

CAPE ROMAIN NATIONAL WILDLIFE REFUGE

Awendaw, South Carolina

ANNUAL NARRATIVE REPORT

Calendar Year 1996

Review and Approvals

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## INTRODUCTION

Cape Romain National Wildlife Refuge was established in 1932 as a migratory bird refuge. Bulls Island was added to the refuge in 1936 when it was purchased from Mr. Gayer Dominick. Cape Romain is located in Charleston County, South Carolina, 20 miles northeast of Charleston, and lies east of U.S. Highway 17 and south of the Santee River. The refuge encompasses a 20-mile segment of the Atlantic coast and includes a fascinating expanse of barrier islands, salt marshes, intricate coastal waterways, long sandy beaches, fresh and brackish water impoundments and maritime forest, and is located within the Savannah - Santee - Pee Dee Ecosystem Unit. The refuge headquarters on Highway 17 and the shop at Moores Landing are the only mainland sites. The remainder of the refuge is accessible only by boat.

Land areas consist of 34,229 acres - 28,000 of which are preserved within the National Wilderness Preservation System. An additional 30,000 acres of open waters within the refuge boundary are closed to the taking of migratory birds by Presidential Proclamation.

The Refuge's original objectives were to preserve in public ownership habitat for waterfowl, shorebirds, and resident species. In recent years, objectives have been expanded to include the management of endangered species, protection of the Wilderness Area, and the preservation of the Bulls Island forest with its diverse plant community.

The salt marshes of Cape Romain are interlaced by waterways that create scores of islands, some so low they are inundated at high tide. Others, like Cape and Bulls Islands, are higher and never covered. Cape Island's trees are pines and myrtles, while the Bulls Island forest consists of live oaks, magnolias, pines, bays, and palmettos.

Bulls Island, an ancient barrier reef, is the most visited part of the refuge. Low and rolling, about six miles long and two miles wide, it lies nearly three miles off the mainland and is reached by boat from Moores Landing. The broad, open beach is shell-strewn and seems to stretch endlessly north and south. Over the centuries, the ocean has washed away a lighthouse, a cape, and many acres of forest. Inland are woods and large ponds. Wintering waterfowl heavily use these ponds; in spring, wood duck families nest in surrounding trees.

The refuge is rich in the history of South Carolina. Sewee Indians inhabited the area before the arrival of the settlers. The tidal creeks and bays provided the natives with ample supplies of fish, oysters, and clams. Several native middens are located on the refuge. English settlers in South Carolina made their first



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## A. HIGHLIGHTS

Two hurricanes skirted the SC coast during the year (Section B).

Refuge Manager Garriss received the Meritorious Service Award (Section E.1).

Six red wolves were received for display at the Sewee VEEC (Section G.2).

Dedication of the Sewee VEEC in December (Section H.1 and Appendix).

## B. CLIMATIC CONDITIONS

Table 1. Monthly Temperature and Precipitation.

Month	Refuge High	Refuge Low	Precip	10 Year Average
January	70	20	1.15	6.0
February	74	14	1.46	3.4
March	71	22	5.51	2.9
April	80	34	4.01	2.5
May	86	48	.85	2.6
June	90	56	2.33	4.4
July	96	64	12.35	4.5
August	91	62	5.77	10.3
September	88	55	7.75	6.8
October	84	40	4.92	6.9
November	84	30	.76	4.5
December	72	19	2.17	3.1
Total:			49.03	57.9

Weather conditions greatly affected refuge operations during the year. Hurricanes Bertha on July 11 & 12 and Fran on September 5 caused significant damage to parts of the refuge. Both hurricanes skirted the South Carolina coast producing high winds, heavy rainfall and extreme high tides. Greatest damage was done to Cape Island where a new break in the island occurred, the front beach eroded and turtle nests were overwashed (see Section G.2). In addition, the high water further accelerated the deterioration of the Moore's Landing pier (Section I.2). The station's Hurricane Plan was implemented for both hurricanes resulting in moving equipment and staff as prescribed. Another hurricane, Gustav, passed by at the end of August, producing high tides but little significant change.

### C. LAND ACQUISITION

#### 3. OTHER

In 1993, the Service began investigating several parcels of land along the Great Pee Dee and Waccamaw Rivers within the Winyah Bay Focus Area, with the intent to acquire and establish a National Wildlife Refuge. These efforts continued in 1996.

Public meetings for the proposed Waccamaw NWR were held in Georgetown on June 18 and in Conway on June 19. The meetings were held to receive comments on the draft EIS for the proposed refuge. Staff from the RO, the refuge and the Charleston Field Office conducted the meetings. The final EIS will be completed and a Record of Decision will be made in 1997.

### D. PLANNING

#### 5. RESEARCH AND INVESTIGATIONS

##### CAPE ROMAIN NWR 95 "AIR QUALITY MONITORING" (42510-1)

The South Carolina Department of Health and Environmental Control (SCDHEC) continued the collection of ambient air data for the Cape Romain Wilderness Area. The monitoring equipment consists of a continuous sulfur dioxide monitor, a high volume air sampler for total suspended particulate, a wet-dry deposition sampler for measuring parameters involved in acid rain, a precipitation gauge to measure rainfall, and a meteorological tower to monitor wind speed and direction. The data collected will be used to determine the effects of industrial development in the Charleston and Georgetown areas on the air quality of the Cape Romain Wilderness Area, which is a Class 1 Wilderness Area. This was the fourteenth year of the study.

In addition to the SCDHEC sampling system, the Service put in an IMPROVE air sampling system in March of 1994. IMPROVE, which stands for Interagency Monitoring of Protected Visual Environments, is a cooperative program of several land management agencies and the EPA to monitor air quality in Class I areas. This system automatically measures particulate mass, H, Na-Pb, nitrate, sulfate, and carbon. The program is coordinated through the University of California at Davis.

A new study was begun in February of 1995 to monitor visibility in the Cape Romain Wilderness Area. An automatic camera was installed, aimed toward the lighthouses, in the Bulls Island fire tower to take pictures three times a day. This visual data is being used in conjunction with other air quality sampling devices on the refuge.



Cape Romain NWR 96 "EVALUATION OF AMBIENT OZONE INJURY ON THE FOLIAGE OF VEGETATION IN THE CAPE ROMAIN NWR, SOUTH CAROLINA" (42510-4).

A study was conducted in August to evaluate the possible ambient ozone injury to vegetation on the refuge. Samples were evaluated from Moores Landing, Bulls Island, Cape Island and Lighthouse Island. Preliminary results showed that little damage was occurring in 1996. Final results of the study had not been received at year's end.

E. ADMINISTRATION

1. PERSONNEL

Bernie Good transferred from Southern California NWR on March 18 to serve as a biologist for the Cape Romain NWR and the Santee NWR. After becoming familiar with Cape Romain, his primary duty station will be Santee. In addition, a significant change occurred when OA Irene Ritchie resigned in March. Irene had been here since 1990. Betty O'Donnell transferred from the Regional Office in Boston on May 27 to fill the vacant position.

Five short-term, 30-60 days, employees were hired at the refuge in 1996. They were hired to work on the wolf pen and dike stabilization. A seasonal fire fighter was brought back and two seasonals were hired to work on the turtle project.

On December 4 Refuge Manager Garriss received the Service's Meritorious Service Award in recognition of his outstanding service and notable achievements with the U.S. Fish and Wildlife Service during his career. The award was presented by Regional Director Clough at an awards ceremony in Atlanta.

Table 2. Comparison of On-Board Strength, 1992-1996.

<u>YEAR</u>	<u>PERMANENT</u>		<u>TEMPORARY</u>	<u>FTE's</u>
	<u>FULL-TIME</u>	<u>PART-TIME</u>		
FY 1996	8	0	8	11.8
FY 1995	8	0	7	11.6
FY 1994	9	0	7	12.9
FY 1993	9	0	4	10.0
FY 1992	9	0	9	15.2





Davis, Collins, Dawsey, Jones, Geathers, Hathaway  
O'Donnell, Klimek, Thompson, Garris, Manigault

1. GARRIS, George R.	Refuge Manager	GS-12 PFT
2. KLIMEK, Larry L.	Asst. Refuge Manager	GS-11 PFT
3. DAVIS, R. Larry	Park Ranger	GS-09 PFT
4. GOOD, Bernard	General Biologist	GS-11 PFT
	Reported 3/96	
5. RITCHIE, H. Irene	Office Assistant	GS-06 PFT
	Resigned 3/95	
6. O'DONNELL, Betty	Office Assistant	GS-07 PFT
7. THOMPSON, Ruth B.	Office Clerk	GS-04 PFT
8. HATHAWAY, William E.	Maintenance Worker	WG-08 PFT
9. MANIGAULT, Herbert	Maintenance Worker	WG-08 PFT
10. GEATHERS, Isiah	Maintenance Worker	WG-06 PFT
11. DAWSEY, Sarah C.	Biological Technician	GS-04 TFT
12. MCCORMICK, Jawana	Forestry Aid	GS-03 TFT
13. WESTON, Glenn	Maintenance Worker	WG-03 TFT
14. COLLINS, Bryan	Biological Aid	GS-03 TFT
15. JONES, Stephen	Biological Aid	GS-03 TFT

## 2. YOUTH PROGRAMS

The Youth Conservation Corps (YCC) program began on June 10 and ended on August 2. Two of the eight enrollees stayed an additional two weeks until August 16.

This year's major projects included assistance with the loggerhead sea turtle program, grounds maintenance, and painting equipment and buildings.

The YCC enrollees were taken on a tour of Fort Moultrie and Fort Sumter by National Park Service personnel. Enrollees were also provided information on wildlife topics such as red wolves, sea turtles and other wildlife populations found on the refuge.



Two of our YCC enrollees, Janelle (back) and Nicole (middle) worked an additional two weeks under the supervision of Jawana McCormick.



#### 4. VOLUNTEER PROGRAM

For the CY 1996, 17 refuge volunteers provided approximately 996 hours to refuge related programs. Volunteers assisted with the loggerhead sea turtle program, lighthouse restoration, site design for the red wolf enclosure and Sewee Visitor Center projects.

The highlight of the 1996 volunteer program was the establishment of the SEWEE Sales Association by refuge volunteer Karen Beshears. Ms. Beshears contributed over 400 hours to this project. For additional information on the Sales Association see section H. 18.

#### 5. FUNDING

In FY96, the refuge received \$401,400 under 1260 base operating funds plus \$71,600 for special projects. Under endangered species sub-activity 1113, we received \$21,000 for the red wolf project and \$18,000 for the sea turtle project.

Table 3. Five Year Base Funding Comparison (thousands)

<u>Activity</u>	<u>FY96</u>	<u>FY95</u>	<u>FY94</u>	<u>FY93</u>	<u>FY92</u>
1260	473.0	398.9	404.4	406.8	363.2
YCC	13.4	13.8	12.5	11.2	11.2
1113	39.0	33.0	33.0	33.0	33.0
1971	-	3.0	-	-	-
9110	13.9	35.3	-	-	-
9120	-	7.5	35.3	12.3	8.2
	539.3	491.5	485.2	463.3	415.6

#### 6. SAFETY

Refuge policy continued to place the safety of the staff and visiting public as the refuge's top priority. To minimize accidents and injury, monthly safety meetings are held, personal protective equipment is provided and its use stressed, and tasks are carefully analyzed for hazards before they are undertaken. There was one accident during 1996. On December 19, maintenance

worker Greg Geathers cut open the tip of one finger while working on a refuge vehicle. He was taken to the hospital for stitches. No lost time occurred due to the accident.

## 7. TECHNICAL ASSISTANCE

The refuge is a member of the Cooper River, Santee River, and Winyah Bay Focus Area Task Forces, and as such provides technical assistance to these organizations, which were formed under the auspices of the North American Waterfowl Management Plan (NAWMP). Meetings were attended by Garriss or Klimek. The current thrust of the task forces is to gain recognition and support which will allow them to further the goals of the NAWMP by protecting valuable wildlife habitat. Specifically, the Winyah Bay Task Force is pursuing the establishment of a National Wildlife Refuge within the Focus Area [See Section C3 for details].

## 8. OTHER

In 1995, the Santee NWR was complexed with Cape Romain as an independent satellite station. The refuge which consists of approximately 15,000 acres alongside Lake Marion is 85 miles inland from Cape Romain. There are currently 3 permanent positions at the refuge with one vacant permanent position. Staff from Cape Romain assisted at Santee throughout the year especially during the farming season and during managed hunts.

## F. HABITAT MANAGEMENT

### 1. GENERAL

Cape Romain is a barrier island refuge extending for 20 miles along the Atlantic Coast. The refuge consists of 34,229 acres of beach and sand dunes, salt marshes, maritime forests, tidal creeks, fresh and brackish water impoundments, and 30,000 acres of open water.

Bulls, Cape, and Lighthouse are the largest barrier islands of the refuge. Bulls Island is 5,496 acres, including 9 freshwater impoundments occupying 701 acres, and 2,091 acres of uplands and former maritime forest. The remainder of the land area is beach and salt marsh. Cape Island is 1,184 acres, comprised mostly of old sand dune systems. There is a former impoundment on the island and 15 acres of hurricane-destroyed forest land. Lighthouse Island is 1,340 acres, 86 acres of uplands and forest and 1,254 acres of saltmarsh.



## 2. WETLANDS

Wetlands comprise the largest habitat type on the refuge with approximately 31,000 acres. Of the land acreage, 90 percent is considered wetlands, and all but approximately 1,000 acres is natural salt marsh.

As in the past, water levels in the Bulls Island impoundments were dictated by climatic conditions because a reliable source of fresh water is not available on the island. Water levels were below normal during the first six months of the year due to low rainfall during the spring and winter months. Heavy rains in July brought water levels back to normal.

Most of the Bulls Island impoundments remain choked with cattail and Southern bulrush. These impoundments, including Pools 1 and 3, Lower Summerhouse Pond, House Pond, Big Pond, and parts of Pool 2 and Moccasin Pond are of limited value for waterfowl and wading birds due to the encroachment of vegetation. Chemical means of control was only partially successful.

With the reduction of over 80 percent of the cattail in Jacks Creek wading bird and waterfowl use has increased. In addition, the amount of submerged aquatic vegetation has increased in the impoundment.



Pool 2 on Bulls Island has become inundated with banana water lily, a favorite duck food.

### 3. FORESTS

The maritime forest on Bulls Island was changed by Hurricane Hugo in 1989 from a mature full-canopied forest to a successional stage dominated by cabbage palmetto trees, shrubs, and annuals. Seven years after Hugo, live oaks and cabbage palms continue to die. In 1996, mast and berry production, primarily from oak, gallberry, and yaupon were at their highest levels since 1989. However, the total mast crop is still lower than pre-hurricane levels. Previous seed sources are proving invaluable for the regeneration of the loblolly pines as nearly all the mature trees were killed. Loblolly pine regeneration was more noticeable this year with many trees growing above the surrounding scrub.



Many of the live oaks continue to show stress seven years after Hurricane Hugo.





Cabbage palms on Bulls Island continue to slowly die from the effects of Hurricane Hugo in 1989.

#### 6. OTHER HABITATS

The dunes on the refuge's barrier islands are unique systems which provide important habitat to several species, such as the ipswich sparrow and sea oats. Dunes also protect salt-sensitive leeward habitats from inundation and erosion. There are approximately 15 miles of dunes on the windward side of Bulls, Lighthouse, and Cape Islands.

The dunes on Cape Island continued to erode during the year. The erosion was accelerated during July and September due to the high tides and heavy rains caused by Hurricanes Bertha, Fran and Gustav. A permanent break, approximately 3 miles from the south end of the island, occurred as a result of the 3 hurricanes. In addition, the primary dunes on portions of the island were leveled. Conversely, the south end of Cape Island continued to lengthen and fill in the channel between Cape and Lighthouse Islands during 1996.



The primary dune line on many parts of Cape Island were flattened by Hurricane Bertha.

#### 9. FIRE MANAGEMENT

The refuge continues its proactive fire program by concentrating its efforts towards pre-suppression. A seasonal Forestry Aid was employed to assist with this program.

On Bulls Island, 16 miles of dikes, trails, and roads are utilized as firebreaks and as such must be continually mowed and kept free of debris.

Firebreaks are also maintained around the lighthouses, buildings and shop areas at Moores and on Bulls Island to protect them from wildfire.

#### 10. PEST CONTROL

Although Bulls Island remains plagued with pest plants, the lack of



funds and manpower resulted in limited control efforts.

Chinese tallow trees have become established on 200-300 acres of Bulls Island since Hurricane Hugo. Areas treated in May with Garlon 4 included the Summerhouse dike and along Mills Road.

Cattail and Southern bulrush are problematic due to their encroachment into open water areas in the Bulls Island impoundments. Several areas along Beach Road in Lower Summerhouse, and Pools 1, 2 & 3 were treated in May with Rodeo. Only limited success was realized.

## 12. WILDERNESS AND SPECIAL AREAS

On January 3, 1975, Public Law 93-632 designated 28,000 acres of the refuge as Wilderness Area. This includes all of the refuge except Bulls Island, Moores Landing, and a narrow band of marsh along the Intracoastal Waterway. Air Quality monitoring is an ongoing project for the Wilderness Area. (See Sec. D.5).

The two lighthouses, located on the island named after them, were listed on the National Register of Historic Places in the 1970's. The first, built in 1827, is 60 feet tall. It's companion, built in 1857, is 180 feet tall. Extensive rehabilitation work has been performed over the last several years on both structures, and volunteers are almost finished restoring the glass cupola of the 1857 lighthouse.

There are four natural areas located on Bulls Island. One, a public use natural area, is composed of 200 acres of representative estuarine salt marsh. The remaining three are research natural areas and are composed of 500 acres of sand live oak-cabbage palmetto habitat, 80 acres of Southern red cedar, and 500 acres of loblolly pine-hardwood habitat.

## G. WILDLIFE

### 1. WILDLIFE DIVERSITY

Cape Romain's natural diversity of habitat types, in combination with habitat management practices, enhance the wildlife diversity of the area. Hurricane Hugo resulted in the loss of large numbers of animals, but overall did not affect the rich diversity of mammals, birds, fish, amphibians, reptiles, mollusks, and crustaceans that are present. This diversity is especially evident in birds, with over 337 species found on the refuge.

## 2. ENDANGERED AND/OR THREATENED SPECIES

There were seven Federally listed and five state listed endangered or threatened species occurring on the refuge. Included on the Federal list are the American alligator, American peregrine falcon, Bald eagle, loggerhead sea turtle, piping plover, red wolf and wood stork. The state list includes the glossy ibis, common ground dove, least tern, American swallow-tailed kite and Wilson's plover. Leatherback sea turtles and red-cockaded woodpeckers are also known to use the area on occasion. The eastern brown pelican, while no longer listed as threatened or endangered, is included in this section to maintain consistency with previous years.

John Conner from the whooping Crane Foundation made a site visit to Bulls Island on December 1. The group is looking at the area as a potential wintering site for whooping cranes.

### AMERICAN ALLIGATOR (Federal - threatened, similarity of appearance)

Alligators have historically been present on both Bulls and Cape Islands. However, due to the decreasing amount of freshwater in the old impoundment on Cape Island their numbers have been greatly reduced. Night spotlight surveys were conducted on Bulls Island in June and August. The estimated population of alligators at least four feet long was 327 and has remained fairly constant during the last five years. Baby alligators were observed in Jacks Creek in the fall. No nesting was observed on Cape Island.

### AMERICAN PEREGRINE FALCON (Federal - Endangered)

Peregrine falcons are spring and fall migrants along the South Carolina coast and are sighted regularly. The majority of the sightings this year were in the fall in the Jacks Creek area of Bulls Island and on Cape Island. The greatest number of birds, four, were observed on Bulls Island on October 19.

### BALD EAGLES (Federal - threatened)

Several eagles are present year round near or on Cape Romain, and are regularly sighted on Bulls Island and at Moores Landing. Bald eagles were also seen near Cape Island in February, September and December.

The nest on Bulls Island Road was successful in 1996 producing one fledgling in February. The adult pair built a new nest for the 1996 nesting season after their 1995 nest collapsed. The new nest was built in a nearby tree.



On January 13, the Mid-winter Eagle Survey was conducted, during which one bald eagle was observed at the nest on Bulls Island Road. On January 12, 2 birds were observed on Bulls Island.

#### LOGGERHEAD SEA TURTLE (Federal - threatened)

Cape Romain's barrier islands support one of the most intensely used loggerhead sea turtle rookeries along the Atlantic Coast. It is the largest U.S. rookery outside of Florida. Although all of the islands are used to some degree, Cape Island receives the highest use. Cape Island receives one third of all nests laid in South Carolina. Historically, two problems have severely hindered the success of the nests after laying: beach erosion and predation by raccoons. In order to lessen the impact of these problems, a nest management program was initiated in 1979, which has proven to increase hatching success.

The management program consists of a hatchery operation, raccoon control program, collecting data on the number of nests and the number of false crawls, monitoring of control nests on the beach, and collecting information for the Sea Turtle Stranding and Salvage Network.

The first nests of the season were laid on May 15, and when the last was laid August 13, a total of 1124 nests had been deposited on Cape Island. This was 17% higher than the 907 nests in the 1995 season. Table 4 summarizes the nesting and crawl data for the past 5 years on Cape Island.

Table 4. Loggerhead Turtle Nesting and False Crawl Densities.

<u>Year</u>	<u>Number Nests</u>	<u>False Crawls</u>	<u>Km of Beach</u>	<u>Density per Km</u>	
				<u>Nests</u>	<u>False Crawls</u>
1992	1,058	1,933	8	132.2	241.6
1993	579	1,340	8	72.4	167.5
1994	1,218	2,190	8	152.3	273.8
1995	907	1,406	13	69.8	108.2
1996	1,124	1,731	13	86.5	133.2

A total of 779 nests (69 percent) of the nests were moved into the protected hatcheries, as erosion or inundation remain serious problems since Hurricane Hugo and other recent severe storms accelerated the destruction of the island's dune system.

Eleven predator-proof hatchery pens were constructed to accommodate the relocated clutches. The hatcheries were constructed out of PVC and chicken wire. Of the 11 hatcheries, 2 non-self-releasing were

erected approximately 85 yards inland to protect them from major storms. The 9 self-releasing hatcheries (SRH) were located 30 yards from the beach, depending on the availability of suitable sites.

Of the 9 SRH, 6 were washed over when Hurricane Bertha passed by South Carolina approximately 50 miles offshore. Sand accumulation and sand compaction in the hatcheries were the result of Bertha. Efforts to maximize hatchling success were undertaken and included removing excess sand in and around the hatcheries, carefully removing and replacing the sand on the top of each nest to the top of the eggs to reduce sand compaction. This was done in 4 of the 6 SRH. Hatch rates in the 6 hatcheries varied from 0% to 86.6%. Other damage from Bertha included the leveling of the primary dunes on large portions of Cape Island and a high tide break in the island which was accelerated by Hurricanes Fran and Gustav.



Extensive sand accumulation from Hurricane Bertha in self-releasing hatchery on Cape Island.



completed the season. Approximately 4 percent of the nests were either completely or partially destroyed by raccoons. The remaining nests (86 percent) were lost due to ocean overwash and beach erosion. Over the last three years, Cape Island is building up toward the south and is now approximately 13km long versus 8km.

As mentioned earlier, loggerheads nest on other refuge islands such as Raccoon Key (13 nests) and Bulls (160 nests), for a total of 173 nests in 1996. Nests laid on these islands face the same problems as those on Cape, but are more subject to loss since they are not included in the hatchery program. Table 6 summarizes the refuge's total production.

Table 6. LOGGERHEAD NESTING AND PRODUCTION - 1995.

<u>Location</u>	<u>No. Nests</u>	<u>Hatchlings Produced</u>
Cape Island Hatchery	779	65,050
Cape Island Beach	345	1,423
Bulls Island	160	6,480
Raccoon Key	13	54
TOTAL	1,297	73,007

Each year the refuge participates in the Sea Turtle Stranding and Salvage Network. This year a total of 15 strandings were recorded: 7 on Cape Island, 2 on Raccoon Key, 5 on Bulls Island and 1 on Lighthouse Island.

#### PIPING PLOVER (Federal - threatened)

Piping plovers are fairly rare migrants along barrier island beaches in the spring and fall. The annual Piping Plover Census was conducted during the second week in January by SCDNR personnel. Five birds were observed on Cape Island and two birds on Bulls Island. Piping plovers were observed on Cape Island in August.

#### RED WOLF (Federal - endangered)

The red wolf program for the refuge increased in complexity during the year when 6 wolves were transferred here on December 4 for educational display at the Sewee VEEC. The wolves came from the WNC Nature Center in Asheville, NC and included an adult female, 4 of her pups from 1996, and 1 pup from 1995. A 0.7 acre pen was constructed to house the wolves.



Six red wolves were released into the new enclosure at the Sewee VEEC.

The Bulls Island project was very active during the year as numerous animals were transferred to and from the refuge and two animals left the island on their own. Both animals were subsequently recaptured. The year began with 9 wolves on the island and consisted of the adult breeding pair, 3 wolves born in 1993, 1 wolf born in 1994, and the 3 pups born in 1995. The year ended with 5 wolves, the adult pair (452M and 449F), the female pup (847F) born this year, and 2 adult males (641M and 521M).

The adult pair denned up in the wild on Bulls and produced 2 pups. However, when the wolves were captured in December only one pup was caught and no signs were evident of the other pup and it was presumed dead.





Two red wolf pups were born in 1996.

Four wolves were transferred from Bulls Island on January 11. Three (640M, 641M, and 642F) were taken to Alligator River NWR and one (771M) was taken to Smokey Mountain National Park. In addition, two of the 1995 pups, 809 and 808, were transferred to Alligator River NWR on June 12 and October 11, respectively.

Two male wolves were brought to Bulls Island during the year. On March 21 a male (521M) was brought to Bulls Island and on June 12, male (641M) was returned from Alligator River NWR.

At the end of the year female wolf (812F), which had been free roaming, was unaccounted for. Bulls Island, the surrounding islands, and the mainland were being checked.

#### WOOD STORK (Federal - endangered)

Wood storks are fairly common on the refuge especially during the summer and fall months. Changes to their historic breeding areas

in south Florida has caused a northern displacement. The most northern nesting was recorded just north of the refuge in 1994.

In 1996, wood storks arrived in June and were regularly seen on Upper Summerhouse Pond through October. Wood storks were also observed at Moores Landing and on the mud flats between Moores Landing and Bulls Island. Numbers peaked at 62 in July on Upper Summerhouse Pond.

EASTERN BROWN PELICAN (No longer listed)

The eastern brown pelican in South Carolina was removed from the Federal endangered species list in 1985. But, because of the potential for loss of nesting habitat, the South Carolina Department of Natural Resources (SCDNR) continued to list it as threatened until 1994 and we have continued to list it under this section. Pelicans were seen on all areas of the refuge throughout the year, but their numbers were greatest during the nesting season. Nesting began in April on Marsh Island.



Over 1,400 pelicans nested on Marsh Island during the year.





Several species of herons and egrets successfully hatched on Marsh Island.

For the fourth consecutive year, soft-bodied bird ticks were not a problem on the refuge. Therefore, spraying of pelican nests was not necessary.

Table 7. Brown Pelican Nesting and Fledgling Success

<u>Year</u>	<u>.....Number of Nests.....</u>		<u>Total Young</u>	
	<u>Marsh Island</u>	<u>White Bank</u>	<u>Nests</u>	<u>Fledged</u>
1992	2,045	104	2,149	2,579
1993	1,936	0	1,936	1,355
1994	1,296	321	1,617	1,213
1995	1,743	187	1,880	unknown
1996	1,413	0	1,413	unknown

GLOSSY IBIS (State-threatened)

Ibis are found throughout the year on Bulls Island in low numbers. There were 17 nests on Marsh Island during 1996.

GROUND DOVE (State - threatened)

Ground doves utilized the refuge regularly, but in small numbers, generally preferring dunes or open sandy soil areas.

LEAST TERNS (State - threatened)

The refuge is one of the most important nesting areas in the state. Least terns were observed nesting on the south end of Cape Island and on the newly formed island just south of Cape Island at the beginning of the season. Data on the actual number of nests in these areas was not obtained before Hurricane Bertha passed by the South Carolina coast creating high tides that destroyed these nesting colonies.

AMERICAN SWALLOW-TAILED KITE (State - endangered)

Kites are generally sighted in early spring, upon their arrival here at their most northern nesting area on the east coast. Although no nests have been found on the refuge, birds are occasionally sighted.

WILSON'S PLOVER (State - threatened)

Wilson's plovers are common visitors to the refuge. Nesting occurs on several refuge islands, most notably Bulls and Cape.

3. WATERFOWLDUCKS

Cape Romain has remained an important stopover and wintering area for waterfowl since its establishment as a migratory bird refuge. The Bulls Island impoundments provide resting and feeding habitat for dabblers, some divers, and to sea ducks when the refuge creeks and bays are rough. However, in 1996, lesser scaup used Jacks Creek continuously during November and December, reaching a peak on November 16 of 14,000 birds. Over 90% of the waterfowl use during the year was in Jacks Creek.

The mid-winter waterfowl survey was conducted on January 5. Birds seen included 15,000 lesser scaup on Bulls Bay, 600 widgeon, 150 blue-wing teal, 1,200 coots, 150 buffleheads, 200 gadwall and 80 mallards primarily on Jacks Creek. In addition, approximately 100 bufflehead were seen in the saltmarshes, tidal creeks and bays. Other species were observed in February including ruddy ducks(400), mergansers(400) and ring-neck ducks(160).

Resident wood duck box use was reduced during the year because of cattail encroachment and excessive ant use. Consequently, only 27 percent of the 22 wood duck boxes were used (Table 8). The areas



around the boxes were cleared and the ant colonies were removed to improve use in 1997.

Blue-wing teal numbers peaked in October when 600 were seen in Pool 2. Waterfowl numbers peaked in November, when 22,509 birds were observed primarily in Jacks Creek feeding on the submerged vegetation. In addition to the scaup, 300 mallards, 900 gadwalls, 700 widgeon, 800 green-wing teal, 600 shovelers, 300 pintails, 1600 ruddy ducks and 350 mergansers were counted.

Waterfowl numbers declined in December when approximately 7,000 were observed. Other waterfowl of note included 3 snow geese observed on Jack's Creek in November and the 100-150 canvasbacks seen in December.

#### SWANS

Tundra swans are regular refuge visitors, but are seldom here in large numbers. Six swans were seen in January and November in the Summerhouse ponds.

#### COOTS

Coot and moorhen populations were stable this year with both species nesting on Bulls Island. The resident population of coots and moorhens was 600 and 300, respectively. Coot numbers were highest in November, when 5,000 birds were observed in Jacks Creek Pool.





#### 4. MARSH AND WATERBIRDS

The refuge is one of the most important areas on the South Carolina coast for marsh and waterbirds. In addition to the brown pelican, some of the other species that nest on the refuge include clapper rails, great blue herons, great egrets, tri-colored herons and snowy egrets.

Numbers peaked in August when approximately 5,600 great egrets, snowy egrets and tri-colored herons were observed on Jacks Creek. In addition, greater numbers (50-100) than in previous years of herons and egrets, were observed all summer using the pond on Cape Island.

A rookery on the south end of Bulls Island contained 48 nests, including 24 great egret, 7 black-crowned night heron, 1 green-backed heron, 1 little blue heron and 15 snowy egret. In addition, 673 tricolored heron, 302 snowy egret, 79 great egret and 17 glossy ibis nests were counted on Marsh Island.

Pied-bill grebes were observed throughout the year especially on Jacks Creek.

#### 5. SHOREBIRDS, GULLS, TERNS, AND ALLIED SPECIES

The refuge's marshes, beaches, islands, and tidal mudflats provide extensive feeding, resting, and nesting habitat for these species. The refuge is considered one of the most important North American regions for wintering shorebirds, as demonstrated by its qualification as a Western Hemispheric Shorebird Reserve. The wintering American oystercatcher population is the largest on the east coast. The refuge is also considered to have excellent habitat for the long-billed curlew. The largest wintering population of marbled godwits utilizes the marshes and mud flats of the southern portion of the refuge.

Other species that use the refuge in winter include short-billed dowitcher, red knot, western sandpiper, dunlin and semi-palmated plover, and are not uncommon in flocks of thousands.

In addition to being an important wintering habitat, the refuge is also an important nesting area. In 1996, 4,312 nests were counted on the refuge including black skimmers(542), gull-billed terns(111), common terns(14), sandwich terns(338), and royal terns(1,674). A majority of the nests occurred on Lighthouse Island and Marsh Island.



Royal terns also nest on Marsh Island.

#### 6. RAPTORS

The most commonly seen raptors are red-tailed hawk, kestrel, northern harrier, great horned owl and screech owl. Birds are seen throughout the year on Bulls Island and Cape Island during the summer. There were nine osprey nests on Bulls Island again this year.

#### 7. OTHER MIGRATORY BIRDS

The refuge's vast expanses of marsh and forest are important habitat for migrating birds. The marshes are important stopovers



and wintering areas for birds such as horned grebes, marsh wrens, seaside sparrows, and rails. The forests of Cape Romain, although severely altered by Hurricane Hugo, still provide important stopover habitat for neotropical migrants. Concentrations of these migrants in spring and fall reach amazing numbers. Birds such as blue-gray gnatcatchers, great crested flycatchers, and palm warblers have been observed in the hundreds, and at times thousands, on Bulls Island. Specifically in 1996, 2,000-3,000 flickers were observed on Bulls Island on October 5.

As the forest recovers, the dense shrub layer of an early stage forest provides good nesting habitat for such neotropical migrants as painted buntings, yellow breasted chats and white-eyed vireos.

#### 8. GAME MAMMALS

Game mammals which occur on the refuge include: white-tailed deer, eastern cottontail, marsh rabbit, gray squirrel, Southern fox squirrel, bobcat, gray fox, and raccoon. In 1996 two archery hunts for white-tailed deer and raccoon were held on the refuge. Seventeen deer, 7 bucks and 10 does, were killed during the hunts (see Section H.8).

The deer population on Bulls Island is estimated at 250 animals. Deer observed throughout the year and taken during the hunts were healthy.



Several nice bucks were observed on Bulls Island during the late summer.

Raccoons are probably the most prolific of the refuge's game mammals. The raccoons on Bulls Island supply the primary food source for the red wolves. Raccoon numbers have decreased dramatically in recent years due to predation by the red wolves.

The southern fox squirrel is present on the refuge only on Bulls Island. For the first 2 years after Hurricane Hugo the animals kept a small but apparently stable population. Fox squirrels were observed in increasing numbers during the year especially during June when they appeared to be feeding on the ryegrass planted along the roadsides. The squirrels appeared to be healthy and their numbers have stabilized.

A bobcat was observed on Bulls Island several times during the archery hunts and by refuge staff. It is not known if more than one animal is present.

#### 9. MARINE MAMMALS

Bottlenose dolphins are the most common marine mammal on the refuge and can be seen year round in the creeks and bays.

The refuge remained a participant in the Marine Mammal Stranding Network. One bottlenose dolphin stranded on the refuge this year. The dolphin was found on the north end of Cape Island on December 19. Cause of death was not determined due to advanced decomposition.

#### 10. OTHER RESIDENT WILDLIFE

Although Cape Romain is a fairly large and diverse refuge, relatively few species of herptiles occur. Because most can not tolerate a saltwater environment, their numbers are limited.

Thirty-five species of herptiles are documented. The primary places they occur are the areas surrounding Moores Landing and the freshwater areas on Bulls Island. Species include a variety of tree frogs, skinks, lizards, snakes, and both marine and freshwater turtles. The yellow rat snakes found on Bulls Island reach a large size with several up to 6 feet in length.



The turkey population has declined over the past 3 years from an estimated 120 birds to 70. Possible causes are increased predation on nests and young by bobcats, rat snakes, hawks, and owls. Fewer young turkeys were seen by refuge staff this year.



This large gobbler weighed 23 pounds and was found dead from no apparent reason during the breeding season.

During the year, river otters were observed regularly all over Bulls Island. The population is probably higher than at any time in recent years.

#### 11. FISHERIES RESOURCES

The fish stocking of Jacks Creek in 1994 with bass and bream does not appear to have been successful. Very few signs of the fish were seen during the year.

#### 14. SCIENTIFIC COLLECTIONS

In August, 10 loggerhead sea turtle hatchlings were collected from Cape Island and taken to the Riverbanks Zoo in Columbia, SC. The turtles are used in an educational display and released after one year.

#### 15. ANIMAL CONTROL

In conjunction with the loggerhead sea turtle nesting program, 13 raccoons were removed from Cape Island.

In May, we were notified that 18 feral goats had been observed on Lighthouse Island. The animals had taken up residence in the bottom of the lighthouse. The lighthouse was locked up and word was put out through the surrounding community to remove the goats. The goats were still present at year's end.

### H. PUBLIC USE

#### 1. GENERAL

Throughout 1996 the Cape Romain Refuge continued to be a popular destination for individuals participating in such activities as fishing, photography, walking, shelling, nature study and relaxation. These activities resulted in over 85,650 activity hours. The monthly breakdown for visitation is as follows:

January	3,050	May	9,500	September	8,500
February	3,400	June	8,300	October	12,500
March	6,200	July	7,200	November	10,200
April	7,500	August	6,800	December	2,500

The highlight for public use for the refuge during 1996 came on December 7 with the ribbon cutting ceremony for the Sewee Visitor and Environmental Education Center. Over three-hundred invited guests attended the ceremony which featured naturalist Rudy Mancke of South Carolina ETV: *Nature Scene* as the key-note speaker. The event was also attended by US Senator Ernest Hollings, Regional Director Noreen Clough, US Forest Service Deputy Regional Forester Robert Bowers, and longtime refuge supporter Arthur Ravenel, Jr as Master of Ceremonies. Guests were treated to continuous showings of the signature video "From the Forest to the Sea", tours of the facility, presentations by the SC Center for Birds of Prey and a catered lunch (sponsored by the SEWEE Sales Association). For additional pictures of the dedication see the Appendix.



## 8. HUNTING

### RAIL

The 1996 rail season fell within the frame-work of the State season. Optimum hunting conditions are rare for rail hunts because, to effectively hunt rails, one needs higher than normal high tides. As in recent years, hunting pressure was light.

### WHITE-TAILED DEER

The 1996 archery hunts for deer on Bulls Island continued to be successful. During the November hunt, 83 hunters took 14 deer and during the December hunt, 29 hunters took 3 deer. Fishing and sightseeing continue to gain popularity during the hunts.

## 9. FISHING

Recreational fishing continued to be the activity which accounts for a large portion of the public use on the refuge. This category includes saltwater fishing, clamming, crabbing, shrimping and oyster gathering. Fishing during the white-tail deer hunts is becoming increasingly popular, with many individuals fishing during the middle of the day. The impoundments on Bulls Island which traditionally have been open to freshwater fishing remained closed throughout 1996 because of restoration due to Hurricane Hugo.

Shrimp baiting is a legal recreational activity in South Carolina in which a cast net is thrown over areas baited with balls of mud mixed with fish meal. Poles mark the location of the bait balls. Shrimp, attracted to the fish meal, are readily caught in large quantities. State limits are currently 48 quarts of shrimp per day per person. The large number of baiters on the refuge are believed to be having significant impacts on the refuge's resources. Since the refuge was "discovered" as a haven for shrimp baiting seven years ago, this activity continues to be a serious problem for the refuge. Wildlife, especially egrets, herons, terns and pelicans, on the small islands were constantly disturbed by bait shrimpers throughout the season. It was estimated that there were over 15,000 visits to the refuge specifically for shrimp baiting.

The 1996 season for recreational shrimp baiting began September 13 and ended November 12. Early in the season, Bulls Bay produced good numbers of large shrimp with good catches also recorded around

Cape Island. An estimated 125-160 boats were on the refuge/day and 30-40 cars at Moores Landing. Increased weekend law enforcement was conducted during the season.

#### 11. WILDLIFE OBSERVATION

The trails and roads on Bulls Island, the Moores Landing pier, and the refuge beaches and marsh areas provide visitors ample opportunity to observe numerous species of wildlife on the refuge. This form of recreation was responsible for the second highest number of public use visits incurred during 1996.

#### 17. LAW ENFORCEMENT

Cape Romain began the year with two collateral-duty Refuge Officers, which increased to three by year's end. The refuge's complex configuration of remote barrier islands, saltmarsh, tidal creeks, and separated mainland sites make law enforcement patrols logistically difficult.

The number of non-resource related incidents increased in 1996. Two cars were burglarized at Moore's Landing on March 16 with car keys and a billfold taken. One car had a window knocked out and the other vehicle had been left unlocked. On July 15, a trailer at the Sewee VEEC construction site was broken into and power tools were stolen. It is believed this may have been done by a former employee of the contractor. The refuge concessionaires tour boat was vandalized four times during the year. Items taken included a radio/cassette recorder, a cooler, and miscellaneous items.

Most of the remaining violations detected in 1996 were minor in nature and resolved with verbal warnings. During the furlough in January, one NOV and several verbal warnings were issued for being on the refuge while closed. Other incidents included animal trespass at Moores Landing and on Bulls Island, use of cast net on pier, obstruction of waterway, littering, and after hours use.





A recurring law enforcement issue is boats being left in the refuge's boat docking area for long periods of time.

Maps of the refuge were distributed to shrimp baiters at the boat ramps and while on the water to help familiarize them to the refuge. Shrimp baiting activities continue to require an increased law enforcement presence from September to November. Increased patrolling, weekend duty, and odd hour shifts are necessary.

Steve Wunderley, National LE Coordinator, conducted an LE review of the refuge on March 7.

#### 18. COOPERATING ASSOCIATIONS

To manage the book sales outlet for the Sewee Visitor Center, the South Eastern Wildlife and Environmental Education (SEWEE) Association, Inc. was established in 1996. Through the dedicated efforts of volunteer Karen Beshears, the Service Agreement was signed off by Regional Director Clough on November 27, 1996.

The Board of directors for the SEWEE Association are: Arthur Ravenel, Jr, Karen Beshears, Lewis Middleton, Rev. William Alston,

Fred Kinard, Mary Pope-Waring, Jim Elliot and Larry Davis. With the dedication of the visitor center on December 7, the sales outlet got underway and did gross sales of \$2,432.79 and memberships of \$350.00 for a one day total of \$2,782.79.



A sales outlet is being operated by the Sewee Cooperating Association in the VEEC.

#### 19. CONCESSIONS

Coastal Expeditions continued to operate the passenger ferry service to Bulls Island throughout 1996. The ferry service operates four days per week from March through November and reduces to one day per week for December-February. The crew for the ferry service is always courteous and helpful to passengers and continues to receive high praises.





The refuge boat slips at the end of the pier continue to silt in making it difficult to operate boats on extreme low tides.

## I. EQUIPMENT AND FACILITIES

### 1. NEW CONSTRUCTION

The Sewee Visitor and Environmental Education Center became a reality in December. Completion of the building was approximately two months late due to extensions given to the contractor. Final inspection of the Center was conducted on November 27. Additional information is in Section H.1.

A red wolf viewing enclosure was built in November and December. The enclosure is 0.7 acre and is accessed by a 250 foot long boardwalk that crosses a wetland. When completed in 1997, the boardwalk will terminate at a viewing platform at the pen and will be handicap accessible.

## 2. REHABILITATION

The pier at Moores Landing continued to deteriorate during the year. The concrete on the lower side of the pier continued to break off exposing the metal rebar in several large sections. High water from the two hurricanes accelerated the deterioration. Engineers from the Atlanta Regional Office were out several times to inspect the structure.



Deterioration of the Moores Landing pier was accelerated due to high water from the hurricanes during 1996.





Temporary repairs have been made to the pier to keep it open for use.

Work continued on the 1857 lighthouse with the brass channeling in place and some of the glass placed in the channel. Volunteers continue to be the major catalyst behind this project, although work has slowed substantially due to other time constraints upon the volunteers.

In January, Tank Tec, Inc. of Tampa, FL began replacing the three underground fuel storage tanks at Moores Landing and one underground tank on Bulls Island with above ground tanks. All four underground tanks were removed and disposed of by the contractor. The tank installed at Moores Landing has two internal compartments which hold 3,000 gallons gasoline and 1,000 gallons diesel. On Bulls, two separate 1,000 gallon tanks for gas and diesel were installed on the raised area behind the Dominick house. The work was completed in February.

### 3. MAJOR MAINTENANCE

The break wall protecting the boat basin at the end of the pier was completely replaced during July. The bottom of the old break wall

had completely rotted below the water line. A ten foot section was knocked out in December probably by a boat. It was replaced before the end of the year.

The well at the office was struck by lightning on June 19. The pump and wiring back to the office had to be replaced.

In October, a large limb from the oak tree adjacent to the carports behind the Dominick House broke off and crushed one half of the structure. Fortunately, the pickup was parked so that the collapsed area was over the truck bed and no damage was done to the truck.



Stress-weakened trees are not just unsightly, they can also do damage to property.





The pier breakwall was replaced due to deterioration by saltwater, before...



and after.

In July, the dock at Cape Island was rehabbed because of erosion problems. It was extended further onto the mainland and sandbags were put around the base.

Protection and stabilization of the Jacks Creek and Upper Summerhouse dikes continued in 1996. Sandbagging was done on an as needed basis by temporary workers and regular staff.

#### 4. EQUIPMENT UTILIZATION AND REPLACEMENT

A new Honda ATV Fourtrax was received in November. It will be used on Bulls Island.

#### 8. OTHER

Sandra Rhodes was awarded the contract for cleaning the office beginning in April. She will be cleaning one day a week.

### J. OTHER ITEMS

#### 1. COOPERATIVE PROGRAMS

The refuge continued to cooperate with the Department of Navy by providing funding and accounting support for wildlife programs on the Charleston Naval Base.

In mid-October, the USGS was given permission to drill sample holes on the refuge. Four shallow wells, less than 150 feet, were drilled on Bulls Island for geologic mapping of the coastal plain area. One deep well, approximately 500 feet, was drilled at Moore's Landing to determine the location of the deep aquifers.

On July 10, several members of the staff attended a press conference sponsored by the USFWS held aboard the Schooner America in Savannah, GA. The Service is promoting the use of pump out and dump station facilities by the boating public.





A drilling truck from the U.S. Geological Survey was carried to Bulls on the refuge transporter.



The U.S. Geological Survey also drilled a deep well at Moore's Landing during the year.

were dredging the ICW. They used the area in May and June.

### 3. ITEMS OF INTEREST

Refuge staff was busy attending meetings and training during 1996. Of special note this year were the meetings associated with Ecosystem Management, Sewee VEEC planning and cooperating/sales association, Awendaw boat ramp issues, and the three focus areas the refuge is involved with.

Naturalist Rudy Mancke and crew from SCETV spent 2 days during January filming at Sandy Point. This show will air during the 1997 *Nature Scene* season, and is the 6th program on the refuge.

### 4. CREDITS

Davis: Public Use Section

O'Donnell: Parts of the Administration Section

Dawsey: G.2 - Loggerhead Sea Turtles and Typing

Jones : Typing

Klimek: Remainder

Garris: Review and Editing



K. FEEDBACK

I don't think that I would be fulfilling my responsibility if I didn't comment on the reorganization that has been going on for the last two years. I have always felt that we have the same responsibility to disagree as we have to agree with our leaders. Remember this is disagreeing not being disagreeable. I believe that this along with competition is the only way to have a strong, progressive organization. (If you disagree with this statement just ask the Russian people.) We are fortunate in this Region to have a Regional Director who shares this philosophy.

All of my career I have been a proponent for the concept of ecosystem management. Evidence of this is that Cape Romain was designated a Biosphere Reserve in 1986. Only a few refuges have been designated, but most National Parks are Biosphere Reserves. Biosphere Preserve management is a form of ecosystem management. It is the form favored by the Park Service because the Park (Refuge) is the center piece. The park staff tries to guide and influence developments in the different zones surrounding the park in order to reduce possible harm or impact to animals, plants, air, water, and visitors. This is what I have tried to do at Cape Romain.

I continue to strongly support the concept of ecosystem management, but I strongly disagree with reorganization. Reorganization has caused confusion both within and outside the Service. It has caused unnecessary strife within the Service.

I still believe everything I said in my March 7, 1995 memo...

As most people know, I have been an advocate for ecosystem management all of my career. I believe totally in the Cycle of Life. None of my comments should be taken as being negative towards ecosystem management.

I am also completely dedicated to refuges. I think they are the good gifts that we are leaving to our children. Nothing should be done that will weaken management on refuges or the positive image with which most people view refuges.

My management background should make it apparent that I am dedicated to endangered species. I want to see the endangered species bill kept strong. Refuge managers can only help as long as their position is strong.

With the outside attacks on laws to protect wetlands and endangered species, now is not the time to make major changes that might be perceived as a weakness within the Fish and Wildlife Service. We don't need distractions and/or people

worrying about their jobs. Refuge people don't need to be worrying about how refuges might be weakened by reorganization. They and the rest of the Service need to be united and working to keep the wetlands and endangered species laws strong and progressive.

My recommendation would be that a Deputy Regional Director position be set up for overseeing and coordinating ecosystem management. This would give emphasis at the highest level for ecosystem management. No one could doubt the sincerity of the effort to make ecosystem management a reality in this region. Each ARD should be left in place to reorganize his program as funds and FTE's permit, with major emphasis on ecosystem management. If there is a problem with having two Deputy RD's, then the person in the RD office who oversees the regional office staff could be called an Administrative Assistant.

I believe the Service can be a stronger organization with different divisions working together, but at the same time using different approaches to solve the same problem. This has worked great in the past for solving problems in this area. I think Jim Kurths' analogy to our military forces clearly defines what strong individual divisions can accomplish. The competition between divisions is great for achieving a stronger organization. Competition is great, but strife only weakens an organization.



L. APPENDIX

Inter-agency cooperation at its finest.



The tent provided a dry setting for the outside dedication ceremony.



Local cub scouts started the ceremony with the presentation of the flag.



State Senator Arthur Ravenel, Jr. entertained the audience as the master of ceremonies.





Refuge Manager George Garriss highlighted the historical beginnings of the center.



District Ranger Glen Stapleton manages the Francis Marion National Forest where the center is located.



Park Ranger Larry Davis received an award for his long term commitment toward completing the center.



Regional Office staff were well represented including Regional Director Noreen Clough and District Manager Bill Grabill.



# EXPLORE



## The Natural Beauty Of **BULL ISLAND**



**PASSENGER FERRY SERVICE**

CAPE ROMAIN NATIONAL WILDLIFE REFUGE

## FERRY TO BULL ISLAND

A leisurely 20-minute ferry ride takes you through rich saltwater marsh creeks, home to dolphins, egrets, pelicans and herons. Relax and enjoy the scenery within South Carolina's most pristine wilderness, the 64,000 acre Cape Romain National Wildlife Refuge.

## STROLL THE ISLAND

Stroll through protected maritime forest along sixteen miles of footpaths including a two-mile NATIONAL RECREATIONAL TRAIL. Pass fresh water ponds teeming with bird and wildlife within the larger barrier island ecosystem. The refuge hosts 250 species of birds. Enjoy the most fabulous stretch of undeveloped beach along the East Coast including "BONEYARD BEACH."

## ENJOY THE REFUGE

Take drinking water and food, and wear comfortable walking shoes. Remember to bring your cameras and binoculars. Any visit during warm spring, summer and fall months requires insect repellent. (Repellent, iced soft drinks, T-shirts and nature books are available on the ferry. Nothing is sold on the island.)

### BULL ISLAND FERRY SCHEDULE

*Please arrive 20 minutes prior to departure.*

#### MARCH 1 - NOVEMBER 30

- Tues, Fri, Sat:** Depart Moore's Landing 9 am & 12:30 pm.  
Land at Bull Island Dock.  
Leave Bull Island Dock Noon & 4 pm.
- Thurs:** Depart Moore's Landing 9 am.  
Land on Beach. Walk 4-5 mi. to Dock.  
Leave Bull Island Dock 4 pm.

***Call for Special Events Calendar***

#### DECEMBER 1 - FEBRUARY 29

- Sat. only:** Departs 9:00 am, Returns 4:00 pm.

Adults: \$20 Children under 12: \$10

**NO RESERVATIONS REQUIRED**



### COASTAL EXPEDITIONS, INC.

514-B Mill St., Mt. Pleasant, SC 29464

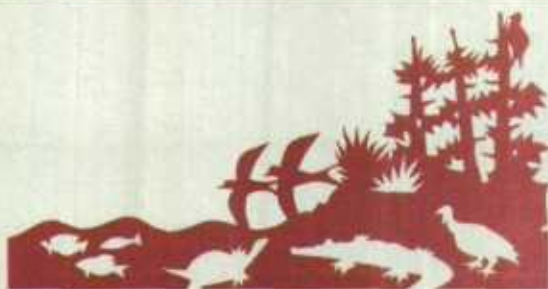
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Ferry service operates under exclusive contract with the U.S. Fish & Wildlife Service; Cape Romain National Wildlife Refuge

### 38 PASSENGER PONTOON CHARTER AVAILABLE

Sunset Cruises, Naturalist-led Charters  
Primitive Camping on Capers Island  
Parties, Weddings, Dolphin/Birding Charters





# Sewee Visitor & Environmental Education Center

*From the Forest to the Sea...  
Your window to the  
Francis Marion National Forest  
and the  
Cape Romain National  
Wildlife Refuge*



Red wolf  
*Canis rufus*



U.S. Forest Service



U.S. Fish & Wildlife  
Service



S.C. Center for  
Birds of Prey

SEWEE Association

*Exhibits about the ecosystems of  
the Francis Marion National Forest  
and Cape Romain National Wildlife  
Refuge*

*Live bird of prey display and  
educational area (In cooperation  
with the SC Center for  
Birds of Prey)*

*Live red wolf display and  
educational area*

*Interactive recreation  
information center*

*Trails*

*Auditorium and  
orientation film*

*Classroom and  
laboratory*

*Educational  
programs  
and materials*

*Book sales outlet*



Swallowtail butterfly  
*Papilio machaon*

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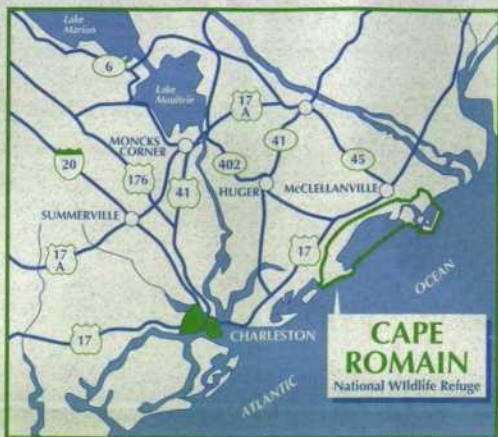


**Hours of Operation:**  
**Tuesday - Sunday**  
**9am - 5pm**

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## FRANCIS MARION NATIONAL FOREST



VICINITY MAP  
SCALE 0 10 20 MILES



# CAPE ROMAIN

## National Wildlife Refuge

SCALE 0 1 2 MILES

### LEGEND

- Wilderness Areas
- Closed Areas
- Refuge Headquarters
- Restrooms -Weather Shelter
- Refuge Access -Boat ramp inaccessible at low tide
- Hiking -Interpretive Trail
- Picnic Facilities
- Sewee Visitor Center







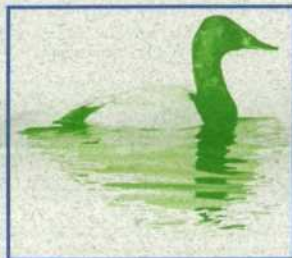
## The National Wildlife Refuge System

**Cape Romain National Wildlife Refuge** is one of over 500 refuges in the National Wildlife Refuge System. This system, encompassing nearly 90 million acres, is a network of lands and waters managed specifically for wildlife. The refuge system is administered by the U.S. Fish and Wildlife Service, an agency of the Department of the Interior. In addition to the refuge system, the Service is responsible for the endangered species program, certain marine mammals and migratory birds, among other wildlife programs.

### A Haven for Wildlife

Cape Romain National Wildlife Refuge was established in 1932. Since that time, in support of wildlife's battle for survival and the fight against constantly disappearing habitat, wildlife managers and biologists have employed a number of wildlife management techniques. Techniques now used to help wildlife, in addition to preserving the naturally occurring habitat, include:

Relocation of threatened loggerhead sea turtle eggs, laid on refuge beaches, to special enclosures to protect them from predatory raccoons and eroding beaches.



Management of artificial ponds. A few years ago prolific cattails began to cover freshwater ponds. Thus wintering wigeons, canvasbacks and ring-necked ducks were unable to find food and a place to rest. Because of wildlife management, today you will see open ponds, some covered with banana waterlilies that will entice these ducks to winter safely on the refuge.

### Preserving a Rich Natural Heritage

Stretching for 22 miles along the coast of South Carolina, Cape Romain National Wildlife Refuge is a rich natural resource. In the shallow bays of the refuge, the incoming tide combines the life-giving nourishment of the ocean with the nutrient-laden fresh waters of several small rivers to make one of the most productive environments on earth. Plants and animals from the land, rivers and ocean are all present at Cape Romain - and all are dependent on the delicate balance of the marshlands.

### Enjoying the Refuge

If your destination is Bulls Island, take drinking water and food, and wear comfortable walking shoes. Always remember to bring your cameras and binoculars. Any visit to the refuge during warm spring, summer, and fall months requires insect repellent.

Ponds on Bulls Island host most of the wintering waterfowl. The pier at Moores Landing is used for saltwater fishing and crabbing. During periods of tide this pier is a good location to observe wading and shore birds.

### The Seasons of Cape Romain

**Spring** is the best time of the year to visit the refuge. You have opportunities to see painted buntings, other

songbirds and warblers, as their migration peaks in March and April. Shorebirds also return at this time. Alligators can be viewed as they sun along the banks of Jacks Creek and Upper Summerhouse Pond.

**Summer** is a hot and humid period. Temperatures sometimes reach above 100 degrees but visitors are rewarded with the possibility of seeing endangered woodstorks, brown pelicans, young wood ducks, fledgling royal terns and other young birds.

**Fall** temperatures begin to cool and fall colors appear in the maritime forest. Endangered peregrine falcons move through and in September ducks begin to arrive in preparation for their winter stay. In October yellow warblers and other songbirds again pass through the refuge.

**Winter** is the season for hunting and fishing. Channel bass runs peak in November and deer hunts occur in November and December. Birders can observe peak waterfowl numbers in late November or early December. At this same time most of the Atlantic Coast's American oyster-catcher population is on the refuge. January and February are prime times to gather clams and oysters.



### Refuge Activities

**Sports Fishing** - Saltwater fishing and surf fishing opportunities are available year-round.

**Clamming, Oystering, and Crabbing** - Allowed in accordance with State regulations.

**Hunting** - a refuge hunting leaflet is available to inform you about the deer, rail and raccoon hunting opportunities.

**Hiking** - A two-mile national recreation trail is located on Bulls Island. This six-mile long, two-mile wide island has 16 miles of roads open for hiking.

### Photography and Wildlife

**Observation** - A small information station is available on Bulls Island. During a visit you may view some of the 277 bird species, 12 types of amphibians, 24 reptile species and 36 varieties of mammals that have been recorded on this refuge. Separate bird, mammal, and amphibian and reptile lists are available.



### Prohibited Refuge Activities

**Camping** - Camping facilities are located nearby on the Francis Marion National Forest. Call (803) 928-3368.

**Fires** - Prohibited due to potential fire hazards.

**Weapons** - Prohibited on refuge lands except during open hunting seasons and in open hunt areas.

**Pets** - Not allowed on refuge islands or the pier at Moores Landing.

**Collection** - Taking of any items, including items of antiquity is prohibited.

**Littering** - Please take your litter home and dispose of properly.

### Refuge Access

The refuge is open sunrise to sunset, seven days a week, year-round. The only facilities accessible by automobile are the refuge office, Sewee Visitor Center, and Moores Landing. Bulls Island lies nearly three miles off the mainland and is reached by boat from Moores Landing. A private ferry service takes visitors to Bulls Island on regularly scheduled days. Visitors desiring to visit Bulls Island should contact the refuge regarding the availability of the boat trip or call (803)881-4582.

### Refuge Office

The refuge office is located approximately 20 miles north of Charleston, SC on Highway 17. The office is open Monday through Friday (except holidays), 8:30am - 5:00pm.

### For Information Contact:

Refuge Manager  
Cape Romain NWR  
5821 Hwy 17N  
Awendaw, SC 29429  
803/928-3368

### Sewee Visitor Center

The Sewee Visitor Center showcases the unique heritage and natural history of the South Carolina Lowcountry. Jointly operated by the U.S. Fish and Wildlife Service and the U.S. Forest Service, the 9,000 square foot facility exhibits hands-on displays on the unique and valuable ecosystems of the Cape Romain National Wildlife Refuge and Francis Marion National Forest. The Center features tourist information on recreational opportunities on the Refuge and Forest. In addition, there are education classrooms for groups; live red wolf and raptor displays; book sales store; and hiking trails. The Center is located one-quarter mile north of the refuge office. Hours are Tuesdays-Sunday, 9:00 am. to 5:00 pm. Phone (803) 928-3368.

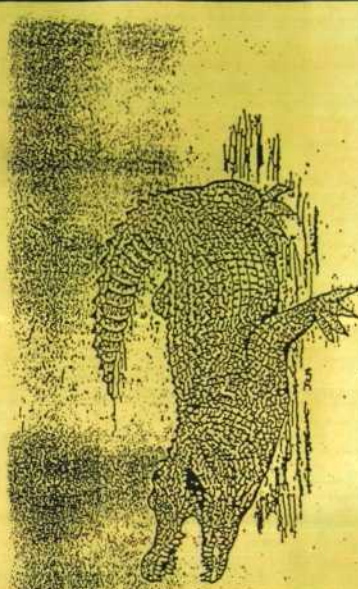


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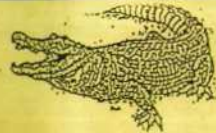


## AMPHIBIANS AND REPTILES

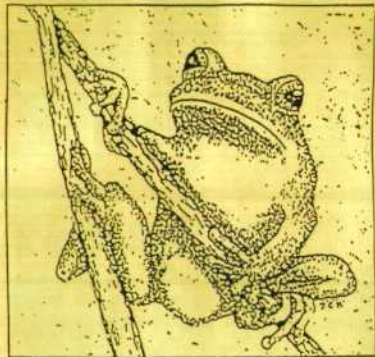


For further information, contact:  
Refuge Manager  
Cape Romain National Wildlife Refuge  
5801 Hwy 17 North  
Arendson, S.C. 29429

DEPARTMENT OF THE INTERIOR  
U.S. FISH AND WILDLIFE SERVICE



Cape Romain National Wildlife Refuge



## AMPHIBIANS AND REPTILES

The Cape Romain National Wildlife Refuge, established in 1932, is located in Charleston County, South Carolina, about 20 miles northeast of the city of Charleston. The refuge includes 34,229 acres of land composed primarily of salt marshes, tidal creeks and barrier islands. An additional 30,000 acres of open water are closed to migratory waterfowl hunting by Presidential Proclamation. Cape Island, Raccoon Key, and Bulls Island are the largest islands within the refuge. These barrier islands provide habitat for many animals. They also protect the salt marshes from the destructive forces of the ocean waves.

Bulls Island is the largest of the refuge's islands being 5,018 acres in size. A magnificent maritime live oak forest covers 1,475 acres and eight impoundments have created about 990 acres of freshwater ponds and marshes. Scrubby salt-spray forests, rolling sand dunes and expansive salt marshes occupy the rest of the island.

Since most herptiles (amphibians and reptiles, collectively) are not adapted to a salt water environment, it is not surprising that there are relatively few of these species at Cape Romain. Many of the species listed below are found in the vicinity of Moores Landing on the mainland, while those marked with an \* are found on the barrier islands and in the salt marshes, tidal creeks and open ocean.

Southern Copperheads and Eastern Cottonmouths are the only poisonous snakes found on the refuge and care should be taken when observing these snakes. The amphibians and reptiles of the refuge are protected by law and should not be killed, collected, or molested.



## AMPHIBIANS

### Salamanders

Marbled Salamander (*Ambystoma opacum*)

Slimy Salamander (*Plethodon glutinosus*)

### Frogs and Toads

Eastern Spadefoot Toad (*Scaphiopus holbrooki*)

Black Toad (*Bufo quercicus*)

Southern Toad (*Bufo terrestris*)

Southern Cricket Frog (*Acris gryllus*)

Green Tree Frog\* (*Hyla cinerea*)

Spring Peeper\* (*Hyla crucifer*)

Squirrel Tree Frog\* (*Hyla squirrella*)

Little Grass Frog (*Limnaeodius ocularis*)

Southern Leopard Frog\* (*Rana utricularia*)

Narrow-mouthed Toad (*Gastrophryne carolinensis*)



### Lizards

Green Anole (*Anolis carolinensis*)

Five-lined Skink (*Eumeces fasciatus*)

Southeastern Skink (*Eumeces inexpectatus*)

Broad-headed Skink (*Eumeces laticeps*)

Eastern Glass Lizard\* (*Ophisaurus ventralis*)

## REPTILES

### Turtles

Eastern Mud Turtle\* (*Kinosternon subrubrum*)

Yellow-bellied Turtle\* (*Chrysemys scripta*)

Spotted Turtle (*Clemmys guttata*)

Diamondback Terrapin\* (*Malaclemys terrapin*)

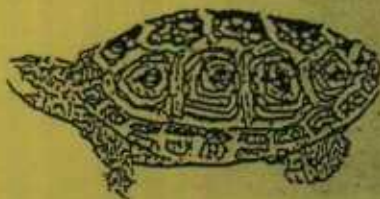
Eastern Box Turtle (*Terrapene carolina*)

Atlantic Loggerhead Turtle\* (*Caretta caretta*)

Kemp's Ridley Turtle\* (*Leiodonchelys kempi*)

### Crocodiles and Alligators

American Alligator\* (*Alligator mississippiensis*)



### Snakes

Southern Black Racer\* (*Coleophthalmus constrictor*)

Corn Snake (*Elaphe guttata*)

Yellow Rat Snake\* (*Elaphe obsoleta*)

Eastern King Snake (*Lampropeltis getulus*)

Banded Water Snake\* (*Natrix fasciata*)

Rough Green Snake (*Ophiodrys melanoleucus*)

Ribbon Snake (*Thamnophis sirtalis*)

Garter Snake (*Thamnophis sirtalis*)

Southern Copperhead (*Agkistrodon contortrix*)

Eastern Cottonmouth\* (*Agkistrodon piscivorus*)

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# **Birds**

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*Cape Romain*

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*National*

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*Wildlife*

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*Refuge*

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# Birds

The Cape Romain National Wildlife Refuge, established in 1932, includes about 34,000 acres of woodland, marsh and water within Charleston County, South Carolina. An additional 30,000 acres of open water are closed to migratory waterfowl hunting by Presidential Proclamation. Bulls Island, one of the refuge's three largest islands, is the only one that is wooded, being covered with a beautiful forest of live oaks, magnolias, pines and palmettos. This 5,000-acre island was added to the refuge in 1936 and has several shallow fresh and brackish water ponds. By furnishing habitat for a great variety and number of birds throughout the year, the Cape Romain National Wildlife Refuge has become recognized as one of the most important wildlife areas on the Atlantic coast.

The bird populations on the Cape Romain Refuge vary greatly in number and species according to the season. Although the refuge fulfills its primary purpose of benefiting waterfowl and shorebirds during migrations and through the winter season, the variety of summer resident species contributes to the year-round attractiveness of this area. The best opportunities for observing a large variety and number of birds are during the fall, winter and spring months.

## Seasonal appearance

Sp	Spring	March - May
S	Summer	June - August
F	Fall	September - November
W	Winter	December - February

## Seasonal abundance

a.	abundant (a common species which is very numerous)
c.	common (certain to be seen in suitable habitat)
u.	uncommon (present but not certain to be seen)
o.	occasional (seen only a few times during a season)
r.	rare (seen at intervals of 2 to 5 years)

This checklist includes 277 species of birds, which have been recorded on the refuge, principally on

Bull's Island and is based on observations by refuge personnel and visiting ornithologists. If you should find an unlisted species, please let us know at Refuge Headquarters. We appreciate your help in updating our records. Those with an \* nest on the refuge, or did so in recent years. Another 58 species considered extremely rare or out of their normal range have been added on the last page.

## Grebes

	SP	S	F	W
Common Loon	o	r	c	c
Red-throated Loon	r		r	u
Pied-billed Grebe*	c	c	a	c

## Pelicans and Allies

Double-crested Cormorant	a	c	a	a
Anhinga	u	u	o	r
Brown Pelican*	a	a	c	c

## Herons, Egrets and Allies

American Bittern	u	u	u	o
Least Bittern*	u	c	u	r
Great Blue Heron*	c	c	c	c
Great Egret*	c	c	c	c
Snowy Egret*	c	c	c	c
Little Blue Heron	c	c	c	u
Tricolored Heron*	c	c	c	c
Cattle Egret	o	o	r	r
Green-backed Heron*	c	c	u	u
Black-crowned Night-Heron*	c	c	c	c
Yellow-crowned Night-Heron*	u	c	o	u

## Ibises and Stork

White Ibis*	c	c	c	o
Glossy Ibis*	u	u	o	r
Wood Stork	c	c	c	u

## Waterfowl

Tundra Swan	r		c	c
Fulvous Whistling-Duck				r
Snow Goose			r	r
Brant				r
Canada Goose	r		o	o
Wood Duck*	c	c	c	c
Green-winged Teal	c		c	c
American Black Duck	c		c	c
Mallard	c		c	c
Northern Pintail	c		c	c
Blue-winged Teal*	c	u	c	c
Cinnamon Teal				r
Northern Shoveler	c		c	c

	SP	S	F	W
Gadwall	c		c	c
American Wigeon	c		a	a
Eurasian Wigeon				r
Canvasback	c		c	a
Redhead	o		u	c
Ring-necked Duck	c		c	c
Greater Scaup	a		c	a
Oldsquaw			r	r
Harlequin Duck			r	r
Black Scoter	u		c	a
Surf Scoter	o		u	u
White-winged Scoter	u			u
Common Goldeneye			u	u
Bufflehead	c		c	a
Hooded Merganser	c		c	c
Common Merganser			r	r
Ruddy Duck*	o	r	c	c
Red-breasted Merganser*	c	r	c	c

## Vultures, Hawks and Allies

Black Vulture*	c	c	c	c
Turkey Vulture*	c	c	c	c
Osprey*	c	c	c	r
American Swallow-tailed Kite	o	u	r	
Mississippi Kite	u	u	r	
Bald Eagle	u	o	u	u
Northern Harrier *	c		c	c
Sharp-shinned Hawk*	c	o	c	c
Cooper's Hawk*	o	o	o	o
Red-shouldered Hawk*	u	u	u	u
Broad-winged Hawk		r		
Red-tailed Hawk*	u	u	c	c
Golden Eagle	r		r	
American Kestrel	u	r	u	u
Merlin	r		r	r
Peregrine Falcon	r		o	o

## Gallinaceous Birds

### (Quail, Turkey and Allies)

Wild Turkey*	c	c	c	c
Northern Bobwhite*	u	u	u	u

## Rails, Gallinules, and Coots

King Rail*	o	o	o	o
Clapper Rail*	a	a	a	a
Yellow Rail				r
Sora	o		u	u
Purple Gallinule	r	r	r	r

	SP	S	F	W
Common Moorhen*	c	c	c	c
American Coot*	c	u	a	a
Virginia Rail	o		o	u
Black Rail*		r		
<b>Shorebirds</b>				
Black-bellied Plover	a	o	c	c
Lesser Golden-Plover	r		r	
Wilson's Plover*	c	c	o	r
Semipalmated Plover	c	c	c	c
Piping Plover	o		o	o
Killdeer*	o	r	c	c
Black-necked Stilt	o	o		
American Avocet	r			r
Greater Yellowlegs	o	r	c	c
Lesser Yellowlegs	o		o	u
Solitary Sandpiper	o	o	o	r
Willet*	a	a	c	c
Spotted Sandpiper	o	r	c	r
Upland Sandpiper	r	r		
Whimbrel	o		o	r
Long-billed Curlew	r		o	o
Marbled Godwit	u		u	u
Ruddy Turnstone	c	c	c	c
Red Knot	c		u	c
Sanderling	a	c	a	a
Semipalmated Sandpiper	u	o	o	r
Western Sandpiper	c	u	c	c
Least Sandpiper	c	u	u	c
White-rumped Sandpiper	o		o	
Pectoral Sandpiper	u	o	u	r
Dunlin	a	o	c	a
Stilt Sandpiper		r		r
Dowitcher	a	c	a	a
Common Snipe	u		c	c
American Woodcock*	o	r	o	o
Wilson's Phalarope	u		u	
Red-necked Phalarope	r		r	r
American Oystercatcher*	c	c	a	a
Laughing Gull*	a	a	c	o
Bonaparte's Gull	u			u
Ring-billed Gull	c	o	c	a
Great Black-backed Gull	r		r	o
Parasitic Jaeger	r		r	r
Herring Gull	c	c	c	a
Caspian Tern*	o	u	u	c
Sooty Tern*	r	r	r	r
Black Skimmer*	a	a	u	o

	SP	S	F	W
Common Tern	o	u	u	c
Farster's Tern	c	o	u	c
Least Tern*	c	c	o	r
Royal Tern*	o	a	c	u
Sandwich Tern*	c	c	o	r
Black Tern		c	c	
<b>Doves</b>				
Mourning Dove*	c	c	c	c
Rock Dove	o	o	o	o
Common Ground-Dove*	o	o	o	o
<b>Cuckoos</b>				
Black-billed Cuckoo	o		r	
Yellow-billed Cuckoo*	c	c	u	
<b>Owls</b>				
Common Barn Owl*	u	u	u	u
Eastern Screech-Owl*	c	c	c	c
Great Horned Owl*	c	c	c	c
Barred Owl*	u	u	u	u
Long-eared Owl				r
Short-eared Owl	r		r	u
<b>Nightjars</b>				
Common Nighthawk*	c	c	u	
Chuck-will's-widow*	c	c	o	
Whip-poor-will	o		o	o
<b>Swifts, Hummingbirds</b>				
Chimney Swift*	c	c	a	
Ruby-throated Hummingbird*	c	c	c	
<b>Kingfishers</b>				
Belted Kingfisher*	c	c	c	c
<b>Woodpeckers</b>				
Red-headed Woodpecker*	u	u	o	o
Red-bellied Woodpecker*	c	c	c	c
Yellow-bellied Sapsucker	o		o	u
Downy Woodpecker*	c	c	c	c
Hairy Woodpecker*	u	u	u	u
Northern Flicker*	c	c	c	a
Pileated Woodpecker*	c	c	c	c
Red-cockaded Woodpecker	r	r	r	r
<b>Flycatchers</b>				
Eastern Wood-Pewee*	u	c	u	
Acadian Flycatcher	c	u		
Eastern Phoebe	u		c	c
Great Crested Flycatcher*	c	c	u	

	SP	S	F	W
Eastern Kingbird*	c	c	u	
Gray Kingbird		o	o	
<b>Martins and Swallows</b>				
Purple Martin*	c	c	c	r
Tree Swallow	c	o	c	c
Northern Rough-winged Swallow*	c	c	o	
Barn Swallow*	a	a	c	r
Cliff Swallow*	u	u	u	
Bank Swallow	u		c	
<b>Jays and Crows</b>				
Blue Jay*	c	c	c	c
Fish Crow*	c	c	c	c
American Crow*	c	c	c	c
<b>Chickadees and Titmice</b>				
Carolina Chickadee*	c	c	c	c
Tufted Titmouse*	c	c	c	c
<b>Nuthatches</b>				
Brown-headed Nuthatch*	c	u	u	u
Red-breasted Nuthatch	r		r	
White-breasted Nuthatch*	u	o	o	u
<b>Creepers</b>				
Brown Creeper	u		o	u
<b>Wrens</b>				
Carolina Wren*	c	c	c	c
House Wren			u	u
Winter Wren			o	o
Sage Wren			u	u
Marsh Wren*	c	c	c	c
<b>Kinglets and Gnatcatchers</b>				
Golden-crowned Kinglet	o		c	c
Ruby-crowned Kinglet	o		a	a
Blue-gray Gnatcatcher*	c	c	u	u
<b>Thrushes</b>				
Eastern Bluebird*	u	u	u	u
Veery	o		o	
Gray-cheeked Thrush	u			
Swainson's Thrush	o			
Wood Thrush*	u	u	o	
Hermit Thrush	o		c	c
American Robin	u		c	u
<b>Thrashers</b>				
Gray Catbird*	o	o	c	c
Northern Mockingbird*	c	c	c	c



	SP	S	F	W
Brown Thrasher*	c	c	c	c
<i>Pipits</i>				
American Pipit*	o		u	u
<i>Waxwings</i>				
Cedar Waxwing*	c		c	c
<i>Shrike</i>				
Loggerhead Shrike*	c	c	o	o
European Starling*	u	o	u	u
<i>Vireos</i>				
White-eyed Vireo*	o	u	o	o
Yellow-throated Vireo*	o	o	o	
Red-eyed Vireo*	c	a	u	
Solitary Vireo	o		o	o
<i>Warblers</i>				
Blue-winged Warbler	r		r	
Golden-winged Warbler			r	
Tennessee Warbler	r		r	
Orange-crowned Warbler	o		o	o
Nashville Warbler	r		r	
Northern Parula*	c	c	u	
Yellow Warbler	c		u	
Chestnut-sided Warbler	o		o	
Magnolia Warbler	r		r	
Cape May Warbler	r		u	
Yellow-rumped Warbler	o		a	a
Black-throated Blue Warbler	u		u	
Black-throated Green Warbler	o	o	o	
Blackburnian Warbler	r		r	
Yellow-throated Warbler*	c	c	c	c
Pine Warbler*	c	c	c	u
Prairie Warbler*	u	u	u	o
Palm Warbler	o		c	u
Bay-breasted Warbler	r	r		
Blackpoll Warbler	o		o	
Black-and-white Warbler	o		u	u
American Redstart	u	o	c	
Prothonotary Warbler	u	u	o	
Worm-eating Warbler	o		o	
Swainson's Warbler	o		o	
Ovenbird	c		c	
Northern Waterthrush	o		o	
Louisiana Waterthrush	o		o	
Kentucky Warbler*		u	o	o

	SP	S	F	W
Common Yellowthroat*	c	c	c	c
Yellow-breasted Chat*	u	o	o	
Hooded Warbler*	c	u	o	
Canada Warbler	r		r	
Wilson's Warbler	r		r	
<i>Tanagers</i>				
Summer Tanager*	c	c	c	
Scarlet Tanager	r		u	
<i>New World Finches</i>				
Northern Cardinal*	c	c	c	c
Rose-breasted Grosbeak	r		r	
Blue Grosbeak	c	u	u	
Indigo Bunting*	c	o	o	
Painted Bunting*	c	c	u	
<i>Sparrows</i>				
Rufous-sided Towhee*	c	c	c	c
Bachman's Sparrow	o	r	r	o
Chipping Sparrow*	o	o	c	u
Field Sparrow*	o	o	o	u
Vesper Sparrow	o		u	u
Savannah Sparrow	o		a	a
Grasshopper Sparrow				r
Henslow's Sparrow				
Sharp-tailed Sparrow	o		c	c
Song Sparrow	u		c	c
Fox Sparrow			u	u
Lincoln's Sparrow				r
White-crowned Sparrow				r
Seaside Sparrow*	u	u	c	c
Swamp Sparrow	c		a	a
White-throated Sparrow	c		c	a
Dark-eyed Junco			a	a
<i>Blackbirds, Grackles, Cowbirds and Orioles</i>				
Red-winged Blackbird*	c	c	a	a
Lapland Longspur				r
Bobolink		c		u
Eastern Meadowlark*	o	o	c	c
Rusty Blackbird	o		a	o
Common Grackle*	c	c	c	c
Brewer's Blackbird	r		r	
Boat-tailed Grackle*	a	a	a	a
Brown-headed Cowbird*	u	u	u	u
Orchard Oriole*	c	o	o	
Northern Oriole	o		o	o



SP S F W

### Old World Finches

Purple Finch	o			o
American Goldfinch	u		o	u
Evening Grosbeak				u
Pine Siskin	o			o

### Introduced non-native species

House Sparrow*	u	u	u	u
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The following 58 species are considered extremely rare or out of their normal range and in many instances substantiated by only one or two observations. Many of these records are found in Sprunt and Chamberlain, 1949, South Carolina Bird Life with a supplement by Burton, 1979, and "The Chat," the journal of the Carolina Bird Club.

Eared Grebe	Razorbill
Western Grebe	Dovekie
American White Pelican	White-winged Dove
Cory's Shearwater	Snowy Owl
Greater Shearwater	Burrowing Owl
Sooty Shearwater	Saw-whet Owl
Littell Shearwater	Western Kingbird
Audubon's Shearwater	Fork-tailed Flycatcher
Great Cormorant	Scissor-tailed Flycatcher
Magnificent Frigatebird	Say's Phoebe
Roseate Spoonbill	Willow Flycatcher
American Flamingo	Least Flycatcher
Mute Swan	Vermillion Flycatcher
Common Eider	Sprague's Pipit
King Eider	Horned Lark
White-tailed Kite	Bachman's Warbler
Swainson's Hawk	Cerulean Warbler
Sandhill Crane	Kirtland's Warbler
Eskimo Curlew	Yellow-headed Blackbird
Red Phalarope	Western Tanager
Baird's Sandpiper	Black-headed Grosbeak
Pomarine Jaeger	Dickcissel
Long-tailed Jaeger	House Finch
Glaucous Gull	Common Redpoll
Iceland Gull	LeConte's Sparrow
Black-headed Gull	Lark Sparrow
Roseate Tern	Clay-colored Sparrow
Bridled Tern	Harris' Sparrow
Brown Noddy Tern	Snow Bunting

### Sighting Notes

Date: \_\_\_\_\_ Time: \_\_\_\_\_ to: \_\_\_\_\_

Weather: \_\_\_\_\_

No. of Species: \_\_\_\_\_

Route or area: \_\_\_\_\_

Observers: \_\_\_\_\_

Remarks: \_\_\_\_\_