

**REVIEW AND APPROVAL**

**ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE  
PEA ISLAND NATIONAL WILDLIFE REFUGE**

**MANTEO, NORTH CAROLINA**

**ANNUAL NARRATIVE REPORT**

**Calendar Year 1997-1998**

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11/12/04

Date

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11/18/04

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11/19/04

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## INTRODUCTION

Alligator River National Wildlife Refuge is approximately 152,000 acres in size and lies at the eastern end of a broad, flat, and swampy peninsula in northeastern North Carolina. Most of the Refuge is located in the mainland portion of Dare County, with some land reaching southward into Hyde County. The Refuge is part of a five-county region bounded on the north by the Albemarle Sound, on the east by Croatan and Pamlico Sounds, and on the south by Pamlico Sound and Pamlico River. The Refuge supports 145 species of birds, 48 fishes, 40 mammals, and 48 reptiles and amphibians.

Alligator River National Wildlife Refuge was established with a 118,000-acre land donation from Prudential Life Insurance Company in Dare and Tyrrell Counties on March 14, 1984. Eventually, the Tyrrell County land was transferred to Pocosin Lakes National Wildlife Refuge and additional land was acquired, some to the south in Hyde County. The addition of 5,100 acres of farmland in 1988 substantially increased opportunities for waterfowl management. Today, the farm units attract numerous tundra swans, pintails, mallards, wigeons, and a variety of other species. In combination with the 46,000-acre Dare County Bombing Range located near its center, this area represents approximately 200,000 acres of relatively undisturbed wetland habitat.

The vast expanse of undisturbed swamp forest and wetlands on the Refuge contains many important wildlife and ecological resources. Since most 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.

The Red Wolf Recovery Program is centered on Alligator River NWR. The wild population of red wolves is currently consists of approximately 100 wolves in 20 packs, distributed across 1.7 million acres in five eastern North Carolina Counties.

The Refuge offers a wide variety of programs and activities for public recreation ranging from hunting and fishing to paddling and wildlife observation and photography. The number of environmental education and interpretive programs is increasing each year, as Americans "discover" this treasure in eastern North Carolina.

**ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE**

**Manteo, North Carolina**

**ANNUAL NARRATIVE REPORT**

Calendar Year 1997-1998

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

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#### A. HIGHLIGHTS

August 28, 1998, Category 3 Hurricane Bonnie made landfall near Wilmington and traveled parallel to the coast line bringing 75 mph winds (Category 1) to the area. The eye of the storm passed directly over north-central Alligator River NWR and then Roanoke Island before exiting at Nags Head. Section B.

Bruce Creef received the Regional Director's Honor Award on April 28, 1998. Section E.

John Wallace was selected for our vacant Deputy Refuge Manager, GS-0485-12 on February 15, 1998. Section E.

The inventory of 3,000 acres of cut-over AWC on the refuge and range was completed in November of 1997. The amount of acreage sampled during the 1997 field season was an astonishing 1881-acres, more than twice that of 1996. Section F.3.

Richard Mattison, along with RM Bryant, DRM Wallace and WIS Strawser conducted research toward developing visual aids and a conceptual site plan for marketing purposes for the 35 acre refuge tract on the north end of Roanoke Island. Section H.1.

The Aycock Brown Welcome Center in Kitty Hawk partnered with the Refuge to create state-of-the-art, interactive exhibits that promote both refuges. In 1998, they were viewed by 451,067 visitors. Section H.6.

Wings Over Water held its first successful year of celebrating wildlife and wildlife habitat on the Outer Banks. Section H.7.

The Coastal Wildlife Refuge Society continues to provide excellent support for Refuges. Section H.18.

A new landing pad was constructed adjacent to the maintenance/fire facility for use by the helicopter that will be stationed at the Refuge. Section I.9.

## B. CLIMATIC CONDITIONS

1997

Winter defiantly arrived in January when we had a low temperature of 16°. Only one light snow occurred this year. Spring was relatively mild and dry. Fortunately we had no threat of hurricanes throughout the season. June showed the highest temperature for the year at 99°

### 1997 ALLIGATOR RIVER NWR WEATHER DATA

Month	Maximum Temperature	Minimum Temperature	Total Rainfall
January	76	16	3.14
February	79	29	3.05
March	84	32	3.02
April	84	31	2.75
May	89	46	2.49
June	99	48	2.74
July	96	58	4.12
August	96	55	3.42
September	91	45	5.24
October	91	32	4.03
November	76	24	3.91
December	71	23	5.31
<b>Total</b>			43.22 inches

The average annual rainfall for the area is 51.30 inches.

Tropical Storm Danny entered the U.S. in Louisiana and passed through Alabama, Georgia, South Carolina, and Raleigh before sending 45 mph winds to the Outer Banks. The storm exited the coast near Norfolk, VA on July 24.

### 1998 ALLIGATOR RIVER NWR WEATHER DATA

<b>Month</b>	<b>Maximum Temperature</b>	<b>Minimum Temperature</b>	<b>Total Rainfall</b>
January	76	27	7.75
February	70	31	5.94
March	87	21	6.13
April	83	35	5.01
May	91	37	5.60
June	96	49	7.23
July	96	56	6.15
August	92	54	5.68
September	94	50	0.32
October	88	33	0.75
November	80	29	1.86
December	81	26	6.65
<b>Total</b>	-	-	59.07 inches

The average annual rainfall for the area is 51.30 inches.

August 28, 1998, Category 3 Hurricane Bonnie made landfall near Wilmington and traveled parallel to the coast line bringing 75 mph winds (Category 1) to the area. The eye of the storm passed directly over north-central Alligator River NWR and then Roanoke Island before exiting at Nags Head.

September 4, 1998, Tropical Storm Earl packing 60 mph winds passed just north of the area and exited near Currituck.

### C. LAND ACQUISITION

#### 2. Easements

A five year easement, initiated in 1993, with the owners of the 4,000 acre Durant Island authorizing the presence of wolves on their property and Service access was allowed to lapse. The lease was not renewed because of a determination by the Red Wolf Project group that this area was not suitable for the wolves to survive and rear young due to marginal habitat.

Partner's Agreement with the owners of the 18,000-acre Mattamuskeet Ventures, Inc., authorizing wolves on the area and Service access, remained in effect.

A Partner's Agreement with the owners of the 6,500-acre Agri-East property authorizing wolves on the area and Service access remained in effect.

A Partner's Agreement with the owners of the 1,000-acre Holbert property authorizing wolves on the area and Service access remained in effect.

#### **Red Wolf Program Partners – 1997-98**

Name	Acres	Location	Type	Status
Bluestone Farms	7,033	Washington County Hwy 64-Newlands Rd	Partner's Agreement \$1,500/yr	1998
Mormon Church	8,500	Tyrrell County	Partner's Agreement \$1,500/yr	1998-2002
Joey Williams	3,000	Hyde County	Partner's Agreement \$1,200/yr	1997-2006

#### **D. PLANNING**

##### **2. Management Plan**

###### **Fire Management Planning:**

In 1997, the Refuge was broken down into Fire Management Units and these units farther divided into compartments and burning units. Work on these plans were initiated and halted several times during the year as prescribed burning and wildfire suppression took higher priorities.

##### **5. Research and Investigations**

###### **Fire Research:**

In 1997, Roger Hungerford and his research group conducted fire management research on the Dare County Bombing Range to study the feasibility and affects of prescribed burning in pocosins. This important landmark research study was funded by the US Air Force, but the USFWS has cooperated by assisting in the collection of field data and other information.

The spare Remote Operated Weather Station from Alligator River was loaned to the research project to assist in the collection and monitoring of weather data. Late this year, we learned that phase II of this project was funded. This will include the conducting of prescribed burning operations on the DBR, and we will send resources to assist in the second phase as well. We are learning much about conducting prescribed burning operations from this research as well.

## E. ADMINISTRATION

### 1. Personnel

The following employees received awards in 1997-1998:

Bruce Creef received the Regional Director's Honor Award on April 28, 1998.



Regional Director Sam Hamilton presents Supervisory Engineering Equipment Operator Bruce Creef with a Regional Director's Honor Award. FWS

#### On-The Spot Awards

Dan Fritsch; Scott Mclellan; Brian Kelly; Art Beyer; Mike Morse; Jessica Hart; Jonathan Windley; Joe Folta; Brain Van Druten; Craig Scheibel; Glen Stratton; Liz Fritsch; Jim Beasley; Donnie Harris; Janice Lane; Amy Midgett; Eric Craddock; Bruce Creef; Alan Emery; Bobby Govan; Bonnie Strawser; Jonathan Powers (09/14/97, 10/12/97).

#### STAR Awards

Kim King-Wrenn; Bernice Kitts

#### Quality Step Increase

Glen Stratton, Mike Morse, Art Beyer, Eric Meekins

Following is a list of the various personnel changes that took place in 1997-1998:

Janice Tripp was selected for a temporary, NTE 1 year appointment as a Biological Technician effective 4/14/97.

Daniel Fritsch was hired in a 30 day emergency appointment as a Biological Science Aid, GS-0404-03 on 03/17/97. The appointment was extended for 30 days effective 04/17/97 and terminated 05/15/97. On 07/20/97 he was selected for a temporary, NTE 1 year Biological Technician, GS-0404-04 vacancy. The appointment was extended for 1 additional year on 07/20/98.

Kim King-Wrenn was hired as a Park Ranger, GS-0025-03 in a NTE 1 year appointment effective 04/27/97. The appointment was extended for an additional year on 04/27/98. On 08/02/98 Kim was selected to fill our permanent, career-seasonal Park Ranger, GS-0025-05 vacancy.

Refuge Operation Specialist Elizabeth Fritsch was promoted to a GS-9 effective 04/28/97.

Thomas Eagle's (Forester, GS-0460-07), term appointment was extended for an additional 2 years effective 04/30/97. Tom accepted a permanent, full time Forester position at Blackwater NWR effective August 17, 1998.

Temporary employee Craig Scheibel was selected to fill our permanent, career seasonal Forestry Technician (Firefighter), GS-0462-04 vacancy on 06/22/97.

Joseph Folta was selected for a NTE 1 year Biological Technician, GS-0404-05 vacancy on 07/20/97. His appointment was extended for an additional year on 07/20/98.

Mark Oetzmann was hired as a 1040 Forestry Technician (Firefighter) on 09/13/97. His appointment was terminated 02/18/98.

Brian Kelly was selected as a Wildlife Biologist, GS-0486-11 to supervise the Red Wolf Recovery Program effective 09/14/97. On 09/27/98 Brian received a career-ladder promotion to a Wildlife Biologist, GS-0486-12.

Kristina Fair was selected for a 1040 Forestry Technician (Firefighter) position effective 09/14/97 and resigned 11/09/97 to take a temporary Biological Technician position at Mattamuskeet NWR.

Kathy Whidbee was hired in a 30 day emergency appointment as a Park Ranger, GS-0025-03 effective 09/29/97 to assist with Wings Over Water Festival. The appointment was extended for an additional 30 days effective 10/29/97 and terminated on 11/27/97. On 12/07/98 Kathy was hired in a 30 day emergency appointment as a Biological Technician, GS-0404-05.

Engineering Equipment Operator Donald Harris and Forestry Technician Eric Meekins were converted from career-seasonal positions to permanent, full-time appointments effective 10/12/97.

Jim Beasley's position title was changed from Range Technician to Forestry Technician effective 11/04/97.

Deputy Project Leader Dwight Cooley transferred to Wheeler NWR on 11/10/97.

Wildlife Biologist Wendy Stanton transferred to Pocosin Lakes NWR on 01/04/98.

John Wallace was selected for our vacant Deputy Refuge Manager, GS-0485-12 on 02/15/98. He transferred from Mackay Island NWR where he had been the Refuge Manager for about one year.

Anthony Ralph was hired in a 30 day emergency appointment as a Tractor Operator, WG-5705-05 on 03/02/98. The appointment was extended for an additional 30 days on 03/31/98 and terminated on 04/29/98. On 08/30/98 Mr. Ralph was selected to fill a vacant NTE 1 year Tractor Operator, WG-5705-05 vacancy.

John Houchins, Patrick Haltigan and Janice Tripp were selected for three 1040 Forestry Technician (Firefighter), GS-0462-04 vacancies on 03/15/98. Ms. Tripp transferred to Pocosin Lakes NWR as a Forestry Technician (Firefighter), permanent, career-seasonal on 07/20/98.

Brian Van Druten was hired in a 30 day emergency appointment as a Biological Technician, GS-0404-04 on 04/27/98. The appointment was extended an additional 30 days on 05/27/98. On 06/07/98 Brian was selected to fill a temporary, NTE 1 year appointment in the same series and grade.

Rhonda Clay arrived for duty on 06/08/98 in the COOP student program as a Student Trainee (Wildlife) GS-0499-04. She returned to school on 08/28/98. Mrs. Clay RTD on 12/06/98.

Jonathan Windley transferred to Cache River NWR as Assistant Refuge Manager effective 07/18/98.

Marie Guilbert reported to work on 06/14/98. She was hired as a Biological Science Aid, GS-0404-03 as a Career Awareness Institute Student. Her appointment was terminated on 08/15/98.

Kris Fair was selected to fill a vacant permanent, career-seasonal Biological Technician, GS-0404-05 vacancy on 09/27/98.

Mike Bryant received a promotion to Refuge Manager, GS-0485-14 effective 10/11/98.

Cathy Sprague was selected in a temporary, NTE 1 year Park Ranger, GS-0025-04 vacancy on 10/11/98.

Art Beyer was promoted from a Biological Technician, GS-0404-07 position to a Wildlife Biologist, GS-0486-9 position on 11/22/98.

Chris Lucash arrived for duty with the Red Wolf Program as a Wildlife Biologist, GS-0486-11 on 12/20/98.

NAME	POSITION	STATUS	EOD
1. Jim Beasley	Forestry Tech. (Fire) GS-0462-07	PFT	05/26/85
2. Art Beyer	Wildlife Biologist, GS-0486-09	PFT	12/02/90
3. Mike Bryant	Refuge Manager, GS-0485-14	PFT	04/14/96
4. Dwight Cooley	Deputy Refuge Mgr., GS-0485-13 Transferred to Wheeler NWR 11/10/97	PFT	04/02/95
5. Eric Craddock	Eng. Equip. Operator, WG-5716-08	PFT	02/21/93
6. Bruce Creef	Eng. Equip. Op. Supv., WS-5716-07	PFT	04/21/71
7. Rhonda Clay	Student Trainee, GS-0499-04	PFT	06/08/98
8. Tom Crews	Fire Mgmt. Officer, GS-0460-12	PFT	01/22/95
9. Thomas Eagle	Forester, GS-0460-07 – transferred to Blackwater NWR 08/17/98	TERM	04/30/95
10. Alan Emery	Automotive Worker, WG-5823-08	PFT	05/22/88
11. Kris Fair	Biological Tech., GS-0404-05	Seasonal	09/27/98
12. Joseph Folta	Biological Tech, GS-0404-05	NTE 1 Yr	07/20/97
13. Elizabeth Fritsch	Refuge Op. Specialist, GS-0485-09	PFT	01/12/92
14. Daniel Fritsch	Biological Tech., GS-0404-4	NTE 1 Yr	07/20/97
15. Jennifer Gilbreath	Wildlife Biologist, GS-0482-09	PFT	06/30/91
16. Bobby Govan	Eng. Equip. Op. (Fire), WG-5716-08	Seasonal	09/03/93
17. Patrick Haltigan	Forestry Tech (Fire), GS-0462-04	1040	03/15/98
18. Donnie Harris	Eng. Equip. Op. (Fire), WG-5716-08	PFT	01/11/96
19. John Houchins	Forestry Tech (Fire), GS-0462-4	1040	03/15/98
20. Brian Kelly	Wildlife Biologist, GS-0482-12	PFT	09/14/97
21. Kim King-Wrenn	Park Ranger, GS-0025-05	Seasonal	08/02/98
22. Bernice Kitts	Office Assistant, GS-0303-06	PPT	04/02/95
23. Janice Lane	Office Assistant, GS-0303-07	PFT	03/25/90
24. Chris Lucash	Wildlife Biologist, GS-0486-11	PFT	12/02/98
25. Eric Meekins	Forestry Tech., (Fire) GS-0462-04	PFT	10/25/93
26. Amy Midgett	Forestry Tech., (Fire) GS-0462-04	Seasonal	05/14/93
27. Mike Morse	Wildlife Biologist, GS-0486-09	PFT	04/09/89
28. Mark Oetzmann	Forestry Tech (Fire), GS-0462-04	1040	09/13/97
29. Murphy Peterson	Eng. Equip. Op. WG-5716-08	PFT	04/22/90
30. Jonathan Powers	Eng. Equip. Op., WG-5716-08	PFT	04/24/88
31. Anthony Ralph	Tractor Operator, WG-5705-05	NTE 1 Yr	08/30/98
32. Craig Scheibel	Forestry Tech., (Fire) GS-0462-05	Seasonal	03/03/96
33. Cathy Sprague	Park Ranger, GS-0025-04	NTE 1 Yr	10/11/98
34. Wendy Stanton	Wildlife Biologist, GS-0485-7 – transferred to Pocosin Lakes NWR 01/04/98	PFT	10/16/94
35. Dennis Stewart	Wildlife Biologist, GS-0486-11	PFT	12/27/91
36. Bonnie Strawser	Park Ranger (Inter.), GS-0025-11	PFT	12/31/80
37. Glen Stratton	Forestry Tech. (FCO), GS-0462-08	PFT	09/01/96
38. Janice Tripp	Forestry Tech (Fire), GS-0462-04 – transferred to Pocosin Lakes NWR 07/20/98	1040	03/15/98
39.cont. Brian Van Druten	Biological Tech, GS-04040-4	NTE 1 Yr	06/07/98
40. John Wallace	Deputy Project Leader, GS-0485-12	PFT	02/15/98
41. Jonathan Windley	Biological Tech., GS-0404-07 – transferred to Cache River NWR 07/18/98	PFT	02/26/89



L to R: Kim King-Wrenn, Janice Lane, Bonnie Strawser, Liz Fritsch, Bernice Kitts, Mike Bryant.



L to R: Eric Craddock, Alan Emery, Murph Peterson, Bruce Creef, Jon Powers



L to R: Jim Beasley, Bobby Govan, Amy Midgett, Donnie Harris, Glen Stratton, Tom Crews, Eric Meekins



L to R: (Back) Art Beyer, Jennifer Glibreath, Mike Morse,  
(Front) Brian Kelly, Jonathan Windley

#### 4. Volunteer Program

During 1997, volunteers contributed 31,446 hours of service and in 1998, 38,597 hours. The majority of the work was for maintenance, resource support, and public use and outreach. This section includes information for volunteers from both Alligator River and Pea Island National Wildlife Refuges. The volunteers of the year were Bill Ackiss and Adele Gould Mathers in 1997 and Dorothy Fink and Mary Ann Springer in 1998. Long time refuge volunteer Win Copeland died on March 29, 1998 as a result of head injuries sustained from a fall in his home.



L to R: Bill Askiss, Wendy Stanton, Adele Gould, Mike Bryant

The Refuge Volunteer Program consists of three programs: interns, organized work groups, and local Refuge volunteers. The Refuge and red wolf intern programs continue to draw attention from college students and graduates who seek to gain experience in wildlife management, research, and public use. Basic guidelines for the intern program require that the interns contribute a minimum of three months of volunteer service. During their tenure, interns (except the red wolf caretaker intern) received a small food stipend and were furnished free housing on the Refuge. All interns worked a 40 hour work week.

Interns for the 1997-98 period include:

1997    Summer: Adam Rettig, Becky Holmes, Briam Bock, Colby Mechan, Corrine Thiboult, Courtney Daniels, Greg Walmsley, Joe Deppe, John Jordin, Max Reiner, Meill Yelverton, Rebecca McArther, Rob Mason  
Fall: Andrew Trent, Clark Gray, Doug Sprouse, Jennifer Thompson

1998 Spring: Jim Lofland

Summer: Crystal Anderson, Brad Davis, Britt Purtee, Dustin Martin, John Jamison, Melinda Farr, Mike Martin.

Fall: Beth Eason, John Martin, Stephen Lamm

Red Wolf Interns – 1998

Scott McClellan, Jessica Hart, Jeremy Rogers, Kristin Query, Kurt Sladky, Phillip Heagy



1997 brought a host of interns!

BS

## 5. Funding

<u>Fund</u>	<u>Name of Fund</u>	<u>FY97</u>	<u>FY98</u>
1113	Red Wolf	370.0	380.5
1230	Mig.Birds	4.0	2.0
1261	Operations	764.2	817.3
1262	Maintenance	95.0	100.0
29..	Storm Damage*	430.9	622.4
8550	Pest (So.Pine Btl)	25.0	80.0
9251	Fire Operations	340.6	370.4
<b>TOTAL</b>		2029.7	2398.6

\*Storm damage money carries over, so the amounts include carryover from previous year.

## 6. Safety

Monthly safety meetings on a wide range of topics were presented to the staff during 1997 and 1998. All refuge staff members were required to attend. Safety topics on heavy equipment, allergic reactions, hazardous materials and rabies were presented. The staff participated in hearing tests, blood pressure and cholesterol checks by the Dare Co. Health Department. In May, an ATV safety course was given by a certified instructor.

All station fire extinguishers at Alligator River and Pea Island refuges were inspected, reconditioned and relocated to meet requirements. Survival suits and life jackets with reflective markings were acquired for water related activities. General safety inspections of all facilities were conducted by committee members.

There were eleven accidents reported in 1997. Nine involved summer interns and two accidents involved permanent employees. Eight of these were personal injuries and three were property damage only. All occurred between June and September. Supervisors and the safety committee reviewed the accidents and recommendations were made to prevent this many accidents in the years to come.

## F. HABITAT MANAGEMENT

### 1. General

Five categories of natural, vegetated habitat are found on ARNWR: marsh, pocosin, mixed-hardwood pine swamp, hardwood swamp, and white cedar swamp. These are classified as

wetlands based on vegetation present, soil type, and hydro-period. ARNWR contains some of the last remaining large tracts of pocosin-type habitat along the east coast. Although much of the refuge is relatively unaltered by humans, large portions have undergone changes in vegetation composition and hydrology caused by ditching and canal dredging for access and logging purposes. The purchase of the Prudential farmlands in March of 1988 added agricultural land to the list of habitats.

## 2. Wetlands

The installation of water control structures (WCS) to restore ditched areas to a more natural hydrological regime continued during 1997 and 1998. As usual, efforts were limited due to equipment and inclement weather. In 1997 risers were installed at four locations. New structures were installed at intersections of Bluebill Road, Sassafras Road, and Poplar Ridge Road with Alligator Road and at the intersection of Possum Road and Dry Ridge North Road. In 1998 one structure was installed at the intersection of H & B Road and Gator 2 Road. Permitting for installing these structures has been simplified as the Corps of Engineers now uses Nationwide Permit 27 instead of an individual permit.

In addition to enhancing wetland function, the structures and fill allow safe movement over the canals by fire equipment and better water management for fire suppression and prescribed burning activities. Pipes and risers replace severely deteriorated wooden bridges, primarily at road intersections. Boards can be placed in the risers up to ground level of the adjacent swamp/pocosin as needed. Wetland restoration of ditched areas will continue with installation of additional structures in 1999. Some attention will be diverted to maintenance of existing structures.

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

**Habitat types/ approximate acreages for Alligator River National Wildlife Refuge,  
Dare and Hyde Counties, North Carolina**

<b>Habitat Type</b>	<b>%</b>	<b>Approximate acreage</b>		<b>Total</b>
		<b>Dare County</b>	<b>Hyde County</b>	
Freshwater pools, ponds, & lakes	0.76	754	398	1,152
Brackish marsh	16.56	22,104	3,100	25,204
Managed wetlands	1.18	1,800	0	1,800
Cropland	1.97	3,000	0	3,000
Cypress-gum forest	0.91	1,380	0	1,380
Atlantic white cedar forest	5.56	6,900	1,568	8,468
Mixed pine/hardwood forest	7.48	11,380	0	11,380
Non-alluvial hardwood forest	8.04	12,236	0	12,236
Pond pine shrub pocosin	25.32	33,021	5,512	38,533
Pond pine cane pocosin	19.97	28,300	2,100	30,400
High shrub pocosin	4.17	5,030	1,320	6,350
Low shrub pocosin	8.08	12,292	0	12,292
<b>TOTAL</b>	<b>100%</b>	<b>138,197</b>	<b>13,998</b>	<b>152,195</b>

In 1997 and 1998 approximately 1,800 acres of moist soil were produced in prior converted farmland on the farm unit. Approximately 1,100 acres were burned and planted in soybeans by cooperative farmers in 1997. In 1998 approximately 400 acres were planted in soybeans by cooperative farmers. After harvest these units were flooded. Approximately 700 acres were burned, disced, and managed for moist soil. Agricultural crops were planted in an effort to control undesirable vegetation in the moist soil units. The effort was successful and waterfowl use in the flooded soybean stubble was excellent. About the same number of acres will be planted in crop during 1999, but crop rotations will be planned as a means for controlling undesirable plant species. From the evidence thus far, it appears that fire and discing are excellent management tools, but not totally effective in controlling undesirable plant species over the long-term. It appears that intensive management practices are necessary to maintain the moist soil units in the most productive state.

In units that were disced before the end of June, overall production of desirable plants (wild millet, smartweed, fall panicum, switchgrass, foxtail, etc.) was greatly improved over previous years. Discing in July typically results in stands of foxtail and paspalum. Discing in late July and August is good for creating a mud flat but produces little to no food because

of the need to start flooding units or the arrival of first frost before seeds can mature. Moist soil units will receive similar treatment again in 1999, except those that were neither disced nor burned will be burned and disced.

### 3. Forests

As documented above, Alligator River NWR is over 152,000 acres in size and over 75% of the land is forested. Due to several man-made factors, nearly all of the forests on the refuge are showing signs of significant declines in forest health.

Past forest management practices such as exploitive logging have had a significant impact on the forest resource. For example, nearly 8000-acres of Atlantic white cedar swamp were cleared from this land prior to it becoming part of the refuge system.

Road construction has also had a negative impact on our forested ecosystem. Most roads act as dikes which block the natural flow of ground and surface water resulting in drastic changes in species composition. In most cases our roads hold water in certain forested stands for prolonged durations, thus, killing new regeneration and causing stress to the mature trees.

The lack of proper forest management has resulted in overstocking and extremely high basal areas which causes a great deal of additional stress on the forest. Other factors, such as the exclusion of fire, the past and present pumping of water from the farm units and the gradual rise of sea level have also contributed to the widespread decline in forest health on Alligator River NWR.

Over the past several years, a combination of various factors caused significant stress to loblolly pine and pond pine forests on the refuge, both of which are regarded as prime habitat for the endangered red cockaded woodpecker (RCW). The significant decline in forest health in these areas ultimately resulted in the southern pine beetle infestation which we have been struggling to control for four years now.

Unfortunately, due to the lack of knowledgeable and dedicated forestry personnel and sufficient funding, nearly all forest ecosystem health issues are not being addressed. The exceptions to this statement include: the Atlantic white-cedar restoration and hydrology restoration projects which are co-funded by the Department of defense, and the meager efforts to control southern pine beetles in or near RCW colonies or foraging habitat which have been funded by the U.S.D.A. Forest Service. These few projects alone have generated more than enough work to keep a forestry and maintenance crew busy for several years.

In this new era of Ecosystem Management within the Fish and Wildlife Service, we need to be placing more emphasis on forest management and forest health. A majority of wildlife species, some of which are endangered or threatened, depend on healthy forests for survival. Therefore, it is our duty to promote forest health throughout the ecosystem for the benefit of

all wildlife, especially endangered species such as the red cockaded woodpecker and the red wolf.

Atlantic white-cedar Restoration:

Atlantic white cedar (AWC) inventory, management and restoration continues to be the only form of forested habitat management performed on the refuge. The Atlantic white-cedar restoration project and AWC management as a whole has made significant progress in the past year. Several outstanding achievements include: the completion of the regeneration surveys on 3000 acres of cut-over AWC, the establishment of the Atlantic white-cedar Alliance, the large scale cedar planting being performed on Pocosin Lakes NWR, and an EPA grant was awarded to Christopher Newport University in the amount of \$750,000 for the sole purpose of conducting research on the ecology of AWC and its associated ecosystems.

Partnerships based on the restoration and management of AWC continue to thrive between the USFWS and the U.S. Air Force, North Carolina Division of Forest Resources (NCDFR) Research Section, Kelly N. Davis Wildlife Management Consulting, North Carolina State University, Richard Stockton College of New Jersey, and now Christopher Newport University.

The inventory of 3,000 acres of cut-over AWC on the refuge and range was completed in November of 1997. The amount of acreage sampled during the 1997 field season was an astonishing 1881-acres, more than twice that of 1996.

Accomplishing this monumental task was a direct result of having a highly dedicated and motivated field crew. We would not have been able to hire them if it had not been for the additional funding provided through the U.S. Air Force conservation funds. As a result of this funding, we were able to employ four forestry technicians for the entire 1997 field season through a private consultant contacted by the U.S. Air Force. Being able to hire technicians through a private contractor eliminated all of the personnel conflicts experienced in the past. In addition to these four technicians, the refuge renewed the NTE 1 year (GS-03) Biological Science Aid position held by Jan Tripp and also upgraded the position to a NTE 1 year Biological Science Technician at the GS-04 level. Jan Tripp was again chosen for this position. The final 1997 crew consisted of one USFWS NTE 1 year Biological Science Technician and four Forestry Technicians, hired by Kelly Davis, Wildlife Management Consultant, and funded by the USAF.



Sub-contracted Forestry Tech Brian Van Druten cuts a transect for the Atlantic white cedar Research project. FWS

For the first time ever, Alligator River significantly expanded its intern program to provide nearly all program areas with volunteer assistance. Between the refuges and range, a total of 14 interns were selected to work in a variety of program areas for a twelve week period. A group of eight interns participated in a rotational program which circulated them through the Atlantic white-cedar project and biological program at the refuge and the forestry and biological program at the range. Each rotation period lasted 3 weeks, thus providing the cedar project with a minimum of two interns at all times. A fairly dry spring and summer provided for much drier working conditions which also aided in accomplishing a tremendous amount of work.

The inventory was performed to determine current plant communities and associations occurring on these sites and help make informed decisions as to the future management for AWC on each of the sites. As part of the inventory, permanent plots will be established in several of the cut-over areas for the purpose of monitoring species competition and

composition, and AWC growth and mortality. The data collected will serve as a baseline of information necessary for making decisions regarding AWC forest restoration and development as well as long term management activities to be implemented on these sites.

Global Positioning Systems (GPS) and Geographic Information Systems (GIS) were both utilized to conduct the inventory work. Rover GPS units with hand-held data loggers were used to record plot data and geographic location of each plot. Map Info software is being utilized to create detailed and accurate GIS coverage for the entire refuge and range. It is our goal to eventually be able to incorporate all ecological and operational data into a GIS from which it can be geographically displayed and easier to comprehend.

Although all of the field work has been completed, it is taking a considerable amount of time to analyze the vast amounts of data. All data analysis should be complete in the Spring/Summer of 1998. As the data from each stand is analyzed it is incorporated into the GIS for the purpose of mapping and spacial analysis.

Once all of the field data was collected for the 3,000 acres of AWC clearcuts, the crew promptly began surveying the remnant AWC stands spared by the logging crews back in the 1970's and 80's. The inventory process in the remnant stands consists of recording data which represents the general health and physical characteristics of the stand. Several plots are sampled within the interior of the stand where data concerning stand purity, stand density, crown cover, micro-topography, hydrology and tree growth. All data is recorded with GPS units and hand held data loggers. Additional points are digitized along the outer fringes of the stand which will serve as reference points for digitizing the stand on the computer using digital aerial photography. The primary goal of this inventory is to determine how much AWC exists on the refuge, where it is located, and what stage of development it is in and how healthy is it. We are not conducting a standard timber cruise at this time. However, timber measurements may be collected at a later date if our management practices require such specific data.

Due to a significantly drier growing season this year, AWC cone collection was extremely productive. The cedar crew spent approximately four weeks harvesting and sorting AWC cones. Cones were gathered by cutting cone filled limbs from trees growing along the roadside. The limbs were then carried indoors where they were stripped of their seed cones. Cones were promptly sent to the NCDNR Nursery for seed extraction and germination testing. Seed collected this season will be stored along with last year's seed until our needs demand that they are planted for seedling production. The total amount of cones collected from Alligator River this year totaled 238 pounds (119 gallons). Cone collection efforts on neighboring refuges and other state and private sites proved to be equally productive.

Future project tasks include: completing the analysis of the regeneration data, inventory all remnant Atlantic white-cedar stands on the refuge (if time and funding allow), incorporate all data into a detailed and concise Geographic Information System, carry out prescribed silvicultural activities to help restore several of the cut-over areas, locate sites on refuge for

additional AWC planting, provide assistance to other neighboring refuges with regards to AWC management; and strengthen and expand upon our many partnerships

During 1998 data analysis began for the 45 clear-cuts surveyed between 1995 and 1997. Twelve remnant, mature stands were visited in 1998. Data were collected on age, diameter breast height, basal area, growth in the last 10 years, understory species present, health, and purity of the stand. This phase of work ended in early 1998 due to lack of funding. Approximately 176 acres of AWC were released with Arsenal on the Dare County Bombing Range. Refuge staff were involved in oversight and monitoring.

#### 4. Croplands

The acquisition of the 10,000 acre Prudential Farms in-holding in March, 1988 gave the refuge even greater diversity of habitats and a great potential for managed habitat for waterfowl, shorebirds, and wading birds. The tract included 5,100 acres of cropland. Prudential had developed the area from forested wetlands by encircling it with dikes and constructing drainage ditches. The area is drained by 5 pumps located at 2 pump stations. Each pump removes 250,000 gallons of water per minute from the farm fields. Pumping is required to keep the area dry enough to farm.

Reconversion of the area to a wetland habitat type is basically simple. It involves not pumping the areas where plans call for permanent water or reduced pumping on moist soil areas. This action is accomplished by judicious placement of new dikes and flash board risers in conjunction with existing dikes and building relatively small, permanent cross dikes. To date about 1,800 acres have been converted to moist soil units.

Refuge cooperative farmers had moderate production in 1997. Soybeans planted early had highest yields (30-35 bushels/acre). Above normal rainfall during the fall affected harvest, but not as bad as in 1996. Overall, farmers were able to harvest their beans and still plant nearly 1,000 acres of winter wheat during the early winter of 1997. Farmers disced approximately 100 acres in refuge moist soil units.

Approximately 120 acres of corn was planted on an experimental basis. The purpose of this planting was to assess the impacts of insect and bear depredation. Of the 120 acres planted about 30 acres survived the extremely abundant wireworm population. Typical yields for the soil types on the refuge are 100+ bushels per acre. Therefore, the 30 acres should have yielded around 3,000 bushels of corn. Because of bear depredation, yield from the remaining 30 acres was reduced to a total of about 200 bushels. Under present conditions, it is not economically feasible for farmers to grow corn on the refuge for the next couple of years until the pest population dies off for lack of a host plant.

The refuge portion of the crop produced for 1997 was 10.0 bushels of corn per acre farmed due to an increase in the price per bushel of corn of over \$3.00 per bushel. A decrease in the rent rate was determined necessary to avoid overcharging cooperative farmers. In 1993 the

refuge received 10 bushels of corn per acre and in 1994 this increased to 12 bushels per acre. After 1994 the rent rate was to increase of 13.5 bushels per acre until 1997 when the long term agreement was to be renewed. Since a good corn yield on this land is 100 bushels per acre, this is believed to be a reasonable rate. However, the rent rate is governed largely by the "going rate" for similar land and when corn prices result in excessive rent charge, it is prudent to modify the rate.

Price projections for winter wheat or other small grains planted in the fall of 1997 for harvest in 1998 were so low that two of the three farmers were not willing to gamble on losing more money. Therefore, they did not plant any winter crops for harvest in 1998. Only one farmer planted and harvested winter wheat and his average yield was about 23 bu/ac. Soybeans planted early had highest yields (about 30 bushels/acre) with an overall yield of 24-28 bu/ac.

Low prices severely affected the financial condition of the cooperative farmers. Farmers disced approximately 100 acres in refuge moist soil units.

With regards to moist soil management, only 30%-50% of each unit can be flooded by gravity flow. Since there are no pump stations capable of pumping water into the units, the remaining increases in water level are due to rain or portable pumps must be used. Given budget constraints, portable pumps were not used. As the wintering period progresses it is interesting to note that the higher elevation moist soil units gradually become flooded and waterfowl use shifts to these units. However, these units have considerably lower use overall when averaged over the season. Since habitat conditions were good to excellent throughout the wintering period, it is not likely that food sources were limiting use.

Cooperative farmers planted soybeans for harvest on approximately 300 acres of moist soil unit fields. One of the primary reasons for this action is to control undesirable vegetation. Waterfowl and shorebirds tend to use these units more because they are considerably more open than unfarmed moist soil units. Also, the soybean stubble and residual soybeans provide an excellent food source.

Food production in the moist soil units was good to excellent as most units contained a frequency of occurrence of good to fair waterfowl plant species within an overall range of 74% in 1997 and 70% in 1998. These frequencies correlate well with the portions of farm fields that can be effectively managed for moist soil vegetation. Shaping of the farm fields for surface drainage during land clearing results in about 1/3 of each field being too high and dry for cost-effective moist soil management.

Smart weed, fall panicum, foxtail, wild millet, and various sedges are among the common moist soil plants produced. The higher crowns in the middle of the field, especially near the headland ends of each field quickly become dominated by dog fennel, paspalum, goldenrod, and ragweed. The tables below show percentages of plant species based upon a relative value as waterfowl food.

<b>1997 Alligator River National Wildlife Refuge</b>				
<b>Moist Soil Waterfowl Food Production</b>				
	<b>Frequency of occurrence (%)</b>			
<b>Moist Soil Unit</b>	<b>Good</b>	<b>Fair</b>	<b>Non</b>	<b>Other</b>
South Twiford Unit A	26.5	25.6	47.9	0
South Twiford Unit B	51.4	33.2	15.4	0
South Twiford Unit C	42.3	31.7	26.0	0
South Twiford Unit D	37.6	12.8	49.6	0
South Twiford Unit E	25.8	35.2	39.0	0
North Twiford Unit A	42.9	37.0	20.1	0
North Twiford Unit B	53.1	19.4	27.5	0
North Twiford Unit C	59.2	31.2	9.6	0
North Twiford Unit D	26.4	34.4	39.2	0
Creef A-1 North	46.0	42.5	11.5	0
Cont. Creef A-1 South	60.5	24.7	14.8	0
Creef A-2	52.0	37.2	10.8	0
Average =	44	30	26	0
Overall food/non-food production =	74		26	

<b>1998 Alligator River National Wildlife Refuge</b>				
<b>Moist Soil Waterfowl Food Production</b>				
	<b>Frequency of occurrence (%)</b>			
<b>Moist Soil Unit</b>	<b>Good</b>	<b>Fair</b>	<b>Non</b>	<b>Other</b>
South Twiford Unit A	23.7	34.2	42.6	0
South Twiford Unit B	48.2	27.7	24.2	0
South Twiford Unit C	34.1	55.1	10.8	0
South Twiford Unit D	22.2	14.3	63.6	0
South Twiford Unit E	17.6	34.2	48.2	0
North Twiford Unit A	48.6	30.9	20.6	0
North Twiford Unit B	35.7	29.2	35.1	0
North Twiford Unit C	45.0	30.5	24.5	0
North Twiford Unit D	33.5	32.1	34.8	0
Creef A-1 North	34.9	48.3	16.9	0
Creef A-1 South	46.7	30.7	22.6	0
Creef A-2	46.3	34.5	19.3	0
Average =	36.38	33.48	30.27	0
Overall food/non-food production =	70		30	

## 9. Fire Management

### Fire Management Program Overview:

Fire Management Planning initiated in 1996 was started and halted several times during 1997 as prescribed burning and wildfire suppression took higher priorities. The refuge was broken down into Fire Management Units and these units further divided into compartments and burning units. Work on these plans continued into 1998 and were finalized in August after an indepth public involvement process where FMO Crews and RM Bryant met with Congressional staffers, County Commissioners, Sheriff Department and other agency staff members, the local community organizations and volunteer fire departments.

A reorganization of the Alligator River National Wildlife Refuge fire crew reflects the staffing plan that was approved in 1995. Personnel actions converted Craig Schiebel to career seasonal firefighter (FF), Donnie Harris to permanent firefighter equipment operator (FFEO), and Eric Meekins to permanent firefighter (FF) (crew leader). The new Fire Control Officer (FCO), Glen Stratton, added a tremendous amount of depth to our fire management program. This has allowed FMO Crews to function more as a district resource. It has also allowed him for the first time to devote more attention to prescribed burning and fire management planning than in years past – both on ARNWR and the other refuges. With our permanent and career seasonal firefighters, and new FCO on board, Alligator River NWR had the best qualified fire crew ever. Combining our fire funded personnel, with the other red-carded refuge operations staff enabled us to expand our fire crew. The interest that the Refuge staff takes in wildfire suppression and prescribed burning activities made a tremendous difference. It gave the fire program at Alligator River the depth it needs to conduct safe and effective fire management operations. It also prepared us to begin a landmark year in our District burning program.

**Dispatch Operations:** Alligator River was able to set up a zone dispatch office for the Refuges in Eastern North Carolina in 1997, using a blend of Operations, Maintenance - Special Projects (1260) and Fire (9251) funding. Veteran Refuge employee Jim Beasley was moved into the dispatcher position with a minor amount of retraining. This move paid big dividends by improving our fire and aviation safety on all the Eastern NC Refuges. Our dispatch office assisted in providing 15 minute flight following services on approximately 400 to 500 hours of fire and biological flights annually and was heralded as the best aviation management dispatch programs in the refuge system. Fire dispatch operations, likewise, improved dramatically, with the fire dispatcher working closely with Pocosin Lakes, Mattamuskeet, and Alligator River NWR Fire Operations staffs. Routine duties included the collection of weather data, setting the fire danger readiness levels, assessing available initial attack resources, coordinating with cooperators, and broadcasting this information to all area refuges during moderate or higher readiness level days. Having a well-trained and competent dispatcher was a great asset. It provided closer operational communications on all wildfire suppression efforts, prescribed burning projects, hurricane response actions and refuge operations activities throughout the year. A satellite-linked weather service unit and two desktop PC's with internet access complemented the highband, lowband, and aviation radio equipment in the dispatch office.

**Prescribed Burning Activities:** The Alligator River Fire Crew contributed to an increase in the program of prescribed burning throughout the Eastern North Carolina Refuges. Teaming up the Alligator River fire crew with those from Pocosin Lakes, Mattamuskeet, and Mackay Island, gave us a multi-talented, capable task force of personnel and increased equipment resources.

After conducting prescribed burning operations at Cedar Island in December of 1996, the ARNWR crew worked with the other district fire personnel to complete the prescribed burning of 8,000 acres at Swanquarter NWR in January and February of 1997. The key

urban interface burning unit at Pea Island's south boundary (at Rodanthe, NC) was burned as were an additional 3,200 acres of waterfowl impoundments, moist soil units, and agricultural fields at Alligator River. We were even able to complete the first pocosin prescribed burn on Alligator River Refuge by burning about half the Blueberry Unit (approximately 350 acres). All total, the Eastern North Carolina Refuges conducted over 17,000 acres of prescribed burns in 1997.



Prescribed burning on Alligator River NWR.

TC

The prescribed burning activities fell off significantly during 1998, as the refuges were forced to spend more time completing the Refuge Fire Management Plans. The Regional Fire Management Coordinator would not approve any prescribed burning without the FMP's in place.

#### 1997 Prescribed Burns

Quad 2.1.3	339
S. Twiford	600
PI West Island	200
Butler #1	1,502
Long Shoal River	300
Creef	200
N. Twiford W.	250
Laurel Bay 2	120
Bluestk#1	250
LSR2.5.4	450
Quad 2.1.1	400
Quad 2.1.2	500
Total	<b>5,111 acres</b>

**1998 Prescribed Burns**

LSR 2.5.5	1,701
Blueberry 3	382
N. Twiford	750
4SR 2.5.2	661
Pea Island	616
Rodanthe	230
Total	<b>4,340 acres</b>

**Wildfire Activity:** A total of five wildfires for 154 acres occurred in 1997 and four fires for 0.8 acres in 1998. In 1997, FWS fire personnel assisted the NPS with a fire at the Bodie Island lighthouse area, and assisted the state with fires at the Dare County landfill and on Bluewing Road. In 1998, one assist at the landfill and one with NPS was also recorded.



Refuge personnel assisted with a 1998 fire at the Dare County landfill which is adjacent to the Refuge.

USFWS

Fire weather during the 1997 spring fire season was moderated by high water levels as a residual effect of the 1996 hurricanes. However, on April 7, the Dare Bombing Range experienced a military use related project wildfire (The Bluewing Road Fire) on a day when the winds were blowing 20-24 mph and the relative humidity was down to 17%. NPS pilot Bob Trick reported the fire at 7:15 a.m. and sized it up for the personnel stationed at the Range.

Alligator River fire crew mobilized to assist the North Carolina Forest Service (NCFS) when it became apparent that this fire had significant potential to affect the Refuge. The USFWS helicopter and a taskforce consisting of two flextracks, a heavy dozer, and two engines were

dispatched to the fire. Tom Crews and Glen Stratton were assigned as strike team leaders on Division A and given the task of leading their two strike teams of operators driving flextracks with plows (two from USFWS and four from the NCFS) in a direct attack on the left flank of the fire. (This was the first time that non-state personnel were placed in a fireline supervision position over NC Forest Service resources). Maneuverability was very poor and it was everything the USFWS and State tractors could do to stay up and operating. Each tractor became stuck numerous times. Fire behavior was extreme, with crowning and torching at the head of the fire and very high flames on the flanks. The fire burned through southern pine beetle killed timber with over a foot of pine litter on the ground in places. The use of the NCFS single engine air tankers and scout plane was critical to safe fire operations. Fortunately, by 1:00 p.m. that afternoon the wind started to diminish and the humidity came back up to 20%. The fire was contained by 3:00 p.m. that afternoon at around 325 acres.

Our folks worked extremely well with the NCFS on the Bluewing Road Fire. Our tractor operators learned much about our equipment and were able to refine our tactics in plowing on extremely wet soils with poor maneuverability conditions. FWS personnel assisted in the mop-up phase of this fire the following day and a subsequent rainfall allowed the fire to be called controlled within a matter of a few days. NC Forest Service and US Air Force and Navy officials were extremely grateful for the assistance on this incident. Cooperative relations were greatly enhanced by our participation on this fire.

There were numerous small wildfires that were contained at less than one acre or declared as natural outs on Alligator River and Pocosin Lakes Refuges this year. The 150 acre Creef Cut wildfire, which resulted from groundfire becoming established in the wooded blocks around the farm fields, kept the fire crews from all the refuges very busy for about a week. The National Park Service "Lighthouse Fire" at Bodie Island occurred in June. Firefighters from Alligator River, Pocosin Lakes, and Mattamuskeet Refuges assisted in the suppression of this marsh and brush fire. Later in August, the Alligator River Crew assisted Pocosin Lakes in the control of the 130 acre Sunday Best Wildfire.

Drought indices for 1997 fluctuated from low to moderate to low and then started climbing during the summer, continuing on into early fall. By late fall, El Nino was pumping the low pressure systems into the weather patterns affecting Eastern NC, and the drought was quickly over. Fire danger seemed to be a normal pattern for the summer and the fire season lasted later than usual, reaching into August and September.

The Fire Season in 1998 again consisted mostly of small fires that were fairly easily contained. The largest fire in the District was the Rumley's Hammock Wildfire at Cedar Island, with 2,500 acres burned. The ARNWR fire crew assisted on this fire using the Mattamuskeet marshmaster.

**Equipment:** The major retrofit of fire tractor AX-4 (Flextrack) in 1996 paid dividends on the 1997 Bluewing Road Fire on the Bombing Range. Likewise, the modifications to AX-2 (Flextrack) greatly enhanced in-woods performance of this machine. The work performed on the fireplows for these tractors also paid off. Other changes were made to improve equipment performance as the year went on.

The retrofit of AX-5, our first fulltracked off-road utility vehicle/tractor (retrofitted military surplus M-548 Cargo/Personnel Carriers) was completed. It was outfitted with high band and low band radios, a 250 gallon tank with small pump, and 100 gallon terratorch. This machine was used in numerous prescribed burning activities and wildfire suppression activities this year. The results of the field use of this tractor has everyone on the Alligator River and Pocosin Lakes fire crews excited about continuing the development of these important new tractors. AX-5 was actually deployed in the suppression of the Buck Run Fire initial attack operation in the grasslands at Pocosin Lakes NWR. This tractor was used as a wildland engine on the off-road side of the fire in an anchoring and flanking tactic, assisting a USFWS tractor plow. When the D-6 tractor plow got stuck while crossing a v-ditch, the operator and crewman were able to winch out their tractor by anchoring their winch cable to the AX-5.

The Mattamuskeet Gotract Flextrack (AX-4) was transferred to Alligator River where it has resided since retrofit in 1996. AX-4 had a major breakdown involving the rear differentials and associated axils that had to be re-built. Finding a local mechanic proved difficult, and once that was settled, it took several months for the mechanic to diagnose the problem, order parts, and affect the repairs needed.

The Alligator River Fire Crew retrofitted Engine 2, stripping the truck down to the chassis and cab, repainting the vehicle and rebuilding the pumper assembly. The resulting new engine is a Type 6 engine with a 200 pound tank and is much more user-friendly with lots of great new features. It has a much better vehicle handling capacity on and off the road with a 2,000 pound reduction in weight. This engine formerly weighed over 13,000 pounds fully loaded, exceeding the 13,000 pound GVW (gross vehicle weight).

Two Marshmaster II marsh buggies were purchased for the Refuges in Eastern North Carolina. One was purchased with Hurricane recovery money to replace the old marsh buggy, from Mackay Island, that was out of commission. It will be used to repost boundary lines and perform cleanup operations in the intertidal marshes. The other was purchased with fire money to provide suppression and presuppression fire management services on the Refuges. The first machine was stationed at Mackay Island, the second at Mattamuskeet. The two Marshmasters added another dimension to our abilities to conduct safe prescribed fire and wildfire suppression activities on the Refuges in Eastern North Carolina.

A Dresser International TD-12 Dozer was purchased with Hurricane funds in 1997 to repair dikes and roads and other infrastructure damaged by Hurricanes Fran and Bertha. This tractor may also become a key resource for fire control on our refuges in the future as well. The TD-12 is considered to be one of the best heavy LGP (low ground pressure) fire tractors available today.

New mobile radios were ordered to replace the charger units in the engines and other emergency fire equipment. A Communications Audit was requested and performed by the USFWS National Radio Coordinator in August of 1997.

**Fire Training:** Fire training in 1997-1998 included sending personnel away to receive critical courses and teaching local training courses. Standards for Survival, and Tractor and Plow Safety (TAPS) and Look-up/Down/Around were taught to around 50 District Personnel each spring during the pre-fire season annual firefighter refresher training. Basic Firefighter Training (S-130) and Basic Fire Behavior (S-190) courses to a group of 12 new personnel, including USFWS, USAF and NCFS. We helped the NPS teach S-130 and S-190 to the Dare County Volunteer Fire Departments. S-260 Interagency Incident Business Management was sponsored at Pocosin Lakes NWR. SA-10 Territorch training was taught at the ARNWR shop, and Helitorch Operations Training was taught there as well.

**Fire Research:** Roger Hungerford and his research group have been conducting fire management research on the Dare County Bombing Range to study the feasibility and affects of prescribed burning in pocosins. This important landmark research study was funded by the US Air Force, but the USFWS has cooperated by assisting in the collection of field data and other information. The spare Remote Operated Weather Station from Alligator River was loaned to the research project to assist in the collection and monitoring of weather data. Late this year, we learned that phase II of this project was funded. This will include the conducting of prescribed burning operations on the DBR, and we will send resources to assist in the second phase as well. We are learning much about conducting prescribed burning operations from this research as well.

## 10. Pest Control

- a. Pest Plants: Cooperative farmers use herbicides and insecticides for pest control on croplands. Pesticide Use Proposals and Pesticide Use Reports are submitted on an annual basis in accordance with Service policy and guidelines. Extra efforts are required to control Phragmites communis in farm fields and moist soil units. These efforts include herbicides, burning, and disking where possible. During 1998, approximately 12 acres of Phragmites were treated with RODEO.
- b. Southern Pine Beetle: Control measures for the Southern pine beetle (SPB) at Alligator River NWR were substantially increased in 1998. Contractors with equipment capable of working efficiently in pond pine pocosin habitat were identified and contracts were issued. Despite wetness, organic soils, and dense understory vegetation, hand crews and a mechanical feller-buncher were successful in cutting buffers around active infestations.

Spring 1998 Contract - This contract enabled protection for 280 acres of pond pine pocosin with two active red-cockaded woodpecker clusters. Cut and leave was practiced throughout the contract because of the low value of the timber and remoteness of the area from the nearest mill. This was done by cutting approximately 14 acres of buffer and 6 acres of travelway with a feller-buncher. Payment was made by the acre. Total cost for this contract was \$39,000.00.

AR Fire Crew Hand Felling 1998 - The Alligator River Fire Crew assisted in hand felling a 2 acre buffer around a very active 0.4 acre SPB infestation. High ambient temperature and humidity as well as ground bees made the job more difficult, but it was finished in

approximately eight working days. They also assisted in cleaning up a "slop-over" from the Spring 1998 contract that encroached an active RCW cluster. Approximately 80 trees were cut in one day to stop the active head and further protect cavity trees.

Fall 1998 Mechanical Felling Contract - This project was very similar to the Spring 1998 contract, except payment was made by the hour. The same contractor was awarded the job. Under this contract five active spots were controlled by cutting about 64.55 acres of buffers. Total cost for this contract was \$38,000.00.

Fall 1998 Hand Felling Contract - A contract for the cutting of 1000 trees by a hand crew was awarded. A two man crew cut the 1000 trees in approximately one month. Total cost for this contract was \$13,980.00.

Pre-suppression & Monitoring 1998 - Many hours were spent on the ground preparing sites for the contracts. Twelve spots were prepared for contractors by cutting trails to active areas and either flagging or painting those areas. Personnel from Virginia Polytechnic Institute and State University continued use of Verbenone, a SPB pheromone, as a treatment on the refuge. Aerial monitoring is the most practical method. Approximately nine hours of aircraft time were required for monitoring infestations.

Mapping - During 1998, all active and inactive SPB infestations within refuge boundaries were located using GPS technology. This required approximately 7 hours of helicopter time for collecting locational data and many additional of computer time to produce final maps.

SPB Summary - Efforts to control SPB infestation increased from 0% to 32% in 1998. This was due largely to our having badly needed funds for contracts and oversight.

Cooperative farmers use herbicides and insecticides for pest control on croplands. Pesticide Use Proposals and Pesticide Use Reports are submitted on an annual basis in accordance with Service policy and guidelines. Extra efforts are required to control *Phragmites communis* in farm fields and moist soil units. These efforts include herbicides, burning, and discing where possible.

## G. WILDLIFE

### 1. Wildlife Diversity

The vast expanse of undisturbed swamp forest and wetlands on the refuge contains many important wildlife and ecological resources. Since much of the Pamlico peninsula has been developed by clear-cutting, peat mining, and agricultural conversion, this area remains one of the most remote and diverse swamps in eastern North Carolina.

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 supports wildlife species which are important

from both a regional and a national standpoint. Its large size and dense vegetation make the refuge a haven for species such as the black bear. Also, the refuge harbors many species adapted to living in forested habitat as opposed to disturbed areas such as field edges. The refuge also provides habitat for the endangered red-cockaded woodpecker and migrating bald eagle and peregrine falcon. Alligator River NWR also lies at or near the northern limit of ranges for several vertebrate species, most notably, the American alligator.

## 2. Endangered and/or Threatened Species

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

### a. Federally Listed Endangered and Threatened Species

**American alligator (Threatened by Similarity of Appearance):** American alligators reach the northern extent of their range on the refuge and probably were never very numerous in the area. The highest density alligator population is consistently found on Whipping Creek

Lake. A few have been seen each year in the marshes, ponds, streams, and canals. Alligator surveys were not conducted in 1997 or 1998 due to insufficient funding and staffing.

One nest was located on the shore of Lost Lake. Fourteen nestlings were observed near the nest site.

**Bald eagle (Endangered):** During the course of the year immature and adult eagles were observed on the refuge. Although eagle sightings are becoming more common, no eagle nests have been confirmed on the refuge as of this writing.

**Peregrine falcon (Endangered):** Peregrine falcons are known to move through the refuge during migration. No reports of peregrine falcons occurred during 1997 or 1998.

**Red-cockaded woodpecker (Endangered):** Trails were cut to previously tagged cavity trees south of Whipping Creek Road. Rapidly spreading infestations of Southern pine beetle are threatening cluster sites and foraging habitat. Attempts to control the Southern pine beetle outbreak will continue

### **Red wolf (Endangered):**

#### Red Wolf Wild Population

The Red Wolf Recovery Program of the U.S. Fish and Wildlife Service, located in northeastern North Carolina, manages the world's only wild red wolf (*Canis rufus*) population. A second reintroduced population located in the Great Smoky Mountains National Park was cancelled in Fiscal Year 1998 due to low pup survival and the inability of wolves to establish home ranges within the park.

In Fiscal Years 1997-98, the red wolf population in northeastern North Carolina was estimated to be 70-80 animals. In Fiscal Year 1997, there were 13 known packs of red wolves and 21 pups were born. In Fiscal Year 1998, there were 15 known packs and 12 pups born.

#### Red Wolf Captive Breeding Program

As part of the Red Wolf Recovery Program, the Red Wolf Captive Breeding Program is effectively implemented by 33 captive facilities across the United States. In Fiscal Year 1998, there were 178 red wolves in the captive population. The captive breeding effort is coordinated by the Red Wolf Species Survival Plan leader located at the Point Defiance Zoo and Aquarium in Tacoma, Washington. This breeding program maintains genetic diversity among red wolves and prepares a small number of red wolves for possible release into the wild. In Fiscal Year 1997, two male pups born in a pen in the Smokies were fostered to a wild litter in the Smokies.

#### Red Wolf Island Programs

The Red Wolf Recovery Program and Red Wolf Captive Breeding Program partner with two U.S. Fish and Wildlife Service national wildlife Refuges to raise red wolves in wild settings on islands. Young wolves growing up on these islands learn survival skills that prepare them for release into the wild red wolf population in North Carolina in the vicinity of the Alligator River National Wildlife Refuge. The Cape Romain National Wildlife Refuge in South Carolina maintains a red wolf family group (2 to 5) on Bull Island that produces pups for eventual release in North Carolina. The St. Vincent Island National Wildlife Refuge in Florida maintains a pair of red wolves, also for breeding in the wild. In Fiscal Year 1998, the island propagation program on Horn Island, part of the Gulf Islands National Seashore in Mississippi, was cancelled due to the increasing likelihood of wolf and visitor interactions. The island programs play vital roles in the red wolf captive breeding program via education and producing wild-born red wolf pups for release.

#### Red Wolf Landowner Agreements

The Red Wolf Recovery Program is partner to conservation and access agreements with owners of private land. These tracts of land are strategically selected to maximize monitoring of red wolves and other canids in the northeastern North Carolina five county experimental population area. In Fiscal Year 1997, we entered into conservation agreements with four landowners while utilizing \$5,700 in Landowner Incentive Funds. In Fiscal 1998, we held six agreements with landowners, totaling \$8,700 in Landowner Incentive Funds.

EASTERN NORTH CAROLINA PRIVATE LAND AGREEMENTS –  
Red Wolf Partners

<b>1997</b>			
<u>OWNER</u>	<u>COUNTY</u>	<u>ACREAGE</u>	<u>COST</u>
Agri-East	Washington	6,500	\$1,500
Holbert	Hyde	1,000	\$1,000
Mattamuskeet Ventures	Hyde	18,000	\$2,000
Williams	Hyde	3,000	\$1,200
<b>TOTAL</b>		<b>28,500</b>	<b>\$5,700</b>

Cost/Acre: .20

<b>1998</b>			
<u>OWNER</u>	<u>COUNTY</u>	<u>ACREAGE</u>	<u>COST</u>
Agri-East	Washington	6,500	\$1,500
Bluestone Farms	Washington	7,000	\$1,500
Holbert	Hyde	1,000	\$1,000
Mattamuskeet Ventures	Hyde	18,000	\$2,000
Mormon Church	Tyrrell	8,500	\$1,500
Williams	Hyde	3,000	\$1,200
<b>TOTAL</b>		<b>44,000</b>	<b>\$8,700</b>

Cost/Acre: .20

**b. State Listed Endangered and/or Threatened Species**

Of other species occurring on the refuge and not federally listed, the State of North Carolina lists some as endangered, threatened, special concern or significantly rare. Although the refuge is not managed for all of these species, present practices do provide benefits for many of them. Species occurring on the state list and refuge are:

**Caspian tern** (Special Concern): Caspian terns are not likely to be seen on most of the refuge. They may be observed flying over the waters of Pamlico Sound, Croatan Sound, Albemarle Sound, Alligator River, and creeks and lakes within the refuge. There are no sites suitable for nesting on the refuge.

**Roseate tern** (Endangered): Roseate terns are not likely to be seen on most of the refuge. They may be observed flying over the waters of Pamlico Sound, Croatan Sound, Albemarle Sound, Alligator River, and creeks and lakes within the refuge. There are no sites suitable for nesting on the refuge.

**Gull-billed tern** (Threatened): Gull-billed terns are not likely to be seen on most of the refuge. They may be observed flying over the waters of Pamlico Sound, Croatan Sound,

Albemarle Sound, Alligator River, and creeks and lakes within the refuge. There are no sites suitable for nesting on the refuge.

**Black skimmer** (Special Concern): Black skimmers are not likely to be seen on most of the refuge. They may be observed flying over the waters of Pamlico Sound, Croatan Sound, Albemarle Sound, Alligator River, and creeks and lakes within the refuge. There are no sites suitable for nesting on the refuge.

**Black-necked stilt** (Special Concern): Black-necked stilts are not likely to be seen on most of the refuge. They may be observed flying over the waters of Pamlico Sound, Croatan Sound, Albemarle Sound, Alligator River, and creeks and lakes within the refuge. There are no sites suitable for nesting on the refuge.

**Little blue heron** (Special Concern): The little blue heron is found around canals and on creeks throughout the refuge. Very little is known about numbers of birds on the refuge. Nesting has not been documented on the refuge.

**Snowy egret** (Special Concern): The snowy egret is found around canals and on creeks throughout the refuge. Very little is known about numbers of birds on the refuge. Nesting has not been documented on the refuge.

**Tri-colored heron** (Special Concern): The tri-colored heron is found around canals and on creeks throughout the refuge. Very little is known about numbers of birds on the refuge. Nesting has not been documented on the refuge.

**Glossy ibis** (Special Concern): The glossy ibis is found farm fields within the farm unit. Very little is known about numbers of birds on the refuge. Nesting has not been documented on the refuge.

**Anhinga** (Special Concern): The anhinga is found around creeks and lakes mostly on the southern end of the refuge. Very little is known about numbers of birds on the refuge. Nesting has been documented on the refuge but has not been confirmed in several years.

**Peregrine falcon** (Endangered): The Arctic peregrine can be observed on the refuge with some regularity. Nesting does not occur on the refuge.

**Carolina water snake** (Special Concern): The Carolina water snake is found throughout the refuge in canals, marsh, creeks, and other water bodies where there is an adequate food supply. Little is known about the life history of this species on the refuge

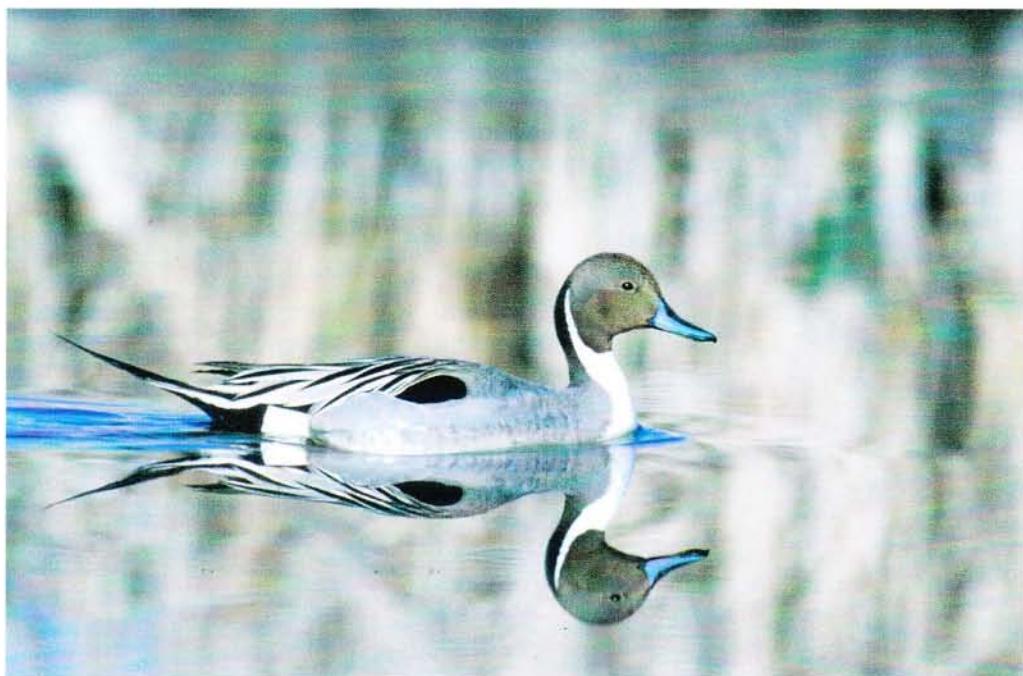
### 3. Waterfowl

Historically, large numbers of waterfowl did not use ARNWR because of the forested character, but the refuge supports a substantial year-round population of wood ducks using the numerous ditches, canals, creeks, lakes, natural openings, and swamps. A large number of waterfowl species could be found on the Alligator River and the associated sounds.

Addition of the 5,100 acres of farmland in 1988 substantially increased opportunities for waterfowl management. This management has been achieved primarily by converting farm fields, classified as prior converted wetlands to moist soil management units.

1997: Results of the 1997 surveys are given in the table below. Peak numbers during the 1996-1997 survey period were 1,537 mallards, 301 blacks, 4,788 pintails, 2,850 green-winged teal, and 778 ring-neck ducks. This compares to 1,901 mallards, 1,580 blacks, 15,310 pintails, 2,393 green-winged teals, and 1,103 ring-neck ducks during the 1995-1996 season. It is interesting to note that Tundra swan peak use has steadily increased from 448 in 93-94, 488 in 94-95, 1,100 in 95-96, and 1,113 in 96-97.

It appears that overall waterfowl use decreased substantially during the 1996-1997 survey period in comparison to the 1995-1996 survey period. Analysis of use days showed a 46% decrease in use by waterfowl in comparison to last year. Species such as the tundra swan, Canada geese, green-winged teal, and coot showed increases in use. Other species such as the mallard, black duck, blue-winged teal, wood duck, and ring-neck duck showed decreases in use.



Northern pintails frequent the moist soil units at Alligator River NWR. USFWS.

**Composition of wintering waterfowl at Alligator River NWR  
during the 1996-1997 survey period.**

SPECIES	PEAK PERIOD	Survey Peak #	# USE DAYS 1996-97	% TOTAL USE DAYS 1996-97	USEDAYS % diff from 1995-96 avg	USEDAYS % diff from long-term avg
Tundra swan	Jan	1,113	84744	12.5	+9	+202
Snow goose	n/a	0	0	0	0	0
Canada goose	Dec	24	920	0.1	+14	-8
Mallard	Feb	1,537	76186	11.2	-37	+33
Black	Dec	301	17663	2.6	-76	-37
Gadwall	Dec	175	4744	0.7	-95	-60
Wigeon	Dec	310	18696	2.8	-71	+35
Pintail	Dec	4,788	252565	37.3	-61	+8
GWT	Dec	2,850	152015	22.4	+55	-19
BWT	n/a	0	0	0	n/a	n/a
Shoveler	Mar	17	754	0.1	-86	-47
Wood	Dec	75	4432	0.7	-75	-83
Ringneck	Jan	778	27003	4.0	-3	-71
Redhead	n/a	0	0	0	n/a	n/a
Canvasback	n/a	0	0	0	n/a	n/a
Scaup	n/a	0	0	0	n/a	n/a
Unknown	n/a	0	0	0	n/a	n/a
Bufflehead	n/	0	0	0	n/a	n/a
Ruddy	n/a	0	0	0	n/a	n/a
Merganser	n/a	0	0	0	n/a	n/a
Coot	Jan	1,160	37685	5.6	+980	+442

1998: Results of the 1998 surveys are given in the table below. Peak numbers during the 1997-1998 survey period were 1,605 mallards, 361 black ducks, 5,164 pintails, 5,262 green-winged teal, 350 wood ducks, and 471 ring-neck ducks. This compares to 1,537 mallards, 301 black ducks, 4,788 pintails, 2,850 green-winged teals, 75 wood ducks, and 778 ring-neck

ducks during the 1996-1997 season. It is interesting to note that Tundra swan peak use has steadily increased from 448 in 93-94, 488 in 94-95, 1,100 in 95-96, 1,113 in 96-97, and 2,046 in the 97-98 season.

It appears that overall waterfowl use increased substantially for some species during the 1997-1998 survey period in comparison to the 1996-1997 survey period. The tundra swan, gadwall, green-winged teal, and shoveler showed the greatest increases. Other species such as mallard, black duck, coot, and ring-neck duck showed decreases in use. The Canada goose numbers are indicative of resident geese as the refuge moist soil units are not used by either the migrant Canada goose or snow goose.

**Composition of wintering waterfowl at Alligator River NWR  
during the 1997-1998 survey period.**

SPECIES	PEAK PERIOD	Survey Peak #	# USEDAYS 1997-98	% TOTAL USEDAYS 1997-98	USEDAYS % diff from 1996-97 avg	USEDAYS % diff from long-term avg
Tundra swan	Jan	2046	117995	15.3	+39	+218
Snow goose	n/a	0	0	0	0	0
Canada goose	Jan	5	72.5	0.01	-92	-92
Mallard	Jan	1605	61277	7.9	-20	+6
Black	Dec	361	15498	2.0	-12	-42
Gadwall	Feb	758	15343	2.0	+223	+25
Wigeon	Jan	631	19442	2.5	+4	+35
Pintail	Jan	5164	261609	33.9	+4	+11
GWT	Jan	5262	233797	30.3	+54	+21
BWT	Jan	125	2221	0.3	*	+352
Shoveler	Jan	75	1641	0.2	+118	+14
Wood	Dec	350	5628	0.7	+27	-76
Ringneck	Jan	471	17128	2.2	-37	-80
Redhead	Dec	6	36	0.01	*	*
Canvasback	Jan	6	67	0.01	*	*
Scaup	Dec	2	13	0.01	*	*
Unknown	Dec	250	1157	0.1	*	-96

<u>Cont.</u>	<b>SPECIES</b>	<b>PEAK PERIOD</b>	<b>Survey Peak #</b>	<b># USEDAYS 1997-98</b>	<b>% TOTAL USEDAYS 1997-98</b>	<b>USEDAYS % diff from 1996-97 avg</b>	<b>USEDAYS % diff from long-term avg</b>
Bufflehead	n/a	0	0	0	0	*	*
Ruddy	Feb	40	456	0.1	*	*	
Merganser	Feb	2	22	0.01	*	-22	
Coot	Feb	405	18341	2.4	-51	+123	

\* = insufficient observations during previous seasons for analysis

The Wood Duck Nest Box Program was inactive until late summer 1997 and mid summer in 1998 due to insufficient funding and staffing. Nest box sites were revisited, checked for use, cleaned, and repaired. Boxes that were damaged beyond repair were removed. Thirty-nine boxes remained throughout the refuge in 1997 and only thirty-four in 1998. Currently, the Wood Duck Nest Box Program is being re-evaluated. Use of nest boxes continues to be low, approximately 2% of the nest boxes showed signs of wood duck use in 1997 and 8% in 1998. However, nest boxes were used by other bird species as well as squirrels and bees. In 1998 eight boxes were used by prothonotary warblers, two by great crested flycatchers, and one screech owl.

#### 4. Marsh and Waterbirds

Although management of moist soil units is focused on waterfowl, numerous other marsh and waterbird species can be observed in these units. Herons, egrets, and rails, appear to be most numerous. Killdeer, woodcock, and snipe are common. Kingfishers are often seen adjacent to canals with deeper, more permanent water. At the present time, there are no formal surveys for these species.

#### 6. Raptors

Many raptor species can be observed on the refuge. Among the most common species are the red-tailed hawk, red-shouldered hawk, and northern harrier (marsh hawk). The kestrel and merlin are also common species. Owl species include great-horned owl, barred owl, short-eared owl, and screech owl.

#### 7. Other Migratory Birds

The refuge is host for migratory species such as the mourning dove. In addition, the vast expanse of relatively unfragmented forested habitat on the refuge provides for a wide range

of neotropical migrant birds. There are tentative plans to begin neotropical migrant bird surveys as soon as budgets and staffing permit.

#### 8. Game Mammals

White-tailed deer are relatively common on the refuge. Although carrying capacity for pocosin habitat is considerably less than bottomland hardwoods or several other habitat types, deer populations appear to be doing satisfactory. During the 1996-1997 and the 1997-1998 seasons, some hunters expressed concerns over a fairly liberal doe season. Impacts of doe harvest will be discussed with the state district biologist.

#### 10. Other Resident Wildlife

Wild turkeys were rarely observed. One turkey was observed on Buffalo City Road in July, 1997. Two wild turkey observations were reported in 1998. One occurred on Buffalo City Road near the intersection with Osprey Road and the other was on Sawyer Lake Road near Milltail Road. No other observations were made after that sighting.

#### 15. Animal Control

Beaver numbers are rapidly increasing and so are all of the associated problems. Beaver population management practices have been implemented and will most likely become a permanent component of refuge management activities.

#### 16. Marking and Banding

Although the quota was not met, wood duck banding was successful in that over 100 birds were banded. Considerable effort was expended toward swan banding. A few swans were banded prior to spring migration.

### H. PUBLIC USE

#### 1. General

Total visits to the Refuge in were estimated to be 18,681 in 1997 and 27,081 in 1998. Administrative offices for the Refuge remained in the General Services Administration (GSA) leased office space in Manteo. In 1998, a proposal was considered and approved to expand the office space (by 2,248 square feet) to include room for the local WHM Office (WB Noffsinger and OA Jones) and for the red wolf program. A few visitors continue to locate the office, but most information is disseminated through web pages, telephone, correspondence, or the news media. The new web pages sponsored by Ruffin and Associates through a partnership with CWRS came online. WIS Strawser responded to 4,841 e-mail requests for information throughout the year. During 1998, the Refuge continued to focus on providing a greater number of media contacts while keeping the messages short and simple. There were a total of 8 news releases in 1997 and 18 news releases 1998.

In 1997, the red wolf program received a lot of attention as personnel were interviewed by an NCTC TV Production Crew for a new red wolf video; a local paper covered the story on the Federal Register's publication of a decision not to delist the red wolf; CNN interviewed personnel for an Earth Matters segment; and Field Coordinator Kelly was interviewed for an article in Sierra Magazine on carnivore restoration.

Richard Mattison, along with RM Bryant, DRM Wallace and WIS Strawser conducted research toward developing visual aids and a conceptual site plan for marketing purposes for the 35 acre refuge tract on the north end of Roanoke Island. The Refuge hosted a stakeholders/partners meeting to discuss the development of a visitor center and administrative site on this tract. County, State, Federal, and NGO representative participated. CWRS contracted Wilderness Graphics to facilitate the meeting and produce an Interpretive Prospectus and Conceptual Plan.

The HWY 64/264/Croatan Sound Bridge project will upgrade U.S. Hwy 64/264 from the intersection with U.S. Hwy 264 to a four lane highway and will build a new high rise bridge across Croatan Sound from Manns Harbor to Roanoke Island.

## 2. Outdoor Classrooms – Students

Creef Cut Wildlife Trail and Sandy Ridge Wildlife Trail are used frequently by groups of students on the way to and from the Outer Banks from inland areas. Both trails are safe and accessible places where children can stretch their legs, work off some energy from a long bus ride, and learn something in the process. Some of these groups contact the refuge to request a teacher/leader to work with their groups. As staff time allows, and as volunteers are available, these requests are usually met. A growing number of schools are also making the Refuges their ultimate destination, and are requesting a variety of programs.

## 3. Outdoor Classrooms – Teachers

Since Alligator River NWR and Pea Island NWR are located in an area rich in conservation education/interpretation agencies, these refuges do not receive the requests common on other stations that are often the sole sources available. The North Carolina Aquarium, Jockey's Ridge State Park, Nags Head Woods Ecological Preserve, and Cape Hatteras National Seashore offer environmental education and teacher training activities. Teachers here are hounded constantly to attend such functions. For this reason, the Refuge has chosen to focus more on other educational needs rather than attempt to compete with other conservation agencies.

## 4. Interpretive Foot Trails

Sandy Ridge Wildlife Trail and Creef Cut Wildlife Trail continue to be used by individuals and groups. The Tyrell County Community Development Corps completed the Sandy Ridge Boardwalk. Total length is 2,100 feet. They have now moved on to Pea Island to construct a small boardwalk at New Inlet. A Sierra Club workgroup completed the Sandy Ridge

boardwalk, groomed the Creef Cut trail, and fabricated new road name signs. Full potential for use of these trails has not been reached.



A group of Sierra Club volunteers provided trail maintenance at the Sandy Ridge Trail area.

BS

Though not a foot trail, the Milltail Creek Canoe/Kayak Trail System continues to be quite popular. On most days, there are several groups using the trail. If there were a local place to rent canoes or kayaks, use would increase dramatically. However, there is not a demand great enough to consider a concession for this purpose. Four local businesses were issued special use permits (SUP) to conduct guided canoe or kayak tours on the Milltail Creek Canoe/Kayak Trail System during 1998. Approximately 6,400 visitors participated in guided tours provided by the holders of these SUP's.

Approximately 14,250 people used Alligator River NWR trails during 1997 and 1998. It is anticipated that there will be a continued increase in trail use on this refuge for some time to come. Approximately 6,511 visitors used the paddling trails, and 4,650 used the Wildlife Drive.

#### 6. Interpretive Exhibit/Demonstrations

Refuge staff manned displays and exhibits at some of the usual annual events around Dare County and eastern North Carolina including the Edenton Boy Scout Jamboree (1200 participants), Manteo High School Career Day, NC Aquarium at Roanoke Island's Earth Day event, the Manteo and Manns Harbor Christmas parades, the Camden County Environmental Field Day, and the Pasquotank County Environmental Field Day. Refuge staff also

participated in the FWS booth at the NC State Fair. Wings Over Water staffed a booth at the Wanchese Seafood Festival.

The Aycock Brown Welcome Center in Kitty Hawk partnered with the Refuge to create state-of-the-art, interactive exhibits that promote both refuges. In 1998, they were viewed by 451,067 visitors.

Regularly scheduled interpretive/educational programs were held in 1997 and 1998. Topics included howling safaris, owl prowls, red wolf programs, canoe tours and sunset canoe tours (\$30 fee, CWRS), refuge management, and careers. The total number of programs in 1997 was 5 with 392 participants and 47 programs with 809 participants in 1998.

#### 7. Other Interpretive Programs

Wings Over Water held its first successful year of celebrating wildlife and wildlife habitat on the Outer Banks. Together with the Coastal Wildlife Refuge Society, the Dare County Tourist Bureau, the Outer Banks Chamber of Commerce, and Dare County; Deputy Refuge Manager Cooley and WIS Strawser prepared an array of speakers, presentations, programs, and workshops for this weekend event. The event was successful with 275 participants and rare birds seen and favorable evaluations received.

The Wings Over Water home page was up and running beginning in 1998. The page was donated by Ruffin and Associates, and allows visitors to download a registration form to their home computers and register from home. Wings Over Water held its second successful year of celebrating wildlife and wildlife habitat on the Outer Banks. Together with the Coastal Wildlife Refuge Society, the Dare County Tourist Bureau, the National Park Service the Outer Banks Chamber of Commerce, and Dare County; the event was successful with approximately 250 participants.

FMO Crews conducted presentations on the Fire Management Plan to several organizations and individuals including Manns Harbor and Stumpy Point Civic Associations, Roanoke and Manns Harbor Volunteer Fire Departments, Seymour Johnson Aire Force Base; Eddie Woodhouse (legal assistant to Sen. Jesse Helms); and Millie Lilley (legislative aide to Rep. Walter B. Jones, Jr.)

#### 8. Hunting

With approval of the Master Plan shortly after establishment, the Refuge was divided into three basic public use areas, with several additional safety or management zones closed to all hunting. As new areas have been acquired, they have been added to one of the three existing categories, or (in the case of the farm fields) put into a newly created category. The farm fields were designated, during September and October, as open to all authorized uses except waterfowl hunting. They are closed to public entry at all other times.

With additions and deletions of land in the Refuge, the ratio of land designated for hunting with chase dogs and land designated as closed to use of chase dogs has remained relatively

Unfortunately, hunting visits are, at best, an educated guess on our part. With so many different entrances to the refuge and so few officers, about the only way to estimate hunting activity is by anecdotal information and leaflets distributed.

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

#### 9. Fishing

The heaviest recreational fishing effort in the vicinity on the Refuge is in the surrounding sound system from October through April. Fishing pressure on the Refuge is relatively low and is a reflection of the isolation of the area and limited access rather than of low catch per unit of effort. Angling for bluegill, crappie, chain pickerel, channel catfish, flier, largemouth bass, and yellow and white perch is considered good. During 1997 and 1998, there were an estimated 3,000 fishing visits to the Refuge. Frog gigging is allowed on the Refuge by special use permit.



FMO Tom Crews and his son Griff inspect a blue crab caught at the annual crabbing rodeo.

BS

#### 10. Trapping

Since trapping is considered a commercial use of the Refuge, neither visits nor activity hours are normally recorded under public use. For the 1997 and 1998 trapping season, five special use permits were issued for Refuge trapping, and one for the 1998-99 season. No furbearers were reported as trapped either year.

**PEA ISLAND NATIONAL WILDLIFE REFUGE**

**Manteo, North Carolina**

**ANNUAL NARRATIVE REPORT**

Calendar Year 1997 and 1998

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

## INTRODUCTION

Formally established as the Pea Island Migratory Waterfowl Refuge, the 5,915 acre area was designated "as a refuge and breeding ground for migratory birds and other wildlife ..." by Executive Order 7864 from President Franklin D. Roosevelt, dated April 8, 1938. Presidential Proclamation No. 2284 on May 11, 1938 also closed 25,700 acres of adjacent Pamlico Sound waters to all migratory waterfowl hunting.

Known today as Pea Island National Wildlife Refuge, the Refuge is situated on the north end of Hatteras Island and is part of a chain of islands known as the Outer Banks of North Carolina. These dynamic, ever-changing barrier islands are separated from the mainland by a series of marshes and sounds which range from very narrow to 25 miles wide. Officially unstaffed and unfunded, Pea Island is managed by staff from Alligator River NWR.

Pea Island's climate is generally moderated by the ocean making it cooler in the summer and warmer in the winter than the mainland. During summer, southwest winds bring warm, humid air followed by cool, damp northeast winds, frequently reaching 20-30 m.p.h., during fall and winter. Average minimum and maximum temperatures are 69 and 56 degrees, respectively. Tropical storms, hurricanes, and "nor'easters" are not uncommon.

Refuge habitat types include ocean beach, barrier dune, sand ridge, brush and grassland, salt marsh, and salt flats. Three impoundments covering 790 acres are managed for food production to provide forage for waterfowl and shorebirds. Prescribed burning is conducted in marshes and impoundments to enhance wildlife habitat and maintain a healthy ecosystem.

The diversity and abundance of birds on Pea Island has deemed it a "birders paradise" - a total of 315 species of birds has been spotted at Pea Island. The Refuge serves as an important wintering ground for tundra swans, snow geese, and more than 25 species of ducks. During spring and fall migration, shorebirds are abundant. Piping plovers use Refuge beaches for feeding, and less frequently for nesting. A fairly low number of loggerhead sea turtles lumber onto Refuge beaches during summer months for nesting as well. Other species of wildlife include a host mammals, fish, reptiles and crustaceans.

Public use at Pea Island is centered around the Visitor Center, North Pond Trail, and undeveloped beaches. Each of these provides opportunities for excellent wildlife viewing. More than 2 million people pass through the Refuge annually along NC Highway 12. The Coastal Wildlife Refuge Society (refuge support group) operates a sales area in the Visitor Center and provides critical financial support for interpretive and educational programs. The Refuge also has a very active Volunteer Program.

#### A. HIGHLIGHTS

Hurricanes Bonnie and Earl impacted the refuge in 1998. On August 28, Bonnie breached South Pond dike at Pea Island resulting in the loss of an entire pump station. All pump related structures were washed away including a relatively new Caterpillar 3208 diesel engine and 30" pump. Total replacement value is approximately 130k. Section B.

Waterfowl food production in impoundments was good. Section F.

In 1997, six sea turtle nests were deposited on the refuge beach. In 1998, 11 nests were recorded. Section G.

Based on the NPS vehicle counter at Bodie Island and adjusted according to new configurations from RMIS, estimated visitation to Pea Island NWR was 2,077,305 in 1997 and 2,323,554 in 1998. Section H.

A special permit was initiated this year to allow for night time surf fishing outside of sea turtle nesting season. Section H.

In 1998, a new osprey platform was erected in North Pond near the Visitor Center to attract nesting ospreys for excellent viewing opportunities. Section H.

A new boardwalk that will serve as the entrance point for North Pond Trail was constructed in 1998. Section I.

## B. CLIMATIC CONDITIONS

Hurricanes Bonnie and Earl impacted the refuge in 1998. On August 28, Bonnie breached South Pond dike at Pea Island resulting in the loss of an entire pump station. All pump related structures were washed away including a relatively new Caterpillar 3208 diesel engine and 30" pump. Total replacement value is approximately 130k.

See the Alligator River National Wildlife Refuge narrative for additional weather details.

## C. LAND ACQUISITION

### 2. Easements

For almost 100 years, the U.S. Coast Guard operated a life saving station on a 10 acre tract inholding on the north end of Pea Island NWR. In 1990, the Coast Guard abandoned use of the property and in 1992 it was quit claim deeded to Dare County by the Coast Guard. Following an unsuccessful attempt by heirs of the Etheridge family to make claims on the property from 1990-1996, Dare County decided to deed the 10 acres to the State of North Carolina.

## D. Planning

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

In 1997, a request for a Special Use Permit for a temporary stockpile area as a result of the Rodanthe Channel dredging project was denied. The temporary stockpile would have been created by NCDOT and used for dune reconstruction in the sandbag area, but the sand from the Channel was determined to be incompatible with Pea Island beach and dune sands. The refuge renewed an offer for NCDOT to mine sand from behind the groin area to use for dune reinforcement.

Development of a monitoring plan for the Oregon Inlet ocean bar dredging and near shore disposal was completed in July. Based on USACOE surveys, approximately 250,000 cubic yards of sand was dredged from the ocean bar and disposed of near shore during September.

## E. ADMINISTRATION

### 1. Personnel

See Alligator River NWR

### 4. Volunteer Program

See Alligator River NWR

## F. HABITAT MANAGEMENT

### 1. General

Pea Island, a coastal barrier island, consists of seven basic habitat types. The most recent survey revealed 456 acres of ocean beach; 518 acres of barrier dune; 630 acres of sand ridge, brush, and grassland; 3,024 acres of irregularly flooded salt marsh; 328 acres of salt flat; and three brackish water impoundments totaling 790 acres. Beach and dune acreages change from year to year.

Dredged material disposal monitoring continued as a result of dredging Oregon Inlet by the Corps of Engineers. It appears that we will learn some interesting facts about indicator species, impacts of beach disposal, and management of dredged materials disposed of on the beach.

Working with the North Carolina Department of Transportation to maintain Highway 12 continued to require significant amounts of time.

### 2. Wetlands

Some difficulty in maintaining target water levels in North Pond due to high-salinity sound water resulted in lower than desired productivity during the 1997 and 1998 growing seasons.

In 1997 sago pondweed and widgeon grass occurred in 19.3% of the sample points . The table below also shows that 47.7% of plant species present are rated as good to fair for waterfowl food in the three impoundments. Of concern is high incidence of bare sample points. North Pond had bare points at the rate of 52.8% and New Field Pond was bare on 43% of the sample points. Bare points in South Pond and the Salt Flats were not found.

Sago pondweed and widgeon grass occurred in 28.3% of the sample points in 1998. The table below shows that 58.6% of plant species present are rated as good to fair for waterfowl food in the three impoundments. Of concern is high incidence of bare sample points. North Pond had bare points at the rate of 19.1% and New Field Pond was bare on 27.8% of the sample points. Bare points in South Pond at a rate of 47.7% and the Salt Flats were found to be 15.6% bare.

The high number of bare points in North Pond and New Field Pond is due to two primary factors. Unanticipated pump breakdowns were the primary reason for not being able to maintain proper water levels at critical times for good submerged aquatic vegetation (SAV) production. Resident Canada geese are the other significant factor. Simply stated, resident Canada geese eat the SAV production as fast as it grows. Due to a different management strategy, enough water was retained in South Pond to maintain high SAV growth rates.

**Impoundment vegetation summary from transect line sampling, Pea Island NWR,  
1997**

<b>Pea Island National Wildlife Refuge</b>						
<b>Impoundment Vegetation (SAV) Summary - 1997</b>						
	<b>Waterfowl Food Plant Species Frequency of Occurrence (%)</b>					
Unit	Good	Fair	Total Food		Non-food	Bare
North Pond	38.2	5.6	43.8		56.2	52.8
New Field Pond	43.7	10.2	53.9		46.1	43.0
South Pond	61.9	26.0	87.9		12.1	0
AVERAGE	47.9	13.9	61.9		38.2	0
Salt Flats	17.8	29.9	47.7		52.4	

In 1997 North Pond produced sago pondweed at a frequency of 18.8%, a dramatic decrease from previous years. For 1998 sago pondweed was produced at a frequency of 27.1%. In general, water levels were lower and salinity was higher than desired levels.

New Field impoundment produced sago pondweed at a rate of 19.2% in 1997 and 1998. Salinity remained higher and water level remained lower than desired.

In 1997 South Pond, in sharp contrast to previous years, had the best SAV production. Excellent production of sago pondweed (59.2%) occurred largely as a result of not having a drawdown and receiving adequate rain for keeping low-salinity water in the impoundment. Since this impoundment has no pumping capability, the management strategy is to trap and hold as much water as possible throughout the growing season.

South Pond SAV production in 1998 was lower than 1997 but remained at a relatively good level for a unit with no pumping capability. Receiving adequate rain fall helped to keep low-salinity water in the impoundment for a portion of the growing season.

Wetlands in the Salt Flats are flooded and dewatered by natural ebb and flow in wind/tides and by rainfall/runoff. Vegetation has remained relatively unchanged for many years in this area. The predominant vegetation is glasswort (Salicornia sp.), sea oxeye and salt meadow cordgrass.

The two small mitigation ponds near the southern boundary created by NCDOT again produced good amounts of wigeon grass. The pond fringes also continued to produce stands of Bacopa sp., Scirpus sp., and Cyperus sp. Waterfowl use is moderate and appears to be increasing.

**Impoundment vegetation summary from transect line sampling Pea Island NWR, 1998**

Pea Island National Wildlife Refuge							
Impoundment Vegetation (SAV) Summary - 1998							
	Waterfowl Food Plant Species Frequency of Occurrence (%)						
Unit	Good	Fair	Total Food		Non-food	Bare	Total
North Pond	34.2	41.2	75.4		24.8	19.1	100
New Field Pond	18.7	40.1	58.8		41.2	27.8	100
South Pond	33.1	8.5	41.6		58.5	47.7	100
AVERAGE	28.7	29.9	58.6		41.5	31.5	100
Salt Flats	17.8	46.9	64.7		35.3	15.6	100

#### 4. Croplands

Much of the plantable area of New Field has been affected by sand deposited by ocean overwash and salt concentration. No crops have been planted in the plantable areas since the relocation of NC 12 in 1996.

#### 9. Fire Management

See Alligator River NWR section.

### G. WILDLIFE

#### 1. Wildlife Diversity

Pea Island has a high natural diversity of habitat types. Habitat management practices, such as prescribed burning, moist soil management, discing, brush removal, and green browse planting, serve to enhance habitat and wildlife diversity. Pea Island provided habitat for a wide variety of mammals, birds, fish, reptiles, amphibians, mollusks, and crustaceans during 1997 and 1998. This diversity was especially evident in birds; more than 315 species of birds have been identified in the area.

#### 2. Endangered and/or Threatened Species

##### a. Federally Listed and Endangered Species

**American bald eagle** (Endangered): Bald eagles, *Haliaeetus leucocephalus*, often pass over Pea Island. Since there is no suitable nesting habitat for eagles, there are no nests on the refuge.

**Peregrine falcon** (Threatened): The Arctic peregrine, *Falco peregrinus tundrius*, is the subspecies of peregrines most often seen at Pea Island. Peregrine falcons were sighted on several occasions on the refuge.

**Piping plover** (Threatened): The Atlantic coast population of Piping plover, *Charadrius melanotos*, was listed as a threatened species under the Endangered Species Act in January 1986. There were two nesting attempts on the refuge in 1998, but the success of these attempts is unknown.

**Atlantic loggerhead sea turtle** (Threatened): The loggerhead sea turtle (*Caretta caretta*) nesting season of 1997 and 1998 on Pea Island National Wildlife Refuge was below average. The refuge has experienced an average of 14 nests with the highest number occurring in 1994 (35 nests and 41 false crawls).

In 1997 six nests were deposited on the refuge beach and there were three false crawls. Eleven nests were deposited on Pea Island and there were five false crawls in 1998. Since dune and beach erosion and ocean overwash continued to be major problems, a section of beach was designated a "safe" area for relocation purposes. In 1998 seven nests were relocated to the safe area and four were left in place. Of the 4 left in place, two of these met the criteria for leaving a nest in place and two failed the criteria and should have been moved. However, they were not moved because they were missed by Turtle Patrol and it was too late to move them when they were found.

The overall hatch rate in 1997 was approximately 59%; and approximately 78% in 1998. A big problem both years was ghost crab predation - these crabs were the number one enemy of eggs and hatchlings. In previous years, many turtles hatched out of nests but never made it to the water. "Reinforcement" crabs actually formed a line along the uprush zone to capture the few turtles that had managed to crawl safely through a beach covered with hungry, hunting ghost crabs. Feral cats were also a problem. These animals were removed from the nesting area.

Once again, the Turtle Watch Program was implemented to provide a safer passage of hatchlings from the nest to the ocean. It entailed digging a 10" deep by 10" wide trench from each nest to the ocean. Volunteers started watching each nest at day 55. They arrived just before dusk and swept the trench smooth; wire cones were placed around the nest with a "sliding board" emptying into the crab free trench. Turtles followed flashlights (which volunteers leap-frogged) to the end of the trench and arrived safely at the ocean. It was necessary to "steer" turtles because of light pollution, primarily from an amusement park at Rodanthe, approximately 5 miles south of the safe area. Monitoring nests took an intensive effort on both staff and volunteers; however, it played a vital role in greatly increasing survival of hatchlings from nest to ocean.

The Turtle Watch Program also greatly increased the number of hatchlings reaching the ocean. Observations in past years indicated that, on some nights, as many as 75% of hatchlings were lost to ghost crabs (prior to trenching). Survival rates from the nest to the ocean have increased to over 90% with the Turtle Watch Program.

Several stranded turtles washed up on Pea Island's beaches in 1997 and 1998. Data were collected from all that were discovered. Approximately 22 dead loggerheads were measured and recorded in 1997. In 1998 approximately 12 dead loggerheads were measured and recorded.

**Green sea turtle** (Threatened): In 1993, the first Green Sea Turtle (*Chelonia mydas*) nested on Pea Island. None were reported for 1997 or 1998.

b. State Listed Species

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

**Osprey** (Special Concern): Two osprey (*Pandion haliaetus*) platform nests at Pea Island were known to have produced fledglings. Numerous sightings of adult ospreys were recorded during 1997 and 1998.

**Least tern** (Special Concern): Historically, least terns (*Sterna antillarum*) have nested 1.5 miles south of the Pea Island NWR Headquarters. For 1997, least tern numbers peaked at 246 during mid-July and at 167 during mid-September in 1998. Nesting colonies were observed at the South Pond sandbars and at Oregon Inlet

3. Waterfowl

Waterfowl surveys were conducted from October through January. Waterfowl numbers peaked at 12,869 during November 1997. The table below compares use days by species for the 1996-1997 season with the mean use days for the previous season and for the past 5 years. Snow goose activity increased in the salt flats following the December prescribed burn.

**Composition of wintering waterfowl at Pea Island National Wildlife Refuge  
during the 1996-1997 survey period.**

SPECIES	PEAK PERIOD	PEAK #	# USE DAYS 1996-97	% TOTAL USE DAYS	# USE DAYS 1995-96	MEAN # USE DAYS (5 yr av.)	% DIFF (5-yr av)
Tundra swan	Nov	1968	997222	5.9	34937	100862	-1
Snow goose	Nov	3300	121636	7.2	84319	105259	+16
Canada goose	Dec	606	28658	1.7	23945	25217	+14
Mallard	Dec	1334	24843	1.5	4970	11964	+108
Black duck	Nov	1542	98114	5.8	176414	96443	+2
Gadwall	Nov	3533	127088	7.6	268011	129332	-2
Wigeon	Nov	5468	186645	11.1	312099	312385	-44
Pintail	Nov	4935	242041	14.4	498204	295700	-18
G.W. teal	Jan	679	31904	1.9	157535	69749	-54
B.W. teal	Oct	489	11313	0.7	42933	17137	-34
Shoveler	Jan	1183	747732	4.5	254600	111816	-33
Ring-neck	Dec	476	10012	0.6	13690	11461	-50
Redhead	Jan	5200	76200	4.5	100	211	+36,014
Canvasback	Dec	3	63	0.01	235	110	-43
Scaup	Dec	774	16654	1.0	46113	14428	+15
Unknown Ducks	Nov	40	962	0.1	225853	59134	-98
Bufflehead	Dec	639	22090	1.3	2306	16840	+31
Ruddy duck	Feb	1185	56578	3.4	83953	35599	+59
Merganser	Dec	743	9505	0.6	43576	26590	-64
Coot	Nov	11875	439339	26.2	46745	100144	+339

Ground brood count surveys were not conducted on the refuge. However, black duck, gadwall, and Canada geese broods were observed in New Field Pond, North Pond, and South Pond.

Several black-crowned night herons were observed on the finger islands in the impoundments during the summer. This suggested nesting activity, however no nests were confirmed.

Waterfowl surveys were conducted from October through January in 1998. Waterfowl numbers peaked at 12,869 during November. The table below compares use days by species for the 1997-1998 season with the mean use days for the previous season and for the past 5 years. Species such as the snow goose, Canada goose, redhead and bufflehead showed an increase in number of use days for the 1997-98 season. The green-winged teal remained about the same as the previous year. All remaining species showed a decline. Snow goose activity increased in the salt flats following the December prescribed burn.

**Composition of Wintering Waterfowl, Pea Island NWR  
1997-1998**

SPECIES	PEAK PERIOD	PEAK #	% TOTAL USE DAYS	# USE DAYS 1997-98	# USE DAYS 1996-97	MEAN # USE DAYS (5 yr av.)	% DIFF (5-yr av)
Tundra swan	Nov	540	2.5	21,323	99722	76047	-72
Snow goose	Dec	3575	18.6	158,638	121636	117573	+35
Canada goose	Nov	532	3.3	28,128	28658	26510	+6
Mallard	Jan	527	1.9	16543	24843	14223??	-14
Black duck	Nov	1390	9.4	79725	98114	94097	-15
Gadwall	Nov	1091	7.7	65367	127088	131866	-50
Wigeon	Oct	2053	6.5	55584	186645	218862	-75
Pintail	Nov	2690	16.7	142541	242041	268285	-47
G.W. teal	Jan	720	6.1	51994	31904	52434	-1
B.W. teal	Oct	108	0.3	2655	11312.5	16694	-84
Shoveler	Dec	1773	6.6	56597	74773	108450	-48
Ring-neck	Nov	165	0.4	3329	10012	9780	-66
Redhead	Dec	1260	3.0	25328	76200	20336	+25
Canvasback	Nov	2	0.01	37	63	122	-70
Scaup	Dec	605	1.3	11056	16654	16309	-32
Unknown Ducks	Dec	36	0.1	623	962	50728	-99
Bufflehead	Dec	982	3.5	29851	22090	21525	+39
Ruddy duck	Nov	1668	5.2	44541	56578	49114	-9
Merganser	Nov	841	1.3	11246	9505	21435	-48
Coot	Nov	1280	5.5	46745	439339	160485	-71

Ground brood count surveys were not conducted on the refuge. However, black duck, gadwall, and Canada goose broods were observed in New Field Pond, North Pond, and South Pond.

#### 4. Shorebirds, Gulls, Terns, and Allied Species

Shorebird surveys were conducted monthly in 1997 and 1998. Shorebird numbers peaked at 8,310 in mid-May, 1997 and at 6,800 in late May 1998. A large colony of nesting black skimmers was observed on the beach about 1.5 miles south of refuge headquarters. A large nesting tern colony occurred at the pan that formed behind the rock revetment at Oregon Inlet. Both areas were posted as closed to public access.

Peak numbers of shorebirds surveyed from April through October 1997 at Pea Island NWR.

<b>Survey Date</b>	<b>APR</b>	<b>MAY</b>	<b>JUN</b>	<b>JULY</b>	<b>AUG</b>	<b>SEP</b>	<b>OCT</b>
Peak number	ns*	8310	4156	3686	5651	4626	1216
Average	ns*	6262	3240	**	4861	3820	915

\*ns = not surveyed

\*\* only one survey for the month

Peak numbers of shorebirds surveyed from April through October 1998 at Pea Island NWR.

<b>Survey Date</b>	<b>APR</b>	<b>MAY</b>	<b>JUN</b>	<b>JULY</b>	<b>AUG</b>	<b>SEP</b>	<b>OCT</b>
Peak number	1542	6800	2696	1164	2313	1887	1333
Average #	1169	4877	4038	890	*	1529	1321

\* only one survey for the month

#### 5. Marsh and Wading Birds

Marsh and wading bird surveys were conducted from April through October in 1997 and June through October in 1998. Bird numbers peaked at 734 in July and at 1,107 during October 1997. In 1998 they peaked at 419 during October.

Brown pelican numbers have continued to increase over the past few years as the species has expanded northward into coastal North Carolina and Virginia. These birds were previously listed as a threatened species in this state and were rarely observed.

**Peak numbers of marsh and wading birds surveyed from April through October 1997 at Pea Island National Wildlife Refuge.**

<b>Survey Date</b>	<b>APR</b>	<b>MAY</b>	<b>JUN</b>	<b>JULY</b>	<b>AUG</b>	<b>SEP</b>	<b>OCT</b>
Peak number	ns*	214	413	734	482	609	1848
Average	ns*	200	329	**	346	436	1107

\*ns = not surveyed

\*\* only one survey for the month

Peak numbers of marsh and wading birds surveyed from April through October 1998 at Pea Island NWR.

<b>Survey Date</b>	<b>APR</b>	<b>MAY</b>	<b>JUN</b>	<b>JULY</b>	<b>AUG</b>	<b>SEP</b>	<b>OCT</b>
Peak number	*ns	14	218	269	419	188	169
Average #	*ns	7	73	135	**	159	158

\*ns= not surveyed

\*\* only one survey for the month

The tables below presents a summary by species of non-waterfowl avian species counted during 1997 and 1998. Since the total number is conditional on the number of surveys conducted, data presented herein are not intended as an indication of demographic trends. However, peak numbers within and between years may be more useful.

**Peak numbers and peak survey days of shore and water birds surveyed at Pea Island National Wildlife Refuge by species 1997.**

<b>1997</b>		<b>TOTAL</b>	<b>%</b>	<b>MAX NUMBER</b>	<b>SURVEY Peak Day</b>
<b>Water Birds &amp; Sea Birds</b>					
Pied-billed grebe		459	0.8	96	11/3/97
Common loon		2	0.0	1	5/12/97
Double-crested cormorant		4152	7.2	1815	10/1/97
White pelican		1	0.0	1	11/3/97
Brown pelican		425	0.7	88	9/22/97
Northern gannet		0	0.0	0	NA
Other Water/Sea bird		1	0.0	1	5/19/97
Unknown Water/Sea bird		0	0.0	0	NA
subtotal		5040	8.7	1817	
<b>Marsh &amp; Wading Birds</b>					
Clapper rail		0	0.0	0	NA
Virginia rail		0	0.0	0	NA
Black rail		0	0.0	0	NA
King rail		0	0.0	0	NA
Great blue heron		232	0.4	32	11/11/97
Little blue heron		277	0.5	76	7/9/97

Tri-colored heron	329	0.6	60	8/27/97
Great egret	520	0.9	76	11/11/97
Snowy egret	770	1.3	389	7/9/97
Cattle egret	24	0.0	10	8/27/97
Black-crowned night heron	92	0.2	22	12/15/97
Yellow-crowned night heron	13	0.0	3	8/13/97
Green heron	1	0.0	1	5/19/97
American bittern	0	0.0	0	NA
Glossy ibis	41	0.1	19	7/9/97
White ibis	950	1.6	272	8/13/97
Other Marsh/Wading Species	0	0.0	0	NA
Unknown Marsh/Wading Species	3	0.0	3	11/3/97
subtotal	3252	5.6	652	
<b>Gulls &amp; Allies</b>				
Herring gull	541	0.9	92	5/12/97
Ring-billed gull	885	1.5	148	10/20/04
Great black-backed gull	686	1.2	147	9/22/97
Lesser black-backed gull	0	0.0	0	NA
Laughing gull	385	0.7	154	7/9/97
Bonaparte's gull	0	0.0	0	NA
Other gull species	4	0.0	4	7/9/97
Unknown gull species	5	0.0	5	9/22/97
subtotal	2506	4.3	366	
<b>Terns &amp; Skimmers</b>				
Caspian tern	340	0.6	183	5/12/97
Least tern	925	1.6	246	7/9/97
Common tern	737	1.3	347	7/9/97
Forster's tern	305	0.5	64	9/22/97
Sandwich tern	175	0.3	101	7/9/97
Royal tern	510	0.9	116	5/19/97
Sooty tern	0	0.0	0	NA
Gull-billed tern	445	0.8	193	5/12/97
Black skimmer	1079	1.9	303	7/9/97
Other species	0	0.0	0	NA
Unknown Tern/Skimmer	33	0.1	16	9/9/97
subtotal	4549	7.9	1145	
<b>Shore Birds</b>				
American oystercatcher	91	0.2	18	6/11/97
Black-necked stilt	168	0.3	47	5/19/97
American avocet	839	1.5	176	11/25/97
Black-bellied plover	165	0.3	55	9/9/97
Ruddy turnstone	46	0.1	18	8/13/97
Semipalmated plover	3083	5.3	1546	9/9/97
Piping plover	8	0.0	2	5/1/97

Wilson's plover	2	0.0	2	9/9/97
Killdeer	5	0.0	5	9/9/97
Common snipe	0	0.0	0	NA
Dowitcher	4228	7.3	1052	7/1/97
Red knot	11	0.0	5	9/22/97
Marbled godwit	167	0.3	84	10/1/97
Whimbrel	47	0.1	30	5/12/97
Willet	1017	1.8	176	7/1/97
Yellowlegs	3008	5.2	763	8/13/97
Sanderling	4856	8.4	1456	9/22/97
Stilt sandpiper	1	0.0	1	5/19/97
Dunlin	9830	17.0	5168	5/19/97
Purple sandpiper	0	0.0	0	NA
Spotted sandpiper	10	0.0	4	5/19/97
Least sandpiper	6184	10.7	1750	6/11/97
Semipalmated sandpiper	5675	9.8	1392	8/13/97
Western sandpiper	1862	3.2	511	6/11/97
Other species	2	0.0	2	6/11/97
Unknown shorebird	1077	1.9	550	5/1/97
subtotal	42182	73.4	7708	
TOTAL	57729	100.0	8292	

**Peak numbers and peak survey days of shore and water birds surveyed at Pea Island National Wildlife Refuge by species 1998.**

1998		Total	%	MAX NUMBER	SURVEY Peak Day
Water Birds & Sea Birds					
Pied-billed grebe		548	1.2	185	9/25/98
Common loon		9	0.0	4	7/29/98
Double-crested cormorant		1095	2.3	297	11/12/98
White pelican		0	0.0	0	3/31/98
Brown pelican		501	1.1	272	11/12/98
Northern gannet		4	0.0	1	5/6/98
Other Water/Sea bird		8	0.0	8	8/13/98
Unknown Water/Sea bird		0	0.0	0	NA
subtotal		2165	4.6	602	
Marsh & Wading Birds					
Clapper rail		0	0.0	0	NA
Virginia rail		4	0.0	2	11/12/98
Black rail		0	0.0	0	NA
King rail		0	0.0	0	NA
Great blue heron		199	0.4	39	12/7/98
Little blue heron		436	0.9	188	8/13/98
Tri-colored heron		212	0.5	60	8/13/98

Great egret	461	1.0	93	12/7/98
Snowy egret	286	0.6	71	8/13/98
Cattle egret	39	0.1	19	9/25/98
Black-crowned night heron	34	0.1	13	12/7/98
Yellow-crowned night heron	0	0.0	0	NA
Green heron	10	0.0	7	7/14/98
American bittern	5	0.0	2	10/27/98
Glossy ibis	202	0.4	175	11/12/98
White ibis	639	1.4	212	12/7/98
Other Marsh/Wading Species	0	0.0	0	NA
Unknown Marsh/Wading Species	0	0.0	0	NA
subtotal	2577	5.4	420	
<b>Gulls &amp; Allies</b>				
Herring gull	505	1.1	110	9/9/98
Ring-billed gull	881	1.9	360	12/7/98
Great black-backed gull	1166	2.5	291	12/7/98
Lesser black-backed gull	0	0.0	0	NA
Laughing gull	470	1.0	95	9/9/98
Bonaparte's gull	11	0.0	11	11/12/98
Other gull species	1	0.0	1	7/14/98
Unknown gull species	0	0.0	0	NA
subtotal	3034	6.5	663	
<b>Terns &amp; Skimmers</b>				
Caspian tern	1	0.0	1	6/24/98
Least tern	472	1.0	167	9/9/98
Common tern	293	0.6	83	9/9/98
Forster's tern	88	0.2	61	9/25/98
Sandwich tern	92	0.2	73	8/13/98
Royal tern	362	0.8	155	9/9/98
Sooty tern	0	0.0	0	NA
Gull-billed tern	14	0.0	14	8/13/98
Black skimmer	897	1.9	260	10/14/98
Other species	176	0.4	167	9/9/98
Unknown Tern/Skimmer	0	0.0	0	NA
subtotal	2395	5.1	786	
<b>Shore Birds</b>				
American oystercatcher	153	0.3	40	6/28/98
Black-necked stilt	199	0.4	44	7/14/98
American avocet	731	1.6	188	11/12/98
Black-bellied plover	278	0.6	44	12/7/98
Ruddy turnstone	318	0.7	141	6/28/98
Semipalmated plover	798	1.7	176	5/28/98
Piping plover	30	0.1	6	8/13/98
Snowy plover	0	0.0	0	NA

Wilson's plover	3	0.0	2	9/25/98
Killdeer	9	0.0	3	10/27/98
Common snipe	0	0.0	0	3/31/98
Dowitcher	2661	5.7	1185	5/14/98
Red knot	351	0.8	107	8/13/98
Marbled godwit	10	0.0	9	7/14/98
Whimbrel	13	0.0	3	7/29/98
Willet	899	1.9	149	9/25/98
Yellowlegs	1185	2.5	362	8/13/98
Sanderling	3086	6.6	533	8/13/98
Stilt sandpiper	0	0.0	0	NA
Dunlin	7996	17.1	1910	5/14/98
Purple sandpiper	0	0.0	0	NA
Spotted sandpiper	2	0.0	1	5/20/98
Least sandpiper	1094	2.3	381	5/6/98
Semipalmated sandpiper	11807	25.3	4125	5/28/98
Western sandpiper	516	1.1	340	12/7/98
Other species	185	0.4	70	6/8/98
Unknown shorebird	4246	9.1	1449	5/20/98
subtotal	36570	78.3	6800	
TOTAL	46691	100.0	6818	

#### 6. Raptors

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

#### 7. Other Migratory Birds

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

#### 8. Game Mammals

Cottontail and marsh rabbits are fairly common on Pea Island. Declines in numbers from a few years ago seem to have reversed. Raccoon tracks have been observed with increasing frequency. In the past raccoons were incidentally captured in traps set for feral cats.

Presence of scat and tracks indicate a continued presence of foxes and opossums. The presence of these species as well as feral house cats may be one of the causes for the decline in pheasant populations.

Deer tracks have frequently been observed around North Pond, New Field, and South Pond, and in the Salt Flats. Staff members have seen both does and bucks on Pea Island.

River otters have been observed in the impoundments. Muskrat, nutria, and mink are also present on Pea Island.

#### 9. Marine Mammals

Several marine mammal strandings occurred on the refuge during the year. All detected strandings were reported to the National Marine Fisheries Service.

#### 10. Other Resident Wildlife

In past years, ring-necked pheasants were occasionally observed in salt marsh, brushland, dunes, and in the Pea Island farm field. Sightings have decreased in recent years. The exact status of pheasant population is unknown. There were no reported pheasant sightings in 1997 or 1998.

#### 15. Animal Control

Feral cats continued to be a problem with nesting birds, waterfowl, and turtles. Cat tracks were found from the beach to the sound. Cats were not actively trapped this year.

#### 16. Marking and Banding

Due to work load and staff changes, the Gypsy Moth Pheromone Trapping Program was not monitored at Pea Island.

### H. PUBLIC USE

#### 1. General

Based on the NPS vehicle counter at Bodie Island and adjusted according to new configurations from RMIS, estimated visitation to Pea Island NWR was 2,077,305 in 1997 and 2,323,554 in 1998. The Visitor Center was open daily during the summer season and weekends during the winter. Volunteers from the Coastal Wildlife Refuge Society continue to staff the Visitor Center.

In cooperation with the NCDOT and Cape Hatteras National Seashore, the Refuge surveyed sign needs/potential on the refuge relative to the Dare County proposal to sign parking areas and "walkovers." Three locations were approved for signs. DRM Wallace, WIS Strawser, and BT Fritsch also evaluated sign needs on the refuge and hope to order and install new visitor information signs before Memorial Day.

In 1997, NCDOT issued a contract to construct a bike lane adjacent to Hwy 12 on Hatteras Island. Construction began during the summer and occurred within the existing right-of-way.

In 1998, South Carolina Educational Television filmed a natural history program on the refuge that will air some time in early 1999.

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

## 2. Outdoor Classrooms - Students

The emphasis on non-staff conducted activities continued during 1997 and 1998. School groups, scouts, etc. were encouraged in the independent use of the Refuge for educational activities. Marsh investigation equipment (seines, mud sieves, etc.) was available for loan from the Visitor Center. Since no registration was required for the use of outdoor classrooms, the Refuge has no record of the actual number of such uses that occurred. On the whole, this type of use continues to increase on Pea Island NWR.

## 4. Interpretive Foot Trails

Many visitors comment that North Pond Trail is the nicest trail they've used in the eastern United States. North Pond Wildlife Trail is universally accessible, offers 8 permanently mounted spotting scopes, and 5 major observation structures. The Visitor Center at its trail head provides just the right opportunity to offer information to Refuge visitors and teach the message of the Service. Approximately 365,000 visitors utilized North Pond Trail during 1997 and 1998.

## 6. Interpretive Exhibits/Demonstrations

The Coastal Wildlife Refuge Society purchased two hardware systems for the visitor center interactive exhibits from a source that provided the materials at cost and donated the extras. The interactive exhibit was installed and made operational, while the hardware remains on-hand to complete the outdoor accessible exhibit.

To celebrate National Wildlife Refuge week, the refuge hosted daily bird walks, and held a temporary exhibit in the visitor center. WIS King-Wren distributed NWR week materials to all Dare County Schools. Another temporary exhibit was also put up in the visitor center to celebrate Wolf Awareness Week.

Refuge staff manned displays and exhibits at some of the usual annual events around Dare County and eastern North Carolina including the NWRS 95<sup>th</sup> birthday Open House, Avon Volunteer Fire Department parade, and the Whalehead Club Excursion Day.

The two interpretive kiosks, located at both the north and south ends of the refuge, provide valuable information on a 24 hour basis for Refuge visitors. Panels located on the front porch of the Visitor Center are also available round the clock. Wilderness Graphics representatives discussed the proposed Kuralt Trail with refuge staff. Representatives from all RTNCF Ecosystems refuges attended.

#### 7. Other Interpretive Programs

Most regularly scheduled on-site interpretive programs during 1997 and 1998 were conducted at Pea Island NWR by Refuge volunteers and interns. Programs included bird walks, children's wildlife discovery, and canoe tours.



Students learn about wildlife and habitat at the Wildlife Discovery Program. BS

Special programs were also conducted for International Migratory Bird Day, Fishing and Boating Week, and National Wildlife Refuge Week.

CWRS purchased and donated 8 canoes and associated paddles, PFDs, and a trailer. This contribution allows the staff and interns to regularly transport the canoes and trailer between refuges to conduct programs.

## 8. Hunting

The Dare Game and Wildlife Commission changed their regulations to include the Pea Island Proclamation Boundary as an area closed to waterfowl blinds.

## 9. Fishing

Pedestrian surf fishing continued to be the major form of consumptive, wildlife-oriented recreation on Pea Island NWR during 1997 and 1998. Bluefish, spot, pompano, croaker, and trout were the major fish caught. The annual Crabbing/Fishing Rodeo was held the second Saturday in June both years with approximately 160 participants each year. The Outer Banks SurfRiders Foundation and CWRS partnered on the event and gave away prizes for children by random drawing.

In 1998, DRM Wallace discussed closure of the refuge to "nighttime surf fishing" with the president of the NC Beach Buggy Association and a former commissioner of the NC Marine Fisheries Commission. The refuge developed a special use permit which would allow this type of activity with date and location restrictions.

## 11. Wildlife Observation

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

During spring and summer, great and snowy egrets replace snow geese as the most easily observed wildlife. Various species of raptors utilize the dunes, power line poles, and sign posts for resting and hunting.

In 1998, WS Creef, BT Fritsch, EEO Harris, and EEO Powers installed a new osprey platform in North Pond near the Visitor Center. This post will give visitors the opportunity to view osprey close-up and may also provide opportunities to develop interpretive programs on birds of prey.

Refuge trails and other access points are located to make wildlife observation (on foot) easy and enjoyable. In choosing the North Pond area for a focal point for public use and closing the areas around the other two impoundments, the needs of the public were seriously and diligently considered. There are many Refuge visitors who realize and support this policy.

Again during 1997 and 1998, there was no FWS LE presence on Pea Island NWR on a regular basis. During the year, two permanent staff (Interpretive Specialist and Maintenance Worker) and one temporary staff (Interpretive Specialist for Visitor Center) worked at Pea Island. The presence of FWS staff helped, since there were more eyes available to see violations and call the Park Rangers. However, the need for a FWS LE presence at Pea Island NWR continues to be evident.

The most common LE problems continued to be public nudity, littering, and dogs off a leash. In April 1998, the newly refurbished restrooms (NPS) at the Visitor Center were vandalized again. NPS maintenance staff quickly repaired the restrooms to be ready for the Easter weekend visitors.

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

## I. EQUIPMENT AND FACILITIES

### 1. New Construction

- Constructed boardwalk behind restroom at Visitor Center to serve as the entrance for North Pond Trail

### 2. Rehabilitation

- Prepared for / cleaned up after Hurricanes Bonnie and Earl
- Replaced New Field pump engine

### 3. Major Maintenance

- General maintenance of vehicles, ATVs, mowers, weedeaters
- Mowed all impoundment roads, dikes and South Boundary
- Dike maintenance (reshaped) between South Pond and New Field Impoundments

### 4. Equipment Utilization and Replacement

- Assisted with Wings over Water and Sierra Club activities
- Regional Office evaluated condition of Pea Island Facilities
- Staff attended Time Management, Dealing with Difficult People, and CPR Training locally
- HAZMAT Inspection by Regional Office Team / resulting clean up effort
- Staff participated in Standards for Survival Training
- Participated in wildfire and prescribed burn efforts
- Assisted with pelican and tern banding projects
- Participated in Road Inventory for TEA21 and ERFO projects

#### J. OTHER ITEMS

##### 3. Items of Interest

Refuge staff met with Mr. Andy Buchanan, a developer who has proposed restoring the old Coast Guard Station on Pea Island and converting it into a bed and breakfast.

##### 4. Credits

This Narrative Report was a joint effort by the entire staff in 2004.

#### K. Feedback

DRM Kathy Whaley is the reason we are finally catching up on our backlog of Annual Narrative Reports. Her diligent, positive, results-oriented approach is greatly appreciated in these times when money remains scarce, but demands on staff are ever increasing.