (1.05)

## Combined Food Values:

Good - 15.7% \*(25.2%)  
 Fair - 59.6% \*(67.2%)  
 Non - 24.7% \*( 7.6%)

## Major Plants:

North Pond -	Muskgrasses	77.4%	*(72.3%)
	Widgeongrass	9.2%	*(12.3%)
	Sago Pondweed	7.2%	*( 6.0%)
South Pond -	Muskgrasses	67.0%	*(48.4%)
	Widgeongrass	14.0%	*(43.8%)
	Sago Pondweed	17.2%	*( 5.3%)
New Field -	Saltmeadow Cordgrass	28.3%	
	Saltmarsh Cordgrass	15.0%	
	Marshelder	7.2%	
Salt Flats -	Glassworts	44.6%	*(45.1%)
	Sea Oxeye	5.6%	*( 8.3%)

## Major Plants Combined:

Muskgrasses	32.3%	*(50.0%)
Glassworts	15.8%	*(24.6%)
Widgeongrass	7.1%	*(21.3%)
Sea Oxeye	1.8%	
Sago Pondweed	5.7%	*( 3.9%)
Saltmeadow Cordgrass	14.2%	*( 2.0%)
Saltmarsh Cordgrass	7.4%	*( 1.6%)
Marshelder	3.5%	

\* 1987 figures in parenthesis

New Field was not sampled in 1987. In addition to destroying North Pond pumping station in 1985, Hurricane Gloria also took out New Field pump station.

#### 4. Croplands

In 1987, the farming regimen for New Field was altered from that of the previous years. Only 20 acres of the 50 acre field were planted with tall fescue. The remainder of the field was either disked and left fallow or left untouched. It was hoped that the Canada and snow geese would have a variety of natural and planted foods to feed on through the winter. In fact, however, they primarily used the plowed ends of the field. In September the entire 50 acres was once again planted with Kentucky fescue. Fertilizer was spread at a rate of 1,500 lbs. per acre and 3,750 lbs. of seed was planted. Observations this fall and winter showed the geese grazing on all portions of the field.

#### 6. Other Habitats

The areas of ocean beach and barrier dunes are not actively managed; they undergo constant gradual movement and are subject to abrupt changes during storms. Strong winds from hurricanes and northeast storms produce beach erosion, ocean overwash and sound side 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. Field measurements were made on June 16. These measurements showed that along the 13 miles of Refuge beach, dune erosion averaged 15 feet. The average for 1987 was 31 feet. This average of 15 feet does not reflect the severe loss of beach and dune at the north end of the island adjacent to the Oregon Inlet Coast Guard Station. In 1987, 293 feet of dune were lost. This year the dune eroded behind our northernmost erosion marker, thus wiping out this reference point and endangering the Coast Guard Station itself. This point most assuredly received the most erosion of any other point on the Refuge. The nine-acre freshwater pond just south of Oregon Inlet and approximately 75 yards from the Coast Guard Station appeared to be holding its own last year, but it was overwashed and breached by the ocean in late December. Just prior to the pond's overwash the U.S. Coast Guard moved its operation from the Refuge across Oregon Inlet to a more stable area on National Park Service land.



#6 - North Point - Note the location of the Coast  
Guard Station and the rip-rap at the base of  
the bridge.  
12/88 SL

#### 9. Fire Management

No controlled burns were conducted on Pea Island in 1988, but two small wildfires did occur on the Refuge in July. On the 19th, a small wildfire broke out on the sound side of the Refuge. It was extinguished by firemen from the Chicamacomico VFD after it had burned only an acre. On the 27th, another wildfire occurred on the beach side of the refuge. Refuge staff made the decision to allow the fire to burn; however, smoke became a problem when it hindered visibility on N.C. Highway 12. Refuge staff with assistance from NPS employees extinguished the fire after several acres were burned.

#### 10. Pest Control

Attempts to keep the nutria and muskrat populations in check were implemented through a public trapping program to reduce burrowing damage to impoundment dikes. No applications were received for Pea Island in 1988, and the program was disbanded.

## G. WILDLIFE

### 1. Wildlife Diversity

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

### 2. Endangered and Threatened Species

#### a. Federally Listed and Endangered Species

Peregrine Falcon (Endangered) - Pea Island had five peregrine falcon sightings in 1988. Unlike last year, no injured peregrines were picked up or observed by Refuge staff.

American Bald Eagle (Endangered) - Bald eagles often pass over Pea Island and each year several sightings are made. This year Refuge personnel spotted two bald eagles on the Refuge. On July 24, ARM Lanier spotted an immature eagle at South Pond and on October 14, BT Elmore and MW Powers spotted an adult eagle near the marsh behind South Pond. On July 4, NPS Rangers turned over to the Refuge staff an immature eagle that had been found injured on Hatteras Island, just south of the Refuge. Refuge personnel took the eagle to a local veterinarian who diagnosed the bird's injury as a gunshot wound. Special Agent Ted Curtis then flew the bird to the Carolina Raptor Center for rehabilitation. After six months of rehab the eagle was released at Mattamuskeet NWR in December. It is hoped that this eagle will complement Mattamuskeet's eagle hacking program.

Piping Plover (Threatened) - No piping plovers were sighted on the Refuge shorebird surveys this year; birders did make several sightings on NPS land near Cape Hatteras.

Atlantic Loggerhead Sea Turtle (Threatened) - 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 60 days, they were checked. If hatchlings had already escaped the self-releasing nests, the nest was excavated.

This year ten nests were found on Pea Island beaches. The first nest was discovered June 2, and the last on August 3. All but one of these nests had to be relocated due to their precarious location. Two nests from non-refuge beaches of Nags Head and Kill Devil Hills were relocated to Pea Island bringing the total to 12 nests.

The hatch rate percentages dropped as the seasonal temperatures cooled. The eggs laid in June had a 91% hatch rate. Those laid in July had an 84% hatch rate. The one nest laid in early August had an 82% hatch rate.

Numerous 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 6, Volunteer Bill Perkinson found a large loggerhead sea turtle with no shell on the north beach of the Refuge.

In December, a team from Virginia Institute of Marine Science brought several large loggerhead sea turtles to Oregon Inlet for release. One turtle weighed approximately 250 pounds. It was outfitted with a satellite transmitter. The U.S. Coast Guard at Oregon Inlet transported the turtles and VIMS staff out to the Gulf Stream for the release.

During November and December, 17 dead sea turtles were documented on the Refuge and other beaches (14 on Refuge and 3 off Refuge). Unfortunately this is not unusual. Trawl boats dragging for flounder are common along our shore during this season. We presume that many of these deaths were caused by turtles being caught and drowned in the trawler nets.

On December 15, a cold, stunned green sea turtle was delivered to Refuge personnel. It was taken to the North Carolina Aquarium for treatment.

On December 15, a huge loggerhead sea turtle was rescued from Avon Harbor. It was taken to the North Carolina Aquarium and treated. Local fishermen volunteered to return the creature to the warm Gulf Stream.



#7 - With a little luck, and the absence of gulls  
and ghost crabs, he'll soon be... 7/88 KD



#8 - ...on the home stretch!

7/88 KD

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) - Two pairs of osprey used the platforms constructed in North Pond for nesting. Each pair produced two young. The platform in New Inlet was also used for osprey nesting this year. Behavior exhibited by the adults using this platform also indicated that young were in the nest. Because nearly all of the platforms on the Refuge were used, additional ones will be installed for next spring.

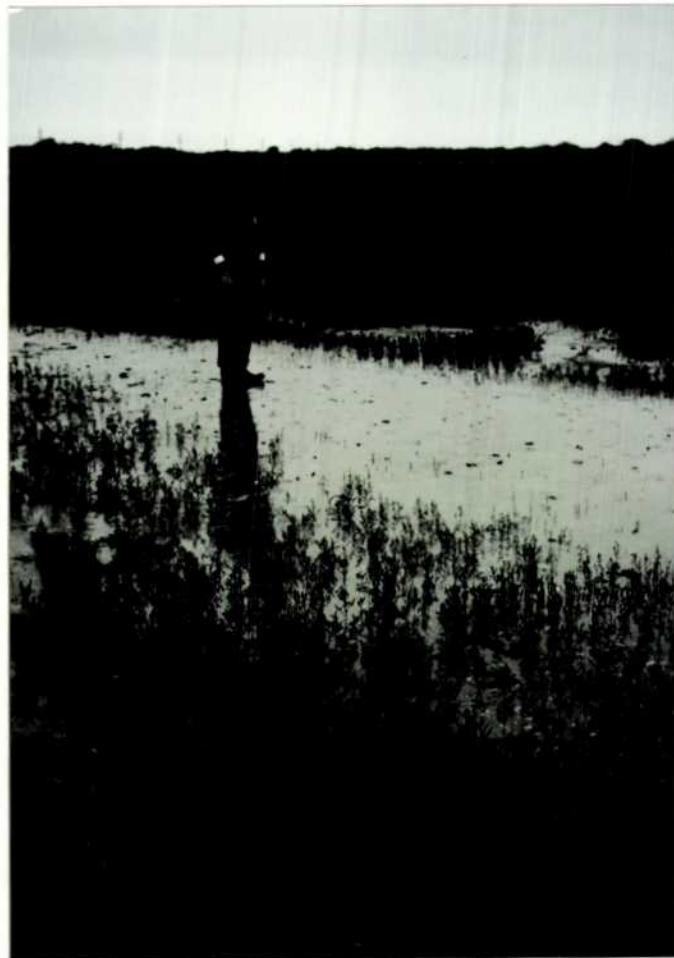
Least Tern (Special Concern) - For many years least terns have nested at a specific area of the Refuge beach. This year no terns nested on the Refuge. Aerial surveys and tern banding expeditions indicated that the terns moved their nesting colonies to nearby dredge spoil islands. Although no one is certain, we believe increased public use in the area coupled with beach erosion prompted this move by the terns. The dredge spoil islands just north of the Refuge in Oregon Inlet have proved to be suitable nesting sites, 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 set a new record low dropping to the lowest levels in 23 years, 4.1% lower than 1986-87's record low. Waterfowl use days dropped to just above 1 million. The waterfowl peak of 13,535 birds however, was slightly higher than last year's record low peak of 12,375 but was still the second lowest of the past 23 years.

Swan use was halved from last year's and reached the lowest point in the past ten years. The peak number of 980 was also the lowest in the past ten years dropping over 2,000 swans to set a ten year low.

Canada geese use days dropped for the fourth consecutive year to break the new record low for the Refuge set last year. The peak of 1,055 was also the lowest on record in at least 23 years, dropping over 500 Canada's below last years record low.



#9 - Bio Tech Elmore examines Canada goose eat  
out in Salt Flats. 12/88 SL

Greater snow goose use also broke a new 23 year record low, dropping to 104,139 use days. Peak numbers increased, however, more than 1,000 birds from last year's 23-year record low.

Coot use also dropped for the fourth straight year setting a new 23 year Refuge low. The peak of 880 was also a new low breaking the previous low of 1,130 set in 1982-83.

Perhaps the only bright aspect of the 1987-88 waterfowl season on Pea Island was duck use. Ducks, rebounded slightly, 180,000 use days from last year's 23-year record low. Peak numbers also rose by 5,700 ducks over last years record low. However, this year's peak was still the second lowest of the past 23 years. See Table 2 below for comparisons.

Table 2

Composition of Waterfowl Wintering on  
Pea Island NWR  
1987-88

Group	Percent	Number Use Days	% Diff. from 1985-86	Peak Number
Swans	5.9	64,127	-49.3	980
Canada Geese	3.8	41,951	-69.1	1,055
Snow Geese & Blue	9.5	104,139	-25.1	3,000
Ducks	76.9	838,736	+24.4	12,700
Coots	3.9	42,000	-28.5	880
TOTALS	100.0	1,090,593	-4.1	13,535

\* Calculations for table provided by East Coast Biologist  
Otto Florschutz.

Brood counts were conducted on Pea Island this year for the first time in several years. A total of five counts were made, two of them aerial counts. A total of 73 broods were counted; the majority were black duck broods. See Table 3 for details.

Table 3

Pea Island NWR Brood Count Totals for 1988

	# of Broods Seen					
	South Pond	New Field	North Pond	Sound Pond	Species Total	Species % Total
Black Duck	7	4	27	0	38	51
Gadwall	3	5	18	0	26	35
Mallard	0	0	1	1	2	3
Unknown	1	0	7	0	8	11
Area Total	11	9	53			
Area % of Total	15	12	72			

#### 4. Marsh and Water Birds

Refuge beaches, marshes, and impoundments were heavily utilized by many species of marsh and water birds for both feeding and nesting. Although no active management occurs exclusively for these species, an upward trend in use days has been observed in recent years. Habitat management practices for waterfowl and other species have had a positive influence on marsh and water bird use of the refuge. For example these species took advantage of the lower water levels in New Field while the impoundment level was down for construction purposes. Bird numbers increased throughout the spring of 1987 and reached their greatest numbers and diversity in the summer and fall.

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 which is suboptimal.



#10 - Some babies are so ugly - only a mother  
could love them! 7/88 BWS

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. There were approximately 960 nests in the pelican colony in the summer of 1988, up 155 nests from the 805 counted in 1987.

5. Shorebirds, Gulls, Terns, and Allied Species

Shorebird surveys were conducted from April until September; the peak population occurred in late August when 3,626 gulls, terns, and shorebirds were sighted. This peak is slightly down from the previous year when 3,689 were sighted, but it is significantly down from 1986's peak of 4,878. As previously mentioned in Section G.2.b. the tern colony was not present on the Refuge beach for the second consecutive year. It appears that the spoil islands in and around Oregon Inlet have provided a more suitable nesting habitat for the birds.



#11 - This fellow was watching on our annual tern banding trip. 6/88 KD

Again this year staff, YCCers and volunteers assisted John Weske in banding terns on the spoil islands at Oregon Inlet. 1,403 royal terns and 331 sandwich terns were banded.

6. Raptors

The Carolina Raptor Center (CRC) again requested permission to band raptors on Pea Island this year. Because CRC personnel were caught and prosecuted for using migratory birds for lure birds at their banding station on the Refuge last year, their request was denied. Permission to band all raptors except threatened and endangered species was given to Dr. Richard Brown. Dr. Brown did not choose to man a banding station at the Refuge when he learned that he would not be able to band peregrine falcons.

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. One hundred and fifteen different species of song birds migrate through Pea Island.

8. Game Mammals

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

Raccoons are fairly common on Bodie Island to the north. In recent years, raccoon tracks have been observed on Pea Island with higher and higher frequency.

Evidence has been found to indicate an influx of foxes and 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.

9. Marine Mammals

Several whales were found on the Refuge beach this year. In May, a dead minke whale was found on the beach north of the headquarters. Bill McLellan (Smithsonian Institute) retrieved certain parts of the whale and advised that it was only the second whale of this species to be found in North Carolina. Later in the summer a beached immature long fin pilot whale was found on the beach. The whale had apparently been entangled in a fishing boat's long line, as the beak and part of the line was still wrapped around it. After several unsuccessful attempts to swim the whale back into the ocean, it was euthanized.



#12 - Immature long fin pilot whale. 8/88 JP

10. Other Resident Wildlife



#13 - Various environmental factors have caused pheasants to be a rarity on Pea Island. MH

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.

#### 15. Animal Control

Muskrat and nutria thrive on Pea Island. Populations are estimated at 5,000 muskrat and 900 nutria. Damage continues to occur on impoundment dikes and berms. The Refuge was open for fur trapping in 1983 for the first time for the month of February. Two trappers worked the refuge with great success, but since 1983 only one has trapped at Pea Island. His efforts were met with limited success. This year, no applications for permits were received.

#### 16. Marking and Banding

Once again Refuge staff experienced a successful duck banding season in 1988 despite the fact that several staff members were absent during banding season. All quotas were exceeded for the third year in a row and additional species were banded.

Pea Island participated in neck collaring Canada geese for the special Atlantic Flyway study. The Refuge has participated in this study since 1983. This year was the least successful year with only 12 geese being collared.

	<u># Banded</u>	<u>Quota</u>
Canada Goose	12	--
Black Duck	370	200
Mallard	119	100
Black/Mallard Hybrid	21	--
Redhead	3	--
Canvasback	1	--
American Wigeon	26	--
Green-winged Teal	17	--
Pintail	32	--

#### H. PUBLIC USE

##### 1. General

Based on the National Park Service vehicle counter at Bodie Island, estimated visitation to Pea Island NWR during 1988 was 1,642,249. The Host/Hostess program continued to provide visitor information at the visitor contact station from April-October. YCC provided manpower for a re-vamping

of the sign program, minor trail maintenance, and general clean-up in visitor areas.



#14 - Word got out that we fed litterbugs to this thing! Actually, it "eats" old pavement.

11/88 AJE

On February 3, WTKR (Channel 3) a subsidiary of CBS filmed waterfowl and discussions about waterfowl banding at Pea Island. The segment was titled "You Wonder Where the Wild Goose Goes? So Do We" and has aired several times locally.

On April 2, two Navy sailors overturned their vehicle at the S curves. They were traveling at approximately 70 mph; no injuries were sustained.

On April 4, representatives from the Auditor's office visited Pea Island to evaluate its potential as a fee collection area. On-site inspection and discussions with RM Taylor and ORP Strawser quickly convinced them that Pea Island would be inappropriate for fee collection. They did indicate that Cape Hatteras National Seashore seemed to have potential.

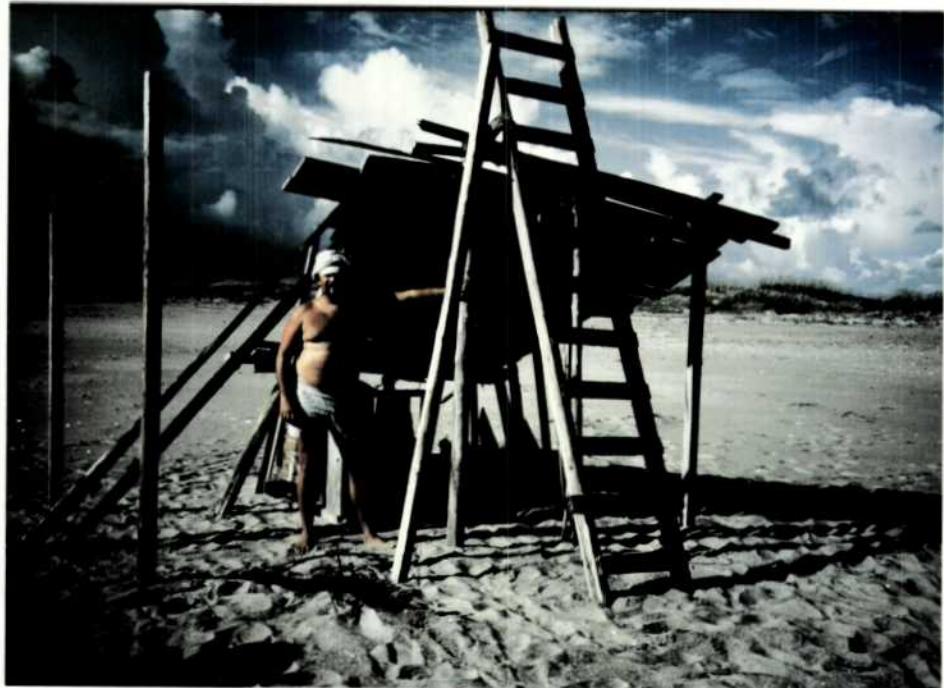
May 17, 1987, marked the 50th Anniversary of the signing of the enabling legislation that created Pea Island NWR, this was the "official" date for the 50th Anniversary. Since the Refuge was not actually purchased until 1938, our focus for the 50th Anniversary Celebration was delayed until 1988.

Several major activities were planned to help celebrate 50 years of wildlife management at Pea Island. Ten special winter bird walks were conducted (see Section H.7.), the Pea Island Beach Sweep was executed (see Section E.4.), and a special-edition eight page tabloid was published in The Coastland Times.

Erosion at the north end of the Refuge had a major impact on public use. Toward the end of May, the emergency work to stabilize the south foot of the Bonner Bridge across Oregon Inlet was begun. Huge boulders, weighing several tons each have been placed over the existing rip-rap at the base of the bridge on the Refuge. Toward the U.S. Coast Guard Station harbor, smaller rip-rap was refurbished.

The area at the base of the bridge has always been a popular fishing spot and draws many fishermen and crabbers. Small children frequently spent many hours in the area while more intent older children, fathers, or mothers fished. The currents in Oregon Inlet are swift and multi-directional; drop offs and shoulders combine to make the bottom extremely unpredictable. The channel to the Coast Guard harbor seems to be a "hot spot" for fish; that means fishermen, of course, are drawn like magnets. There have been several drownings in this area over the years. Since the large boulders have been added, a number of minor injuries have resulted from visitors climbing over them to reach the water. The National Park Service provides a parking area with porta-johns at the base of the bridge. The U.S. Coast Guard facility was manned for most of 1988; that added a third "controlling" agency in the area. If the north end were closed to public use, enforcement would be impossible. As it is, controlling the public there has been an on-going, unsolvable problem for the National Park Service, the Coast Guard, and the Refuge.

On the south end of the Refuge, the potential for public use problems has reared its head on several occasions. During 1987, RM Taylor met with representatives from Mirlo Beach Properties to discuss their concerns. They requested the Refuge consider leaving the old pavement when N.C. 12 was relocated at the famed "S curves". We certainly considered their request, but decided that an additional parking area would have a negative impact on wildlife and habitat on the Refuge. In 1988, when the N.C. Department of Transportation actually began the work to relocate N.C. 12, a group of citizens of Rodanthe rallied for support from the Dare County Commissioners in converting the old roadbed to a parking area. The commissioners passed a legislation to send to the governor. Fortunately, by the time this process occurred, the pavement had been removed.



#15 - Beach development is rampant all around the Refuge. Actually, this "beach cottage" was built on the Refuge! 8/88 AJE

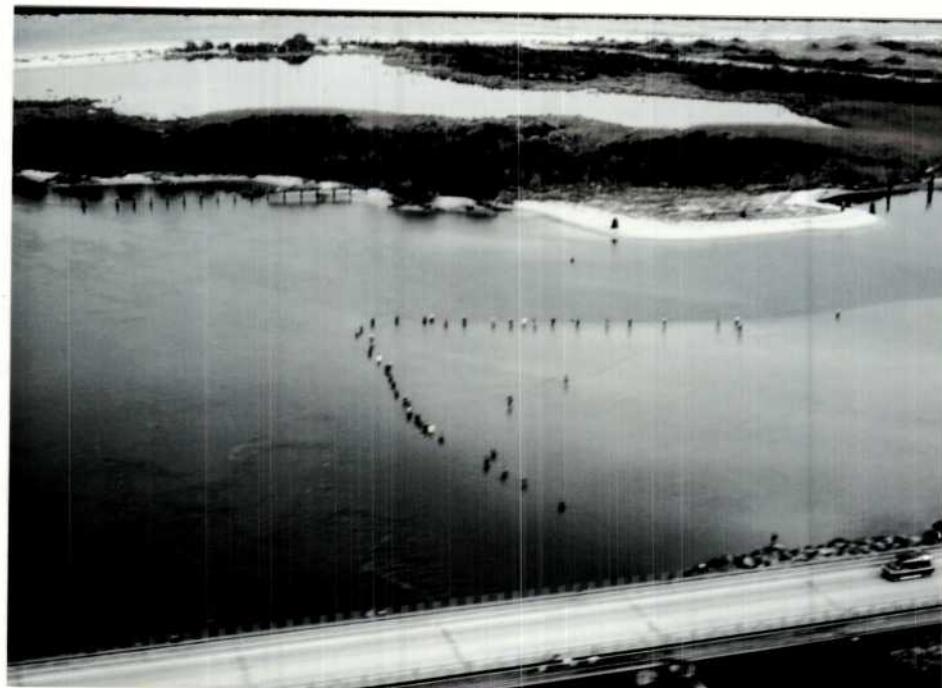
Public demand for beach access increases yearly. The amount of undeveloped beach frontage property decreases yearly. Towns and villages in the area are supported almost entirely by the tourist industry, yet the burden to supply services for these visitors is thrust toward the federal government. The National Park Service expands its services as the budget allows. The Pea Island Master Plan established a maximum number of parking spaces on the Refuge. We have reached that level. At Pea Island, public use efforts will be aimed at improving the quality of the visit.

On September 13, Dan O'Neal and Richard Mattison (Public Use Atlanta) visited Pea Island to evaluate the possible use of the Oregon Inlet Coast Guard Station as a Visitor Center for the Refuge. The Coast Guard abandoned the entire facility in late winter.

An old "bench mark" marked "US Biological Survey - 1938" washed out of a dune near the Coast Guard Station in September.

Due to the rapid erosion on the north end, the U.S. Coast Guard Station abandoned the facility on the Refuge and moved

to the old "lighthouse keepers quarters" on Bodie Island. A historic structure, a newer section of the actual station, and numerous out buildings, the harbor, etc. were left behind. Several agencies and organizations have made requests for the historic structure. We have requested the newer section of the station, the outbuildings, docks, etc., and the 10 acres of land on which they lie. As far as we know, no decision has been made as to its future at this point.



#16 - Judging from the fishermen, can you guess where the channel lies to the harbor?

9/88 SL

## 2. Outdoor Classrooms - Students

The emphasis on non-staff conducted activities continued in 1988. School groups, scouts, etc. were encouraged in the independent use of the Refuge for educational activities. Marsh investigation equipment (seines, mud sieves, etc.) was available for loan from the VCS.

Since no registration is required for the use of outdoor classrooms, we have no record of the actual number of such uses that occurred. Several groups borrowed equipment from the Refuge for marsh investigations. Also, the North Carolina Aquarium utilized Pea Island marshes for a number of conducted salt marsh studies during 1988.

#### 4. Interpretive Foot Trails

North Pond Trail finally received new interpretive plaques during 1987. Five plaques were ordered from Wilderness Graphics in Tallahassee, FL. These were so well received we ordered an additional six plaques to be installed past the overlook on the trail. These should be in place before the summer, 1989.

The usual clearing, cleaning, and trimming was done on the North Pond Trail during 1988. Volunteer Fran Jolliff took a real interest in keeping the trail looking good. Her efforts were obvious to the many folks who visit there.

Approximately 135,481 visitors (270,962 AH) utilized interpretive foot trails at Pea Island during 1988.

#### 6. Interpretive Exhibits/Demonstrations

The two interpretive kiosks constructed in 1984 have been popular spots for Pea Island visitors. These exhibits have done an excellent job of presenting the "message of the Service" while answering many of the common questions asked by Refuge visitors.

Exhibits displayed in the VCS have also been popular with Refuge visitors. Though these displays are "homemade", and their quality is below Service standards, they represent the Refuge's best effort. Office renovation for a more appropriate VCS may be possible in the near future.

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. If we receive the structure and determine that it is feasible to convert it for visitor contact, it may be the answer we've been looking for in providing the "captive audience" at Pea Island with some real meaningful information.

During 1988, 73,907 visits (18,467 AH) and 6,500 visits (1,625 AH) were spent at the kiosk and VCS, respectively.

#### 7. Other Interpretive Programs

Summer interpretive programs were conducted, as usual, at Pea Island. The Refuge continued to be independent of the National Park Service in its programming during 1988. In years prior to 1986, staff or interns from the N.C. Aquarium or National Park Service conducted public programs on the Refuge during the summer months. By 1986, the volunteer program had developed enough to handle the programs in house.

Three bird walks and a children's wildlife discovery program were conducted weekly during the summer months. Interns Morse and Royce and Volunteer Bush conducted most of the children's wildlife discovery sessions; the interns and Volunteers Kristoffersen and Pitcher shared responsibilities for the bird walks.

Participation for 1988 follows: Birdwalk - 33 programs conducted and 703 participants; Children's Wildlife Discovery - 11 programs conducted and 216 participants; Participation in the winter "50th Anniversary" Saturday bird walks mostly involved local people, since winter-time tourism is low. A total of 34 people participated in nine bird walks as a part of this program.

On the advice of the volunteers who lead most of the walks, the program was changed from winter to fall. That meant we received a "double dose" during 1988. The switch appeared to be a good one: numbers were up and the weather was gorgeous. A total of 147 people participated in walks scheduled during October, November, and December.

In addition to the regularly scheduled public programs, the following special programs were conducted:

On January 23, Bio Tech Elmore conducted a program on bird banding for a group of Elizabeth City Boy Scouts.

On February 3, 21 children from the Mt. Olivet Preschool visited Pea Island for waterfowl banding. Unfortunately, no birds were caught. We banded stuffed birds, brought out "Boris", the corn snake, and improvised for a few minutes to help make their trip an educational and memorable one.

On February 26, ORP Strawser and Volunteer Dyar conducted a "Take Pride in America" program for the Wildlife Club at the Manteo Middle School to build interest in the Pea Island Beach Sweep. Approximately 45 students attended.

On March 25, Volunteers Dyar and Pitcher conducted a bird walk and discussion on wildlife management for a group of advanced biology students from Murfreesboro High School.

On April 26, Volunteer Dyar conducted a bird walk and Refuge program for 33 advanced students from Orange High School in Hillsboro, NC.

On May 12, Volunteer Kristoffersen conducted a bird walk for the Dunes of Dare Garden Club. Approximately 20 people attended.

On June 7, Volunteers Morse and Royce conducted beach and impoundment programs for approximately 100 kindergarten students from Manteo Elementary School.

On June 12, Volunteer Morse conducted a marsh study for a group of Boy Scouts from Elizabeth City. Approximately 12 people participated.

9. Fishing

In 1988, 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. As always, a popular fishing spot was Oregon Inlet; many visitors parked their vehicles on the Refuge and walked onto the catwalks on the Bonner Bridge to fish. Approximately 1,310,615 AH (262,123 visits) were spent fishing on Pea Island during 1988.

A number of notable "fish tales" occurred:

During March, blue fish blitzes were almost constant, resulting in blue fish carcasses and fishermen being thick on Refuge beaches. One fisherman reported he caught 25 large bluefish in less than 2 hours.



#17 - We encourage wildlife related public use on  
Refuge lands.

10/88 BWS



#18 - Unfortunately, some consumptive users...  
4/88 BWS



#19 - ...as well as non-consumptive users, have  
little environmental respect and no  
"manners"!  
4/88 BWS

At April's close, there were still large numbers of blue fish in the sound. It was unusual for this number of fish to be here this late in the year. No other fish were evident in the sound: blue fish appeared to be eating blue crabs. One blue fish reportedly had 149 hard crabs inside its belly when gutted. Locals have speculated that this may have a major effect on crab populations in the next couple of years.

On and around October 11, the north end of Pea Island was literally "taken over" by fishermen going after speckled trout and small red drum in Davis Channel and the Cost Guard boat basin.

Approximately 1,310,615 AH (262,123 visits) were spent fishing on Pea Island during 1988.

#### 11. Wildlife Observation

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

Due to the location of the road (N.C. Highway 12) through Pea Island, it is difficult for a traveler to pass without observing wildlife. On most days of the year, the quality of observation is quite high. During the fall and winter, greater snow geese frequently feed on the road shoulders. Often vehicles must pause to allow the birds to move out of their paths.

During the 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, thus making them clearly observable from a vehicle. During 1988, an estimated 1,231,414 visitors spent time in association with vehicular wildlife observation.

Refuge trails and other access points are located to make wildlife observation (on foot) easy and enjoyable. Refuge visitors spent approximately 541,906 AH (270,953 visits) participating in this activity during 1988.

#### 12. Other Wildlife Oriented Recreation

Wildlife photography continues to be a popular activity at Pea Island. Several photo blinds are available as staff time allows for their maintenance and placement on a first-come, first-served basis, but most photographers wander around the impoundments or use the observation platforms

along North Pond Trail. Good photographs tend to be the result of being at the right place at the right time.

During 1988, the use of Refuge photo blinds was limited by dike work and lack of staff time to place them, but "wandering photography" was popular. Approximately 21,380 AH (5,345 visits) were spent with photography at Pea Island last year.

#### 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. In several places, the beach is easily visible from N.C. Highway 12 and the temptation is more than some motorists can handle. Increased signing has become a necessity. ORV violations have become more frequent and, as always, the violators are difficult to apprehend. More often than not, officers arrive at the scene to find only the tell-tale ruts in the sand.

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.



#20 - Though not encouraged, non-wildlife related public use, such as this, will continue to occur at Pea Island. CC

No facilities have been constructed specifically for these uses. Approximately 1,075,143 AH (314,976 visits) were spent in non-wildlife oriented recreation on Pea Island in 1988.

#### 17. Law Enforcement

Staff participation in law enforcement was limited at Pea Island NWR during 1988. Due to a MOU with Cape Hatteras National Seashore, the National Park Service 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. Most enforcement by Refuge officers is incidental to other duties. The assignment of Mackey Island's LEO Mike Panz to Alligator River NWR half-time in 1988 helped the situation immensely.

At Pea Island, many law enforcement problems are related to the high public use in the summer. National Park Service rangers assist by handling most of the problems stemming from non-wildlife oriented recreation. Car clouting, illegal parking, vandalism to the NPS restrooms, public

nudity, littering, and dogs off a leash are among the most common problems.

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. Pea Island's beaches are closed to vehicular traffic, but many trespass violations occur.

There are minor poaching problems at Pea Island; occasionally cars will stop and shots will be fired at waterfowl from the road. Occasionally, poachers slip in from Pamlico Sound to quickly shoot as many waterfowl as they can and 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 were on record for 1988:

2 - fishing in a close area; \$50 each forfeiture of collateral.

2 - vehicle trespass; \$50 each forfeiture of collateral.

2 - general trespass; \$25 each forfeiture of collateral.

1 - taking over limit of swans (State charge); \$150 fine plus \$40 cost of court.

1 - aiding and abetting over limit of swans (State charge); \$150 fine plus \$40 cost of court plus loss of hunting privileges for 6 months.

2 - aiding and abetting hunting over bait; NOV pending.

1 - hunting with aid of bait; \$200 (forfeiture of collateral).

2 - littering (State charge); \$50 forfeiture of collateral.

Other noteworthy matters relating to law enforcement follow:

In February, the Carolina Raptor Center was charged with two counts of illegal possession of migratory birds. These charges stemmed from the Center's banding operation at Pea Island last year. They were observed by Refuge staff and SA Ted Curtis using migratory birds for decoys and bait to bring raptors into the traps.

Some time during the weekend of February 24-25, a "gun battle" occurred in the men's room at the Pea Island Comfort

Station. This has been a continual site for vandalism and homosexual graffiti. Evidently, someone shot a number of rounds from a hand gun, breaking most of the fixtures and causing extensive damage to the walls, floors, etc. The NPS began repair work immediately.

Memorial Day weekend brought the usual crowds of visitors to Pea Island. Severe erosion on the north end of the Refuge surprised most returnees. Favorite fishing spots, for many, washed away months ago. Because much of the road to the Oregon Inlet Coast Guard Station has been closed to vehicles, it seemed interest in fishing the bridge area increased. Folks just don't like to walk very far to get to the beach! Construction work (rip-rap) around the base of the bridge compounded the confusion and the problems in the area. Increased signing and enforcement for the area did little to help clarify regulations for the visitors and encourage compliance. The saga of the north end continues.



#21 - Traffic problems resulting from the relocation of the "S-curves" plagued the Refuge during summer and fall. 9/12 SL



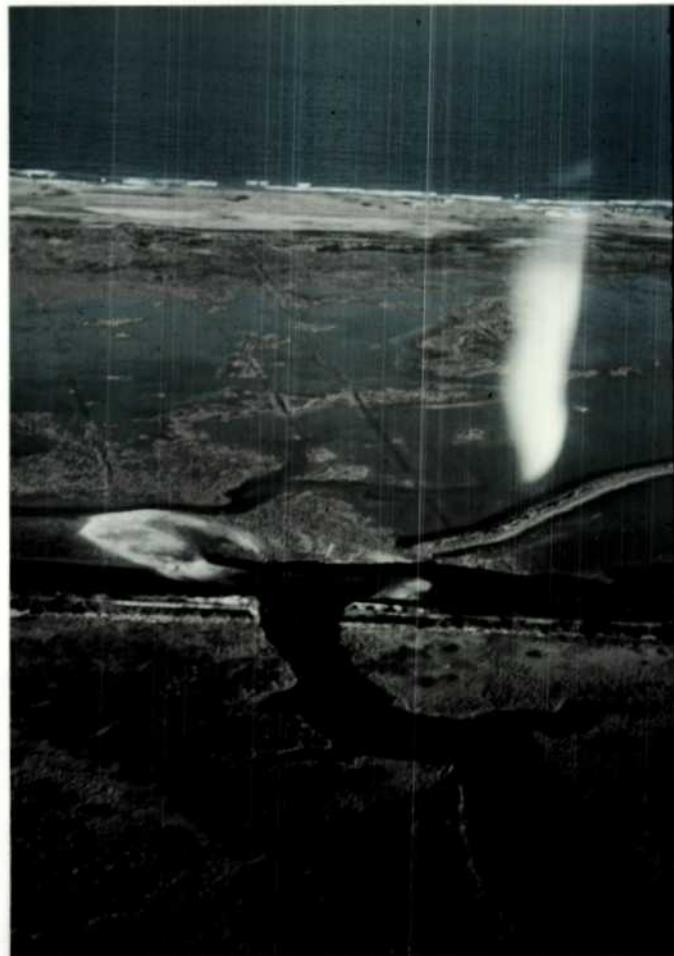
#22 - Believe it or not, there's a 70 car parking lot just to the left (see photo on page 11).  
Folks just don't like to park in parking lots.  
10/88 SL

During August, County Deputies spent many hours on the Refuge in an effort to catch car clouters. This summer, as in summers past, Pea Island has been a popular spot for this type of activity.

#### I. EQUIPMENT AND FACILITIES

##### 1. New Construction

The North Carolina Department of Transportation's contract work on relocating the portion of N.C. Highway 12 known as the S-curves was completed between August and November. Overwash from the Atlantic Ocean frequently closed this portion of the road, especially during NE storms. Mitigation for wetland losses included construction of two ponds at the south end of Pea Island. A 1.3 acre and a 3.1 acre pond should improve waterfowl utilization on the south end. Also included under this construction package was removal of the old asphalt and roadbed leaving that area as another shallow depression capable of holding some moisture.



#23 - In 1985, Hurricane Gloria left New Field  
dike a little something to remember her  
by...  
12/85 JTT



#24 - Finally, the repairs were completed this  
year!  
12/88 SL

## 2. Rehabilitation

Hydro seeding of the New Field dike finally finished damage repairs from 1985 and 1986 hurricanes. With the New Field dike repairs completed, and pump station platform in place, an engine was borrowed from the North Pond pump and a test of this pump was conducted. Now all we need to find is a complete engine unit of \$5,000 to put a spare engine on-line.

## 3. Major Maintenance

Carpeting was replaced at the Refuge quarters. Storm doors were replaced on the Refuge quarters and exterior doors and rusted door jambs were replaced in the grain house and oil storage building.

## 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 on Alligator River. Hauling capabilities currently limit the practicability of a total transfer at this time. As transport capabilities increase most equipment will be stored at Alligator River and transported to the coast as needed.

## 5. Communications Systems

See Alligator River narrative.

## 7. Energy Conservation

Car pooling of travel and trips to Pea Island and the other units of Alligator River NWR is practiced whenever possible. A faulty heat pump unit was replaced at the Pea Island quarters.

## J. OTHER ITEMS

### 1. Cooperative Programs

The Corps of Engineers (Wilmington) has been conducting beach profile studies since 1983 under a special use permit which was renewed again this year.

A special use permit was issued to the Carolina Raptor Center again this year. After carefully explaining the rules, regulations, and conditions, an on site inspection

revealed the use of mourning doves and brown headed cowbirds as bait. The Center was prosecuted and the permit not renewed.

A five year special use permit was reissued to the U.S. Coast Guard to utilize well points on the Refuge to provide water to the Oregon Inlet Station.

A special use permit was issued to the State of North Carolina, Department of Transportation to stabilize the shoreline on the south bank of Oregon Inlet where the Bonner bridge is anchored.

#### 4. Credits

This narrative was a joint effort by all the Refuge staff with special kudos to ORP Strawser and Office Assistant Midgett.

#### K. FEEDBACK

What to do with injured or sick wildlife is an on-going problem for most refuges. We have a PR obligation to do "something" when Joe Public brings in a sea gull with a broken wing. Even though we are aware that the loss of a sea gull, or ten sea gulls, or even a hundred sea gulls won't hurt the population, the public expects us to respond. For this reason, it's always nice to have a local rehaber with the necessary permits to channel these birds toward.

We have run into a situation where a local rehaber is doing more harm than good. We have had reports from numerous individuals, among them two local veterinarians, of her abusive treatment of migratory birds. In one case, she force fed milk into a Great Horned Owl's lungs. She routinely chops off the broken wings, force feeds everything, and then proceeds to "rehab". She has no known education, experience, or training for rehabilitation work. She is demanding and aggressive toward the Refuge staff. She frequently makes negative comments to groups and individuals about the USFWS, particularly the refuge. On several occasions, she has intercepted refuge volunteers who were performing assigned duties (going to pick up an injured osprey for the refuge) and told them that they were violating federal law- that only she had the legal right to touch those birds.

We contacted Law Enforcement (Atlanta) to request her rehab permit be revoked. We were advised that there was no mechanism for doing so. No matter how badly a rehaber treats a birds, how poorly trained, or what kind of attitude she has, all she has to do is apply to get a permit, and there's no way to take it away!

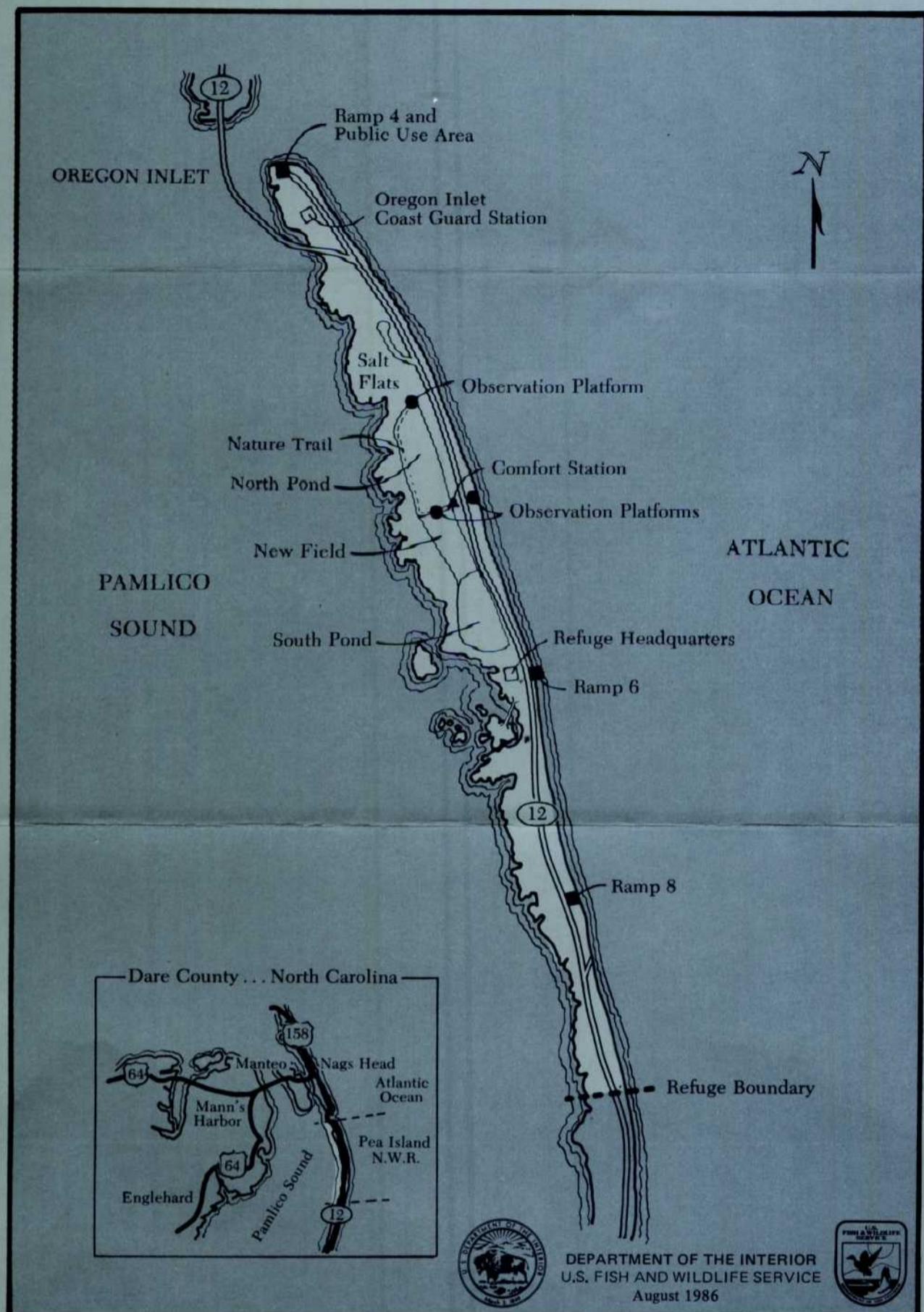
We have resorted to making it a station policy not to give any birds to her and not to recommend to anyone else that she receive birds. We make it clear that she does have a legal right to accept birds, but that we prefer sea gulls, etc. be left in the wild to let "nature take it's course" and other birds be brought to us for treatment.

Can't the Service come up with a way to control this sort of situation? After all, the it's against the law to "harass, harm, etc." migratory birds.

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



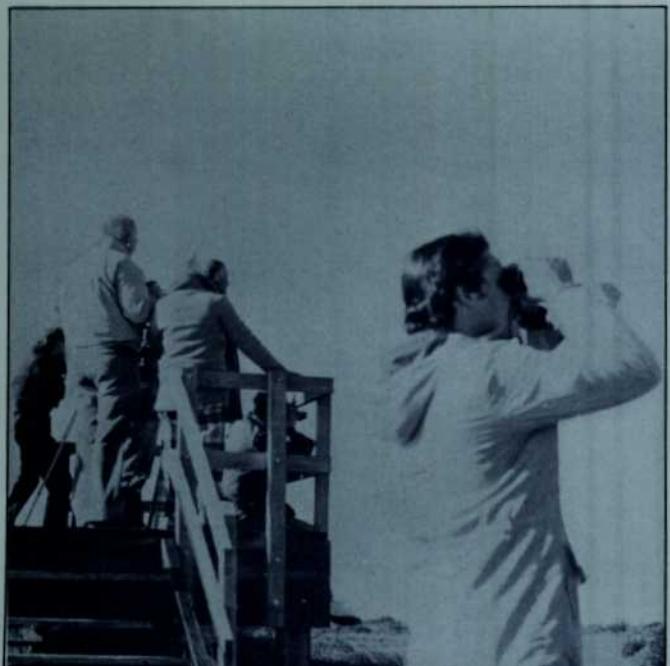
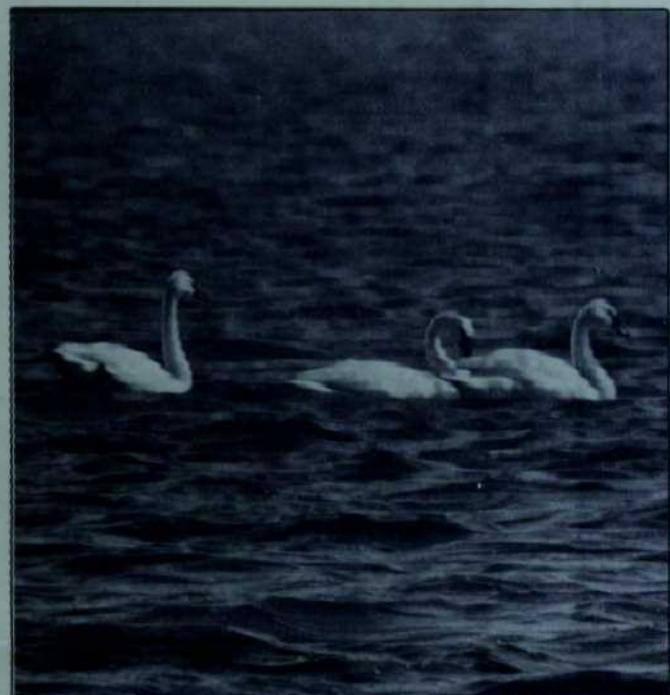
**Pea Island National Wildlife Refuge** is administered by the Fish and Wildlife Service on Cape Hatteras National Seashore. Pea Island is composed of 5,915 acres of coastal barrier island extending over 12 miles along North Carolina's "Outer Banks" from Oregon Inlet southward to the village of Rodanthe.

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

## 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

## 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.



## 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)		
<input type="checkbox"/> Opossum		D
INSECTIVORA: (Shrews and Moles)		
<input type="checkbox"/> Southeastern Shrew		D
<input type="checkbox"/> Least Shrew		E
<input type="checkbox"/> Eastern Mole		E
CHIROPTERA: (Bats)		
<input type="checkbox"/> Silver-haired Bat		D
<input type="checkbox"/> Eastern Pipistrelle		E
<input type="checkbox"/> Red Bat		E
<input type="checkbox"/> Hoary Bat		E
<input type="checkbox"/> Evening Bat		E
LAGOMORPHA: (Rabbits)		
<input type="checkbox"/> Eastern Cottontail		D
<input type="checkbox"/> Marsh Rabbit		D
RODENTIA: (Rodents)		
<input type="checkbox"/> Rice Rat		D
<input type="checkbox"/> Eastern Harvest Mouse		E
<input type="checkbox"/> Hispid Cotton Rat		E
<input type="checkbox"/> Meadow Vole		D
<input type="checkbox"/> Muskrat		D
<input type="checkbox"/> Norway Rat		D
<input type="checkbox"/> House Mouse		D
<input type="checkbox"/> Nutria		D
CARNIVORA: (Meat Eating Mammals)		
<input type="checkbox"/> Gray Fox		E
<input type="checkbox"/> Raccoon		D
<input type="checkbox"/> Mink		D
<input type="checkbox"/> 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:

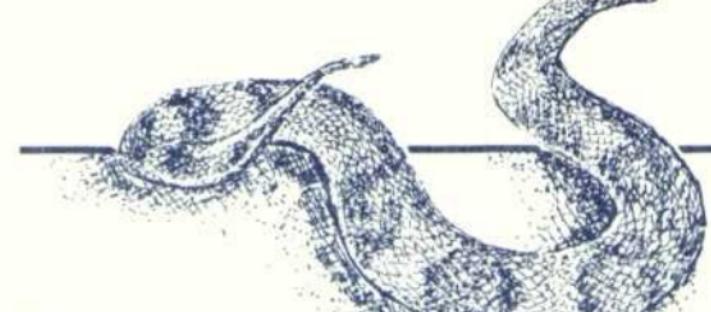
a - abundant	a common species that is numerous.
c - common	probable to be seen in suitable habitat.
u - uncommon	usually present, but not certain to be seen.
o - occasional	seen only a few times during a season.
r - rare	seen at intervals of 2 to 5 years.

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

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## • Reptiles

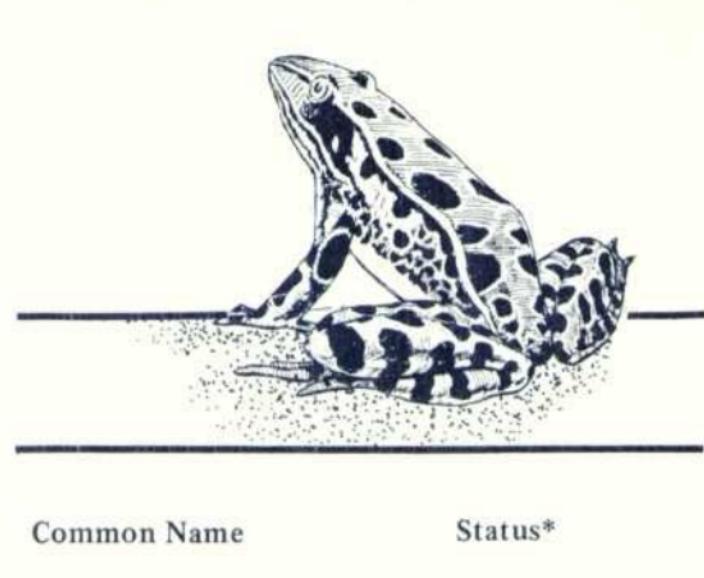
## Reptiles

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	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-breasted 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



— Green Treefrog	D
— Squirrel Treefrog	D
— Bullfrog	E
— Southern Leopard Frog	D

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

- **Amphibians**

		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
— 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.

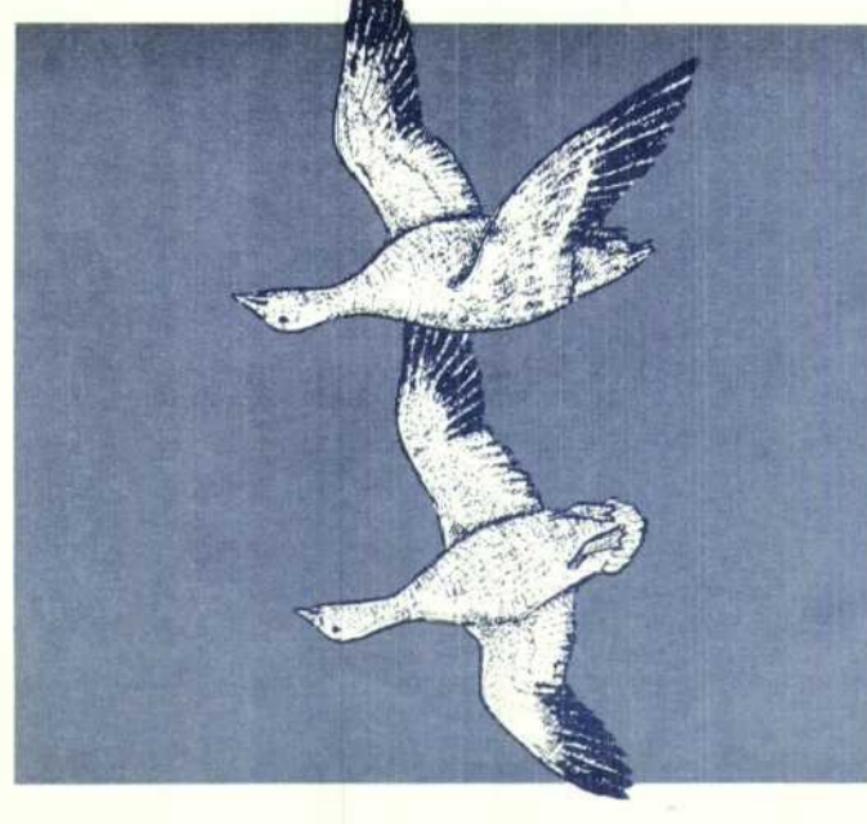
Wildlife observation can be very enjoyable. Field guides and binoculars might make the experience more rewarding. We encourage visitors to report any rare or unusual sightings to the refuge headquarters.

## • General Information

## 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 . . . . .	r	r	r	r
—	Black Rail . . . . .	c	c	c	c
—	*Clapper Rail . . . . .	c	c	c	c
—	*King Rail . . . . .	u	o	u	u
—	Virginia Rail . . . . .	c	u	a	u
—	Sora . . . . .	r	r	r	
—	*Purple Gallinule . . . . .	u	u	u	r
—	*Common Moorhen . . . . .	a	r	a	a
—	American Coot . . . . .				
—	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-breasted 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
—	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
—	Evening Grosbeak . . . . .				r
—	*House Sparrow . . . . .			u	u

## 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 . . . . .	r	r	r
— Horned Lark . . . . .	u	u	c
— Purple Martin . . . . .	c	u	a
— Tree Swallow . . . . .	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
— *Fish Crow . . . . .	c	c	c
— *Carolina Chickadee . . . . .	u	u	u
— Red-breasted Nuthatch . . . . .	c	c	
— White-breasted Nuthatch . . . . .	r	r	
— Brown Creeper . . . . .	o	c	u
— *Carolina Wren . . . . .	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
— 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
— *Gray Catbird (Catbird) . . . . .	a	a	c
— *Northern Mockingbird (Mockingbird) . . . . .	u	u	u
— *Brown Thrasher . . . . .	u	u	u
— Water Pipit . . . . .	u	u	u
— Sprague's Pipit . . . . .	u	u	c
— Cedar Waxwing . . . . .	u	u	c
— Loggerhead Shrike . . . . .	r	r	
— *European Starling (Starling) . . . . .	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

## ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE

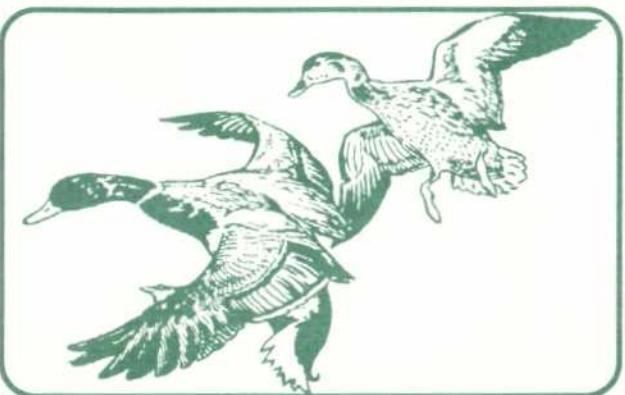
### Regulations

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

—Hunters utilizing the refuge are subject to inspections of licenses, hunting equipment, bag limits, vehicles and their contents during compliance checks by Refuge or State officers.

Only the following may be hunted:

mourning doves, geese, swans, ducks, snipe, woodcock, squirrels, rabbits, quail, raccoons, opossums, and deer.



In addition to these, all State and County regulations and Title 50 of the [Code of Federal Regulations](#) apply.

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

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

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

TAKE PRIDE IN AMERICA'S WILDLIFE RESOURCES.

REPORT WILDLIFE VIOLATIONS.

1-800-662-7137

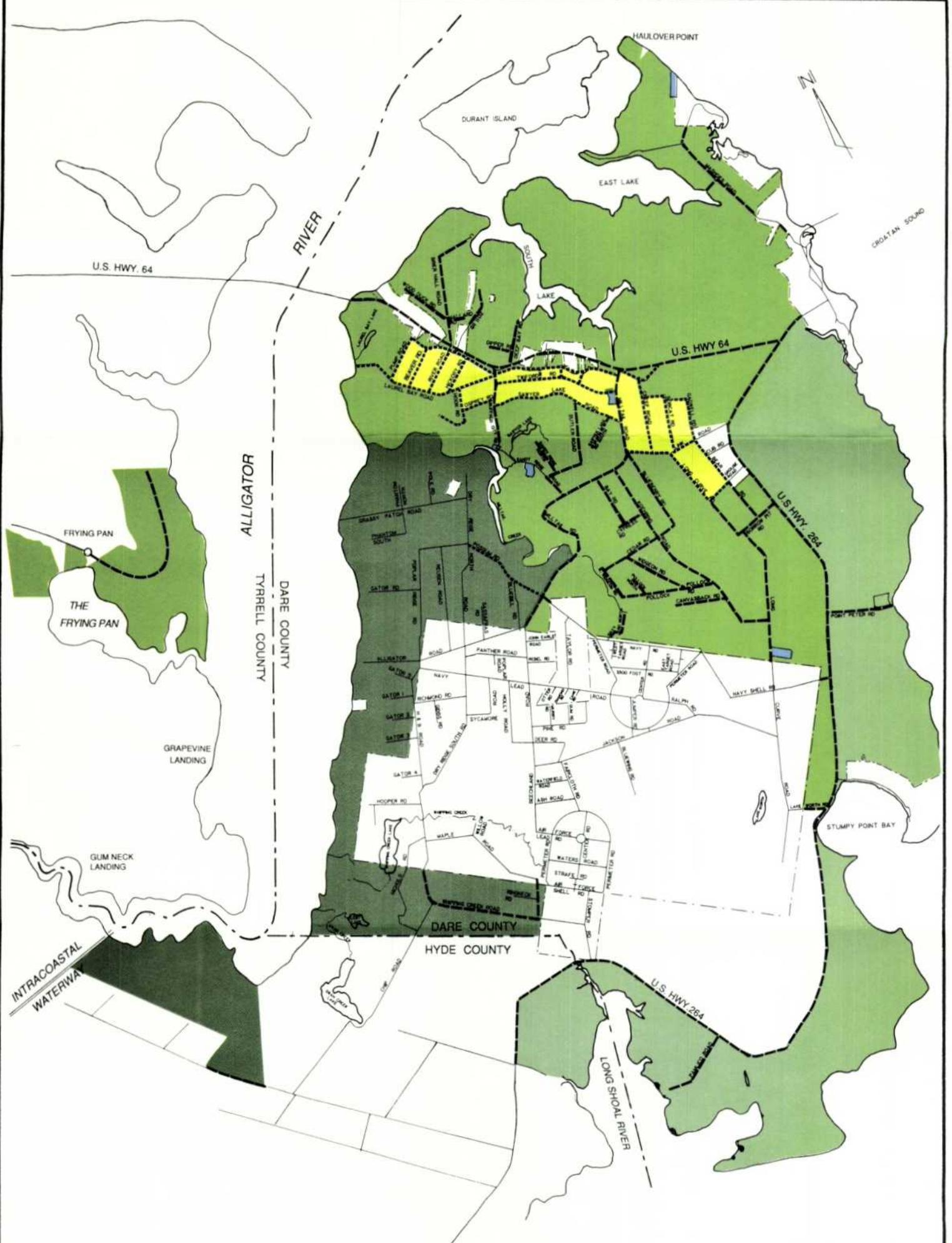


DEPARTMENT OF THE INTERIOR  
U.S. Fish and Wildlife Service  
4-RF-41630-August 1988

## ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE



## HUNTING REGULATIONS



- [Dark Green Box] Gum Swamp Unit - Hunting allowed; dogs prohibited.
- [Light Green Box] Hunting allowed; the use of dogs is restricted to bird hunting with retrieving dogs.
- [Medium Green Box] Hunting with dogs allowed.
- [Yellow Box] Farming Area-Open September 1-October 31 (dogs allowed); other times CLOSED TO ALL ENTRY.
- [Blue Box] No Hunting - Safety/Resource Management Zone.
- Roads open to motorized vehicles.
- - - Roads open seasonally to motorized vehicles.

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

## ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE