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

Manteo, North Carolina

ANNUAL NARRATIVE REPORT

Calendar Year 1985

Review and Approvals

Submitted By	Date 6/4/86
Refuge Supervisor Review	Date 6-10-86
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U.S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

INTRODUCTION

Location

The 118,000 acre Alligator River National Wildlife Refuge lies at the eastern end of a broad, flat, and swampy peninsula in northeastern North Carolina. The majority of the refuge is located in the mainland portion of Dare County, with some land in Tyrrell County. The mainland portion of Dare County 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 7-mile-wide neck of land between Alligator River and Long Shoal River of Pamlico Sound. Thus, the mainland Dare County portion of the refuge is on a small peninsula at the tip of a large one. Since construction of the Intercoastal Waterway canal between Alligator River and Pamlico Sound, the area has been, at least technically, an island.

Background

Alligator River Refuge and the surrounding areas were first inhabited by native Indians. Although the first attempt at English settlement was made on nearby Roanoke Island in 1587, no large settlement by whites was established in the refuge area until a community called Beechlands was established in the late 1700's or early 1800's, 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 their permit application and dissolved their 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. Appraisors for Prudential valued it a 43 million dollars. A compromise of 47 million dollars was agreed upon. 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 2 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.

#1 - Low pocosin bordering South Lake. Typical Alligator River NWR scene. 12/85 JTT

The vast expanse of undisturbed swamp forest and wetlands on the refuge contain 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.

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A. HIGHLIGHTS

New refuge established. (Introduction).

Alligator River, Currituck, Pea Island "complex" formed. (Section E.8.).

Refuge master plan initiated. Deer hunting with chase dogs is major issue. (Section D.).

Reintroduction of Red Wolf on Alligator River NWR becomes real possibility. (Section G.2.).

#2 - The Red Wolf ... on the edge. Will it be extinction or reintroduction into the wild???
USFWS file photo

B. CLIMATIC CONDITIONS

Climatic conditions were typical throughout most of the year with a hot humid summer and mild winter. The yearly temperatures averaged 64 degrees F. January 21, was the coldest day with the temperature dropping to 6 degrees F. Highest temperatures were recorded on August 14 and September 7, when they reached 90 degrees F. July was the warmest month with an average temperature of 79.6 degrees F. Temperatures during January, the coldest month, averaged 40 degrees F.

Total precipitation for 1985, was 67.17 inches, 12.15 inches above the ten year annual mean precipitation. October and November were the wettest months with a total of 31.25 inches of rainfall. March, April, and December were the dryest periods with 2.28 inches, .67 inches, and .64 inches respectively.

Hurricane Gloria blew by the eastern United States during the last week of September. Continuous rainfall, thunderstorms, and gusty winds of 85+ mph pelleted most of eastern North Carolina on September 26 and 27. Refuge pocosins were saturated to overflowing. Unusually high water levels pushed deer, bear, and other wildlife to higher and dryer ground. Most higher areas were along the refuge road network. Several hunters took this as an opportunity to fill their freezers. Due to fallen trees across major access roads, numerous areas of the refuge were closed. Several days of work were required to clear wind blown trees and limbs to clear impassable refuge roads. Other damage caused by Hurricane Gloria was minimal.

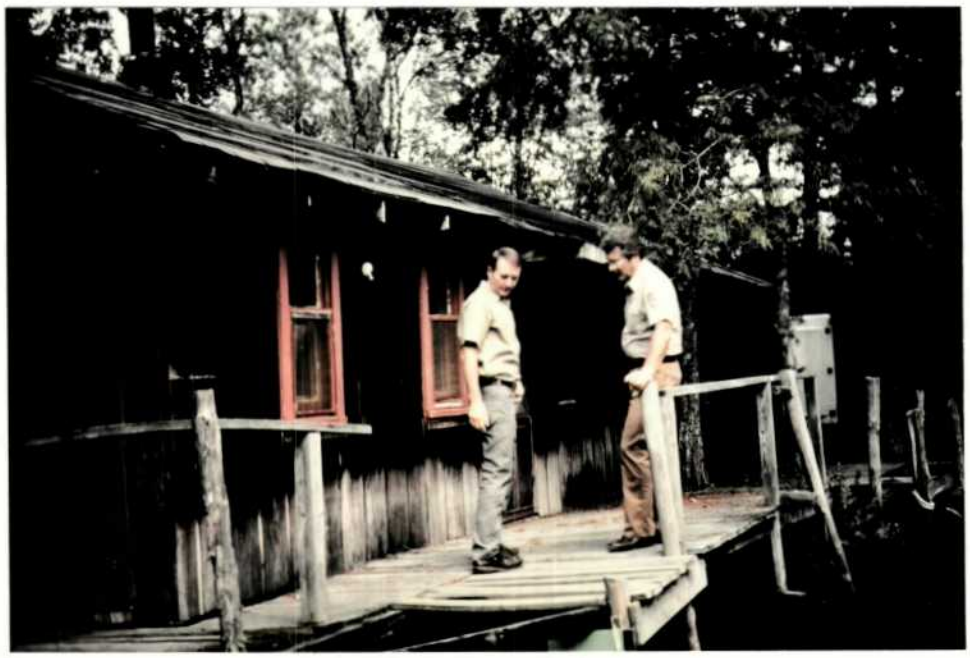
C. LAND ACQUISITION

1. Fee Title

Several potential headquarter sites were located on Roanoke Island and have been visited by regional office realty personnel. No further action has been taken.

3. Other

Two private hunting camps with cabins were located on the refuge at the time of its establishment. The Tull-Lennon hunt camp, located on Milltail Creek, was built some 50-60 years ago. The club has never had a written lease from any former property owner and no taxes have ever been paid on the camp. The second camp is located on Whipping Creek and has been in existance since the early 1950's. This camp was also operating under verbal permission from the former landowners but had been paying county property taxes. Due partly to congressional pressure, the Service allowed the continued use of both camps during the 1984-85 and 1985-86 hunting seasons. Even though these camps are on government property without any legal authority, the hunt clubs qualified under the Uniform Relocation Assistance and Land Acquisition Policies Act of 1970 for financial reimbursement. In August, 1985 offers of $5,000 and $2,500 respectively were made to the club owners for the appraisal value of their property. Both camps have until March 31, 1986 to remove or vacate the camps.



#3 - Regional Director Jim Pulliam and Refuge Supervisor Travis McDaniel visiting Tull-Lennon hunt camp. 10/85 JTT

Another hunting camp/inholding did survive donation in the East Lake area. The Henderson camp with approximately 21 acres of land remains totally within the refuge. An excellent waterfowl pond approximately one acre in size lies adjacent to the camp and access and use has been exclusively from the fenced Henderson camp. From county tax maps, it appears that there is a very strong possibility that this pond is within the boundaries of the refuge rather than the Henderson camp property. A requested survey of this line could make the 1986-87 waterfowl season very interesting!

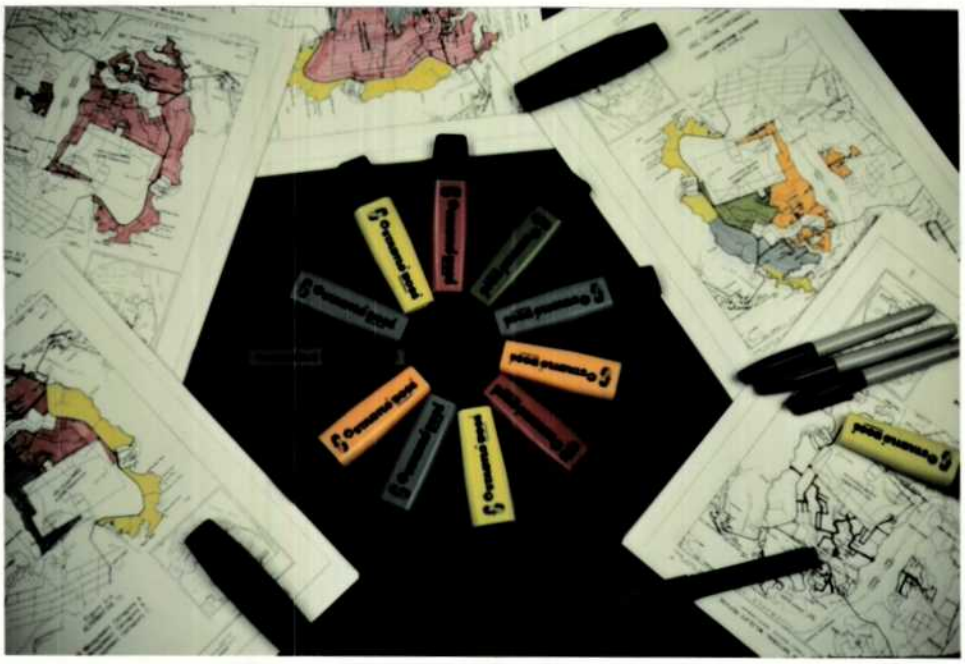
#4 - Henderson camp "inholding" at Alligator River.
12/85 JTT

D. PLANNING

1. Master Planning

Data gathering for the Alligator River NWR master plan began even prior to staffing the new refuge. When the original staff came on-board in January, the Pea Island staff had accumulated files of information and a collection of documents awaited their use. Even with this head start, master planning was difficult due to the uniqueness of the area, the circumstances surrounding it becoming a refuge, and the diverse public interest in the new refuge

Regional office guidance in the master planning process was somewhat nebulous due to reorganization and internal conflicts over the actual need for a master plan. At Alligator River, much work had been accomplished before any RO guidance at all was received. Fortunately, few major discrepancies occurred, and the process has proceeded smoothly, on the whole. At the close of 1985, a majority of the draft plan was completed. Internal and public review is expected early in 1986.



#5 - Master planning has been a "colorful" experience. We have considered everything from "red" wolves and "black" bear to "white" cedar. 12/85 AJE

2. Management Plan

A proposed fire management plan was submitted to the regional office by Forrester Czuhai prior to his retirement in September.

A public use management plan was submitted in August, and a hunting plan was submitted in March, 1984.

3. Public Participation

Since the Alligator River NWR master plan was begun early in 1985, a great deal of public participation was sought throughout the year. In March, a "mail-out" was sent to over 200 individuals, organizations, and agencies seeking comments on the new refuge and asking for management alternatives for consideration in the master planning process. Several news releases and radio spots were executed for the same purpose. Four public scoping meetings were held in the communities local to the refuge to hear public concerns, needs, and opinions. Refuge staff actively sought oral and written comments. NEPA requirements for public participation in the planning process were met to the fullest extent.

#6 - Scoping meeting. One suggestion was to "introduce jack rabbits on the refuge".
3/85 BWS

4. Compliance With Environmental and Cultural Resource Mandates

National Environmental Policy Act mandates were carefully followed during the master planning process.

6. Other

Small mammal surveys were conducted to determine the suitability of Alligator River NWR for use as a reintroduction site for the Red Wolf. Assistance was provided by refuge staff in the trapping effort and showing various wolf experts around the area.

E. ADMINISTRATION

1. Personnel

#7 - Front Row: 1, 5, 4, 2
Back Row: 6, 9, 3, 7

4/86 ADM

PERSONNEL

1.	John Taylor	Refuge Manager	GS 12	EOD 01/07/86	PFT
2.	Mervin Dunaway	Asst. Refuge Manager	GS 11	EOD 07/24/83	PFT
3.	Alan Schriver	Asst. Refuge Manager	GS 09	EOD 05/11/85	PFT
4.	Bonnie Strawser	Outdoor Rec. Planner	GS 07	EOD 12/31/80	PFT
5.	Beverly Midgett	Secretary (Typing)	GS 05	EOD 10/06/71	PFT
6.	James Beasley	Biological Technician	GS 05	EOD 05/26/85	PFT
7.	Angela Elmore	Biological Technician	GS 5	EOD 04/19/82	PFT
8.	Joseph Creef	Maintenance Worker	WG 8	EOD 04/21/75	PFT
9.	Lawrence Proseus	Temp. Biological Aid	GS 03	EOD 04/29/85 Terminated 09/28/85	TFT
10.	Steve Holden	YCC Laborer Foreman	WS 01	EOD 06/19/85 Terminated 08/18/85	TFT
11.	Scott Lanier	Cooperative Education Student	GS 04	EOD 01/14/85 Terminated 04/21/85	TFT

The office for Alligator River NWR began operation on January 7, 1985 in the N.C. Marine Resources Center on Roanoke Island. The office was established to administer both Alligator River and Currituck NWR's. Manager John Taylor and ORP Bonnie Strawser reported for duty at that time. John transferred from Becharof/Alaska Peninsula NWR in Alaska and Bonnie transferred from Pea Island NWR in North Carolina.

Lawrence Proseus, an intern student from East Carolina University, reported for three months of volunteer duty beginning January 14. In April he was hired as a NTE 180 day Biological Aid.

North Carolina State Cooperative Education Student Scott Lanier reported for duty on January 21 and terminated on April 21.

On March 11, Pea Island NWR became a substation to Alligator River NWR. Thereafter, the Pea Island staff reported for duty at Alligator River Refuge.

Secretary (Typing) Beverly Midgett was promoted to GS-5 on April 14.

On May 15, Assistant Manager Alan Schriver arrived in Manteo. Assistant Manager Schriver transferred to Alligator River from Laguana Atascosa NWR in Texas.

Bio-Tech Jim Beasley reported for duty to Alligator River on May 28, transferring from Cape Hatteras National Seashore.

Steve Holden entered on duty June 19, as Laborer Foreman for the 8-week YCC program.

On October 13, Laborer Elmore was converted from a WG-2 Laborer to GS-5 Biological Technician.

Refuge staffing for Alligator River included 2 full time employees from January until March. After complexing with Pea Island, total staffing for the refuge was 8 full time employees and 2 temporary employees.

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2. Youth Programs

#8 - 2, 7, 1, 3, 6, 5, 4 7/85 BWS

YCC ENROLLEES

1.	Vicki Basnight	06/24/85 - 08/29/85
2.	Gracie Mann	06/24/85 - 08/29/85
3.	Luther Nash	06/24/85 - 08/29/85
4.	John Lane	06/24/85 - 08/29/85
5.	Jeff Horne	06/24/85 - 08/29/85
6.	Mary Cooper	06/24/85 - 08/29/85
7.	Craig Springer	06/24/85 - 08/29/85

Alligator River hosted a seven-enrollee YCC program in 1985. Recruitment for the YCC positions and one labor foreman began on February 15 and culminated in a random drawing for enrollee selection on March 18 by Sharon Pro of the Coastland Times newspaper. Steven Holden, assistant principal of the Manteo Middle School was selected as the YCC Labor Foreman. Steve reported for duty June 19; the enrollees began on June 24. ORP Strawser acted as YCC coordinator for the program.

The program began with the annual tern banding expedition to spoil islands near Pea Island Refuge with John Weske of the Smithsonian Institute. This year, over 3,500 royal terns and 150 sandwich terns were banded. The Raleigh News and Observer covered the activity with a full page of copy and photos. Later in the summer, YCCer's assisted Weske in banding 92 brown pelican chicks in the same vicinity.

A third banding trip was taken on August 8, to band wood ducks at Pungo NWR. Thirty-two wood ducks were banded, and the enrollees received a guided tour of Pungo and participated in a work-out with Pungo YCC and staff.

Most work accomplished by YCC was on Pea Island Refuge, with major jobs on Alligator River being litter and illegal dump cleanup and boundary posting.

All seven enrollees completed the eight week program; several worked one to two weeks extra. The 1985 YCC program officially ended on August 29.

5. Funding

FY 85 base funding for Alligator River was $120,000. For FY 86, Alligator River received base funding of $257,200 to cover all three refuges. We also received ARMM monies of $10,000 for North Pond pump repairs and $70,000 for repairs to the New Field dike (hurricane damage) at Pea Island. Another $20,000 was received for purchase of fire equipment and a $5,000 job order for installing a water control structure on Alligator River.

TWO YEAR FUNDING COMPARISON

Work Code	FY 1986	FY 1985
1260	252,200	120,000
ARMM	80,000	
RPRP	3,000	
Fire Equipment	20,000	
ENHAN R4	5,000	
Totals	360,200	120,000

6. Safety

Thanks to a safety conscious staff and a little luck, 1985 was completed without a lost-time accident. The last lost-time accident occurred on Pea Island in 1959, 207,181 safe hours ago. One minor incident required a trip to the doctor. YCC enrollee, Luther Nash had a huge splinter jabbed all the way through his finger (ouch!). He returned to work a little sore but was able to carry on normal activities.

Regular safety meetings were held with major topics being physical fitness standards for Fire Management Activities, Fire Safety and Equipment, hurricane preparedness, attitudes and personal safety equipment, watercraft and aircraft safety standards, hunting safety, safe driving, heavy equipment safety, handling toxic or hazardous wates, wildlife related diseases, and the revised refuge Safety Plan.

Several accomplishments in our 1985-86 Safety Program were:

- completion of Basic Fire Fighting and Introduction to Fire Behavior fire training courses by Manager Taylor

- completion of N.C. Forest Service Basic Fire Behavior class by Biological Technician Elmore

- implementation of a physical fitness program to prepare for fire season

- the design of safety dips for cannon net rockets

- presentation of hunter safety programs

- training of volunteers in the operation of ATV's

- participation in the Regional Safety Slogan Contest which resulted in 3 winners: "Good Luck Follows Safe Workers" by John Taylor, "Safety! Use It Or Lose It" by Jim Beasley, and "Safety Works For You" by Angela Elmore.

7. Technical Assistance

Staff assistance was provided:

- to Ecological Services - Raleigh, Dare County, and the State of North Carolina, concerning water quality problems arising from the East Lake Landfill.

- assistance for the development of a wildlife management plan on the bombing range was provided to the U.S. Air Force and the U.S. Navy.

- assistance and advice to North Carolina Power Company concerning osprey nesting on power poles, relocating nests, and providing alternative nesting structures.

F. HABITAT MANAGEMENT

1. General

Five basic habitat types are found on Alligator River Refuge. These are classified as wetlands based on the vegetation present, the degree of soil saturation, and the hydroperiod. The Refuge represents one of the few remaining large tracks of pocosin along the east coast. Although much of the refuge is relatively unaltered by man, large acreages have undergone changes in vegetative composition and hydrology caused by ditching and canal dredging for access and timber logging purposes.

2. Wetlands

No active management has yet been applied to wetlands. Future management will include water level management, prescribed fire, and forest management. Initial steps were taken in 1985 to identify hydrology related needs and concerns for the development of a Refuge Water Management Plan. Plans were also made for the installation of a small water control structure at an existing 90 acre fallow field. The field will be managed as a moist soil impoundment for waterfowl.

Wetland types present on the Refuge are described as follows. Wooded swamps are discussed in Section F.3.

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

Dominant vegetation within the 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 and lakes, and in isolated pockets in disturbed areas. Panic grasses, arrow arum, blue flag, water lily, cattail, and sawgrass are predominate in these areas.

Alligator River NWR Habitat Types
Table 1

Vegetated Wetlands Habitat Type	%	Approximate Acreage Dare	Tyrrell	Total
White Cedar Swamp	6.7	6,900	1,000	7,900
Hardwood Swamp	10.5	10,600	1,800	12,400
Hardwood-Mixed Pine Swamp	31.3	33,800	3,200	37,000
Low Pocosin	6.9	8,100	--	8,100
Cane Pocosin	1.9	2,300	--	2,300
Tree Pocosin	20.4	24,100	--	24,100
Lakes/Open Water	1.0	1,000	--	1,000
	100	112,000	6,000	118,000

Pocosin - Alligator River NWR exhibits typical pocosin vegetation, which is characterized by a dense growth of shrubs associated with scattered trees. The dominant trees are usually pond pine with some loblolly bay, red bay, and sweet bay. Common shrubs are titi, honey cup, fetterbush, bitter gallberry, and sweet gallberry. The shrubs and smilax vines often grow so dense that walking through them is almost impossible. Shrub-dominated areas are known as short or low pocosins which are usually found over deeper peat deposits and are characterized by long hydroperiods. Tree pocosins are similar to low pocosins but contain more trees and lack grasses, sedges and herbacious plants in the understory. Cane pocosins are dominated by a switch cane understory.

3. Forests

Refuge forested wetlands cover approximately 51,300 acres on the Dare County track and 6,000 acres in Tyrrell County. With the donation of refuge lands from Prudential Life Insurance Co., the Service inherited a timber contract with Atlantic Forest Products which is outstanding through 1996. Since 1974, Atlantic Forest Products has harvested 178,000,000 board feet of timber, most of which was Atlantic white cedar. The company plans to complete the contract and terminate operations in 1986. Preliminary surveys of clear-cut cedar stands indicate that fair to good natural juniper regeneration is occurring in at least some of the clear-cut area.

#9 - Clear-cut after removal of eastern white cedar.
5/85 JTT

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

Hardwood-Mixed Pine - Mixed pine hardwoods is found primarily in the western half of the refuge but occurs in scattered areas throughout. Red maple, red bay, and black gum are the dominant hardwood species and are mixed with loblolly and scattered pond pines. Dominant understory vegetation is fetterbush, bitter gallberry, and red bay. Little or no herbaceous vegetation is present.

Hardwood Swamp - Hardwood swamps are found in the western half of the refuge. The dominant trees in these communities are red maple, black gum, and red bay. Scattered old-growth bald cypress is present in stands bordering the Alligator River. Red bay and fetterbush are prevalent in the shrub layer. Very little herbaceous vegetation is present.

White Cedar Swamp - Atlantic white cedar swamps are also found in the western half of the refuge, primarily along Milltail Creek and in the southwest corner in the Whipping Creek area. Dense stands of white cedar dominate, but black gum is an important subdominant. The shrub layer in these areas is dominated by sweet gallberry and fetterbush. Virginia chain-fern is the only herbaceous plant present in substantial amounts.

9. Fire Management

Fire is a natural and common occurrence in pocosins. Most pocosin vegetation regenerates quickly after burning, and some plants species may actually be dependent on fire. Fuel loading in pocosins vegetation can average over 15 tons per acre.

Wildfire is a problem on the eastern half of the Refuge which is dominated by tree (pond pine) pocosin, low (shrub) pocosin, and cane pocosin. This portion of the Refuge burns most frequently as a result of errant bombs and other munitions originating from either the Navy or Air Force bombing ranges located in the south part of the Refuge midway between the Pamlico Sound and Alligator River. Wildfires which occur from these sources generally run from a southwest to northeast direction. Frequent electrical storms and rapid fuel build up in burned over pocosins magnify the problem.

Wildfire presuppression, detection, and suppression services were furnished by the N.C. Division of Forest Resources under a cooperative agreement.

Two wildfires occurred in 1985. The Deep Creek Fire, March 18-19, burned 275 acres of marsh and hardwood-mixed pine forest. The probable cause was a misdirected Air Force bomb. Reimbursement costs to the State totalled $1,851.63. A ± 20 acre fire, apparently caused by a lightning strike, ignited and burned itself out in late July or early August near the Alligator River just north of Whipping Creek. The burn was discovered on a "Delta 9" Canibus reconnaissance flight on August 5.

The draft Alligator River Fire Management Plan was submitted to the Regional Office in September.

G. WILDLIFE

1. Wildlife Diversity

Alligator River NWR and its surrounding waters support many species of resident and migratory fish and 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 large size of the Refuge and its cover diversity provide habitat for forest dwelling as well as marsh and shrub dwelling avaian and mammalian species.

2. Endangered and Threatened Species

Four endangered species have been documented on Alligator River NWR. Although extremely rare, red-cockaded woodpeckers nest and have been sighted on and adjacent to Refuge lands in loblolly and pond pine stands.

#10 - USFWS assists Air Force with Red-cockaded Woodpecker search. 12/85 JTT

One bald eagle was observed on South Lake in December, and arctic peregrine falcons are occasionally seen migrating through the Refuge.

American alligators reach the northern extent of their range in North America at Alligator River NWR. Alligators occur in several Refuge marshes, ponds, and slow-moving streams and canals.

No inventory plans have yet been developed for any endangered species occurring on the Refuge. Field observations are collected on any notable sightings by Refuge staff in the field.

Preliminary survey work, including canid siren-howl counts and small mammal trapping, has been conducted to determine the suitability of Alligator River NWR as a reintroduction site for the endangered and extinct-in-the-wild red wolf. Thus far all results indicate Alligator River NWR to be a favorable release site.

#11 - A growing problem is "refuge bears" being attracted to dumping areas just off the refuge. 11/85 CM

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.

Current administrative offices for the refuge are in the laboratory section of the N.C. Marine Resources Center. Though adequate for administrative purposes, the office leaves much to be desired for the visiting public. Though a few folks actually find the office and stop by, most information is dissiminated by telephone, correspondence, and through the news media. During 1985, the Refuge staff responded to 1,070 public inquiries and issued 7 news releases directly related to Alligator River NWR. In addition, staff members participated in numerous radio "spots" about the master plan, hunting, and other wildlife refuge topics.

#12 - Traditional public use. 12/85 JT

6. Interpretive Exhibits/Demonstrations

A number of exhibits/demonstrations were set up and manned by the the Refuge staff during 1985.

The local Soil Conservation Service office sponsored a Conservation Field Day on April 15. ORP Strawser presented several short sessions on "How Wildlife and People Fit Into Nature's Cycle" to approximately 150 sixth graders.

On June 1, Manager Taylor, Assistant Manager Dunaway and ORP Strawser manned a refuge exhibit at the annual Dare Day celebration. Approximately 2,000 people attended.

On June 22, Secretary Midgett and Laborer Elmore manned an exhibit at the annual Wanchese Seafood Festival. Attendance was estimated at 3,500.

On September 9, Assistant Manager Schriver presented a $50.00 savings bond to Mickie Haywood of Manteo High School for her national level merit award poster for the 1985 National Hunting and Fishing Day Poster Contest. Much time and energy was expended for the 1985 National Hunting and Fishing Day Expo on September 28. Unfortunately, Hurricane Gloria's presence on the Outer Banks caused the cancellation of this event until 1986.

7. Other Interpretive Programs

A number of off-refuge programs were conducted throughout the year, many of which served to inform the public of progress being made on the master plan. A list of programs and brief descriptions of each follow:

On March 18, Manager Taylor met with the Manteo Lions Club to provide information on the new Refuge and its planning process.

Also on March 18, ORP Strawser presented a program to the Outer Banks Audubon on the new Alligator River NWR and led a discussion on the volunteer program and possibilities for Audubon involvement.

A group of 12 TNC members toured Alligator River NWR on May 11.

On July 22, ORP Strawser conducted a program on Alligator River NWR planning for 115 Rotarians in Elizabeth City.

In September, ORP Strawser conducted a program on Alligator River NWR for the Roanoke Island Garden Club and briefed the group on the progress of the master plan. Approximately 65 people attended. A smiliar presentation was conducted for the Duck Woods Golf Club Women's Auxillary on October 2. Approximately 80 women attended.

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.

White-tailed deer are the most sought after game species on Refuge lands. Alligator River contains 118,000 acres of habitat traversed by more than 200 miles of logging roads. 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 60% go unreported. State records show 123 bucks and 5 does taken on the Refuge in 1985. That translates into a more realistic harvest of ± 320 deer.

A limited amount of waterfowl hunting took place on the Refuge, but most occurs over open water in the sounds and in East Lake.

#13 - Many registered blinds are located in the sounds surrounding Alligator River NWR.
12/85 MH

Esimated public use on hunting activities are shown below:

Activity	Visits	AH
Duck	295	1,235
Deer (gun)	1,205	7,230
Deer (bow)	142	764
Small Game	371	1,580
Upland Game Birds	189	945

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 arms of South Lake. Angling for bluegill, crappie, chain pickeral, channel catfish, flier, largemouth bass, and yellow and white perch is considered good.

During 1985, there were an estimated 5,871 fishing visits to the refuge with 28,393 activity hours spent participating in this activity.

10. Trapping

Furbearer trapping was allowed during State seasons under North Carolina regulations. Since no refuge permit was required in 1985, there is no quantitative data available on the number of trappers or trapper success. Species taken include raccoons, muskrat, otter, and mink.

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 1985:

Activity	Visits	AH
Foot	1,595	2,570
Vehicle	3,820	7,640
Boat	1,345	5,990
Photography	160	640

13. Camping

Since the master plan was not completed during 1985, changes in traditional camping use were not affected. During 1985, approximately 465 visits (22,000 AH) to the Refuge involved camping. A majority of these visits were for hunting with a lesser number for canoeing and fishing.

17. Law Enforcement

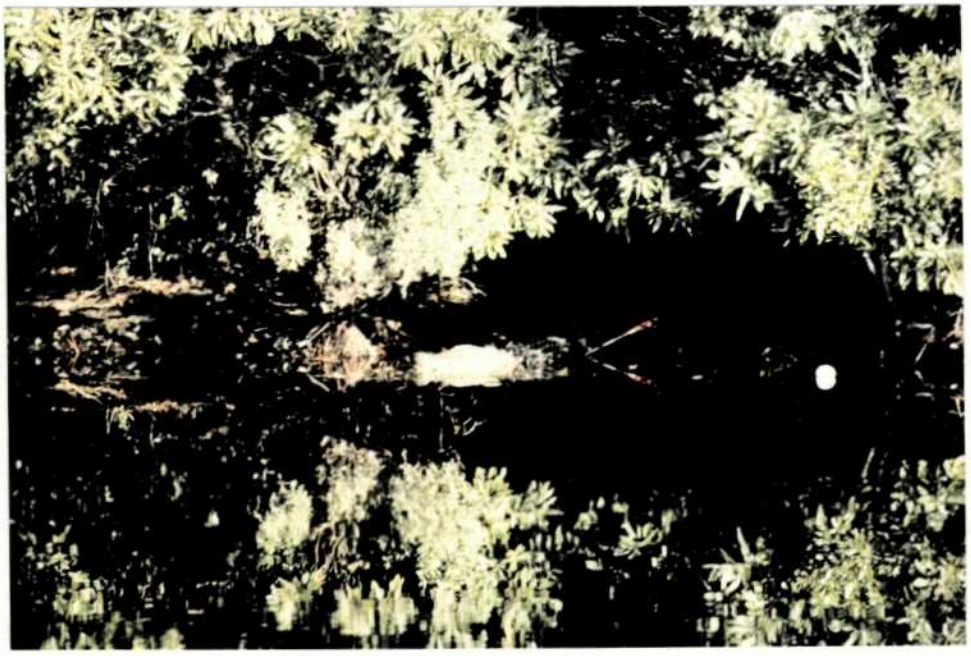
At the beginning of 1985, the law enforcement staff totalled four officers. By spring, two new Refuge officers were added, Assistant Manager Schriver and Biological Technician Beasley.

In January, Assistant Manager Dunaway and ORP Strawser participated in "Operation Rock", a wide-scale effort to slow the illegal commercial taking and selling of striped bass. The organized effort of Federal and State law enforcement agencies along the eastern seaboard resulted in the arrest of 22 individuals.

In July, a truck stolen from a local bank in Manteo, N.C. was recovered from a canal on the Refuge and investigated by the Dare County Sheriff's office. Outcome of the case is pending.

During the spring and summer, the staff responded to several reports of tampering and destruction of osprey nests. One such case involved a local power company. After warning the responsible party the tampering continued and the investigation was turned over to the Special Agents office.

On Tuesday, September 17, a report was received that a large alligator had been shot on the refuge. An investigation revealed that a 9 foot alligator had been shot with two arrows in East Lake Canal. Attempts to capture the injured animal failed and the gator died the next day. The arrows were sent to the SBI for fingerprints, and an investigation by Refuge officers, Special Agent Ted Curtis, and N.C. Wildlife Resources Commission personnel followed but to no avail. Most of the community was outraged by the act. Several newspaper articles, letters to the editor and one radio interview resulted in several "informers" telling us they "thought so-and-so did it", but no conclusive evidence was found.



#14 - The most frustrating unsolved case of the year began during archery season for deer.
10/85 JT

Also occurring in 1985, was a marijuana field detection operation called "Delta 9". L.E. staff members flew over Alligator River Refuge and substations in an effort to identify any fields within the three refuges. No active or harvested fields were detected.

All Refuge L.E. officers qualified in firearms qualification with both handguns and shotguns twice during the year.

A breakdown of cases made on Alligator River in 1985 are as follows:

Violation	No.
Taking waterfowl out of season	1
No hunting license	1
No duck stamp	1
M.B.T.A. violation (destruction of osprey nest)	1

Most law enforcement efforts in 1985 were directed at illegal waterfowl hunting activities on Currituck NWR and in Currituck Sound.

I. EQUIPMENT AND FACILITIES

1. New Construction

A 24" pipe and riser were delivered to the Long Curve Pond. This water control structure will be installed after waterfowl use of the pond decreases next spring.

A cable gate was installed on Long Curve Road at the bombing range boundary.

3. Major Maintenance

Road maintenance was gratiously provided by Dare County and by Atlantic Forest Products. This is primarily a "break down" maintenance operation. Access is critical to any activity on the Refuge, and due to the size of the road system even minimal road maintenance will become a major maintenance consideration.

4. Equipment Obligation and Replacement

Two vehicles were upgraded and two more were purchased. Vehicle needs have become more important with three scattered subunits to manage from one central location. Heavy equipment needs, especially for a road grader, truck/tractor, and lowboy trailer continue to prevent any continuity in maintenance. Dependence upon borrowing these items from other stations severely hinders any maintenance planning.

5. Communications Systems

Telephone and radio capabilities were installed at the Alligator River office. Two new mobile units were purchased to keep up with the expanding vehicle fleet. A excess base station was shipped in from Hillside NWR and installed at Alligator River.

6. Computer Systems

A Digital Equipment PC100 and accessories were brought in on temporary loan to assist with master plan preparation. On line from August until the end of the year, dependency upon the fast and effective data processing capabilities began to outweigh the problems of unfamiliarity. Welcome to the real world Alligator River!

#15 - Computer on loan from the refuge law enforcement office at FLETC speeded up master planning. 4/85 BS

7. Energy Conservation

Car pooling and combining trips out of the headquarters area provided the initial thrust on conserving motor vehicle fuel. Lack of funds caused a change in strategy to "park unless absolutely necessary".

Regional procedures whereby motor fuels are not listed as a fixed expense on budget requests from the field could very well become the most effective energy conservation measure yet devised.

8. Other

All major property was tansferred from Pea Island NWR to Alligator River.

J. OTHER ITEMS

1. Cooperative Programs

Under a cooperating agreement between the FWS and the N.C. Division of Forest Resources, the State agrees to provide presuppression, detection and suppression services for all Refuge wildfires. For these services the FWS is charged $83,760 for presuppression and detection services, plus all costs incurred during suppression work. In an effort to get its money's worth, the refuge is pursuing the possibility of having the State grade all Refuge roads as a presuppression action.

2. Items of Intrest

On October 28, Refuge staff learned that Dare County was pumping effluents from the East Lake Landfill onto Alligator River NWR. Assistant Manager's Dunaway and Schriver conducted a ground check on October 30 and discovered that, in fact, waters from the landfill were being pumped into woods which drained onto Refuge lands. This act is in violation of the county's permit form the N.C. Division of Environmental Management. The permit requires the water to be pumped into Deer Creek which drains through the Refuge into South Lake. The BOD (biological oxygen demand) and mercury levels in the water have been tested as being beyond the legal limits. Assistance from the Raleigh ES office was requested to assess the impacts to the Refuge. Manager Taylor met with Dare County Manager Jack Cahoon and the landfill supervisor on October 31, to discuss Refuge concerns and county plans to correct the problem. The county is subject to a $5,000 fine per day for the violation, but no fines have been levied to date. The State has agreed to waive fines if the county will sign an "intent" to build a water treatment facility to solve the problem. Cahoon has not signed the statement yet, contending that it may be construed as an admission of guilt. The cost of the proposed treatment facility is $400,000 to $500,000. Refuge Manager Taylor advised Cahoon that the Refuge is and will be assessing the impacts of the present operation and the planned operation to determine its compatibility with Refuge purposes. In this effort, Raleigh ES will take soil and fish samples in the affected area and one control area to ascertain impacts.

#16 - East Lake Landfill (Aerial) 12/85 JT

As the national field representative of the Refuge Management Information System (RMIS) Task Force, Manager Taylor attended a station review at Eastern Neck NWR in March and a meeting in the Central Office in August to select a vendor for the computer system. However, a decision was made shortly thereafter for the system to cover all divisions of the Service, and the Task Force disbanded.

Revenue sharing checks were presented as follows: Dare County $297,212 (includes Pea Island) and Tyrrell County $11,428.

Much interest has been shown by Congressman Walter Jones in the administration of this newest refuge in his district. Several visits by his staff were made to refuge-conducted public meetings and the Refuge during the year.

3. Credits

This narrative was a joint effort by all the Refuge staff with special kudos to Assistant Manager Dunaway for "production" and Secretary Midgett for deciphering our penmanship.

K. FEEDBACK

It is difficult to understand why the largest and, in my opinion, the most important division of the Service "gets no respect". It is obvious that Congress in the form of special funding (ARMM, BLHP, RRP, etc.) and frequent inquiries cares and expects the Division of Refuge Management to receive the attention it needs. The people have spoken. Why then has the Service not heard the voice of the people.

I have been unfortunate enough to be a member of two refuge task forces which have been derailed by the Service. As a member of the Refuge Maintenance Management Team and the Refuge Management Information System each for two years, I had the opportunity to observe firsthand how we get pushed around. Each of these teams made great progress in developing better systems to more effectively and efficiently manage refuges. Nevertheless, each refuge-focused thrust was stopped cold by decisions to go with Servicewide systems.

In fact, the vendor was about to be selected for the RMIS. It seems that after the Division of Refuges does all the ground work and the other divisions see the fruits of our hard work that everyone wants to hop on our wagon. The results are sad. We now have a cumbersome Maintenance Management System which would roll the eyes of any manager, and most refuges are still in the "stone age" waiting on the okay to buy a computer.

Congress needed our maintenance backlog and reoccurring needs years ago to adequately fund maintenance of refuge facilities and equipment. With current budget cuts expected, we may have missed our chance to fund many refuge maintenance needs, and Lord knows when most refuges can expect to get a computer. We just don't get no respect!

CURRITUCK NATIONAL WILDLIFE REFUGE

Manteo, North Carolina

ANNUAL NARRATIVE REPORT

Calendar Year 1985

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 which 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 has further been identified as an important black duck wintering area. Fish and Wildlife Service ownership would ensure perpetuation of basic wetland functions including nutrient cycling, floodplain and erosion control; and would help preserve the role of Currituck Sound estuary's as important nursery areas. Ownership of the protective buffer east of the productive marshes bordering the sound would protect 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 Hunt Club and the Monkey Island Club. Funds to purchase these areas were provided by the Melon Foundation, a sponsor of the National Wetlands Project. TNC had committed to a 2 to 1 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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L. INFORMATION PACKET (inside back cover)

A. HIGHLIGHTS

Fee acquisition completed from the Nature Conservancy March, 1985. (Section C.).

Dunes and upland areas posted closed to vehicles on August 13. (Section D.).

Meetings held (August 15, 19, Sept. 3, 25) over vehicular access after immediate outcry by public over governmental control. (Section D.3.).

Hurricane Gloria passes through September 26. (Section B.).

East Coast Biologist inspects cattle and horse impacts upon waterfowl feeding areas. (Section F.2.).

B. CLIMATIC CONDITIONS

The climatic conditions of the Outer Banks of North Carolina typically consisted of hot, humid summers and mild, windy winters. The yearly temperatures averaged 64 degrees F. Rainfall was generally evenly distributed throughout the year. The driest weather occurred in March, April, and December. The wettest month was November. The yearly precipitation was 67.17 inches.

C. LAND ACQUISITION

1. Fee title

Fee title acquisition from TNC for Monkey Island, Mary Islands, Little Raccoon Island, Ships Bay Islands, and the Waterlilly landing, was completed on August 31, 1984, for $470,000. The fee title lands comprise approximately 29 acres. On March 5, 1985, $3,430,000 was paid to TNC for the Outer Banks tract of Monkey Island (approximately 344 acres), Herbert Tract (42.37 acres), Little Lungren Island (15.26 acres), and the Swan Island Tract (812 acres). Approximate acreage acquired fee title is 1,185 acres.

2. Easements

The $470,000 purchase of the islands and Waterlilly landing also included hunting blind rights and a conservation easement on the northern 166.53 acres of the property TNC transferred to the State of North Carolina for inclusion in the National Estuarine Sanctuary Program. This easement was for the purpose of benefiting and protecting the aesthetic, scientific, educational, and ecological integrity of real property (FWS lands) in close proximity to and having an unobstructed view of the protected property (State land).

On August 31, 1984 a conservation easement was purchased from TNC for $30,000 for "a common purpose to conserve natural values of Currituck..." and to prevent uses contrary to those of a National Wildlife Refuge (such as permitting free-ranging cattle and horses). This easement covered the Monkey Island Tract, Herbert Tract, and Little Lungren Island all of which were later secured by fee title acquisition.

Initial correspondence on the Currituck acquisition by Assistant Secretary Arnett indicated that a TNC conservation easement on 4,600 acres of wetlands owned by the Swan Island Hunt Club would be donated to FWS by TNC upon acquisition of the Monkey Island Tract by FWS. TNC holds that easement at this writing.

D. PLANNING

3. Public Participation

When the Currituck property came into Federal ownership this year, access was automatically mandated to be restricted to "designated areas". Since the Fish and Wildlife Service had no desire to cut off residents and landowners from their land, it became necessary for the refuge to officially designate a route of travel. The initial proposal was the first step in this process.

Immediate concerns over the proposed policy were expressed by the landowners and the County of Currituck. In four public meetings and two meetings with the County Board of Commissioners, the Fish and Wildlife Service heard and addressed these concerns. In an effort to provide the needed access and to demonstrate a sincere "good neighbor" policy, the U.S. Fish and Wildlife Service has listened to the needs of the people, reevaluated the decision, and revised the policy.

On October 14, 1985, the U.S. Fish and Wildlife Service announced final modifications to the proposed policy on vehicular access through Currituck National Wildlife Refuge. The official USFWS policy follows:

> Vehicular traffic is permitted on the beach area from the ocean to the dune line. This route is open 24 hours a day, year-round, to all persons. When this route is impassable due to extreme high water against the dunes, an alternate route behind the dune line may be utilized by the landowners and their lessees north of Corolla and south of the Virginia State line (including their families and guests). County, State, and public utility employees in the performance of

their duties may also use this route. This emergency route may not be marked initially. Until marked, vehicles may pick any route through the refuge when high water prevents beach travel.

Landowners will be given the opportunity to help the refuge staff lay out the emergency route if it is marked. The Fish and Wildlife Service does not intend to improve this emergency route since it is to only be used during extreme high water.

This final statement of policy is the culmination of several months of negotiations between the Fish and Wildlife Service, Currituck County Board of Commissioners, local landowners, public officials, and other interested individuals.

This official policy on vehicular access through Currituck National Wildlife Refuge allows for access through refuge lands that is legally greater than the public access available prior to its federal status.

4. Compliance with Environmental and Cultural Resource Mandates

Jim Cobb, regional archeologist, visited the area to evaluate the historical significance of the Monkey Island Hunt Club. The individual buildings and the hunt club complex did not possess historical significance sufficient to qualify for listing in the National Register of Historic Places. A documentary record of the buildings has been prepared by Mr. Cobb to preserve the Monkey Island Hunt Club.

The State Historic Preservation officer would prefer to see a caretaker hired for continued maintenance of the hunt club buildings. This is clearly out of the question in light of our budget, and the State has only verbal support to provide.

E. ADMINISTRATION

2. Youth Programs

A three day spike camp on Monkey Island was one of the summer highlights for the seven enrollees and the labor foreman. The group "camped out" in the hunting lodge and spent working hours clearing, cleaning, scraping, and hauling assorted equipment, furniture, etc. An objective of the trip was to secure the buildings and to replace broken windows with plywood. Cooking over open fires, volleyball, tag football, swimming and fishing were just a few of the side benefits of the trip.

Two YCC enrollees from the Alligator River/Pea Island program spent several days posting the east boundaries of both the Swan Island and Monkey Island tracts.

5. Funding

See Alligator River NWR narrative, Section E.5.

F. HABITAT MANAGEMENT

1. General

The majority of Currituck NWR is 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 river systems draining the coastal plain and overwash from storm surges. Currituck Spit and surrounding Outer Banks islands are primarily perpetuated by the following processes: long shore currents, tides and tidal currents, wave action, storm surges, and wind action. These dynamic ongoing processes coupled with sea level rise cause shorelines and dunal environments 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. Cover mapping and measurements will be refined as realty determines exact boundaries.

2. Wetlands

Limited water control has been conducted on the Swan Island tract by the Swan Island Hunt Club. Two weir type plugs have been installed to restrict outflow of runoff from a fresh water pond to Currituck Sound. These structures have not been maintained in recent years, but could provide the Refuge with some water management capabilities with minimal construction or maintenance.

East Coast Biologist Otto Florschutz visited the refuge to assess cattle grazing damage to aquatic vegetation in a large seasonally flooded shallow pond on the Swan Island tract. Much damage to natural waterfowl food plants was evident.

G. WILDLIFE

1. Wildlife Diversity

No inventories (except occasional aerial waterfowl counts) and/or management activities have been initiated on Currituck NWR.

#1 - Rookery on Monkey Island. 8/85 BWS

2. Endangered and Threatened Species

Loggerhead turtles are known to utilize the beaches to a limited extent. Development in the area has increased vehicular traffic on the beach, and these activities may have an effect upon loggerhead usage of the Refuge. Commercial fishing offshore may also adversely impact sea turtles in the area. Refuge staff observed one dead loggerhead washed ashore on the Refuge this past year. Because of the infrequency of Refuge patrols in the area, this could hardly be an isolated incident.

Piping plovers are suspected to use the beach/dune areas.

3. Waterfowl

Limited aerial counts were made this past year. The scarcity of waterfowl generally was no exception in Currituck Sound. Waterfowl numbers were at record lows this year. Refuge

staff attended a meeting at the Swan Island Hunt Club to discuss declining waterfowl populations in the area. Attending were personnel from N.C. Wildlife Resources Commission, N.C. State University, Swan Island Hunt Club, Currituck Hunt Club, and USFWS (Alligator River NWR, MacKay Island NWR, East Coast Biologist). Aside from lower continental waterfowl numbers, changes within and around Currituck Sound are believed to be contributing factors. Study proposals concerning Currituck Sound ecology will be encouraged and recommended.

6. Raptors

Osprey use of the area is increasing. Ospreys are utilizing structures suitable for nesting throughout the area.

8. Game Mammals

White-tailed deer, marsh rabbits, raccoons, and gray squirrels have been observed on the Refuge. Deer hunting is not permitted on the Currituck Outer Banks by the N.C. Wildlife Resources Commission.

9. Marine Mammals

Two bottle-nosed dolphins were found dead on the beach during the year. Commercial fishing netting activities are suspected to be the cause.

13. Surplus Animal Disposal

"Wild" horses are present on the Refuge. The Currituck Outer Banks ponies are another potential timebomb. Damage to vegetation in the natural waterfowl ponds caused by trespass livestock and the horses is more than we can tolerate. Political, historical, and aesthetical problems are relatively certain to surface when we find the time and manpower to tackle the surplus horse issue.

#2 - Typical "wildlife" at Currituck. The mammals list reads "horses, cows, buffalo,..."
9/85 BWS

H. PUBLIC USE

1. General

Estimates on specific public activities were made and reported throughout the calendar year. By talking with local residents and making observations while on the infrequent trips to the Refuge, the following yearly totals were reported:

Activity	# Visits	# AH
Wildlife Observation		
Foot	2,890	2,890
Vehicular	24,825	12,412
Photography	380	1,520
Hunting	120	520

Total visits to the Refuge were 26,528.

In addition, there were 1,135 public inquiries, 4 news releases, and 5 public appearances related specifically to Currituck NWR, mostly concerning public access through the refuge.

8. Hunting

Currituck Sound and Refuge marshes and ponds have traditionally received heavy gunning pressure from waterfowlers. State hunting seasons and regulations applied in 1985. Waterfowl numbers and hunter success were extremely low.

Hunting blind rights in Currituck Sound were acquired with the Monkey Island Tract purchase. Eighteen point blind locations were licensed by the USFWS 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 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. Also discussed with the Commission was the possibility of creating a permanent sanctuary area in Currituck Sound.

#3 - One of 13 hunting blinds in Currituck Sound licensed to FWS by Currituck County Game Commission. 5/85 JT

17. Law Enforcement

Law enforcement activities at Currituck NWR in 1985 included several patrols of the Refuge properties and surrounding waters.

A two day law enforcement detail during the early waterfowl season in October netted several waterfowl related violations. Since the 1985 waterfowl season was the first hunting season for the newly established Refuge, a number of verbal warnings were given to hunters for minor infractions. Cases made on Currituck by the Refuge staff during 1985 is as follows:

Violation	#
Hunting migratory waterfowl without State hunting license	2
Hunting migratory waterfowl without Federal duck stamp	4

Other reports of CFR violations on the Currituck Refuge are currently being investigated.

Vandalism continues to be a problem. The Swan Island Tract experienced almost a total loss of boundary and regulatory signs. Live oaks on both tracts were cut down. Most of these trees were felled to block roads and trails approaching the marsh and sound. ATC tracks were common throughout the area.

#4 - East Coast Biologist Florschutz inspecting a potential cause of decreasing mast production.
12/85 AS

Livestock (cattle) trespass is very common. Initial contacts with a local cattle owner has been unproductive. Grazing damage to emergent vegetation in waterfowl feeding areas is extensive.

J. OTHER ITEMS

1. Cooperative Programs

The Refuge served as a voting member of the Advisory Board for the N.C. Marine Estuarine Sanctuary during the year, and has a conservation easement over a portion of the sanctuary. Since the Refuge, the sanctuary and The Nature Conservancy have adjacent lands on the Currituck Banks, much coordination and several meetings were held during the year to plan concerted management and solutions to mutual problems.

A revenue sharing check for $2,781 was presented to Currituck County.

Refuge staff provided technical assistance to the Swan Island Hunt Club in the construction of a moist soil waterfowl impoundment. The impoundment will be next to the club house, closed to hunting, and hopefully, will attract birds for observation

4. Credits

This narrative was a joint effort by all the Refuge staff with special kudos to Assistant Manager Schriver for "production" and Secretary Midgett for deciphering our penmanship.

PEA ISLAND NATIONAL WILDLIFE REFUGE

Manteo, North Carolina

ANNUAL NARRATIVE REPORT

Calendar Year 1985

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

INTRODUCTION

Location

Pea Island National Wildlife Refuge was established in 1938 by Executive Order 7864 as a wintering area for the greater snow goose and other migratory waterfowl. The Refuge contains 5,915 acres of beach, dunes, high marsh dikes, salt marsh, impoundments, ponds, and salt flats. Presidential Proclamation #2284 closed 25,700 acres of adjacent waters in the Pamlico Sound to migratory waterfowl hunting.

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

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

Pea Island's climate is generally moderated by the ocean, thus 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.

#1 - Snow geese at Pea Island. 12/85 JT

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A. HIGHLIGHTS

Hurricane Gloria hits the Outer Banks. Refuge suffers major break in New Field dike. (Section B.).

1985 is record year for Volunteer Program. Outer Banks Audubon "Adopts" Pea Island. (Section E.4.).

Overall waterfowl use was lowest on record for last 22 years. (Section G.3.).

Public use numbers continue to soar. (Section H.).

#2 - Results of Hurricane Gloria on New Field dike.
12/85 JT

B. CLIMATIC CONDITIONS

The weather was relatively mild throughout most of 1985. However, both high and low records were broken by temperature extremes.

Record low temperatures, power outages, and frozen pipes at the headquarters complex hampered work activities during the week of January 20. The mercury dropped to 6 degrees F on January 20, the coldest reading on the Outer Banks since the first records were kept on December 30, 1880. Thirty-nine mph winds lowered the chill factor to -47 degrees. A light snow fell on the 20th, and the impoundments and Pamlico Sound remained frozen throughout the week.

The 88 degree F record temperature for June 10, set in 1933 at Hatteras, N.C. was broken by a steamy 92 degrees on June 10.

July was the warmest month with temperatures averaging 79.6 F. Unseasonably warm temperatures continued throughout November with high averaging in the low 70's common.

Total precipitation for 1985 was 67.17 inches, a full 25.62 inches over last year. The wettest months were October and November with a total of 31.25 inches. March, April, and December were the driest months.

During the last week of September, Hurricane Gloria curled along the coast of North Carolina. The staff had been tracking her progress northward via radio and the U.S. Weather Service Station in Buxton, N.C. Priorities changed daily as she moved closer to the Outer Banks. By September 25, we entered a Hurricane Watch. The staff began securing the Refuge by topping off the water tank, adjusting water levels in the impoundments, relocating boats, vehicles and heavy equipment. Gas tanks were filled, other equipment secured and volunteers were released until after the danger period. By September 26, we were in Condition One, 12 hours until landfall. The Regional Office was advised of the condition. Staff members taped and boarded up windows. Boats and 4 wheel drive vehicles were moved off of Pea Island onto Roanoke Island. All power supplies to the buildings were cut off before leaving. By 11:00 a.m. on Thursday all staff had been placed on administrative leave. Most Refuge families secured their homes and evacuated the area.

Gloria passed through late Thrusday with 85+ mph winds. At Pea Island, a 50 yard section of the New Field dike had blown out, "relocating" the newly installed pump 10 to 12 feet under water. Needless to say, we were disheartened. A long summer's work "down the drain". Other damage included: a cut through the dike between North Pond and New Field; gorged and gullied roads; ruptured bulkheads; demolished goose traps; contorted transmission line poles and lines; lost sea turtle nests; sandblasted gas pumps and headquarter structures; eroded dune line and ocean overwash on Highway 12; eroded dikes along impoundments; hugh depositions of marsh grass and debris on Highway 12, Refuge service roads, and interpretive trails; and wrecked photo blinds. A rough estimate of the damage caused by Hurricane Gloria to Refuge facilities totalled $143,000.

D. PLANNING

2. Management Plan

The Fire Management Plan was amended to add approximately 450 acres of marsh to burning prescriptions. The prescribed burning season was also changed from December 1, through February to include the months of October and November. Additional browse for migrating and wintering geese will be provided as a result of these changes.

4. Compliance With Environmental and Cultural Resource Mandates

A permit was received in April from the Corps of Engineers to excavate fill material associated with the installation of a new low lift pump in the New Field dike. This permit, along with a nationwide permit authorizing the repair and/or replacement of currently serviceable structures or fills, also covers repair of the hurricane damaged dike.

6. Other

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

E. ADMINISTRATION

1. Personnel

Pea Island became a substation of Alligator River on March 11, 1985. See staff photo and particulars in Alligator River Section E.1.

2. Youth Programs

YCC projects at Pea Island included North Pond Trail clearing, sandbagging erosion control plots in New Field, painting headquarters buildings, pole shed clean up and construction of lumber racks, vehicle clean up and litter pick up on N.C. 12. YCCer's also landscaped the two new interpretive kiosks.

For more details of the 1985 YCC program, see Section E.2. of the Alligator River NWR Annual Narrative Report.

#3 - Home made "sandbag filler". The 1985 YCC camp was known for creativity. 7/85 BWS

#4 - Cable and pulleys allowed for safe and easy sandbag delivery. 7/85 BWS

4. Volunteer Program

The most effective and active phase of the 1985 Volunteer Program for the 3-refuge complex was the Pea Island Host/Hostess Program.

With the transfer of Pea Island's administrative responsibilities to the Alligator River office in Manteo, space became available in the Pea Island headquarters building for a small visitor contact station. The front office was converted to a visitor contact area and plans were initiated to have the room manned by volunteers. Contacts were made with the Outer Banks Audubon Society chapter and by April, Pea Island had become "adopted" by the chapter.

Hosts and hostesses manned the visitor contact area, greeted visitors, provided refuge and wildlife information, answered the telephone, and relayed radio messages. In addition, they assisted with office work, minor construction and rehab projects, conducted public interpretive programs, and assisted with the supervision of YCC projects. By the end of the year, 26 trained volunteers were contributing 40 to 60 hours each week.

#5 - Pea Island Hosts/Hostesses 11/85 BWS

The Hosts/Hostesses for 1985 were: Allen Valpey, Arch Bush, Jessie Bush, Bill Perkinson, Virginia Valpey, E. J. Buckingham, Ritchie Buckingham, Margaret Burns, Herman Wortman, Elva Wortman, Martha Hohman, Bob Pitcher, Warren Davis, Jane Davis, Maryalice Blocher, Lee Yoder, Pat Yoder, and Larry Bray.

The Pea Island Host/Hostess Program proved to be a beneficial link between the Refuge and the local and visiting communities. These volunteers are proud of their Refuge. As one of our hostesses expressed it, "It isn't just that the Audubon chapter adopted Pea Island; I adopted it!!".

Another popular volunteer program was the "Turtle Patrol". Sixteen volunteers were trained to operate the three-wheeler safely, locate turtle crawls, and use the radio. Volunteers patrolled the beach daily to locate the crawls. Staff members were called to the scene when crawls were found to locate nests, make biological decisions, and move the nests if necessary. In addition to providing valuable assistance to the Refuge, this activity effectively demonstrated cooperation between federal agencies (many of the volunteers were U.S. Coast Guard personnel), thus giving both agencies a positive boost in the public's eye.

Other volunteer projects ranged from manning hunter check stations to photography to transporting corn from Mattamuskeet NWR for banding purposes.

All in all the 1985 volunteer program was a big success. A total of 51 volunteers contributed 2,068 hours. Giant strides were made in organizing and implementing a successful program. Many staff hours were saved, freeing our few paid staff members up to work on other projects. We owe a debt of gratitude to our dedicated volunteers.

5. Funding

Pea Island's base funding was $158,600 along with ARMM monies of $12,400 which went to replace a vehicle. Pea Island also received BLHP monies of $25,125 to replace the water control structure in New Field and $57,000 for dike work and marsh rehab. See five year funding comparison on the next page.

8. Other items

Effective in March, administration of the Pea Island Refuge was assigned to the Alligator River office. With the newly established Currituck Refuge, the three refuges are presently administered from rental space in the North Carolina Marine Resources Center located in Manteo, N.C.

FIVE YEAR FUNDING COMPARISON

Work Code	FY 1985	FY 1984	Fy 1983	FY 1982	FY 1981
1260	155,600	177,500	124,000	123,000	100,000
1240			31,000	23,000	19,000
1400				1,100	1,100
1220			2,000	2,000	
1994	3,000	3,000	2,500	4,331	1,800
BLHP	82,125		65,000	83,000	60,000
Special			8,000		
ARMM	12,400	10,000			
RPRP	3,000				
Totals	256,125	190,500	232,500	236,431	181,900

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 duens, 630 acres of sand ridge brush and grassland, 3,024 acres of irregularly flooded slat marshes, 328 acres of salt flats, three brackish water impoundments totalling 950 acres, and one nine acre fresh water pond. Beach and dune acreages have changed since the survey. Hurricane Gloria which hit on September 26 and 27, and several intense northeast storms over the past several years caused moderate to severe erosion along the beach and dunes. (See Section F.5.). See photo #6 on next page.

2. Wetlands

Refuge wetlands consist of irregularly flooded salt flats, impoundments, and one fresh water pond. The sizes of the impoundments are: North Pond (461 acres), New Field (266 acres), and South Pond (223 acres).

Total precipitation was significantly greater than in 1984, 12.15 inches above the annual mean-rainfall during the growing season was 5" above the same period in 1984. Consequently, waterfowl food production benefited.

#6 - North Point at Oregon Inlet. The most severe beach erosion occurs here and for several miles south. 12/85 JT

South Pond was dewatered in the spring of 1983 and 1984 to encourage the production of good emergent waterfowl foods. Although this has proved to be very successful, South Pond was held at full capacity for the entire 1985 growing season because New Field impoundment was dewatered for pump replacement. Sixty-five hours of pumping were necessary. The prior drawdowns apparently rejuvenated South Pond, and an excellent stand of sago pondweed (Potamogeton pectinatus) dominated the plant life in 1985. During the drawdown years water hyssop (Bacopa monnieria) and panic grasses (Panicum spp.) were prevalent. In 1985, sago pondweed and muskgrasses comprised over 78% of the vegetation present according to the annual vegetation transect line results. (See Table 1).

North Pond was also managed as a permanent pool to favor submergent vegetation. Only twenty hours of pumping were necessary to supplement spring and summer rainfall. Muskgrasses (Chara spp.) made up 60% of the vegetation present, and widgeongrass (Ruppia maritima) replaced dwarf spikerush (Eliocharis parvula) which was prevalent last year probably because the pond was flooded longer and deeper in 1985 than in recent years. (See Table 2).

The management scheme in New Field was interrupted to replace the deteriorated flap gate water control structure with a new 30" low lift pump. The pond, which is normally kept full throughout the year and produces 50+ acres of dense widgeongrass, was dewatered in March. No vegetation transects were run, however, annual grasses, particularly panicums and wild millet (Echinochloa crusgalli), appeared to dominate. Giant foxtail (Sataria magna) and saltmarsh cordgrass (Spartina alternaflora) also responded well to the drawdown.

The 328 acre natural tidal area north of North Pond referred to as the "salt flats" has not changed much in the 18 years surveys have been run here. Glassworts (Salicornia spp.) continued to dominate the vegetation, and an abundance of bare ground was present. For an unknown reason, saltmarsh cordgrass (Spartina patens) appears to be diminishing from this ebb-and-flow area and saltmeadow cordgrass is increasing. (See Table 3).

In March 1984, experimental vegetation plots were established in erosion cuts on the impoundment side of the New Field dike. Saltmeadow cordgrass, cattail, California bulrush, phragmites, giant cordgrass, and panicum plots were established and protected from wave action by sandbags or fiberglass cloth skirts. The plants were fertilized with orchard pellets (28-8-4) and again with ammonium nitrate (34-0-0) in August. The plots were evaluated in March and again in October. Plots protected by sandbags all faired well with saltmeadow cordgrass, cattail, and phragmities making the best showing YCC enrollees added additional sandbags and replaced the inferior fiberglass cloth with sandbags. Certainly, the lower water due to the breached dike contributed to the improved establishment of the plants. See photo #7 next page.

4. Croplands

Approximately 35 acres of tall fescue were planted for goose browse in New Field in September. The field was fertilized with 10-10-10 at a rate of 1,000 pounds per acre and broadcast seeded at a rate of 100 pounds per acre.

Soon after the fescue germinated, salt groundwater forced up by Hurricane Gloria took its toll. Fescue in low portions of the field was lost, and the remainder of the crop never fully recovered. This also occurred in 1984 with Hurricane Josephine as she swept past the coast.

#7 - Experimental vegetation plot in cut at top of New Field dike. 10/85 MAD

Table 1
South Pond Vegetation Transect Line Comparisons[1]
Pea Island NWR
1985

Plant Species	Percent Composition 1985	1984	1983	1982	1977-83 Avg.	1968-76 Avg.
Sago Pondweed	40.9	23.1		18.5	6.8	6.9
Muskgrasses	37.2	5.5		42.3	20.4	66.0
Water Hyssop	7.8	32.9	26.3	1.0	8.5	3.8
Three-square	2.4	2.6	0.4	2.1	1.7	0.2
Knot Grass (*Paspalum distichum*)	1.7	2.9	0.9		1.0	
Panic Grasses	0.9	2.2	20.6		4.5	0.1
Seashore Mallow (*Kosteletsyka virginica*)	0.9					
Spikerushes	0.9	11.6	2.0	7.9	11.1	4.6
Climbing Hempweed (*Mikania scandens*)	0.7					
Sofstem Bulrush (*Scirpus validus*)	0.6					
Flat Sedges	0.4	0.4	1.3	0.4	0.5	Trace
Wild Millet (*Echinochloa crusgalli*)	0.3	1.6	6.4	1.0	1.7	Trace
Blue Lettuce (*Lactuca* sp)	0.1					
Unidentified	0.6	0.2				
Bare Ground	4.5	10.5	19.3	13.9	24.4	12.5
Totals	99.9	93.5	77.2	87.1	80.6	94.1
Plants per Point Sample	1.65	1.32	1.06	1.12	-	-

[1] 1985 Wetland Vegetation Results, Otto Florschutz, East Coast Biologist

Table 2
North Pond Vegetation Transect Line Comparisons[1]
Pea Island NWR
1985

Plant species	1985	1983	1982	1977-83 Avg.	1968-76 Avg.
Muskgrasses (*Chara* spp.)	60.4	58.4	52.0	49.2	66.8
Widgeongrass (*Ruppia maritima*)	6.1	1.5	16.3	8.0	5.6
Dwarf Spikerush (*Eleocharis parvula*)	3.9	14.1	3.7	4.3	1.0
Giant Foxtail (*Setaria magna*)	1.7				
Saltgrass (*Distichlis spicata*)	1.5				
Water Hyssop (*Bacopa Monnieria*)	1.5	0.3	0.2	2.4	0.9
Fleabane (*Pluchea camphorata*)	1.2				
Flat Sedges (*Cyperus* spp.)	0.7				
Sago Pondweed (*Potamogeton pectinatus*)	0.7		21.8	6.5	10.0
Three-square (*Scirpus Americanus*)	0.7				
Round Rush *Juncus* sp.)	0.5				
Spikerushes (*Eleocharis* spp.)	0.5	5.8	4.9	4.4	1.5
Panic Grass (*Panicum* sp.)	0.2				
Unidentified	1.7				
Bare Ground	18.7	19.3	0.4	24.1	14.1
Totals	100.0	99.4	99.3	98.9	99.9
Plants per Point Sample	0.89	0.88	1.63	-	-

[1] 1985 Wetland Vegetation Results, Otto Florschutz, East Coast Biologist

Table 3
Salt Flats Vegetation Transect Line Comparisons[1]
Pea Island NWR
1985

Plant Species	Percent Composition 1985	1983	1982	1981	1977-83 Avg.	1968-76 Avg.
Glassworts (*Salicornia* spp.)	40.3	31.2	31.9	32.6	36.0	24.5
Saltmeadow Cordgrass (*Spartina patens*)	10.5	2.0	1.9	3.8	1.8	1.4
Sea Oxeye (*Borrichea frutescens*)	6.1	3.4	3.3	2.4	2.5	0.7
Saltgrass	3.6		0.9	2.4	1.2	1.7
Beakrush (*Rhynchospora* sp.)	1.5					
Saltmarsh Cordgrass (S. *alterniflora*)	1.1	4.2	4.5	7.2	4.7	2.2
Climbing Hempweed	0.4					
Foxtail (*Setaria* sp.)	0.4					
Sea Lavendar (*Limonium nashii*)	0.4	0.9	0.9	0.2	0.4	Trace
Three-square	0.4					
Groundselbush (*Baccharis halimiflora*)	0.2					
Round Rush	0.2					
Unidentified	0.2					
Bare Ground	34.7	58.2	53.3	49.6	52.1	57.7
Totals	100.0	99.9	96.7	98.2	98.7	88.2
Plants per Point Sample	0.73	0.43	0.48	0.53	-	-

[1] 1985 Wetland Vegetation Results, Otto Florschutz, East Coast Biologist

The 9 acre fresh water pond just south of Oregon Inlet seems to be holding its own despite the constantly shifting inlet channel. The pond lies between the inlet and the U.S. Coast Guard Oregon Inlet Station. Three years ago the Coast Guard expressed concern over danger to the Station if the inlet breached the pond and accelerated erosion resulted. Since that time, however, scouring action and overwash during storms and high tides has moved enough sand to create a berm which separates the pond from the inlet by some 300 feet.

Brush along a one mile section of the North Pond dike was cleared and burned beginning in March. A seedbed was prepared and lovegrass was seeded and fertilized to reestablish favorable nesting areas for black duck and gadwall.

9. Fire Management

No wildfires occurred On Pea Island in 1985.

Prescribed burning was conducted on approximately 750 acres in February, March, and early April. Areas burned included the Salt Flats, marsh west of New field and South Pond, and brush areas at the south end of Pea Island. A total of 485 acres of burned over brushland were disked to further retard wax myrtle growth.

#9 - Spring green-up after prescribed burn.
5/85 JT

6. Other Habitats

The areas of ocean beach and barrier dunes are not actively managed but undergo constant gradual movement and are subject to abrupt changes during storms. Strong winds caused by Hurricane Gloria produced severe ocean overwash and sound side flooding on September 26 and 27. High tides and strong winds covered N.C. Highway 12 with several feet of sand in the area of the S-curves. Less severe overwash and flooding occurred over much of Highway 12.

#8 - And each year the ocean gets closer and closer. 10/85 JT

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.

Overall dune erosion caused by Gloria and several northeaster storms in 1985 was relatively minor compared to damage caused by other storms in recent years. Along the 13 miles of Pea Island beach, dune erosion averaged only 2.5 feet from May 31, 1985 through April 3, 1986. The greatest dune loss occurred approximately one mile south of Oregon Inlet where the dune line receeded 13 feet and at the south end at the S-curves where 16 feet were lost. Of the 25 points sampled along the dune line after Hurricane Gloria, nine either remained unchanged from the May, 1985 survey or showed minor accretion rather than erosion.

10. Pest Control

Nutria and muskrat populations are kept in check through a public trapping program to reduce burrowing damage to impoundment dikes. (See G.15.).

G. WILDLIFE

1. Wildlife Diversity

Pea Island exhibits a natural diversity of habitat types. Habitat management practices such as prescribed burning, moist soil management, disking, brush removal, and green browse plantings serve to enhance habitat and wildlife diversity. Annual habitat management practices and reestablishment of waterfowl nesting habitat is discussed in Section F. Pea Island exhibits a rich multiplicity of mammals, birds, fish, reptiles, amphibians, mollusks, and crustaceans. This diversity is especially evident in birds with over 315 species of birds having been identified in the area. The 1985 Christmas Bird Count identified 112 species on December 28.

2. Endangered and/or Threatened Species

a. Federally Listed Endangered and Threatened Species

Peregrine Falcon (Endangered). In February, a peregrine falcon provided by Pea Island, was mounted and presented to the Refuge by Ed thompson of Fernbank Science Center in Atlanta, Georgia. After a short stay in Pea Island's front office/visitor center, the falcon was packaged and mailed to Louisiana for display in the USFWS exhibit at the 1985 Worlds Fair. The bird will eventually be used in a new diorama to be designed for the Pea Island VCS.

A special use permit was issued to the Carolina Raptor Center to capture and band raptors on the Refuge for the third consecutive year. Fifty-four peregrine falcons were observed by the banders during October (see Section G.6.).

Peregrine falcons were sighted at Pea Island by Refuge volunteers and visited consistently throughout the latter half of September.

Atlantic Loggerhead Sea Turtle (Threatened). The staff cooperated with the Asheville Endangered Species Office in developing a "procedures guide" for loggerhead sea turtle programs on east coast refuges.

A decision was made to eliminate the Pea Island hatchery this year and to allow instead, sea turtle eggs to incubate in their natural beach setting when nests were not in immediate danger of ocean overwash. Nests were relocated to nearby sites on the beach safe from inundation.

Loggerheads utilized Pea Island for nesting even though the beach was highly vulnerable to ocean overwash and severe erosion. A daily beach survey was performed from Memorial Day until August 31, to locate nests. Refuge volunteers were trained and conducted the patrols. Experienced staff members handled the marking and/or relocating of each nest, once a crawl was found.

#10 - Bio-Tech Angela Elmore trains U.S. Coast Guard volunteers in procedures for the "turtle patrol". 6/85 BWS

This year 12 nests were located on Pea Island. The first nest was discovered on June 2, and the last on August 17. National Park Service personnel found 2 nests on non-refuge beaches of Cape Hatteras National Seashore that were relocated to a "safe" area along the Pea Island beach.

Refuge staff also relocated to the Refuge, 2 nests from Kill Devil Hills and 2 nests from Nags Head bringing the grand total of nests on Pea Island to 18. Of these 18 nests, 8 were marked and left in place and 10 were relocated and marked.

Unfortunately, we are unable to supply detailed information on hatch rate because Hurricane Gloria completely obliterated nest markers and deposited layers of sand and debris on the beach and dunes. Of the 5 nest sites we were able to relocate and excavate, hatching success was high. The mean hatching rate for the 5 nests was 87.4%.

Bald Eagle (Endangered). Bald eagles are listed in the Pea Island bird list as "rare". Rare interpreted to mean seen at intervals of 2 to 5 years. This year there were no sightings reported.

b. State Listed Endangered and Threatened Species

Of the other species that occur on the Refuge, the State of North Carolina lists 7 as threatened and 26 as species of special concern. Although Refuge management does not emphasize every one of these, they do benefit from present practices. The species specifically managed for are listed below:

Osprey (Special Concern). Three elevated platforms were constructed in 1981 to provide nest sites for ospreys. One platform had an active nest in South Pond. Adult pair behavior indicated that young were in the nest.

The Cape Hatteras Electric Membership Co-op began repoling the line through Pea Island in April. Existing poles with active osprey nests were allowed to remain until the young fledged. The first osprey chicks of the year on Pea Island were reported on April 22, in a nest near New Inlet.

On November 20, Manager Taylor met with N.C. Power representatives, the mayor of Southern Shores, and the manager of Martin's Point subdivision to discuss conversion of old power line poles spanning Currituck Sound at Southern Shores to osprey nesting structures. N.C. Power has agreed to construct and attach nesting platforms to the poles as they remove old lines and insulators. Martin's Point and Southern Shores tentatively agreed to the project. Concurrence from Currituck County and Kitty Hawk is presently being sought.

Least Tern (Special Concern). The least terns have nested at a specific area of the Pea Island beach for many years. The primary management tool has been the exclusion of human disturbance from nesting areas. This has been accomplished by posting the nesting areas on three sides (the ocean marking the fourth side), and excluding vehicular traffic on the entire beach.

The colony is larger than in past years in numbers of nests, number of species represented, and area covered. See Section G.5. for details.

3. Waterfowl

Overall waterfowl use in 1985 was the lowest on record for the last 22 years declining 10% from the previous low set last year. The peak population fell 5,000 birds from 1984, due primarily to declines in Canada goose, swan, and coot numbers.

Canada goose use was only about half that of last year, which was a rebound year from 1983-84's twenty-two year record low. The Canada goose population peak was down over 40% from 1984-85. Swan use was down 29% compared to last year, but swan use and peak numbers were unusually high last year. Snow goose use and peak were down only slightly, but enough to set new record lows in both categories. The peak of 2,840 broke the old low peak of 3,409. Duck use and peak remained in the average range for Pea Island. Duck use increased 2.4% over last year and the peak was 17,300 birds. Pintails increased 46% in use days and the peak population more than doubled from last year to remain the most abundant duck species. Black ducks were the second most species. Significant decreases in canvasbacks, redheads, and ring-necks occurred in 1985-86.

4. Marsh and Water Birds

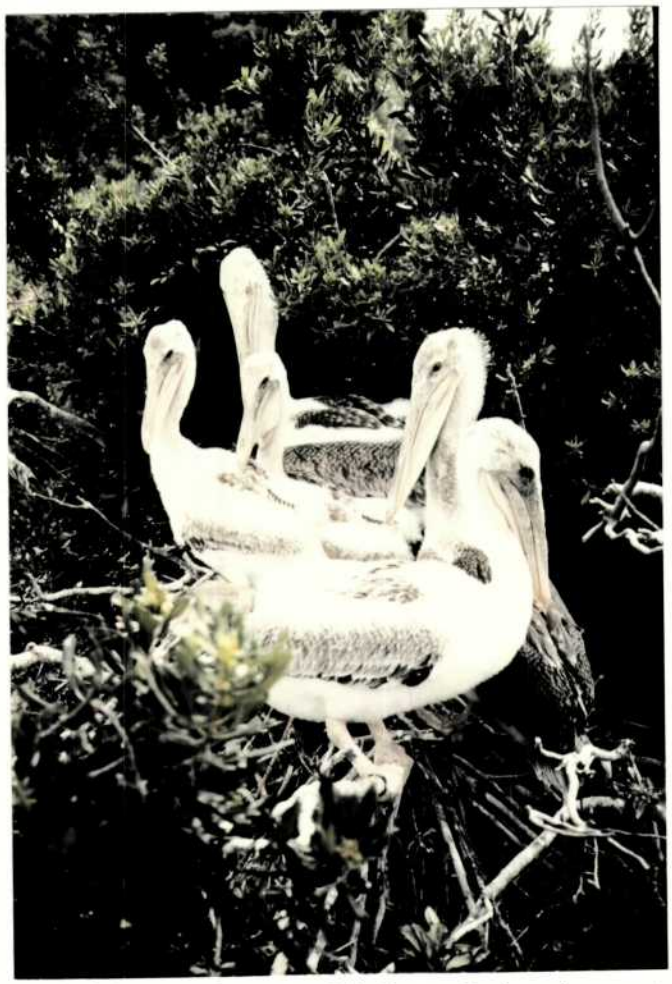
Refuge beaches, marshes, and impoundments were heavily utilized by many species of marsh and water birds for both feeding and nesting. Although no active management occurs exclusively for species in this category, a upward trend in use days has been observed in recent years. Habitat management practices for waterfowl and other species groups have had a positive influence on marsh and water bird use of the Refuge. For example, bird use in South Pond has greatly increased since the management scheme was changed to include a spring draw down. Marsh and water birds also took advantage of the lower water level in New Field while the pond level was down for construction purposes. Bird numbers increased through the spring and the greatest numbers and diversity occurred during the summer and fall.

The increasing use of the Refuge may also be due to habitat loss along the Outer Banks and increased human disturbance.

The wading bird rookery in North Pond was censused on June 6, and included the following (adult count): 33 black-crowned night herons, 5 yellow-crowned night herons, 23 little blue

herons, 10 great egrets, 17 cattle egrets, 26 tri-colored herons, 5 snowy egrets, 18 glossy ibises, and 5 white ibises.

Brown pelican numbers have increased steadily over the past several years as the species has expanded northward into coastal North Carolina. Once considered a rare sighting in the area, they are now quite common especially from spring through the fall months. An early June census of the nesting pelican colony on a spoil island near Oregon Inlet revealed 83 active nests. The colony contained 65 active nests last year and only 3 nests in the same area were confirmed in the spring of 1983. These were the northern most nesting ever recorded for brown pelicans. Dr. Jim Parnell, University of North Carolina - Wilmington, surveyed the colony.



#11 - The pelican colony off Pea Island continues to grow. A record number of nests were established in 1985. 7/85 BWS

5. Shorebirds, Gulls, Terns, and Allied Species

Peak populations of most of these species occurred in December. The most numerous species were ring-billed gull, herring gull, sanderling, great black-backed gull, and Bonaparte's gull. Over 45,000 ring-billed gulls were observed during the Christmas Bird Count conducted on December 28. Four piping plovers were also sighted on Pea Island during the count.

Monthly colonial nesting bird surveys were conducted from May through July by Refuge volunteers and UNC - Wilmington student Walker Golden. Active nests found in the south beach colony included:

	May 29	June 20	July 15
Least Tern	305	42	5
Common Tern	154	90	35
Gull-billed Tern	120	72	16
Caspian Tern	19	8	4
Black Skimmer	1		

The colony was larger than in past years in number of nests, species represented, and area covered.

#12 - ...this looks like a good spot. 6/85 MH

6. Raptors

The Carolina Raptor Center operated a banding/observation station on Pea Island again in 1985. The station was manned a total of 194.5 hours from October 2 - October 26. Sharp-shinned hawks made up 50.6% (442) of the 871 raptors sighted and American kestrels represented another 30%. Fifty-four peregrine falcons were observed. A total of 121 birds were banded which included 13 peregrine falcons.

Osprey continued to stage their comeback along the Outer Banks with a successful nesting season. The first osprey chicks of the year on Pea Island were observed on April 22 near New Inlet.

#13 - A relatively uncommon sighting for Pea Island birders...a barn owl. 11/84 MH

7. Other Migratory Birds

The diversity of bird life on Pea Island is so great that it is sometimes referred to as a "birders paradise". This is especially true when considering the passerines. One hundred and fifteen different species of song birds migrate through Pea Island.

Several projects designed to increase habitat diversity were conducted this year (see Section F.). These will benefit many species of migratory birds as well as waterfowl.

8. Game Mammals

Rabbits are the only game mammals that occur in any numbers on Pea Island. Cottontail and marsh rabbit numbers are estimated at ± 1,200.

Raccoons are fairly common on Bodie Island to the north. Occasional raccoon tracks have been observed on Pea Island for several years, but no raccoons have been sighted.

In early June a buck white-tailed deer was sighted swimming in Oregon Inlet. The confused deer was captured and brought ashore to Bodie Island on a commerical fishing boat. On November 1, a road-killed doe was found on the shoulder of N.C. Highway 12 at the north end of Pea Island. This is the only known record of white-tailed deer on Pea Island.

9. Marine Mammals

On May 30, a 12' pilot whale was examined by Assistant Manager Schriver approximately 2.7 miles north of the Avon Pier near Hatteras.

On June 1, a beached whale was 3 miles north of the Rodanthe pier on the Refuge. The whale was determined to be a pilot whale, approximately 12 feet in length. The Smithsonian was notified.

10. Other Resident Wildlife

Ring-necked pheasant are observed year-round over most of Pea Island. The birds concentrate around the impoundment dikes and New Field browse area. It is estimated that the annual peak population is 750 birds, with approximately 500-550 being present throughout the year. These numbers represent approximately one bird per eight acres of suitable habitat.

14. Scientific Collections

Ed Thompson, curator for Fernbank Science Center in Atlanta, Georgia collected the following specimens in December for educational purposes: 1 pintail and 2 shovelers.

15. Animal Control

A trapping program was again held in 1985 to reduce the number of muskrat and nutria present in Refuge impoundments and to allow for recreational utilization of furbearing animals.

The bid system of selecting trappers was dropped this year in favor of a fixed fee application system because of lack of interest in the program. Only one application was received and this trapper was permitted to trap all three impoundments. A total of 158 muskrat and 24 nutria were taken from January 28 through February 27. Incidental catches included approximately 10 American coots, one black duck, and one mink. The black duck was released. No unexpected problems were encountered.

16. Marking and Banding

The destruction caused by Hurricane Gloria painted a bleak outlook for duck and goose banding on Pea Island. Before pre-season banding efforts could begin for the Flyway Canada Goose Study, much repairing and clean up of Refuge roads, dikes, and other facilities was required. Our large new, YCC constructed walk-in goose/duck trap was completely demolished and fescue planted in New Field to attract geese for banding was killed by salt water.

The back edge of New Field was finally re-seeded, and another walk-in trap was constructed in Pamlico Sound. The fescue did better than expected and two rocket net sites in the field turned out to be productive. All banding quotas were met or exceeded except for canvasback and ring-necked quotas. These continue to be assigned, but are not realistic at Pea Island.

Three live decoy geese were obtained from Dennis Luszcz, N.C. Waterfowl Biologist, for use in the walk-in goose trap which was only moderately successful.

Pea Island participated in neck-collaring Canada geese for the third year of a special 3-year Atlantic Flyway Study. Yellow neck bands with black numbers and letters were placed on all the Canada geese banded. Banding accomplishments and quotas are presented below:

	# Banded	Quotas
Canada Geese	107	75
Black Duck	350	200
Mallard	102	100
Canvasback	0	50
Ring-necked Duck	0	50
Black/Mallard Hybrid	11	0

For the annual YCC tern banding and trip to Pungo NWR to help band wood ducks, see Section E.2. of the Alligator River narrative.

The N.C. Raptor Rehabilitation Center began banding activities on September 30, see Section G.6.

H. PUBLIC USE

1. General

Pea Island had a total of 1,088,206 visitors in 1985. Most effort in the "Interpretation and Recreation" category at Pea Island went toward "finishing touches". The front office was converted to a conservative visitor contact station in March. Displays were developed and the Pea Island Host/Hostesses program was planned and implemented, see Section E.4.

#14 - Margaret Burns is a regular Wednesday occurrence at Pea Island. What a benefit the Host/Hostess program has been!! 8/85 BWS

Landscaping was done on the new kiosks, and the sign system was evaluated and new signs ordered.

Unfortunately, the traffic counters installed during 1984 proved to be impractical in the harsh Outer Banks environment. By February, all counters had ceased to function, victims of salt and sand.

Again in 1985, the National Park Service printed 350,000 copies of "In The Park", their summer season information leaflet. Pea Island's section was reduced to a half page, but we did at least get coverage.

On May 29, Joseph Canedo, Departmental Section 504 Program Manager, USDI, met with Manager Taylor for an on-site inspection to evaluate programatic and facility access for the handicapped. Mr. Canedo pointed out several areas in which access could and should be improved. As plans are made for future facilities improvement and development, the suggested changes will be incorporated.

During the year, Pea Island received 10,750 requests for information and 10 news releases were prepared. The newly established volunteer program helped a great deal in meeting the needs of the public during 1985.

2. Outdoor Classrooms - Students

The emphasis on non-staff conducted activities continued in 1985. 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. During the year, 1,673 visits to the Refuge involved the use of Outdoor Classrooms. Approximately 2,963 AH were spent in this activity.

4. Interpretive Foot Trails

Due to other activities of higher priority, several planned I&R projects were put on a "back burner" in 1985. Among them were upgrading interpretative signs for Pea Island's two trails. A high priority item for 1986 is to develop and implement interpretive signing for the North Pond and New Inlet Trails.

Approximately 75,277 visitors (150,554 AH) utilized interpretive foot trails at Pea Island in 1985. In addition, volunteers conducted walks for 1,224 visitors (2,187 AH).

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. Hopefully, office renovation for a more appropriate VCS will be possible in the near future. Over a million visitors a year pass within a stone's throw!

7. Other Interpretive Programs

Again this year, guided summer activities were provided by the N.C. Marine Resources Center. Refuge volunteers and National Park Service personnel filled in as necessary. Sponsored activities and participation were as follows:

Program Name	# Programs Conducted	Total Participation
Bird Walk	22	317
Children's Wildlife Discovery	20	354
Refuge tour	20	211

In addition to these programs, 419 other visits to the refuge involved participation in a conducted interpretive program. Most of these activities were also led by Refuge volunteers.

8. Hunting

The second rabbit/pheasant youth hunt at Pea Island took place from October to December, 1985. Several changes were made this year in hopes of improving the hunt. The major change involved issuing whole day permits instead of half day permits as was done the previous year. Although fewer permits were issued, this allowed all day hunting and cut down on staff time required to administer the hunt.

Harvest of rabbit and pheasant was up only slightly, and hunter participation was 50% less than last year. Results of the hunt are on the following page.

Results of Rabbit/Pheasant Hunt

Date	# Parties	# Individuals	Rabbits # Seen	Rabbits # Bagged	Pheasants # Flushed	Pheasants # Bagged
Oct. 26	4	13	7	2	5	1
Nov. 02	3	8	12	2	15	5
Nov. 09	4	17	2	0	13	4
Nov. 16	3	13	2	1	6	2
Nov. 23	1	4	0	0	4	0
Nov. 28	2	6	1	0	1	0
Nov. 29	3	10	4	1	1	0
Nov. 30	2	7	1	0	7	3
Dec. 07	1	2	0	0	0	0
Dec. 14	1	4	4	2	0	0
Totals	24	84	33	8	52	15

In all, 621 AH (106 visits) were spent hunting at Pea Island in 1985.

9. Fishing

Pedestrian surf fishing continued to be the major form of consumptive, wildlife-oriented recreation on Pea Island during 1985. 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 568,412 AH (142,103 visits) were spent fishing on Pea Island during 1985.

#15 - The always popular sport of surf fishing.
3/77 MH

10. Trapping

The 1985 trapping program at Pea Island was the third in Refuge history. Trapping is considered a management tool at Pea Island; therefore, the program is discussed in detail in Section G. of this narrative report.

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 (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 1985, an estimated 725,380 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 213,742 AH (161,688 visits) participating in this activity during 1985.

12. Other Wildlife Oriented Recreation

Wildlife photography continues to be a popular activity at Pea Island. Several photo blinds are available 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 1985, the Refuge photo blinds were utilized frequently. Approximately 12,128 AH (3,032 visits) were spent with photography at Pea Island last year.

15. Off-Road Vehicling

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.

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.

No facilities have been constructed specifically for these uses. Approximately 612,736 AH (179,268 visits) were spent in non-wildlife oriented recreation on Pea Island in 1985.

17. Law Enforcement

Law enforcement duties are normally carried out in conjunction with other Refuge activities. The high public use on Pea Island and the responsibilities and authorities of other agencies require Refuge staff to work closely with the National Park Service, the Dare County Sheriff's Department, N.C. Wildlife Resources Commission, N.C. Marine Fisheries, N.C. Highway Patrol, and the U.S. Coast Guard.

In 1985, the Refuge became an active participant in the Dare County "Crimeline" program. This is a cooperative group of representatives from each law enforcement agency within Dare County who meet regularly to discuss and update the various agencies on recent crimes which have occurred. Officers exchange information and ideas on solving these crimes, some of which occur on Refuge property.

Violation cases handled by the Refuge staff are listed below.

Violations	No.
Driving in closed area	3
Tresspass into closed area	2

As of June 1985, the National Park Service reported handling 24 law enforcement related cases on Pea Island. Of these, 15 were lesser C.F.R. violations (camping, travel off roads, etc.). Seven larceny cases (breaking and entering autos); one involving drugs (Marijuana), and 1 case involving firearms were reported.

The Dare County Sheriff's office in Hatteras, N.C. reported handling 52 law enforcement related situations of which 30 incidents involved criminal activity on Pea Island.

I. EQUIPMENT AND FACILITIES

1. New Construction

Mattamuskeet NWR provided welding and mechanical skills to produce a new low-lift pump for installation at New Field.

#16 - Pump installation at New Field. 10/85 BWS

2. Rehabilitation

Cedar pilings were installed as a facing and barrier to the headquarters information kiosk. Sand and beach litter was filled in between the pilings and signs. This will give visitors something to occupy their hands with other than the plexiglass. Concrete approaches and ramps were poured around the kiosk.

3. Major Maintenance

Rusted hydraulic lines were replaced on the John Deere 4240, D-3, and D-6.

The domestic water supply pumps and switches were repaired several times and finally replaced.

NE winds in mid-June caused undercutting of the bulkhead at the North Pond pump. The engine was ready to fall off when a crane was brought in to rescue it. The shed was also saved, only to disappear during Hurricane Gloria.

#17 - Washed out roadway compliments of Hurricane Gloria. 10/85 JT

4. Equipment Utilization and Replacement

Early in the year, some equipment was transferred to Alligator River NWR to facilitate their "start-up". All major property was eventually transferred to Alligator River to avoid the confusion of two inventories, two sets of property files, etc.

5. Communications Systems

A number of calls to the repair service were necessary this year. Electrical fluctuations and feed line problems require regular attention. With the telephone out as much or more than it's in, reliable radio communications are necessary for Pea Island to keep in touch.

7. Energy Conservation

Daily efforts are made to share the ride and to use the most fuel efficient vehicles available.

8. Other

Harrison International Corporation constructed a new 34.5 Kv electric power transmission line for the Cape Hatteras Electric Membership Corporation. This line runs the entire length of Pea Island and provides our power then continues south the length of Hatteras Island. Even with the new line, power fluctuations and outages are common on the Outer Banks.

J. OTHER ITEMS

1. Cooperative Programs

a. The Manteo (Shallowbag) Bay Project which was authorized by Congress in April of 1980 continues to draw a lot of attention. The U.S. Army Corps of Engineers applied for a permit from the Department of the Interior to construct a pair of jetties to stabilize Oregon Inlet, a navigable channel lying between Bodie Island and Hatteras Island. Land north of the inlet is a part of Cape Hatteras National Seashore. Pea Island NWR borders the inlet on the south. Initially, the project called for $100 million in funding and $600 million over the 50 year life of the project. The costs have most likely doubled since 1980.

The basic design of the project as it affects the Refuge includes the construction of two rubble mound or concrete armor jetties and a sand bypass system that would require placement of dredge material on the Refuge. The total length of the Pea Island jetty would be 8,700 feet with the shorwardmost 2,300 feet connected to the Refuge and permanently occupying 4.4 acres. During construction, another 41 acres of Refuge land would be required for sand bypassing, storage and access areas, and pipeline right-of-way. Sand bypass would include annually pumping sand from the accretion filled behind the north jetty onto the Refuge beach. The Corps has not yet designed the sand transport system or shown that such a system will work.

The probable effects of the project were studied and a compatibility statement was prepared. The project was determined to be incompatible, and the permit request was denied. The Service's position has been to support the maintenance of a safe, navigable channel through Oregon Inlet by hopper dredging, a more cost-effective and environmentally acceptable alternative.

#18 - The hopper dredge - an alternative to jetties at Oregon Inlet. 10/85 JT

On October 12, 1984, legislation that would transfer Interior lands needed for the jetty project to the Corps of Engineers died in the U.S. Senate. However, local and Congressional pressure on the present administration continues.

b. As a cooperative venture between the USFWS and the N.C. Marine Resources Center, the 1985 National Hunting and Fishing Day celebration was planned for September 28. However, Hurricane Gloria arrived the day before and cancelled the function until 1986.

c. Again during 1985, the N.C. Raptor Rehab Center was issued a special use permit to capture and band hawks on Pea Island. They manned one banding site during October from which 871 raptors were observed, counted, and some captured, banded, and released. During 25 days in October, 54 peregrine falcons, 442 sharp-shinned hawks, 6 Cooper's hawks, 41 Northern Harriers, 14 osprey, 53 merlins, and 261 kestrels were observed. Of this number, 118 were banded and 3 foreign bands recovered.

d. Refuge staff met with representatives from Cape Hatteras Electric Membership Cooperative during the year to monitor work to replace existing power lines across the refuge.

e. In May, Bio-Tech Beasley assisted the Coast Guard in dealing with osprey nests on intercoastal waterway navagational aids. Battery changes required personnel to be in very close proximity to the nest and the Coast Guard requested assistance to protect both the nest and USCG personnel. This sort of cooperative effort between the two agencies has helped with interagency PR and communications.

f. A Special Use Permit was issued in April to Nature Scene, South Carolina Educational TV, to film a PBS television program on Pea Island.

g. The Corps of Engineers was once again issued a Special Use Permit to continue a beach profile study of Refuge beach.

h. Again this year, Refuge staff, YCC and volunteers assisted John Weske of the Smithsonian Institute with the banding of terns on a spoil island in Oregon Inlet. Approximately 3,500 royal terns and 150 sandwich terns were banded.

4. Credits

This narrative was a joint effort by all the Refuge staff with special kudos to Assistant Manager Dunaway for "production" and Secretary Midgett for deciphering our penmanship. A majority of the photos were taken by Refuge staff. Photos credited as "MH" were taken by Michael Halminski and "CM" by Clyde McFadden.

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

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

WILDLIFE

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

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

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

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

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

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

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

MANAGEMENT

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

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

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

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

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

RECREATIONAL OPPORTUNITIES

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

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

The 12.2 miles of pristine beach provides the surf fishing enthusiast an excellent opportunity to take home a good catch. Speckled and gray trout, spot, flounder, blue fish, red drum and striped bass are some of the most sought after species. Swimmers, sunbathers, beachcombers, and surfers all find plenty of sea and sand.

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

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

REGULATIONS

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

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

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

Fishing is allowed on the beach, not in the ponds.

Camping is prohibited. Check NPS camping areas on Bodie Island.

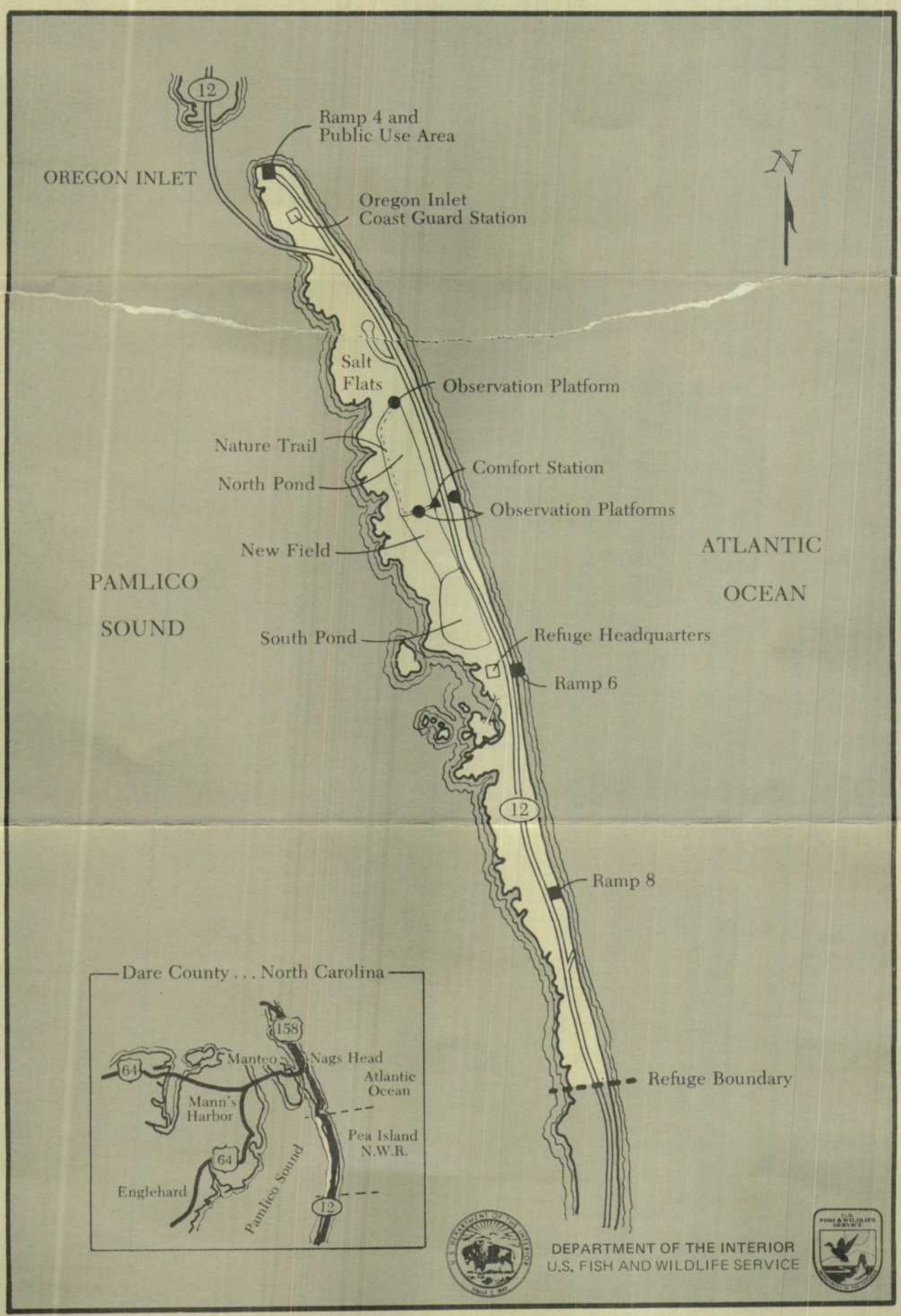
Fires are prohibited.

Pets on a leash are allowed on the beach. Pets are not allowed around the ponds.

Hunting is prohibited.

Weapons are prohibited.

Vehicles are allowed only in parking areas and on Highway 12.



Pea Island National Wildlife Refuge

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 swmmming in the ponds. Colorful pheasants are abundant and can be seen almost anywhere on the refuge.

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

VISITOR INFORMATION

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

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

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

Ask about the following opportunities:

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

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

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

NOTES

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

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

Calendar of Wildlife Events

Pea Island National Wildlife Refuge

WILDLIFE

PEA ISLAND
National Wildlife Refuge

- General Information
- Amphibians
- Reptiles
- Mammals
- Birds
- Birds
- Birds

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.

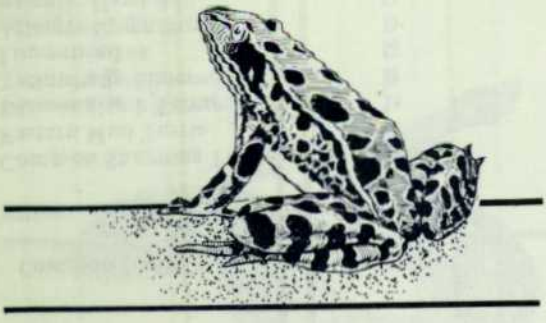
In observing the wildlife populations here, remember the dynamic nature of a barrier island. Over the years inlets open and close. The ocean overwashed intermittently during frequent winter storms. Sometimes all surface water is salty. Animal populations here generally have more limiting factors than 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**
- **Reptiles**
- **Mammals**
- **Birds**
- **Birds**
- **Birds**

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.



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

*Documented - actual observations on the refuge are recorded.

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

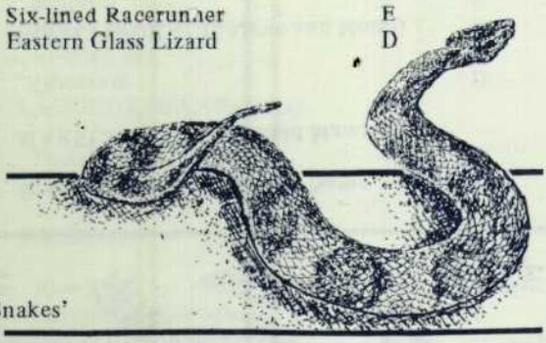
- **Amphibians**
- **Reptiles**
- **Mammals**
- **Birds**
- **Birds**
- **Birds**

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
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**
- **Mammals**
- **Birds**
- **Birds**
- **Birds**

Mammals

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

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

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

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

- **Mammals**
- **Birds**
- **Birds**
- **Birds**

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.

	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				

• Birds

• Birds

	S	S	F	W
Fulvous Whistling Duck (Fulvous Tree Duck)	r		r	u
Tundra Swan (Whistling Swan)	c	r	c	c
Greater White-fronted Goose	r			r
Snow Goose	a	r	a	a
Ross' Goose				r
Brant			r	r
Barnacle Goose			r	r
Canada Goose	a	r	a	a
Wood Duck	r		r	r
*Green-winged Teal	a	r	a	a
*American Black Duck	a	u	a	a
*Mallard	u	o	u	u
Northern Pintail	c		a	a
*Blue-winged Teal	a	o	a	r
Northern Shoveler	c		c	c
*Gadwall	c	c	c	u
Eurasian Wigeon (European Wigeon)				r
American Wigeon	c		c	a
Canvasback	u		u	c
Redhead	u		c	c
Ring-necked Duck	c		c	c
Greater Scaup	c	r	u	c
Lesser Scaup	c		u	c
Common Eider				r
King Eider				
Oldsquaw	u		r	u
Black Scoter (Common)	c		u	c
Surf Scoter	c		u	a
White-winged Scoter	u		u	u
Common Goldeneye	r		r	o
Bufflehead	c	r	c	c
Hooded Merganser	u		u	c
Common Merganser	u		u	u
Red-breaster Merganser	a	r	c	a
Ruddy Duck	c	r	c	c
Black Vulture	r	r	r	r
Turkey Vulture	r	r	r	r
*Osprey	u	u	c	
American Swallow-tailed Kite				
Bald Eagle	r	r	r	r
Northern Harrier (Marsh Hawk)	c		c	c
Sharp-shinned Hawk	o		a	u
Cooper's Hawk	r		r	r
Red-shouldered Hawk	r		r	r
Swainson's Hawk				
Red-tailed Hawk	r		r	r
Rough-legged Hawk				
Golden Eagle				
American Kestrel (Sparrow Hawk)	c		a	a
Merlin (Pigeon Hawk)	u		c	u
Peregrine Falcon	u		c	u
*Ring-necked Pheasant	c	c	c	c
Yellow Rail				
Black Rail	r	r	r	r
*Clapper Rail	c	c	c	c
*King Rail	c	c	c	c
Virginia Rail	u	o	u	u
Sora	c	u	a	u
*Purple Gallinule	r	r	r	
*Common Moorhen	u	u	u	r
American Coot	a	r	a	a
Black-bellied Plover	a	u	a	c
Lesser Golden Plover	r		o	r
*Wilson's Plover	u	o	u	u
Semipalmated Plover	c	u	c	u
*Piping Plover	u	u	u	u
*Killdeer	u	u	u	u
*American Oystercatcher	c	u	u	r
*Black-necked Stilt	u	c	c	
*American Avocet	u	u	u	r
Greater Yellowlegs	a	c	a	c
Lesser Yellowlegs	a	c	a	u
Solitary Sandpiper	u	o	u	o
*Willet	c	c	c	u
Spotted Sandpiper	c	u	c	o
Upland Sandpiper (Plover)	o	o	o	
Whimbrel	c	r	c	o
Long-billed Curlew			u	
Hudsonian Godwit	r	r	u	
Bar-tailed Godwit				
Marbled Godwit	o	u	c	u
Ruddy Turnstone	a	u	a	u
Red Knot (Knot)	c	u	c	u
Sanderling	a	c	a	a
Semipalmated Sandpiper	a	c	a	u
Western Sandpiper	c	u	a	c
Least Sandpiper	a	c	a	u
White-rumped Sandpiper	o	r	c	
Baird's Sandpiper		u	u	
Pectoral Sandpiper	u		c	r
Purple Sandpiper				
Dunlin	a	u	a	c
Curlew Sandpiper				
Buff-breaster Sandpiper			r	
Ruff				
Short-billed Dowitcher	c	c	a	u
Long-billed Dowitcher	u	r	c	u
Common Snipe	a	r	c	a
American Woodcock	r		r	r
Wilson's Phalarope	r	r	u	
+Red-necked Phalarope (Northern)	c		c	
+Red Phalarope	c		c	r
+Pomerine Jaeger	u	u	c	r
+Parasitic Jaeger	r	u	u	
+Long-tailed Jaeger	u		u	
*Laughing Gull	a	a	a	u

• Birds

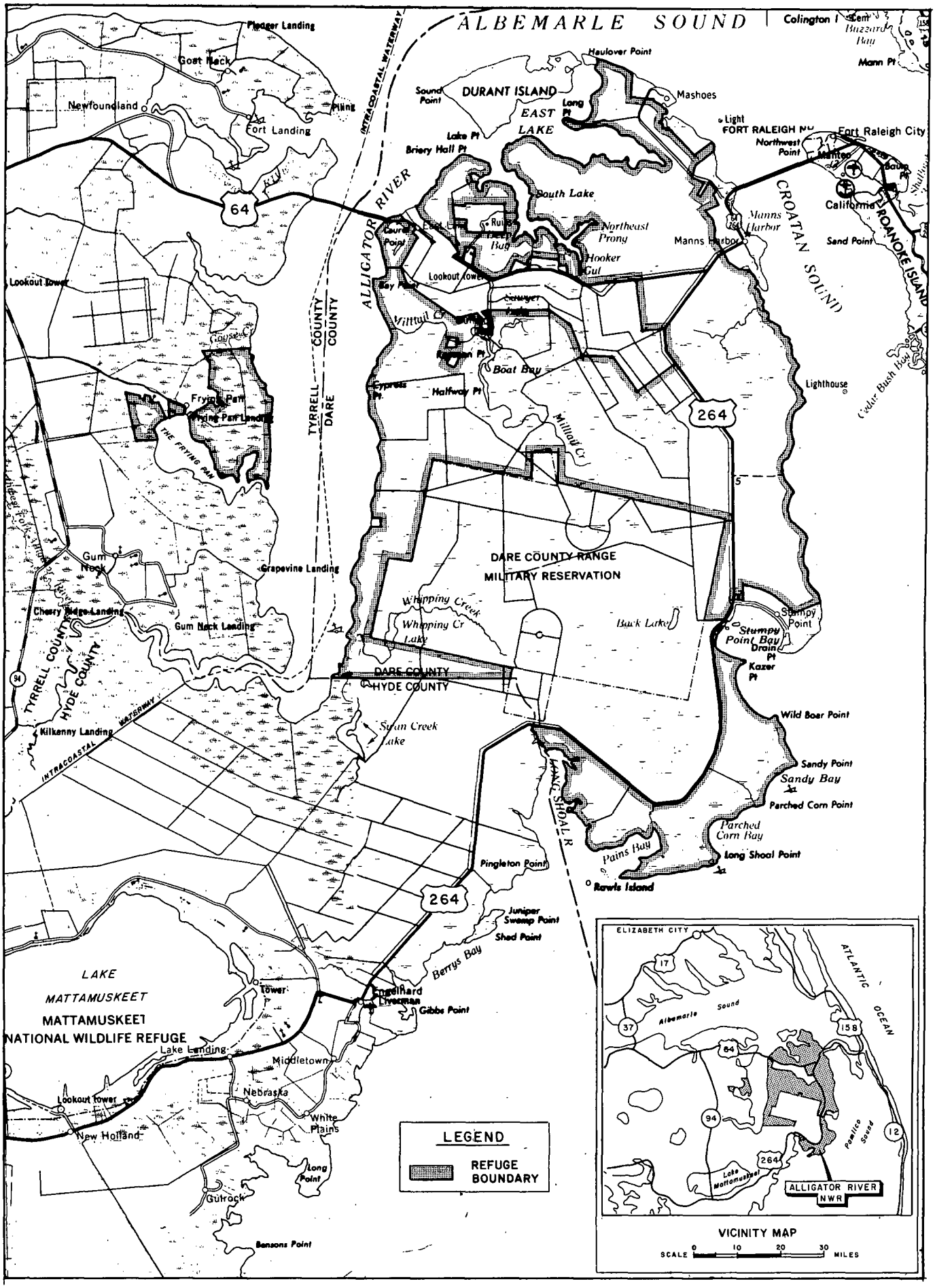
	S	S	F	W
____ Little Gull				
____ Common Black-headed Gull				
____ Bonaparte's Gull	c		u	c
____ Ring-billed Gull	a	c	a	a
____ *Herring Gull	a	c	a	a
____ Iceland Gull				
____ Lesser Black-backed Gull				u
____ Glaucous Gull	r			r
____ *Great Black-backed Gull	c	c	c	a
____ +Black-legged Kittiwake		r	u	c
____ *Gull-billed Tern	c	c	u	
____ *Caspian Tern	u	u	c	o
____ *Royal Tern	c	c	c	u
____ *Sandwich Tern	c	c	c	
____ Roseate Tern	r	r	r	
____ *Common Tern	c	c	c	r
____ Forster's Tern	a	c	r	a
____ *Least Tern	c	c	c	
____ +Bridled Tern		c	u	
____ Black Tern	u	c	a	
____ *Black Skimmer	c	c	c	u
____ Dovekie	r		r	r
____ Thick-billed Murre				
____ Razorbill				r
____ White-winged Dove				
____ *Mourning Dove	u	u	u	u
____ Black-billed Cuckoo	r		r	
____ *Yellow-billed Cuckoo	u	u	c	
____ *Common Barn-Owl	o	o	o	o
____ Snowy Owl				
____ Short-eared Owl	o		u	u
____ Northern Saw-whet Owl				
____ *Common Nighthawk	o	o	o	
____ Chuck-will's Widow	r	r	r	
____ Chimney Swift	o	o	o	
____ Ruby-throated Hummingbird	o	u	u	
____ Belted Kingfisher	u	u	c	c
____ Red-headed Woodpecker			o	
____ Yellow-bellied Sapsucker	u		c	u
____ *Downy Woodpecker	u	u	u	u
____ Hairy Woodpecker	r		r	r
____ *Northern Flicker (Common, yellow-shafted)	u	u	a	c
____ Olive-sided Flycatcher			r	
____ Eastern Wood-Pewee	u	u	u	
____ Yellow-bellied Flycatcher			r	
____ Acadian Flycatcher			r	
____ Eastern Phoebe	u		u	u
____ *Great Crested Flycatcher	u	u	u	
____ Western Kingbird			u	
____ Eastern Kingbird	c	c	c	
____ Gray Kingbird				
____ Scissor-tailed Flycatcher				
____ Horned Lark	r		r	r
____ Purple Martin	u	u	c	
____ Tree Swallow	c	u	a	u
____ Northern Rough-winged Swallow (Rough winged)	r		r	
____ Bank Swallow	o		u	
____ Cliff Swallow			r	
____ *Barn Swallow	a	a	a	
____ Blue Jay	r	r	r	
____ American Crow (Common)	u	u	u	u
____ *Fish Crow	c	c	c	c
____ *Carolina Chickadee	u	u	u	u
____ Red-breasted Nuthatch	c		c	
____ White-breasted Nuthatch	r		r	
____ Brown Creeper	o		c	u
____ *Carolina Wren	c	c	c	c
____ House Wren	u		c	u
____ Winter Wren	o		u	o
____ Sedge Wren (Short-billed Marsh Wren)	c		c	c
____ *Marsh Wren (Long-billed Marsh Wren)	c	c	c	c
____ Golden-crowned Kinglet	u		c	u
____ Ruby-crowned Kinglet	c		c	c
____ Blue-gray Gnatcatcher	o		u	
____ Veery	u		u	
____ Gray-cheeked Thrush	o		u	
____ Swainson's Thrush	o		c	
____ Hermit Thrush	o		c	o
____ Wood Thrush			r	
____ American Robin	u	u	c	c
____ *Gray Catbird (Catbird)	a	a	a	c
____ *Northern Mockingbird (Mockingbird)	u	u	u	u
____ *Brown Thrasher	u	u	u	u
____ Water Pipit	u		u	u
____ Sprague's Pipit				
____ Cedar Waxwing	u		u	c
____ Loggerhead Shrike			r	r
____ *European Starling (Starling)	c	c	c	a
____ *White-eyed Vireo	u	c	c	
____ Philadelphia Vireo			o	
____ *Red-eyed Vireo	u	u	u	
____ Blue-winged Warbler				
____ Tennessee Warbler	r		u	
____ Orange-crowned Warbler	u		u	c
____ Nashville Warbler			u	
____ Northern Parula (Parula Warbler)	c		c	
____ *Yellow Warbler	u	c	c	
____ Chestnut-sided Warbler			r	
____ Magnolia Warbler			c	
____ Cape May Warbler			c	
____ Black-throated Blue Warbler	u		c	
____ Yellow-rumped Warbler (Myrtle)	a		a	a
____ Black-throated Green Warbler			u	
____ Blackburnian Warbler			r	
____ Yellow-throated Warbler			r	
____ Pine Warbler			u	
____ *Prairie Warbler	u	a	a	

ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE

DARE AND TYRRELL COUNTIES, NORTH CAROLINA

UNITED STATES
DEPARTMENT OF THE INTERIOR

UNITED STATES
FISH AND WILDLIFE SERVICE



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

0 10560 21120 42240 FEET
0 1 2 4 6 8 MILES

NORTH

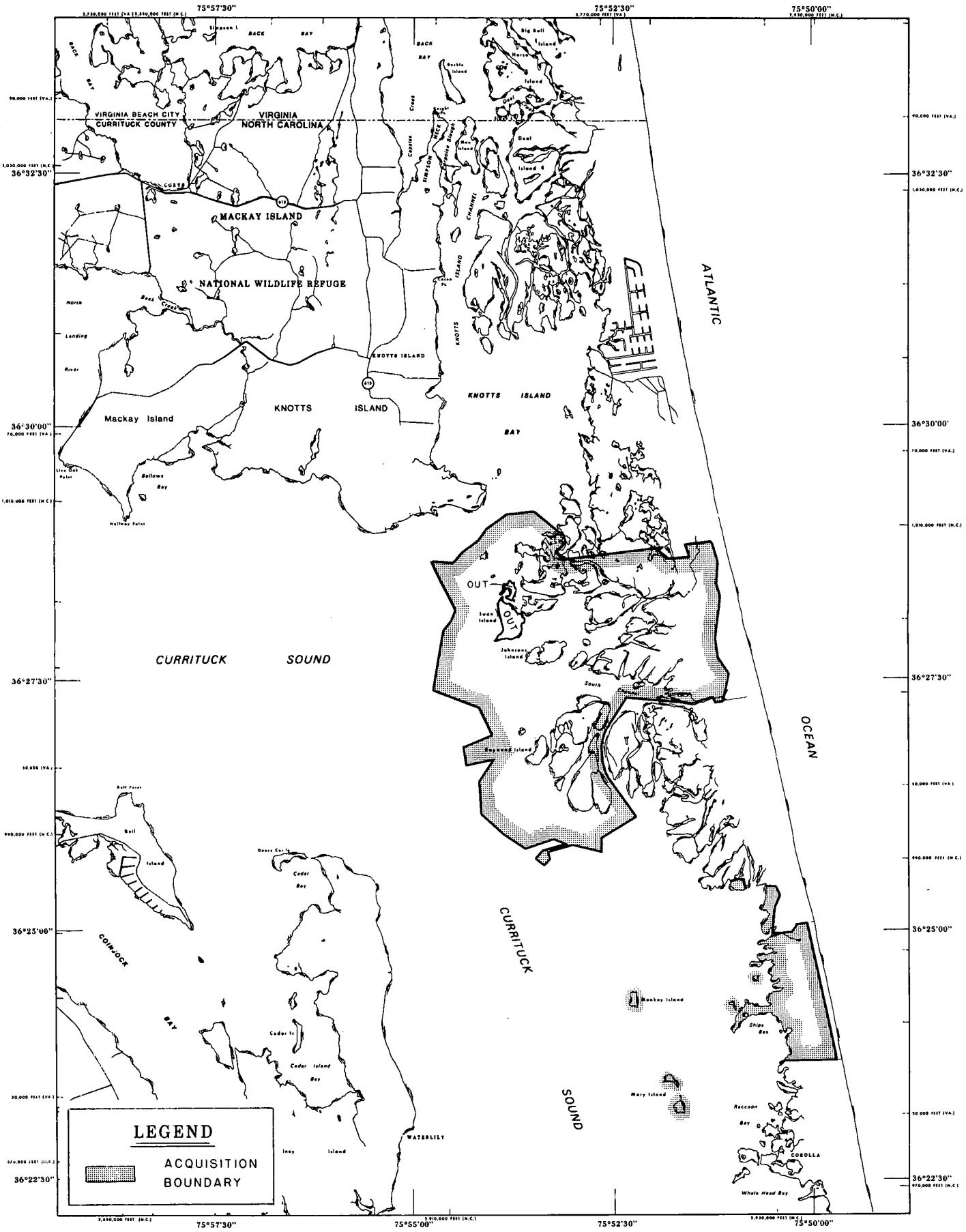
ATLANTA, GEORGIA MAY, 1984

CURRITUCK NATIONAL WILDLIFE REFUGE

UNITED STATES
DEPARTMENT OF THE INTERIOR

VIRGINIA BEACH CITY, VIRGINIA & CURRITUCK COUNTY, NORTH CAROLINA

UNITED STATES
FISH AND WILDLIFE SERVICE



COMPILED IN THE OFFICE OF REALTY
FROM ORTHOPHOTOQUADS AND AERIAL PHOTOGRAPHS

ATLANTA, GEORGIA JULY, 1983

SCALE 0 2000 4000 6000 8000 FEET

0 0.5 1.0 1.5 2.0 KILOMETERS

8° Magnetic N True North

MEAN DECLINATION 1971