

CAPE ROMAIN NATIONAL WILDLIFE REFUGE

Awendaw, South Carolina

ANNUAL NARRATIVE REPORT

Calendar Year 1994

Review and Approvals

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Regional Office Approval	Date

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, 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 landing in the New World on Bulls Island to resupply their stocks of wood, water, and food before proceeding further south. They

eventually established the first permanent European settlement in South Carolina at the present location of the City of Charleston.

Bulls Bay and the creeks behind Bulls Island were reputed hideouts for pirates plundering ships along the coast. The remains of the "Old Fort" on Bulls Island are believed to have been a martello tower built in the early 1700's. Stories of retreating British warships restocking supplies on Bulls Island during the Revolutionary War, Confederate blockade runners using refuge tidal creeks, and the Union troops' destruction of the martello tower used as a Confederate powder magazine are documented.

Two lighthouses still stand on Lighthouse Island. The first was built in 1827, and the other in 1857. Although neither is operational, they are still used as daytime landmarks for ships and fishermen.



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A. HIGHLIGHTS

Bobcat sighted for the first time in many years on Bulls Island.
(Section G10)

Record production of sea turtle hatchlings in hatchery program.
(Section G2)

Refuge holds Supporter Appreciation Day. (Section J3)

B. CLIMATIC CONDITIONS

Table 1. Monthly Temperature and Precipitation

Month	10-Year		10-Year		Refuge Avg.	10-Year Avg.	Precip
	Refuge High	Avg. High	Refuge Low	Ave. Low			
January	66	59	13**	38	40	49	9.12
February	70	61	24	42	47	52	1.41
March	74	67	34	46	54	57	3.58
April	79	76	40	55	60	66	2.73
May	89	82	50	62	70	72	1.15
June	94*	86	62	68	78	77	7.62
July	90	89	63	71	77	80	5.61
August	88	89	56	71	72	80	6.60
September	90	84	58	67	74	76	8.09
October	83	77	45	57	64	67	19.16
November	77	69	34	47	56	58	3.80
December	76	61	32	39	58	58	9.62
	81	75	43	55	63	65	78.49

*Year's High

**Year's Low

This year's temperatures were generally extreme, with refuge high temperatures exceeding the 10-year average maximum temperature in every month save August, and refuge low temperatures significantly lower than the 10-year average minimum temperature every month.

As was true with most of the southeast, January was unseasonably cold as arctic winds brought freezing temperatures for extended periods throughout the month. Also an unusually large amount of precipitation (9.12") fell in January. Relatively scant rainfall in February through April, coupled with higher than normal temperatures contributed to moderate to high fire danger conditions in May (See section H9). This condition was gradually ameliorated by increasing rainfall throughout the summer months. In late May, easterly winds and tidal influence contributed to extensive flooding in the area, impacting several species of wildlife and habitat (see sections G2, G4, G5, and H6).

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 1994.

On March 21, Garris and Stieglitz joined Biologist John Oberheu, Field Supervisor Roger Banks, and Winyah Bay Focus Area Task Force Chairperson Joe Carter in discussing such matters as acquisition strategy and establishing the project boundary. Later, representatives from Georgia-Pacific arrived to specifically discuss the tracts available for sale.

In December, word was received that the Preliminary Project Proposal had been approved in Washington for these acquisitions, to be known as the Winyah Bay or Waccamaw Neck National Wildlife Refuge.

Refuge neighbor Lewis White contacted the refuge earlier this fall regarding the easement across the Moores Landing property that he and his brothers, Charles and Jim, use to access their property. When the current shop building was constructed in the early 1980's, it was inadvertently sited across the official easement. At the time, this did not create any difficulty, as all three brothers had been using an "unofficial" easement known as the Woods Road for over 10 years. However, Jim White now wishes to subdivide his property for his children, and cannot get County approval without a recognized easement. While the refuge was working with Lewis on siting a new easement, Jim petitioned Senator Strom Thurmond to clear up the matter.

Garris and Stieglitz met with the brothers on November 8 at the refuge office to discuss the matter and establish an easement agreeable to all concerned. Stieglitz and Lewis walked out the proposed easement on November 22, which was immediately cut for surveying by Hathaway.

Local surveyor James McClellan has been employed to survey and mark the new easement. He is already familiar with the site and situation, as he is doing other survey work for the Whites in the area surrounding Moores Landing.

4. FARMERS HOME ADMINISTRATION CONSERVATION EASEMENTS

The refuge was assigned its first conservation easement on March 14, 1994. The easement, known as the Boyer Tract, is 11.15 acres of palustrine forested wetlands located on Johns Island, SC.

D. PLANNING

2. MANAGEMENT PLAN

Several refuge plans were revised this year. In June, the hunt plan was rewritten in conjunction with the nationwide secondary use compatibility review. It was revised to incorporate comments received (see Section D3) prior to submission and approval.

In November, the Fishery Management Plan, last revised in 1985 by the Charleston Fishery Biologist, was rewritten. During this period, the realization was made that managing for freshwater fishery and waterfowl under the conditions on Bulls Island was virtually mutually exclusive. As Cape Romain was established for waterfowl, the priority was clear. At year's end the document was being reviewed for station approval.

In December, the Water Management Plan was rewritten. At year's end, it too was being reviewed for station approval.

3. PUBLIC PARTICIPATION

As part of the nationwide secondary use compatibility review conducted this year, the public was given the opportunity to review and comment upon the newly rewritten Hunt Plan and the associated Environmental Assessment and Finding of No Significant Impact from June 20 to July 20 in accordance with the National Environmental Policy Act (NEPA). Copies of these documents were distributed to the South Carolina Department of Natural Resources (SCDNR), the Charleston Ecological Services Field Office (Chas. ES), the South Carolina Coastal Conservation League (SCCCL), and the Five Rivers Coalition (FRC). Copies of the documents were available for public review at the refuge office, or mailed to those submitting a SASE.

A notice was placed in several area newspapers, including the Charleston Post and Courier and the Santee Stripper, which elicited several generic letters of approval or opposition.

5. RESEARCH AND INVESTIGATIONS

CAPE ROMAIN NWR 94 "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 has a Class 1 air quality rating. This was the twelfth year of the study.

CAPE ROMAIN NWR 93 "POST HURRICANE HUGO AIR POLLUTION SYMPTOMS ON FORESTED HABITAT OF CAPE ROMAIN NWR" (42510-2)

Transect points initially established in 1988 and relocated and remarked in 1992, were surveyed in 1993 to evaluate vegetative species of special concern based on importance, abundance, and potential pollutant sensitivity. The survey consisted of 59 sampling points distributed along a line transect randomly located on Bulls, Cape, and Lighthouse Islands. A draft final report for the study was received in late May. The report, over 6 months late, concludes that the dramatic increase in stress to vegetation on Bulls Island is due to increased salt spray and changes in soil chemistry due to Hurricane Hugo. Evidence is lacking to support a direct link to pollution.

CAPE ROMAIN NWR 94 "SURVEY OF AIR QUALITY AND AMPHIBIAN POPULATIONS AT CAPE ROMAIN NWR" (42510-3)

This was to be a four year study conducted by the University of Georgia. The project received funding for FY92 and FY93. Even though not funded for FY94, regular testing continued through July. The objective was to obtain information on precipitation chemistry and information on freshwater habitats and fauna that might be at risk to air quality and concomitant water quality deterioration, as well as from the effects from Hurricane Hugo.

6. OTHER

In accordance with the 1994 Work Activity Guidance, the Refuge revised its objectives and outputs in November. The revised objectives and outputs are:

OBJECTIVES:

- *Preservation, restoration, and enhancement of habitat for migratory birds and resident species.
- *Protection and enhancement of endangered and threatened species.
- *Preservation and restoration of the Bulls Island forest and associated communities for natural diversity.
- *Preservation of the Cape Romain Wilderness Area.

*Promotion of the use of sound biological principles to guide the community at large in preserving biodiversity at an ecosystem level, utilizing the refuge as an anchor point and demonstration area.

OUTPUTS:

Endangered Species Production	2	EA
Endangered Species Maintenance	1,000	UD
Threatened Species Production	90,000	EA
Threatened Species Maintenance	1,200,000	UD
Waterfowl Production	200	EA
Waterfowl Maintenance	1,000,000	UD
Environmental Education	3,900	AH
Interpretation	70,000	AH
Wildlife Observation	120,000	AH
Hunting	5,000	AH
Fishing	70,000	AH

E. ADMINISTRATION

1. PERSONNEL

The permanent full time staff at Cape Romain Refuge began the year with nine employees, and ended with eight. Range Technician Peter Range transferred to Carolina Sandhills NWR effective October 2.

Seven temporary employees were hired at the refuge in 1994. Four maintenance workers were hired to work on dike stabilization; one seasonal fire fighter was brought back and two seasonals were hired to work on the turtle project.

Table 2. Comparison of On-Board Strength, 1990-1994

<u>YEAR</u>	<u>PERMANENT</u>		<u>TEMPORARY</u>	<u>FTE'S</u>
	<u>FULL-TIME</u>	<u>PART-TIME</u>		
FY 1994	9	0	7	12.9
FY 1993	9	0	4	10.0
FY 1992	9	0	9	15.2
FY 1991	10	0	11	14.2
FY 1990	11	1	7	15.5



Stieglitz
Geathers
Hathaway
Davis
Garris
Brown
Ritchie
Manigault

1. GARRIS, George R.	Refuge Manager	GS-12 PFT
2. STIEGLITZ, Barry W.	Asst. Refuge Manager	GS-11 PFT
3. DAVIS, R. Larry	Park Ranger	GS-09 PFT
4. RANGE, Peter G.	Range Technician	GS-07 PFT
Transferred 10/2/94		
5. RITCHIE, H. Irene	Office Assistant	GS-06 PFT
6. BROWN, Ruth B.	Office Clerk	GS-04 PFT
7. HATHAWAY, William E.	Maintenance Worker	WG-08 PFT
8. MANIGAULT, Herbert	Maintenance Worker	WG-08 PFT
9. GEATHERS, Isiah	Maintenance Worker	WG-06 PFT
10. DAWSEY, Sarah C.	Biological Technician	GS-04 TFT
11. AVENS, Larisa	Biological Aid	GS-03 TFT
12. McCORMICK, Jawana	Forestry Aid	GS-03 TFT
13. ODEN, Donald	Tractor Operator Leader	GS-06 TFT
14. KEITH, James	Maintenance Worker	GS-03 TFT
15. VANDERHORST, Cliff	Maintenance Worker	GS-03 TFT
16. WESTON, Glenn	Maintenance Worker	GS-03 TFT

2. YOUTH PROGRAMS

The Youth Conservation Corps (YCC) program began on June 13 and ended on September 17. There were eight enrollees from Mt. Pleasant, Awendaw, Huger, and McClellanville.

This year's major projects included assistance with the relocation of 971 loggerhead sea turtle nests to protected hatcheries, erecting sand fence and sand bagging dikes.



Biological Aid Larisa Avens is assisted by YCC enrollees F.B. Del Porto and Tammy Gross with construction of sea turtle hatcheries. BWS 8/94

As in past years, the enrollees, accompanied by Garris and Thompson, were provided a tour of Forts Sumter and Moultrie 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.

4. VOLUNTEER PROGRAM

Refuge volunteers provided approximately 1,050 hours to refuge programs throughout 1994. Volunteers assisted with turtle projects, site design, litter removal, and general maintenance. During the year, 37 volunteers donated time for the above projects.

The highlight of the 1994 year was the volunteer effort of a high school senior, Molly Stout. Miss Stout has been writing a senior thesis on the loggerhead sea turtle program. To accomplish this, she donated over 200 hours to the turtle program by assisting in the relocation of turtle nests, releasing hatchlings, and digging up old nests. Miss Stout has submitted her thesis to the General Electric Foundation in hopes of winning a \$40,000 scholarship, and will present a poster on her work at the 15th Annual Sea Turtle Symposium.

5. FUNDING

In FY94, the refuge received \$404,400 under 1260 base operating funds plus \$12,500 for the YCC program. Under endangered species sub-activity 1113, we received \$15,000 for the red wolf project and \$18,000 for the sea turtle project. Funding for fire sub-activity 9120 was \$35,300.

Table 3. Five Year Base Funding Comparison (thousands)

<u>Activity</u>	<u>FY-94</u>	<u>FY-93</u>	<u>FY-92</u>	<u>FY-91</u>	<u>FY-90</u>
1260	404.4	406.8	363.2	335.4	318.0
YCC	12.5	11.2	11.2	10.3	10.0
1113	33.0	33.0	33.0	29.0	29.0
1971	-	-	-	56.9	-
9120	35.3	12.3	8.2	55.6	21.0
TOTAL	485.2	463.3	415.6	487.2	378.9

6. SAFETY

Garris' refuge policy continues 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 1994. Biological Aid Larisa Avens was bitten by fire ants and had to receive an injection for the swelling. No time was lost due to this incident.

In a continuing effort to place the safety of the visiting public and the staff as the refuge's top priority, the agreement with the Medical University of SC transport service was continued in 1994. The transport service is the MEDUCARE helicopter lift which provides assistance in transporting injured or extremely sick persons off the islands to nearby medical facilities. Six landing sites were designated and placed into the computer system onboard the MEDUCARE helicopter.

Monthly safety meetings were conducted throughout 1994. Safety videos from the regional office followed by discussion on various safety issues were presented at each meeting.

7. TECHNICAL ASSISTANCE

The refuge is a member of both the 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). Monthly and special meetings were attended by Garris and/or Stieglitz. The current thrust of both task forces is to gain recognition and support similar to that enjoyed by the popular ACE Basin Focus Area, which will allow both 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).

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 maritime forest. The remainder of the land area is beach and salt marsh. Cape Island is 1,184 acres, most of which are 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 usual, water level in the Bulls Island impoundments were at the mercy of the prevailing climatic conditions. A continued lack of a reliable source of fresh water allows the precipitation to dictate water levels and, to some degree, pool salinities. Salinities decreased in February, following heavy January rains. Significant increases in salinity were

seen in May in both Jacks Creek Pool and Upper Summerhouse Pond. This increase was due to a combination of high temperatures causing increased evaporation, low rainfall, and, in the case of Jacks Creek Pool, the introduction of sea water during exceptionally high spring tides. A major increase in salinity between June and August in Upper Summerhouse Pond was caused by the introduction of sea water when that pool's water control structure blew out. This was contrasted with the salinity decreasing throughout the summer in Jacks Creek Pool through the fairly heavy rainfall in June, July, and August.



Remains of the Upper Summerhouse Pond culvert after a blowout in August. GRG 8/94

Most of the Bulls Island impoundments remain choked with cattail and Southern bullrush. These impoundments, including Pools 1 and 3, Lower Summerhouse Pond, House Pond, Big Pond, and parts of Pool 2 and Moccasin Pond, remain virtually worthless for waterfowl utilization due to the encroachment of vegetation. Mechanical control is desperately needed, but a lack of water control capability often confusticates planning efforts.

With the reduction of over 80 percent of the cattail in Jacks Creek and the drawdown of the Summerhouse impoundments, 5-8,000 wading birds utilized the impoundments throughout August

and September. These species were great egret, snowy egret, great blue heron, tri-colored heron, little blue heron, night herons, and white ibis.



Respectable crop of banana waterlily, much favored locally by waterfowl, in Pool 2. GRG 5/94

3. FORESTS

The maritime forest on Bulls Island has been changed from a mature full-canopied forest to a successional stage dominated by palmetto trees, shrubs, and annuals. The previously dominant species, live oak and loblolly pine, are slowly recovering and regenerating, respectively. It was estimated that approximately 50 percent of the surviving oaks produced acorns this year, resulting in the best mast crop since Hugo. However, due to extreme limb loss, the total mast crop is still significantly 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.



Typical view of post-Hugo Bulls Island forest.

GRG 6/94

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 12 miles of dunes on the windward side of Bulls, Lighthouse, and Cape Islands.

In recent years, these systems have been deteriorating rapidly. Hurricane Hugo flattened many of the dunes, and their rebuilding has been aggravated by several intense storms, of note the March 1993 "Storm of the Century".

In places, over 30' of beach was lost between May 9 and 19. In October, severe storms eroded over 30' of beach from the north end and center of Bulls Island. These same storms again eroded Cape Island, where the central hatchery site is threatened (see Section G2).



Remains of Bulls Island dune system following severe May storms and associated flooding. GRG 6/94

In June, Range and the YCC erected approximately 40 units of 20' long sand fence on the north and northeast side of Bulls Island to protect the Jacks Creek Dike. On Cape Island, 5 units of 25' long sandfence were erected adjacent to remaining large dunes, in hopes of enlarging them. A lack of funds precluded the purchase and installation of additional units of sandfence.

Sandfencing was previously erected on several locations on Bulls and Cape Islands in 1992, but much of it, located by the South Carolina Coastal Council, was too close to the ocean and washed out.

9. FIRE MANAGEMENT

The Refuge continues its proactive fire program by concentrating its efforts towards pre-suppression. A seasonal Forestry Aid is 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 kept mowed, free of flammable debris, and otherwise cleared.

Firebreaks are also maintained around the lighthouses to protect them from wildfire.

Both fire caches (Bulls Island and Moores Landing) were inventoried during the fall of 1994. Replacement items for NUS will be ordered from fire funds when the FY95 fire budget is distributed.

A single wildfire occurred on the refuge this year. On August 20, Garris detected smoke issuing from the top of a snag located just south of the Old Fort on Bulls Island. Early the next day, Manigault, Geathers, and McCormick responded to the site, where they quickly cut a dozer line and felled and extinguished the snag.

Refuge employees contributed to the western fire emergency this summer by spending 71 days on western fire assignments in July, August and September.

After receiving a tremendous amount of precipitation in January, dry conditions in February, March, and April coupled with well above average temperatures created hazardous conditions for wildfire in May. The refuge was fortunate to avoid lightning-caused wildfires during this period as many were detected locally. Fairly heavy precipitation throughout June restored the refuge to normal fire danger conditions.

Plans for a cool season burn in the Big Pond Unit on Bulls Island were foiled by the aforementioned heavy January rains. District Fire Management Officer Brian McManus had visited the unit on January 6 in anticipation of this burn to assist with formulation of the burn plan. When conditions become favorable the refuge will again pursue this burn.

10. PEST CONTROL

Although Bulls Island remains plagued with pest plants, a lack of funds and manpower precluded an active eradication program.

Chinese tallow is an opportunistic invader, which readily took advantage of the canopy openings created by Hugo. Introduced as an ornamental, birds rapidly spread the seeds of this tree, which favors poorly drained soils. As much as 100 acres of Bulls Island forest may be Chinese tallow, including several thick monotypic stands. A few acres were treated in April, using a 20 percent solution of Garlon 4 in diesel fuel, applied basally.

Cattail and Southern bulrush, although native, are problematic due to their encroachment into open water areas in the Bulls Island impoundments. A more detailed discussion of this problem may be found in Section F2. Several acres along Beach Road in Lower Summerhouse and House Pond were treated in April, using a 20 percent solution of Rodeo.

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.

The two lighthouses located on the island named for 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. The house and associated structures of the lighthouse keeper have been lost. Extensive rehabilitation work has been performed over the last several years on both structures, and volunteers continue to restore 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, respectively.

In July, the refuge installed a single IMPROVE module (SIM) at Moores Landing. 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, such as the Cape Romain Wilderness Area. This program will supplement other air quality research ongoing at Cape Romain.

G. WILDLIFE

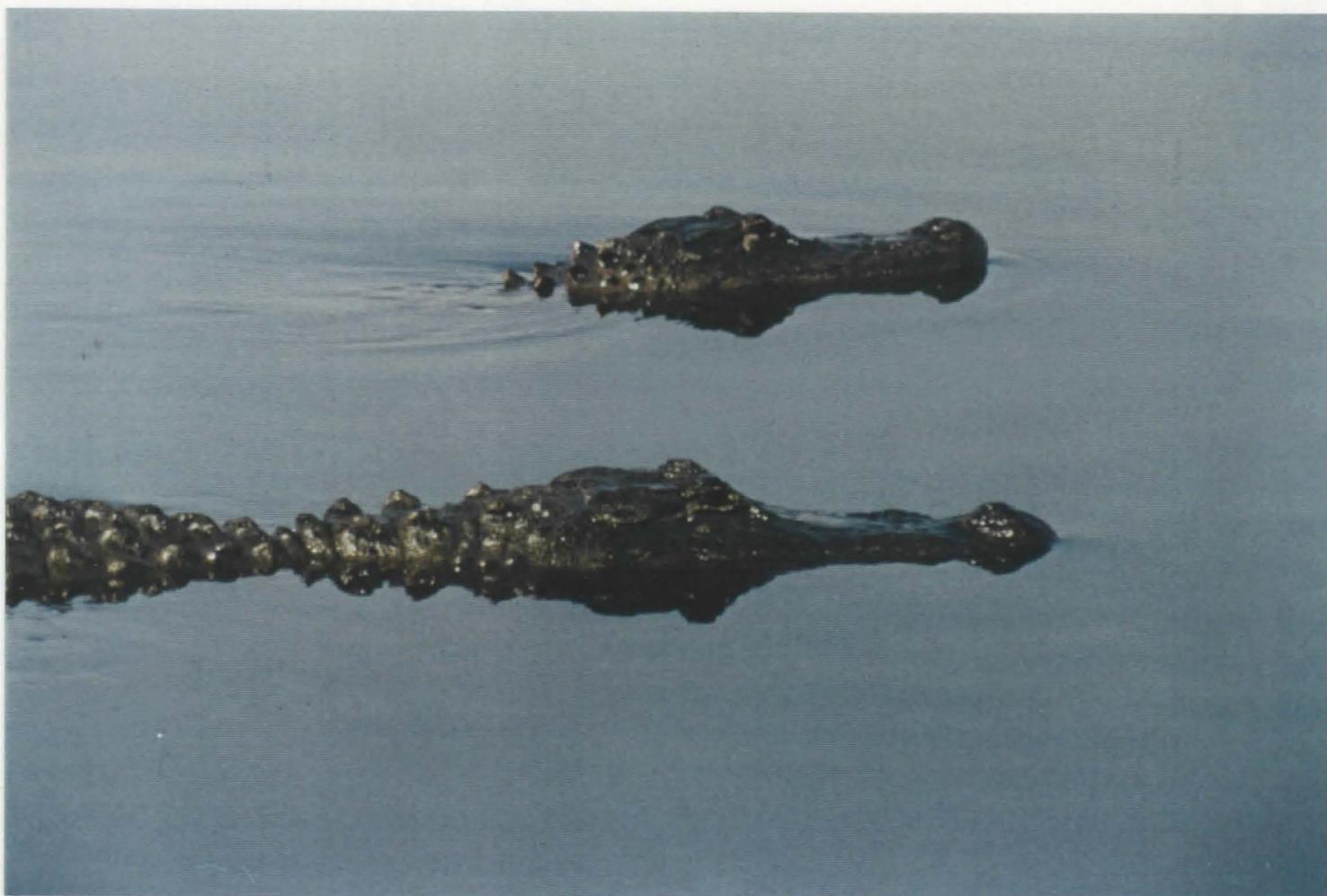
1. WILDLIFE DIVERSITY

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. Ryegrass, clover, and lespedeza were planted along roads and in fire breaks to provide food for wildlife. These plantings provide supplemental food until the oaks start producing sufficient mast for the wildlife.

With the loss of Range in October, the refuge's ability to collect biological data and wildlife observations decreased significantly. Therefore much of the fall and early winter census data is unavailable or incomplete.

2. ENDANGERED AND/OR THREATENED SPECIES

There are seven Federally listed and eight State listed endangered or threatened species occurring on the refuge. Included are American alligator, Arctic peregrine falcon, bald eagle, Cooper's hawk, Eastern brown pelican, glossy ibis, common ground dove, least tern, loggerhead sea turtle, osprey, piping plover, red wolf, American swallow-tailed kite, Wilson's plover, and wood stork. Leatherback sea turtles and red-cockaded woodpeckers are also known to use the area on occasion.



Bulls Island is home to over 600 American alligators. GRG 6/94

AMERICAN ALLIGATOR (Federal - threatened, similarity of appearance)

Alligators are present on both Bulls and Cape Islands. A night spotlight alligator survey conducted on Bulls Island on June 22 found 167 animals over 4 feet in length. Based on these survey results, it is believed that the Bulls Island population is at its highest level in record. An estimated 100 hatchlings were produced in the 2 nests on Bulls Island. No nesting was observed on Cape Island.



Although primarily piscivorous, alligators are highly opportunistic and, as can be seen, cannibalistic. GRG 7/94

ARCTIC PEREGRINE FALCON (Federal - threatened)

Peregrine falcons are spring and fall migrants along the South Carolina coast and are sighted regularly. The majority of the sightings were in the Jacks Creek area of Bulls Island. The falcons appear to feed primarily on shorebirds which use the tidal mud flats.

BALD EAGLES (Federal - threatened)

The bald eagle began the year in the region as endangered and as a threatened species. Several eagles are present year round at Cape Romain, and are commonly sighted.

The nest on Bulls Island Road was not utilized in the 1993-94 nesting season, but the pair apparently nested nearby, as they were often seen in the area. During September and October, they were a common sight, often seen fishing in the Atlantic Intercostal Waterway and consuming their catch on nearby exposed oysterbars. In late October and November, the pair was observed repairing and enlarging the nest on Bulls Island Road. At year's end (the peak egg laying period in South Carolina), the pair appeared to be incubating eggs.

Two adult and two juvenile eagles were commonly observed on the north end of Bulls Island every month of the year. Adult bald eagles were seen with regularity at the north end of the refuge, especially on Cape Island and near Alligator Creek on the Intercoastal waterway.

On January 7, Range conducted the National Mid-winter Eagle Survey, during which he sighted three of our resident birds.

COOPER'S HAWK (State - threatened)

The Cooper's hawk is rarely seen on the refuge. Individuals were seen in the spring and fall both on Bulls Island and at Moores Landing. This species was delisted this year by South Carolina.

EASTERN BROWN PELICAN (State - threatened)

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 this year. 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. Unfortunately the May flooding destroyed approximately half of the pelican nests on the Bulls Bay nesting islands. Eggs and hatchlings washed onto nearby shores for several days.

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

Table 4. Brown Pelican Nesting and Fledgling Success

<u>Year</u>	<u>.....Number of Nests.....</u>		<u>Total Nests</u>	<u>Young Fledged</u>
	<u>Marsh Island</u>	<u>White Bank</u>		
1990	2,534	0	2,534	1,898
1991	1,982	75	2,057	550
1992	2,045	104	2,149	2,579
1993	1,936	0	1,936	1,355
1994	1,296	321	1,617	1,213

Late in the year, the SCDNR reported that Bird Key-Stono, the largest pelican rookery in the State, had been reduced by erosion from 20 acres to approximately 0.1 acre. The refuge anticipates a major shift of these birds north onto the refuge in the 1995 breeding season.

GLOSSY IBIS (State-threatened)

Ibis are found throughout the year on Bulls Island in low numbers. Nesting occurred on Marsh Island and the White Banks Island with 40 nests found this year.

GROUND DOVE (State - threatened)

Ground doves utilized the refuge regularly, but in small numbers, generally preferring dunes or open sandy soil areas. In May, the regular sighting of a pair at Moores Landing indicated that they were nesting in the area. Several sightings were made along roadsides on Bulls Island in August.

LEAST TERNS (State - threatened)

The refuge is one of the most important nesting areas in the state with over 458 nests found on the refuge. A colony of 45 nesting pairs on the northern tip of Cape Island was destroyed by flooding in late May.

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: predation by raccoons and beach erosion. 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, collecting sand temperature data from the beach and hatcheries, and collecting information for the Sea Turtle Stranding and Salvage Network.

The first nests of the season were laid on May 4, and when the last was laid in September, a total of 1,218 nests had been deposited. This was significantly higher than the 579 nests in the 1993 season and the cumulative average of 1,000 nests. Nesting activity was high throughout the region. Table 5 summarizes the nesting and crawl data for the past five years on Cape Island.

Table 5. Loggerhead Turtle Nesting and False Crawl Densities

<u>Year</u>	<u>Number</u>	<u>False</u>	<u>Km of</u>	<u>Density per Km</u>	
	<u>Nests</u>			<u>Crawls</u>	<u>Nests</u>
1990	1,361	2,365	8	170.1	295.6
1991	1,061	2,234	8	132.6	279.3
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

A total of 971 nests (80 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.

Twelve predator-proof hatchery pens were constructed to accommodate the relocated clutches. The hatcheries were constructed out of PVC and chicken wire. Of the twelve hatcheries, three non-self-releasing were erected approximately 150 yards inland to protect them from major storms. The nine self-releasing hatcheries were located 20 yards from the beach, depending on the availability of suitable sites.



Part of the warren of self-releasing hatcheries required to accommodate this year's record 971 translocated nests. BWS 7/94

Approximately 83.3 percent of the 120,330 eggs placed in the pens hatched successfully, yielding approximately 100,234 hatchlings, which is over twice the number of hatchlings produced in 1993. The hatching success rate was determined by excavating 25 percent of whole nests of the 971 relocated.

Table 6. Hatching Success and Production in Hatcheries

<u>Year</u>	<u>No. of Nests</u>	<u>1990 - 1994</u>		<u>% Hatch Success</u>	<u>Hatchlings Produced</u>
		<u>No. of Eggs</u>	<u>Mean Clutch Size</u>		
1990	531	66,796	125.8	88.6	59,181
1991	718	84,434	119.8	77.1	65,099
1992	741	90,878	125.0	83.8	76,155
1993	500	59,443	124.4	79.1	47,019
1994	971	120,330	124.6	83.3	100,234

In 1994, as in previous years, raccoon predation, ocean overwash, and beach erosion were major problems for nests not moved into hatcheries. Only 50 percent of the nests left on the beach successfully hatched. Approximately 14 percent of the nests were either completely or partially destroyed by raccoons. The remaining nests (54 percent) were lost due to ocean overwash and beach erosion. The severe erosion caused by storms in May created an escarpment along much of the Cape Island beach. This escarpment prevented many females from nesting and increased the number of false crawls early in the season.

As mentioned earlier, loggerheads nest on other refuge islands such as Raccoon Key (116 nests), Lighthouse (88 nests) and Bulls (130 nests), for a total 329 nests in 1994. 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. Approximately 20 percent of nests on these islands survive to hatching stage. Most of the losses were due to ocean overwash and beach erosion. During 1994, the 329 nests produced an estimated 9,238 hatchlings. Table 7 summarizes the refuge's total production.

Table 7. LOGGERHEAD NESTING AND PRODUCTION - 1994

<u>Location</u>	<u>No. Nests</u>	<u>Hatchlings Produced</u>
Cape Island Hatchery	917	100,234
Cape Island Beach	247	6,832
Bulls Island	130	3,596
Lighthouse	88	2,434
Raccoon Key	116	3,208
TOTAL	1,498	116,304

Each year the refuge participates in the Sea Turtle Stranding and Salvage Network. This year a total of 16 strandings were recorded: 12 on Cape Island, 2 on Raccoon Key, 2 on Bulls Island, and none on Lighthouse Island. The cause of death was not identifiable for any of these turtles.

Overall, the sea turtle program was conducted with one less person than normal, and significantly lower volunteer contributions than in the past several years. This shortfall was remediated through the additional use of permanent staff. The staffing shortage was also somewhat offset by the closure of the cut on Cape Island, which reduced the amount of time and effort required to move nests laid on the south end of Cape Island into the hatcheries. Although the additional use of permanent staff detracted from other refuge programs, it appeared to be a worthwhile investment.

A record number of nests (971) were translocated into hatcheries. This number is 31 percent higher than in the previous record year, 1992, and accomplished with fewer dedicated turtle personnel. A slightly above average hatch success (83.3 percent) produced over 100,000 hatchlings in these hatcheries. This too, was a record for the refuge. On June 29, a refuge record of 37 nests were deposited.

Of concern this year were the high number of strandings (16 and overwashed nests (65). In June, a large female loggerhead stranded every few days for 2 weeks. These strandings mysteriously decreased when the U.S. Coast Guard was contacted and increased their enforcement activities on the shrimp trawlers working just offshore of Cape Island.

Dune restoration on Cape Island was identified in the 1993 loggerhead sea turtle recovery plan as a high priority project. The refuge will continue dune restoration projects on Cape and Bulls Islands to the extent possible with current funding and staffing levels.

OSPREY (State - threatened)

Osprey are observed throughout the year, but are most common on Bulls Island during migration and nesting season. The five nests used in 1993 were again used this year with an average of 1 young per nest. A sixth nest was built on Summerhouse Road, which also produced one fledgling. Of the six nests, only three survived this year's storms. The nest on Sheepshead Ridge Road was blown down in August and the two nests near North Beach Road were blown down late in the year. These nests were also utilized by great horned owls and great blue herons.

The osprey was also delisted by the State in 1994.

PIPING PLOVER (Federal - endangered)

Piping plovers are fairly rare migrants along barrier island beaches in the spring and fall. A high of 16 plovers were seen in March, and were present on the refuge as late as May.

RED WOLF (Federal - endangered)

The Bulls Island red wolf project began this year with an adult breeding pair (452M and 449F) and three of their eight-month-old young (640M, 641M and 642F). The radio-collared adults were tracked daily throughout the year. During periods of high public use, such as the archery hunts, telemetric observations were increased to twice or thrice daily. Movements and other information was recorded after each successful location.

All five wolves were captured over the three day period of January 19-21 using the sliding door trap. On January 25, veterinarian Dr. John Murray checked and treated the animals, finding them all in good health. The male had gained 7 pounds and the female 8 pounds in their 6 months in the wild. After being checked and cleared the adults were released, while the pups were detained for transfer to Alligator River National Wildlife Refuge.



One of the adult red wolves is given a final check immediately before being released.

BWS 1/94

The adults hunted together for the first few months of the year, until May, when their movements seemed to indicate they were denning. Rather than disturb the adults during this sensitive period, Garris decided to await the emergence of pups to confirm their existence. In September Garris confirmed the existence of one pup by visual observation on Old Fort Road.

The wolves continued to provide valuable service as top predators on Bulls Island. It was not unusual to find dead raccoons that they had killed but not eaten. This indicated that they were killing more than they needed for food. As an indication of their value as a top predator, another sea turtle nesting season was concluded with only three nests damaged by raccoons. In the years before the release of the red wolf, the first night predation averaged 95 percent. The family groups also take deer. Even if the red wolf was not endangered, it has established a place of importance on refuge lands. They should be released on all refuge and park owned islands.



Red wolf patrolling its pen.

GRG 1/94

AMERICAN SWALLOW-TAILED KITE (State - threatened)

Kites were 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 regularly 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. This year, each island had six Wilson's nests.

WOOD STORK (Federal - endangered)

Wood storks are fairly common on the refuge during the late spring to late fall. 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 this year. In anticipation of increasing demand for suitable nesting sites, the refuge intends to erect artificial nesting structures on Bulls Island.



Wood storks (and friends) roosting on Bulls Island. GRG 4/94

In July, low water levels in Upper Summerhouse Pond attracted 65 wood storks to feed. A total of 71 were observed on Bulls Island in August, gradually increasing to 120 birds in September. In October, the number of storks on Bulls Island decreased to 6. By November, the last of the birds had migrated.

The tidal Cape Island impoundment also provided feeding areas attractive to storks. Throughout the summer, 6-20 birds were present feeding at low tide. This impoundment is very close to a stork rookery on the nearby Washoo Reserve.

3. WATERFOWL

DUCKS

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 and some divers, and to sea ducks when the Refuge creeks and bays are rough.

Weekly waterfowl surveys are conducted on Bulls Island throughout the winter months, and are supplemented by monthly refuge-wide surveys and the mid-winter waterfowl survey in January. Results of these surveys follow.

During the first two weeks of the year duck use on Bulls Island remained high with 6-7,000 birds present. Duck numbers peaked on January 20 with 9,015 birds including a record 3,821 American wigeon on Bulls Island, mostly concentrated in Jacks Creek Pool. By the end of the month duck numbers dropped to about 3,000 birds.

During February, the number of ducks present in the Bulls Island impoundments rose as migration began. At mid-month 3,702 ducks were present. This number increased to 4,523 by month's end and consisted predominantly of scaup. Of note were two canvasbacks sighted on the February 11 survey. Most of the non-resident birds departed by March 15.

Resident wood duck use of the Refuge throughout the summer was normal, with an estimated 75 percent of the 28 wood duck boxes in use. An estimated 85 hatchlings survived to flight stage.

A pair of mottled ducks was observed throughout the summer in the former Cape Island impoundment, and is believed to have nested, although this was not confirmed.

Waterfowl arrived in earnest again in November, when 1,100 ducks were observed in Jacks Creek Pool. Over 30 percent of these birds were bufflehead, which remained in high numbers to year's end, exceeded in number only by scaup in December.

SWANS

Tundra swans are regular refuge visitors but are seldom here in large numbers. Jacks Creek Pool hosted a peak of 16 swans in January, dropped to seven in February with those departing in March. Two swans were again present in Jacks Creek Pool in December.

COOTS

Coot and moorhen populations increased this year with high numbers of moorhens nesting on Bulls Island. The fall population of coots and moorhens was 600 and 300, respectively. Coot numbers were highest in December, when over 1,000 birds were observed in Jacks Creek Pool.

4. MARSH AND WATERBIRDS

The refuge is one of the most important nesting 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.



Heavy use by wading birds is typical on Bulls Island. GRG
5/94

In January, a flock of 100 white ibis fed in the Bulls Island impoundments. In mid-March, the number of herons and egrets rose sharply. Nineteen great blue heron nests were located on Bulls Island. A rookery on the south end of Bulls Island contained 34 nests, including 16 great egret, 11 black-crowned night herons, 4 green-backed herons, and 3 tri-colored herons. Three pairs of black-necked stilts nested near Upper Summerhouse Pond.

Also of note were a pied-billed grebe nest and two purple gallinule nests in Pool 2. The first sighting of a purple gallinule, a rare event itself, was on April 29. Shortly thereafter its nest was located near the dike, which was quickly closed to pedestrian traffic to protect this sensitive nester from disturbance. This was the first documented nest on Bulls Island. A second nest was located in May. Collectively, these two nests produced nine chicks. On August 29, a second brood of chicks was observed, although an accurate count could not be obtained.

A large flock of 48 anhingas was observed migrating north over Bulls Island in late April.

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 for 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 includes 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 for black skimmers, Wilson's plovers, gull-billed terns, American oystercatchers, sandwich terns, and royal terns.

Monthly shorebird surveys were conducted during the migration months on Bulls Island until Range's transfer in October. Numbers were low until the first migrants arrived in March, including 500 dunlin and 3,000 red knots. Diversity remained good with normal use throughout the remainder of the year.

Several notable sightings were made in 1994. On January 13, a black-legged kittiwake was sighted on the north end of Bulls Island. On May 25, a magnificent frigatebird was sighted soaring south along the front beach of Cape Island. Both of these species are normally pelagic, rarely sighted within sight of land, and the frigatebirds range does not normally extend to South Carolina. This was the seventh recorded sighting of a magnificent frigatebird in the State.

Two white-rumped sandpipers were observed on Bulls Island in May and August. This species is uncommon on the refuge.

6. RAPTORS

The most commonly seen raptors are red-tailed hawk, kestrel, and northern harrier. The fall falcon migration this year started with several sightings in mid-September with most birds moving through by November (see Section G2), although several remained resident throughout the winter.

The most common owls on the refuge are screech and great horned, both of which nest on Bulls Island. Three pairs of great horned owls nested on Bulls Island this year. Two pairs used osprey nests near North Beach Road, while the third pair nested in a live oak on the south end of the island. Each of the northern nests fledged two young, while fledglings were not confirmed in the southern nest.

Three great horned owls were seen throughout May on Cape Island. It is hoped they will suppress the raccoon and Norway rat populations, thereby reducing predation on loggerhead sea turtle nests and hatchlings.

A pair of red-tailed hawks fledged two young from a nest on the north end of Bulls Island.

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.

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.

Throughout January and February, numbers of neotropical migrants remained fairly steady although yellow-rumped warbler numbers were well below previous years' figures. Migration began slowly, but picked up substantially by the end of April, with warblers making a good turnout. They returned southward in July, with a good number of black-throated blue, black and white, and palm warblers present.

Several sightings of note were made this year. Three ipswich sparrows were observed near Jacks Creek dike January 3-21. On Bulls Island a blackpoll warbler was sighted in April while a late white-crowned sparrow was observed on May 16. A State record sighting was made on August 4, when a lark sparrow was observed near Jacks Creek.

8. GAME MAMMALS

Mammals on which South Carolina has an open season that use the refuge include: white-tailed deer, eastern cottontail, marsh rabbit, gray squirrel, Southern fox squirrel, bobcat, gray fox, and raccoon.

In 1994 two archery hunts for white-tailed deer and raccoon were held on the refuge. Twenty-six deer were killed during the hunts (see Section H8).

The deer population on Bulls Island, estimated at over 300 animals, continues to feel the effects of Hurricane Hugo. Mast production, although much higher this year than any since Hugo, was still reduced and familiar browse plants were limited. Some of the natural vegetation that deer utilized was the small amount of evergreens that survived, such as red bay and yaupon. Deer observed throughout the year seemed healthy.

Biological Aid Sarah Dawsey reported the presence of three deer on Cape Island. It is thought they crossed Cape Romain Harbor on a low tide from Murphy Island.

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.

The Southern fox squirrel is present on the refuge only on Bulls Island. For the first two years after Hurricane Hugo the animals kept a small but apparently stable population. In the late summer of 1993 signs of a population crash began. By the end of the year, only the location of perhaps six animals were known. The cause of the disappearance is unknown.



Fox squirrel showing melanism typical for Bulls Island. BWS 11/94

9. MARINE MAMMALS

On July 9, the refuge participated in a Statewide dolphin count sponsored by the South Carolina Department of Natural Resources and the National Marine Fisheries Service. Approximately 28 man-hours were spent by refuge staff, volunteers, and YCC counting dolphins off the shore of Cape Island.

Stieglitz remained an active participant in the Marine Mammal Stranding Network. Three bottlenose dolphins stranded on the refuge this year. In addition, in late April a stranded dolphin was reported on the north end of Bulls Island, but could not be located by refuge staff. Level A (minimal) data was collected by Stieglitz and Range. The cause of death is unknown for all three dolphins.

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. Only 35 species of herptiles are documented. The primary places they occur are the areas surrounding Moores Landing and the freshwater areas on the barrier islands. 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 reaching six feet in length. Diamondback terrapins were quite active nesting on Cape Island this year.



Wild turkeys utilizing food plot on Bulls Island. GRG 10/94

Over 100 wild turkeys live on Bulls Island. Nesting and hatching went well with large broods of young observed, but by the time they reached flight stage, most broods were down to 2 or 3 poults.

11. FISHERIES RESOURCES

High temperatures and cloudy skies were believed responsible for two freshwater fish kills on Bulls Island. On June 13, several thousand fresh and saltwater fish were observed dead in Jacks Creek, followed on June 22 by thousands more in Upper Summerhouse Pond.

12. WILDLIFE PROPAGATION AND STOCKING

On March 2 and 3, 600,000 bluegill and redear sunfish and on April 6, 11,000 largemouth bass were stocked in Jacks Creek on Bulls Island by personnel from the Bo Ginn NFH.

14. SCIENTIFIC COLLECTIONS

Ten loggerhead sea turtle hatchlings were collected for the Riverbank Zoo in Columbia, SC on September 26. These hatchlings will be raised by hand for a year before being released into the Gulfstream. During the interim, they will be used for various environmental and sea turtle education programs.

On November 28, four Carolina diamondback terrapin eggs were transferred to the National Marine Fisheries Service Forensic Laboratory in Charleston, SC for use as voucher specimens in law enforcement cases involving sea turtle egg poaching. The eggs were collected on June 15 on Cape Island.

15. ANIMAL CONTROL

In conjunction with the loggerhead sea turtle nesting program, 20 raccoons were removed from Cape Island.

H. PUBLIC USE1. GENERAL

Throughout 1994 the Cape Romain Refuge received approximately 73,000 visitors. Refuge visitors participated in various activities such as fishing, photography, walking, shelling and nature study which resulted in 240,000 activity hours. The monthly breakdown for visitation is as follows:

January	2,898	May	8,050	September	4,370
February	4,025	June	6,555	October	6,440
March	8,280	July	8,510	November	5,060
April	9,200	August	5,060	December	4,830

Countless hours were spent in meetings and/or planning sessions for the joint Sewee Visitor and Environmental Education Center between the refuge and Francis Marion National Forest. By year's end, the architectural firm of Rosenblum and Associates and the exhibit firm of Lyons/Zaremba had submitted their final plans (see Section I8 for renderings of the Center). Construction is scheduled to begin in summer of 1995, with completion perhaps by February/March of 1996. This center will provide information to visitors regarding other areas of the refuge as well as Bulls Island and of National Forest.

2. OUTDOOR CLASSROOMS - Students

Approximately 500 area school students and scouting groups visited the refuge during 1994. The majority of the visits were scouts camping at Camp Sewee located adjacent to the refuge. When prior arrangements were made, a staff person provided an informal talk or tour of Bulls Island.

During the winter and early spring months, off-refuge presentations were provided to several area schools by Davis. Presentations on endangered species and management of the refuge were given to approximately 1,000 students in classrooms and assemblies.

3. OUTDOOR CLASSROOMS - Teachers

Teacher's workshops were presented to area teachers in 1994. The first workshop was conducted on June 22 for 25 teachers. The workshop centered around endangered species and how to develop a program for use back in the classroom. The workshop was conducted by Davis utilizing the Santee NWR auditorium.

A second teacher's workshop was given to 26 Charleston County teachers on November 7. This workshop was a joint effort between the Refuge and the Francis Marion National Forest. Cheron Rhodes (USFS) and Davis gave presentations on the refuge, forest, endangered species, forestry management and, most notably, the Sewee Visitor and Environmental Education Center.

In an effort to assist the refuge and forest in developing an educational program for the Sewee Center, an educational advisory board was formed. This board consists of Charleston, Georgetown, and Berkeley county educators who have agreed to meet throughout the school year. Their purpose is to provide guidance and assistance in developing an educational program which would compliment and enhance the curriculum being taught in area schools. The charter meeting was held at the refuge office on October 27. Cheron Rhodes and Larry Davis conducted the meeting. The individuals serving on the board are as follows:

William Bates, Headmaster
Archibald Rutledge Academy
McClellanville, SC

Cindy Buscemi, Teacher
McClellanville Middle School
McClellanville, SC

Juanita Middleton, Principal
St. James-Santee Elementary
McClellanville, SC

Chuck Washington, Bio. Teach
Lincoln High School
McClellanville, SC

Woody Collins, Principal
Jennie Moore Elem. School
Mt. Pleasant, SC

Julie Cliff, Bio. Teacher
Wando High School
Mt. Pleasant, SC

Carole Temple, Science Coor.
Charleston County Schools
Charleston, SC

Rie Cowen, Teacher
Buist Academy
Charleston, SC

Wendy Allen, Director
Belle Baruch Nature Center
Georgetown, SC

4. INTERPRETIVE FOOT TRAILS

The Bulls Island Nature Trail was designated a National Scenic Trail for its beauty. This 2-mile trail originates in the public use area on Bulls Island and winds its way through several habitats. A dozen signs interpret habitats and wildlife species such as freshwater marsh and the American alligator along its' length.

6. INTERPRETIVE EXHIBITS/DEMONSTRATIONS

The Twelfth Annual Southeastern Wildlife Exposition was held in Charleston, February 18-20. This year's exhibit theme for the refuge was coastal resources. The exhibit was provided by the Atlanta Regional Office. Refuge and ecological service employees staffed the exhibit along with two RO employees from Public Use. The Charleston Raptor Center was also a part of the exhibit. An estimated 42,000 persons attended the three-day event.

The refuge participated in the first annual Crab Festival on September 25, 1994, at the State Ports Authority Terminal in Charleston. Public and private land management agencies manned exhibits and provided information on their respective agencies. The refuge's exhibit was set up next to Francis Marion and therefore provided information on the SeWee Visitor and Environmental Education Center. The Crab Festival was the kick-off celebration for the BOC Round The World sailboat race. An estimated 8,000 persons attended the afternoon event.

An exhibit on the refuge and endangered species was set up at Brookgreen Gardens on April 22. This was an Earth Day '94 celebration organized by Brookgreen and attended by 800 school students from Horry and Georgetown counties.

7. OTHER INTERPRETIVE PROGRAMS

Throughout 1994, on- and off-site interpretive talks and tours were given to 31 groups totalling 1,045 persons. These were given to such groups/events as the Refuge Manager's and Ecological Services Training Academy, Sierra and Audubon Groups, universities, nursing homes, and the annual Coastweeks Celebration.

8. HUNTING

RAIL

The 1994 rail season falls within the frame-work of the State season which was September 7 - October 10 and November 1 - December 6. The hunt area was posted by Stieglitz and Davis prior to the season. Optimum hunting conditions are rare for rail hunts because to effectively hunt rails one needs higher than normal high tides. This year there were fewer than 25 optimum days.

WHITE-TAILED DEER

The 1994 archery hunt for deer on Bulls Island was the most successful since Hugo both in numbers of deer taken and participants. A combined total of 122 hunters participated this year. This increase can certainly be attributed to the frequency of hunt news releases in the state and local papers and a very enthusiastic hunt club in Lexington, SC.

During the November hunt 55 hunters killed 12 deer all of which were bucks. There were an additional six deer hit, but not recovered. The hunt during December was even more successful with 67 hunters, bagging 11 bucks and 3 does. The live weight ranged from a mere 50 pounds to a possible record of 145 pounds. All deer appeared to be in good health.

9. FISHING

Recreational fishing continued to be the activity which accounts for a large portion of the public use on the refuge. This category included saltwater fishing, clamming, crabbing, shrimping, and oyster gathering. The impoundments on Bulls Island which traditionally have been open to freshwater fishing remained closed throughout 1994 because of restoration due to Hurricane Hugo. Perhaps in 1996 the impoundment will once again be open to freshwater fishing.

Shrimp baiting is a legal sport in South Carolina and other coastal states in which a cast net is thrown over areas baited with balls of mud impregnated 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 inflicting significant negative impacts on the refuge's resources.

The 1994 season for recreational shrimp baiting began on September 9 and ended on November 8. Since the refuge was "discovered" as a haven for shrimp baiting six years ago, this activity continues to be a serious problem for the refuge.

Wildlife, especially egrets, heron, terns and pelicans, on the small islands were constantly disturbed by shrimp baiters throughout the season. During October there was a serious boating accident which occurred to shrimp biaters. It was estimated that there were over 16,000 visits to the refuge by persons specifically for shrimp baiting.

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 is responsible for the second highest number of public use visits incurred during 1994.

17. LAW ENFORCEMENT

Cape Romain began the year with four Refuge Officers, but this number was halved 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 violations and incidents has increased from previous years.

Most of the violations detected in 1994 were minor in nature and resolved with verbal warnings. These included bicycles on the pier (2), animal trespass at Moores Landing and on Bulls Island (6), possession of alcohol (3), use of cast net on pier (3), obstruction of waterway (1), fishing in a closed area (2), littering (3), after hours (3), parking zone (2), shrimp baiting without a permit (1), no trailer lights (1), no boat registration (1), and abandoning shrimp baiting poles (1).

Violations requiring additional corrective measures (written warnings or Notice Of Violation) included obstruction of boat ramp (2), commercial shell collecting (1), no running lights (1), entering a closed area (1), destruction of vegetation (1), use of climbing spikes (1), use of flagging (5), after hours (5), and tampering with government property (3). A case of shrimping out of season was referred to the State for prosecution. Nearly one-third of the violations detected were perpetrated by shrimp baiters.



Recreational shrimp baiters on Bulls Bay. In addition to being responsible for the majority of violations occurring on the refuge, the sheer number of boats causes navigation and other public safety hazards (see below). BWS 10/94

Two thefts from refuge boats were discovered on July 19. The first was the theft of a marine radio valued at \$300.00 from the transporter, probably on July 16 or 17. The thieves removed the door hinges in order to gain access into the boat cabin and take the radio. The second theft involved the removal of a toolbox and anchor from the bow of the 16' Glassmaster. These items, also valued at \$300.00, were taken after the hinges to the bow locker door were removed, thereby bypassing the door lock. This theft could have occurred anytime during the previous 6 months.

A forcible entry into a pickup truck parked on refuge property outside the Moores Landing gate was interrupted by Stieglitz on September 23. A dark vehicle was observed circling through the Moores Landing lot before stopping next to another vehicle parked on the side of Bulls Island Road. The suspect vehicle quickly left the area upon Stieglitz' approach. A thin chisel was found in the back of the pickup truck which may match pry marks in the rear window of the pickup truck.

South Carolina Department of Natural Resources officers reported two boating accidents on or adjacent to the refuge in October. The first, occurring October 8, involved a couple whose boat collided with a channel marker in broad daylight in the Intra-coastal Waterway immediately after leaving the refuge boundary. Both individuals sustained fairly severe injuries. The second occurred on October 21 when two boats travelling together collided after the lead boat slowed to orient. Minor injuries were sustained by both individuals in the lead boat.

I. EQUIPMENT AND FACILITIES

1. NEW CONSTRUCTION

The water treatment system for the Moores Landing facilities was completed in November except for a few "punch list" items.

2. REHABILITATION

Work continued on the 1857 lighthouse with most of the brass channeling in place and the glass ready to be 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.

3. MAJOR MAINTENANCE

Of great concern during 1994 was protection and stabilization of the recently repaired Jacks Creek dike. After consulting with the Army Corps of Engineers, based on the general lack of available funds, sandbagging was selected as the preferred method to meet this goal. In July, four temporary laborers were hired to protect the Jacks Creek and Upper Summerhouse dikes with armed sandbags. Their work continued throughout the remainder of 1994.

4. EQUIPMENT UTILIZATION AND REPLACEMENT

The transporter was successfully removed from the water and scraped and painted in July.

8. OTHER

Planning efforts for the Sewee Visitor and Environmental Education Center got into full swing in 1994. In late 1993, a protest was filed by a competing exhibit firm regarding the awarding of the exhibit contract to Lyons/Zaremba from Boston, Massachusetts. A stop work order was issued to Lyons/Zaremba and the architect, Rosenblum and Associates. Once the dispute was settled, both firms were once again busy on the project. Throughout 1994 several meetings/presentations were held in

Atlanta and at the refuge office with both firms. RO personnel and refuge and Forest Service staff attended the meetings. By year's end, Rosenblum and Lyons/Zaremba had submitted their final plans. Since both firms were under contract at the same time, they were able to share their ideas and work with each other. This cooperation has resulted in the design of an outstanding facility with complimenting exhibits. Construction of the center is targeted for summer of 1995.

Below are an artist's rendering of the outside of the SVEEC, with the main entrance towards the center, and an inside view showing the inset map and reception desk.





J. OTHER ITEMS

3. ITEMS OF INTEREST

The South Carolina Wildfire Cooperators Meeting was held at the refuge on January 6 and 7. Various issues of concern, changes at several areas, training and qualification needs, and the weather condition known as subsidence were discussed.

A meeting was held on January 13 with representatives from the U.S. Army Corps of Engineers, Gene Metzger (USFWS, R4-Engineering), and refuge staff to discuss stabilization of the Jacks Creek dike. The Corps has agreed to serve as consultants on the project, which will be completed under force account by the refuge.

Davis was the guest speaker for the Third Annual Science Fair awards ceremony at Birney middle School in North Charleston, SC. Davis' presentation covered the wildlife of Cape Romain and problems facing wildlife in general. The ceremony, held February 8, was attended by 300 students and parents.

A meeting was held February 15 by refuge staff to discuss shrimp baiting concerns with representatives from the SCDNR, SCCCL, Wildlife Federation, Coastal Carolina University, and the Regional Office.

Stieglitz attended a special meeting of the SCDNR committee

Garris and Stieglitz met Director Beattie at a gathering held in conjunction with the Refuge Manager Training Academy and the Ecological Services Basic Training.

On March 5, Ken Granneman, Branch Chief for Technical Services in the Washington, D.C. office visited Bulls Island for an overview of the refuge and its programs.

Nine participants from the Ecological Services Academy visited Bulls Island on March 6.

Deputy Assistant Regional Director Phil Morgan visited the refuge and toured Bulls Island on March 7 in conjunction with a personal trip to the area.

The 28 attendees of the 1994 Basic Refuge Manager Training Academy and 4 academy advisors and instructors came to the refuge for a field trip on March 11. Various refuge staff members gave the tour and addressed various refuge programs and issues and tied them to academy course material.

Carolina Camera reporter Michael Trouche and South Carolina alligator biologist Walt Rhodes filmed an educational segment on alligators on Bulls Island on March 29.

Stieglitz was detailed to the Branch of Technical Services, Division of Refuges in Washington, D.C. April 4-22.

Garris attended an ecosystem management meeting sponsored by the U. S. Forest Service on April 5 in the Francis Marion NF. On April 20, Garris attended the Coastal Society's 14th Biennial Conference in Charleston, SC.

Garris attended the South Carolina Rural Development Council quarterly meeting in Columbia, SC on April 21.

On April 23, Garris attended the Community Meeting on Environmental Preparedness sponsored by the Medical University of South Carolina in Charleston, SC. One and one-half hours of the meeting was taped and aired on the South Carolina PBS station on May 6.

The Charleston Natural History Society conducted their annual spring bird count on Bulls Island on April 30.

Deputy Regional Director John Eadie visited the refuge on May 11. He was given a tour of Bulls Island to see the effects of Hurricane Hugo.

Cape Romain held a Refuge Supporter Appreciation Day on Sunday, May 15. Over 80 of 120 invitees came to Bulls Island to meet the staff, reacquaint themselves with the island, discuss management issues and concerns, and meet with others

with similar viewpoints. The day was considered a great success by all.

On May 31, reporter Greg Shull from a Myrtle Beach, SC newspaper visited Marsh Island to see firsthand the effects of the spring flooding.

On June 3, Davis provided a tour of Cape and Lighthouse Island to Senator Holling's press secretary Andy Brack. Mr. Brack was very impressed with the restoration work completed on the lighthouses and the sea turtle program on Cape Island.

On June 28 journalist Michael Trouche accompanied Garris to Marsh Island to film a segment on the colonial nesting birds on the island. The piece aired on June 29 on public and local cable broadcasts.

Carolina Camera reporter Michael Trouche was accompanied by Garris to Marsh Island on July 9 for an interview and filming of a segment on nesting sea birds.

On July 22, Range gave a tour of Bulls Island to the Ft. Sumter (NPS) YCC.

Garris and Stieglitz met with Roger Banks of the Charleston ES office on August 23 to develop ecosystem management strategies for Cape Romain NWR.

Soil Conservation Service representatives visited Bulls Island on September 14. Their purpose was to evaluate representation of indigenous plant species on the island and familiarize staff with SCS programs.



1994 Refuge Manager Academy trip to Bulls Island. BWS 3/94



Refuge Supporter Appreciation Day.

RBT 5/94

Stieglitz attended a meeting of the Georgetown County Council on September 15. The meeting was held to address concerns over the County's proposed impoundment management ordinance, which is intended to assist with mosquito abatement, but will have negative impacts on Service trust species. Charleston and other nearby counties are awaiting the outcome of the Georgetown ordinance before initiating similar ordinances of their own.

Carolina Camera reporter Michael Trouche visited the refuge on September 19 to film portions of segments on shrimp baiting and the fifth anniversary of Hurricane Hugo.

Stieglitz accompanied and assisted Sandra Silva, Chief of the Air Quality Branch, and Ellen Porter, Biologist with the AQB, with their review of conditions, equipment in use, and past research conducted at Cape Romain on September 28 and 29.

On November 8, Carolina Camera reporter Michael Trouche visited Bulls Island to film a segment on the archery hunt. He will return in December to complete his filming.

Garris attended a wilderness management conference sponsored by the Society of American Foresters and held in Albuquerque, NM November 14-18.

Davis met with Rhet Wilson, Program Manager for the South Carolina Aquarium, on November 17 to discuss the Sewee Visitor and Environmental Education Center.

Stieglitz completed the I-259 Security Manager self-study course on November 28.

Six participants in the Ecological Services Academy were given a tour of Bulls Island by Stieglitz on December 3.

On December 6, Carolina Camera reporter Michael Trouche returned to Bulls Island to complete filming for a segment on the archery deer hunts conducted there.

Training for refuge employees continued to be a priority throughout 1994. The following individuals attended training/conferences:

Garris: Project Leaders Conference, Atlanta, GA 2/8-11
 Sea Turtle Workshop, Hilton Head, SC 3/1-5
 District Cluster Meeting, Savannah, GA 5/16-17
 LE Refresher, Tallahassee, FL 5/22-28
 Supervisory Aviation Training, Atlanta, GA 8/26
 Wilderness Training, Albuquerque, NW 11/14-18

Stieglitz: ITS Training, Charleston, SC 1/12
 Heavy Equipment Training, Charleston, SC 1/28-29
 Fire Training (S-211/212), Tyler Bend, AR 1/30-2/5
 Fire Training (I-220/Standards), Walhalla, SC 2/10
 LE Refresher, Tallahassee, FL 3/13-19
 Shorebird Workshop, Georgetown, SC 4/27-29
 Prescribed Fire Manager, Kingstree, SC 5/3
 District Cluster Meeting, Savannah, GA 5/16-17
 Aviation Training, Savannah, GA 5/18

Davis: Education Program Planning, San Jose, CA 1/10-14
 LE Refresher, Tallahassee, FL 3/13-19
 Aviation Training, Savannah, GA 5/18

Range: Shorebird Workshop, Georgetown, SC 4/27-29
 LE Refresher, Tallahassee, FL 3/13-19
 Aviation Training, Savannah, GA 5/18

Geathers: Fire Training (S-211/212), Tyler Bend, AR 1/30-2/5
 New Employee Orientation, Atlanta, GA 4/11-15

4. CREDITS

Davis: A (pts); E2-4, 6; F12; H; I8; J(pts). Editing.
 Garris: G2; K. Editing.
 Stieglitz: A; B; C; D; E7-8; F1-11, 13-16; G; H17; I; J1-2.
 Editing, typing.
 Thompson: Typing, assembly.

K. FEEDBACK

On this, the fifth anniversary of Hurricane Hugo, extra photos showing vegetation recovery on Bulls Island are included in the addendum. Surveys made during the second and third years following Hugo, indicated that plants that are important to wildlife, such as live oaks, yaupon holly, American holly, palmettoes, pine, bays, myrtles, etc., were being reproduced at about the same ratio as before the hurricane. The bad news is that the tallow tree, an exotic, is taking over in many areas. Also live oaks damaged by Hugo continue to die after five years.

Most wildlife populations have returned to their normal numbers or even exceed their population before Hugo. Some of the wildlife populations that are greater now than before the hurricane includes turkeys, hawks, owls, herons, egrets, doves, and otter. Also wintering waterfowl populations have increased during the past two years, after repairs were completed to the Jacks Creek impoundment.

Hugo caused activities, such as cleanup projects, dike repairs, and beach stabilization continue to require much of the field crew's time. A new refuge office has been completed and funds are available to complete the joint venture visitor and environmental education center that is being planned in cooperation with the U.S. Forest Service. Funds in excess of \$3,500,000 are still needed to complete recovery projects. The largest items remaining to be completed includes maintenance and public use facilities on Bulls Island and the Moores Landing pier and boat facilities. These facilities were either completely destroyed by Hugo or damaged to such an extent that they no longer meet Service standards. The pier has been declared a potential safety hazard by Service engineers.

On another subject, refuge people are concerned with reorganization talk. Refuges are one of the few good gifts that we are leaving to our children. We hope nothing will be done that will weaken refuges or that will make people outside the Service think that refuges are being de-emphasized. This could lead to a move by a few people to try and take over some of our refuges for selfish purposes. This is usually for development or for some other economic use.

Over the years, refuges have created a positive image in peoples minds. Most surveys indicate that there is strong support for refuges. The strong support that refuges have built up over the years has helped advance other Service concerns. If the refuge system is able to maintain its strong image, it will also be able to help with the ecosystem endeavor, as well as counteract some of the efforts to weaken the endangered and wetlands movements.

Hopefully we will continue to have a strong refuge system that will have a positive effect on the ecoystem movement as it has had on

endangered species management and wetlands protection. The Cape Romain Refuge is an ideal example, where two Service groups, along with the State, have worked cooperatively to save endangered species --- red wolf, brown pelican, and sea turtle. This cooperative venture has worked so well that the brown pelican in South Carolina has made a complete recovery and is no longer considered endangered.

During the next few unpredictable years, the Service needs to demonstrate a strong united front. Otherwise, those things that we love and have worked so hard to advance could take a backward turn from which it would take years to recover.



Forest remaining in dune system. Note loss of majority of live oak, meager understory, and some pine regeneration.



Forest remaining inland. Note loss of pines and predominance of palm trees.



Fallen trees continue to block paths, watercourses, and hinder travel through the forest.



Live oaks, in spite of courageous adventitious budding, continue to die back.



Hurricane-caused openings create opportunities for plant species, some, like this sesbania, desirable....



... and others, like this Chinese tallow, or popcorn tree, very undesirable.

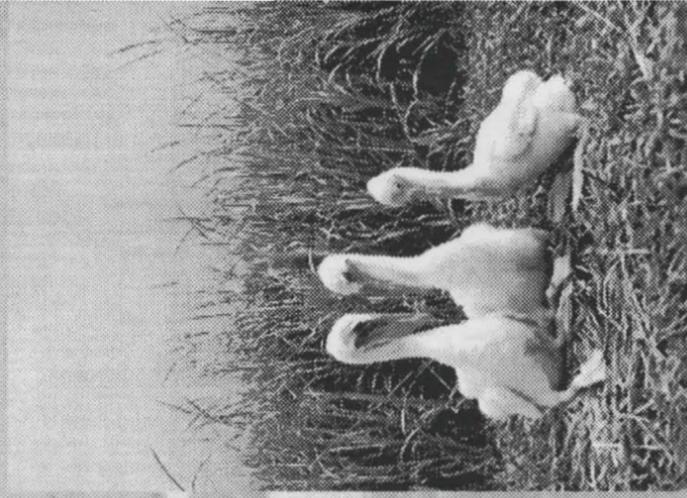
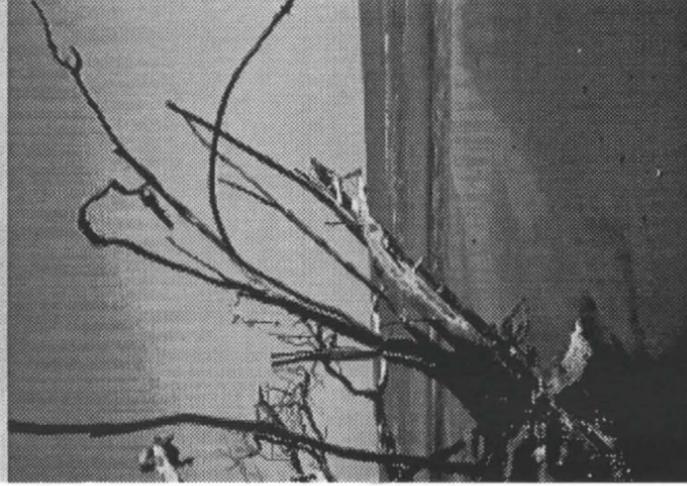


Several species are making a comeback, such as red bay ...

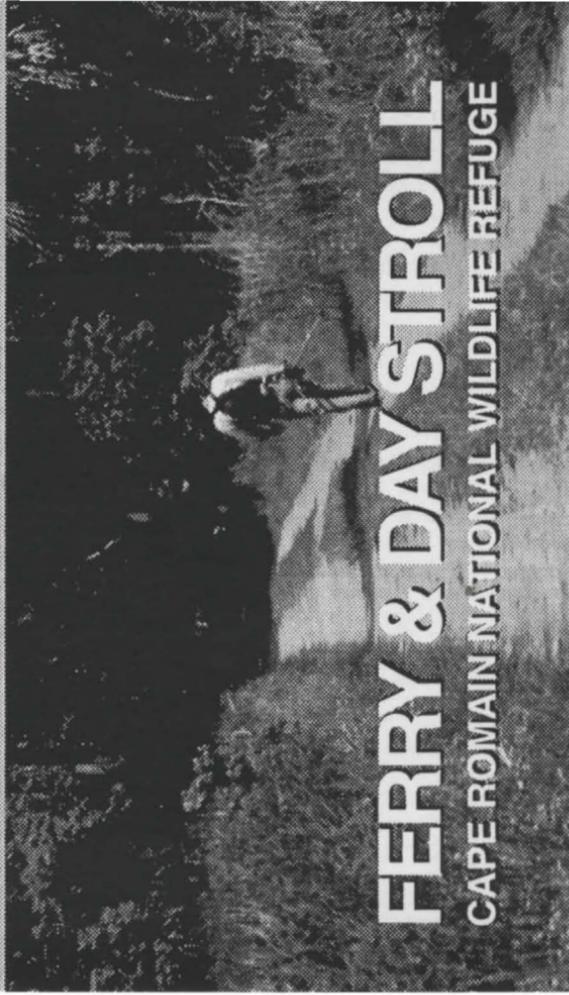


... and the loblolly pine native to Bulls Island.

EXPLORE



The Natural Beauty Of
BULLS ISLAND



FERRY & DAY STROLL
CAPE ROMAIN NATIONAL WILDLIFE REFUGE

FERRY TO BULL'S 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 teaming 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 and fruit juices are available on the ferry. Nothing is sold on the island.)

BULLS ISLAND FERRY SCHEDULE

March 1 - ~~October 31~~ ^{Nov 30} Tues., Fri., & Sat.

Departs Moore's Landing 9:00 a.m. & ~~noon~~ ^{12:30} Returns 4:00

~~Nov.~~ ^{Dec} 1 - Feb. 29 Saturdays only. Departs 9:00, Returns 4:00

Adults: \$15.00 Children under 12: \$10

Student & Youth Group Rates Available

Weather Permitting

NO RESERVATIONS REQUIRED



CAPE ROMAIN TOURS, INC.

P.O. Box 556, Sullivan's Is., S.C. 29482

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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

Waterways of the Cape Romain National Wildlife Refuge

Primitive Camping on Capers Island

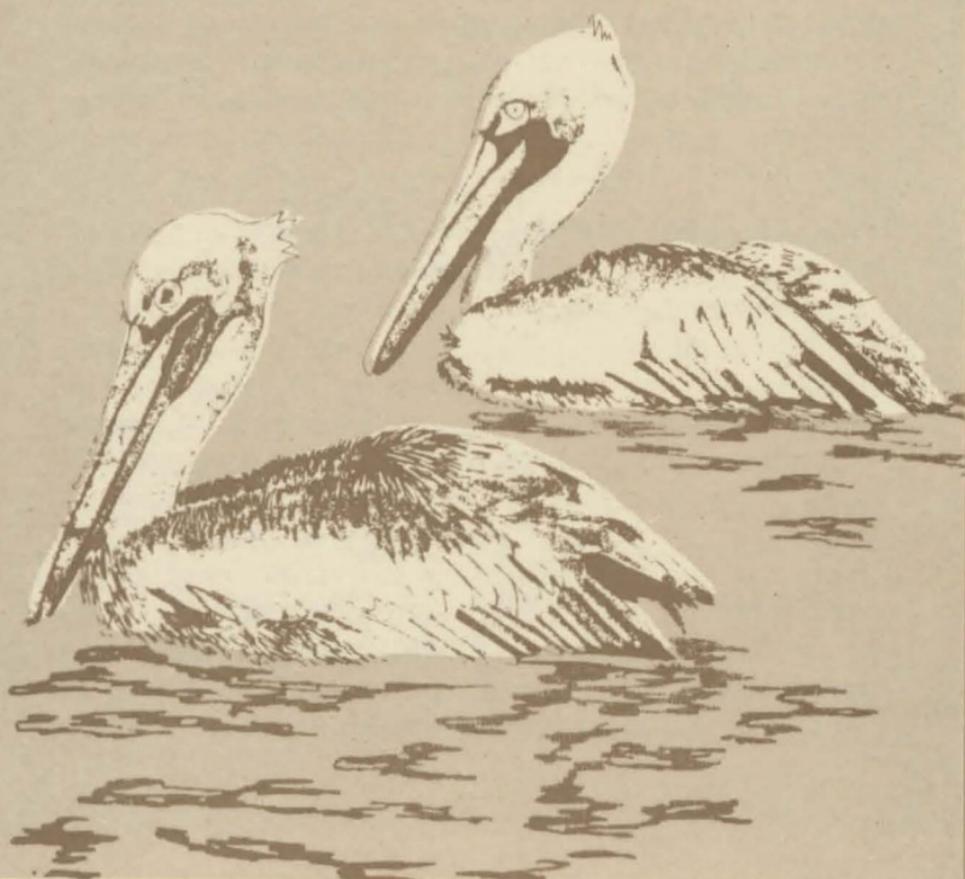
Special Shuttles to Bulls Island

Shelling Excursions

Special Events: Parties, Sunset Cruises, Dolphin/Birding Charters

BIRDS

Cape Romain National Wildlife Refuge
South Carolina



General Information

Loons, Grebes, Pelican, Cormorants, Anhingas, Bitterns,
Herons, Egrets, Ibises, Storks, Swans, Geese, Ducks

Vultures, Osprey, Kites, Eagles, Hawks, Falcons, Turkey
Quail, Rail, Sora, Coots, Gallinules, Plovers, Stilts, Shorebirds

Gulls, Terns, Skimmers, Doves, Cuckoos, Owls, Goatsuckers
Swifts, Hummingbirds, Kingfishers, Woodpeckers
Flycatchers, Swallows

Jays, Crows, Chickadees, Titmice, Nuthatches, Creepers,
Wrens, Kinglets, Gnatcatchers, Bluebirds, Thrushes, Mimics
Pipits, Waxwings, Shrike, Starling, Vireos, Warblers

Tanagers, Cardinals, Grosbeaks, Buntings, Sparrows
Meadowlarks, Blackbirds, Orioles, Finches

Accidentals

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 wild-life 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.

Many outstanding ornithologists have contributed to bird study on the refuge. The resulting bird list contains 279 species which have been recorded on the refuge, principally on Bulls Island. 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.

Season and relative abundance symbols are as follows.

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

- 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.

General Information

Loons, Grebes, Pelican, Cormorants, Anhingas, Bitterns, Herons, Egrets, Ibises, Storks, Swans, Geese, Ducks

Vultures, Osprey, Kites, Eagles, Hawks, Falcons, Turkey Quail, Rail, Sora, Coots, Gallinules, Plovers, Stilts, Shorebirds

Gulls, Terns, Skimmers, Doves, Cuckoos, Owls, Goatsuckers Swifts, Hummingbirds, Kingfishers, Woodpeckers Flycatchers, Swallows

Jays, Crows, Chickadees, Titmice, Nuthatches, Creepers, Wrens, Kinglets, Gnatcatchers, Bluebirds, Thrushes, Mimics Pipits, Waxwings, Shrike, Starling, Vireos, Warblers

Tanagers, Cardinals, Grosbeaks, Buntings, Sparrows Meadowlarks, Blackbirds, Orioles, Finches

Accidentals



Wood Duck

	Sp	S	F	W
— Red-throated Loon	r		r	u
— Common Loon	o	r	c	c
— *Pied-billed Grebe	e	c	a	c
— Horned Grebe	o	r	c	a
— Red-necked Grebe			r	u
— Northern Gannet	u			u
— Wilson's Storm Petrel		r	r	
— *Brown Pelican	a	a	c	c
— Double-crested Cormorant	a	c	a	a
— Anhinga	u	u	o	r
— 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
— *White Ibis	c	c	c	o
— *Glossy Ibis	u	u	o	
— Wood Stork	c	c	c	u
— Fulvous Whistling-Duck				r
— Tundra Swan	r		c	c
— 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
— <i>Cinnamon Teal</i>				r
— <i>Northern Shoveler</i>	c		c	c
— Gadwall	c		c	c
— Eurasian Wigeon				r
— American Wigeon	c		a	a
— Canvasback	c		c	a
— Redheads	o		u	c
— Ring-necked Duck	c		c	c
— 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	r	c	c
— Common Merganser			o	o
— *Red-breasted Merganser	c	r	c	c
— *Ruddy Duck	o	r	c	c

Loons, Grebes, Pelican, Cormorants, Anhingas, Bitterns, Herons, Egrets, Ibises, Storks, Swans, Geese, Ducks

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Pipits, Waxwings, Shrike, Starling, Vireos, Warblers

Tanagers, Cardinals, Grosbeaks, Buntings, Sparrows
Meadowlarks, Blackbirds, Orioles, Finches

Accidentals

	Sp	S	F	W
*Black Vulture	c	c	c	c
*Turkey Vulture	c	c	c	c
*Osprey	c	c	c	r
American Swallow-tailed Kite	o	u	r	c
Mississippi Kite	u	u	r	
Bald Eagle	r		r	o
Northern Harrier	c	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	r
American Kestrel	u	o	u	u
Merlin	r		r	r
Peregrine Falcon	r		o	o
*Wild Turkey	r	r	r	r
*Northern Bobwhite	c	c	c	c
Yellow Rail				r
Black Rail		r		
*Clapper Rail	a	a	a	a
*King Rail	o	o	o	o
Virginia Rail	o		o	u
Sora	o		u	u
Purple Gallinule	r	r	r	r
*Common Moorhen	c	c	c	c
*American Coot	c	u	a	a
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
*American Oystercatcher	c	c	a	a
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	c	c	r
Upland Sandpiper	r		r	
Whimbrel	o		o	r
Long-billed Curlew	r		o	o
Marbled Godwit	c		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
Purple Sandpiper	r		r	u
Dunlin	a	o	c	a
Stilt Sandpiper	r		r	
Buff-breasted 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



Osprey

Vultures, Osprey, Kites, Eagles, Hawks, Falcons, Turkey Quail, Rail, Sora, Coots, Gallinules, Plovers, Stilts, Shorebirds

Gulls, Terns, Skimmers, Doves, Cuckoos, Owls, Goatsuckers Swifts, Hummingbirds, Kingfishers, Woodpeckers Flycatchers, Swallows

Jays, Crows, Chickadees, Titmice, Nuthatches, Creepers, Wrens, Kinglets, Gnatcatchers, Bluebirds, Thrushes, Mimics Pipits, Waxwings, Shrike, Starling, Vireos, Warblers

Tanagers, Cardinals, Grosbeaks, Buntings, Sparrows Meadowlarks, Blackbirds, Orioles, Finches

Accidentals



Great Horned Owl

	Sp	S	F	W
Parasitic Jaeger	r			r
*Laughing Gull	a	a	c	o
Bonaparte's Gull	u			u
Ring-billed Gull	c	o	c	a
Herring Gull	c	c	c	a
Great Black-backed Gull	r		r	o
*Gull-billed Tern	c	c	u	o
*Caspian Tern	o	u	u	c
*Royal Tern	a	a	c	u
*Sandwich Tern	c	c	o	r
Common Tern	o	u	u	c
Forster's Tern		o	u	c
*Least Tern	c	c	o	r
Sooty Tern	r		r	
Black Tern		c	c	
*Black Skimmer	a	a	u	o
Rock Dove	o	o	o	o
*Mourning Dove	c	c	c	c
*Common Ground Dove	u	u	u	u

Black-billed Cuckoo	o			
*Yellow-billed Cuckoo	c	c	u	
*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
*Common Nighthawk	c	c	u	
*Chuck-will's Widow	c	c	o	
Whip-poor-will	o		o	o
*Chimney Swift	c	c	a	
*Ruby-throated Hummingbird	c	c	c	
*Belted Kingfisher	c	c	c	c
*Red-headed Woodpecker	r	r	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
Red-cockaded Woodpecker	r	r	r	r
*Northern (yellow-shafted) Flicker	c	c	c	a
*Pileated Woodpecker	c	c	c	c
*Eastern Wood-Pewee	u	c	u	r
Acadian Flycatcher	c	u		
Eastern Phoebe	u		c	c
*Great Crested Flycatcher	c	c	u	r
*Eastern Kingbird	c	c	u	
Gray Kingbird		u		
*Purple Martin	c	c	c	r
Tree Swallow	c	o	c	c
*Northern Rough-winged Swallow	c	c	o	
Bank Swallow	u		c	
*Barn Swallow	a	a	c	r
*Cliff Swallow	u	u	u	

Gulls, Terns, Skimmers, Doves, Cuckoos, Owls, Goatsuckers
Swifts, Hummingbirds, Kingfishers, Woodpeckers
Flycatchers, Swallows

Jays, Crows, Chickadees, Titmice, Nuthatches, Creepers,
Wrens, Kinglets, Gnatcatchers, Bluebirds, Thrushes, Mimics
Pipits, Waxwings, Shrike, Starling, Vireos, Warblers

Tanagers, Cardinals, Grosbeaks, Buntings, Sparrows
Meadowlarks, Blackbirds, Orioles, Finches

Accidentals

	Sp	S	F	W
*Blue Jay	c	c	c	c
*American Crow	c	c	c	c
*Fish Crow	c	c	c	c
*Carolina Chickadee	c	c	c	c
*Tufted Titmouse	c	c	c	c
Red-breasted Nuthatch	r			r
*White-breasted Nuthatch	u	o	o	u
*Brown-headed Nuthatch	c	u	u	u
Brown Creeper	u		o	u
*Carolina Wren	c	c	c	c
House Wren			u	u
Winter Wren			o	o
Sedge Wren			u	u
*Marsh Wren	c	c	c	c
Golden-crowned Kinglet	o		c	c
Ruby-crowned Kinglet	o		a	a
*Blue-gray Gnatcatcher	c	c	u	u
*Eastern Bluebird	u	u	u	u
Veery	o		o	
Gray-cheeked Thrush	u	u		
Swainson's Thrush	o	o		
Hermit Thrush	o		c	c
*Wood Thrush	u	u	o	
American Robin	u		c	u
*Gray Catbird	o	o	c	c
*Northern Mockingbird	c	c	c	c
*Brown Thrasher	c	c	c	c
*Water Pipit	o		u	u
*Cedar Waxwing	c		c	c
*Loggerhead Shrike	c	c	o	o
*European Starling	u	o	u	u



Carolina Wren

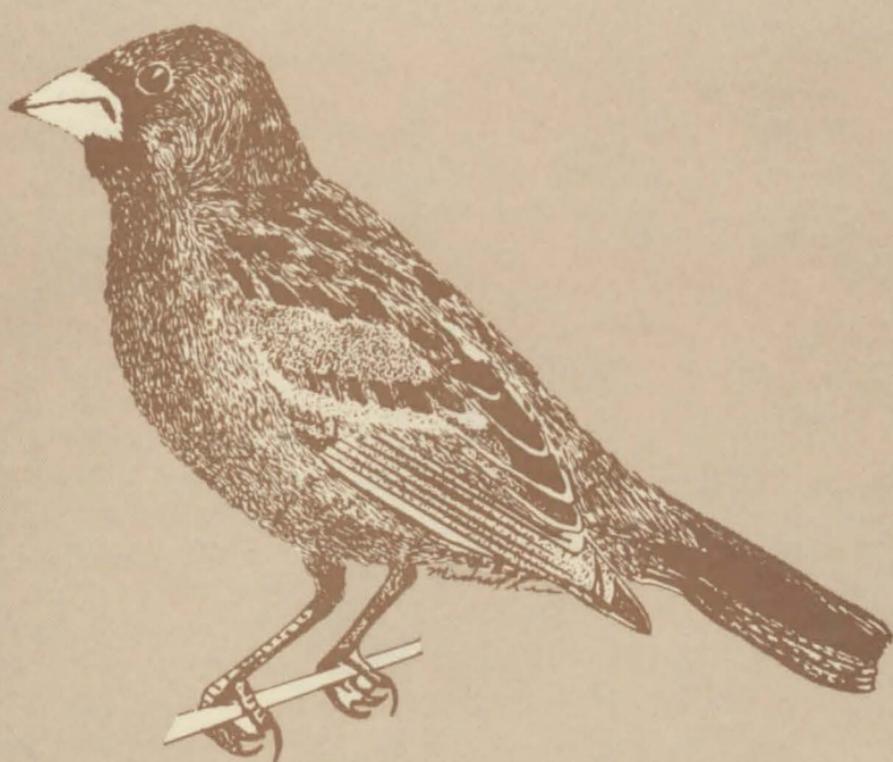
*White-eyed Vireo	o	u	o	o
Solitary Vireo	o		o	o
*Yellow-throated Vireo	o	o	o	
*Red-eyed Vireo	c	a	u	
Blue-winged Warbler	r		r	
Golden-winged Warbler		r		
Tennessee Warbler	r		r	
Orange-crowned Warbler	o		o	o
Nashville Warbler	r		r	
*Northern Parula	c	c	u	
Yellow Warbler	c		u	
Chestnut-sided Warbler	o	o	o	
Magnolia Warbler	r		r	
Cape May Warbler	r		u	
Black-throated Blue Warbler	u		u	
Yellow-rumped (Myrtle) Warbler	o		a	a
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	
Blackpoll Warbler	o		o	
Black-and-white Warbler	o		u	u
American Redstart	u	o	c	
Prothonotary Warbler	o	o	o	
Worm-eating Warbler	o		o	
Swainson's Warbler	o		o	
Ovenbird	c		c	
Northern Waterthrush	o		o	o
Louisiana Waterthrush	o		o	
*Kentucky Warbler	u	o	o	
*Common Yellowthroat	c	c	c	c
*Hooded Warbler	c	u	o	
Wilson's Warbler	r		r	
Canada Warbler	r		r	
*Yellow-breasted Chat	u	o	o	

Jays, Crows, Chickadees, Titmice, Nuthatches, Creepers, Wrens, Kinglets, Gnatcatchers, Bluebirds, Thrushes, Mimics, Pipits, Waxwings, Shrike, Starling, Vireos, Warblers

Tanagers, Cardinals, Grosbeaks, Buntings, Sparrows, Meadowlarks, Blackbirds, Orioles, Finches

Accidentals

	Sp	S	F	W
— *Summer Tanager	c	c	c	
— Scarlet Tanager	r		u	
— *Northern Cardinal	c	c	c	c
— Rose-breasted Grosbeak	r		r	
— Blue Grosbeak	u		u	
— *Indigo Bunting	c	o	o	
— *Painted Bunting	c	a	u	
— *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				r
— Sharp-tailed Sparrow	o		c	c
— *Seaside Sparrow	u	u	c	c
— Fox Sparrow			u	u
— Song Sparrow	u		c	c
— Lincoln's Sparrow				r
— Swamp Sparrow	c		a	a
— White-throated Sparrow	c	r	c	a
— White-crowned Sparrow				r
— Dark-eyed (Slate-colored) Junco			a	a



Blue Grosbeak

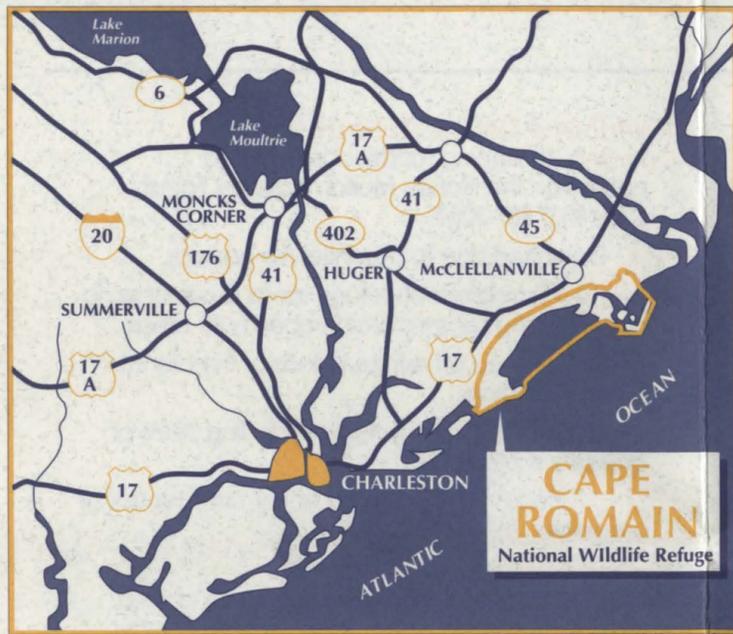
— Lapland Longspur				r
— Bobolink	c	c		
— *Red-winged Blackbird	c	c	a	a
— *Eastern Meadowlark	o	o	c	c
— Rusty Blackbird	o		o	o
— Brewer's Blackbird	r		r	
— *Boat-tailed Grackle	a	a	a	a
— *Common Grackle	c	c	c	c
— *Brown-headed Cowbird	u	u	u	u
— *Orchard Oriole	c	o	o	
— Northern (Baltimore) Oriole	o		o	o
— Purple Finch	o			o
— Pine Siskin	o			o
— American Goldfinch	u		o	u
— Evening Grosbeak				u
— *House Sparrow	u	u	u	u



Seaside Sparrow

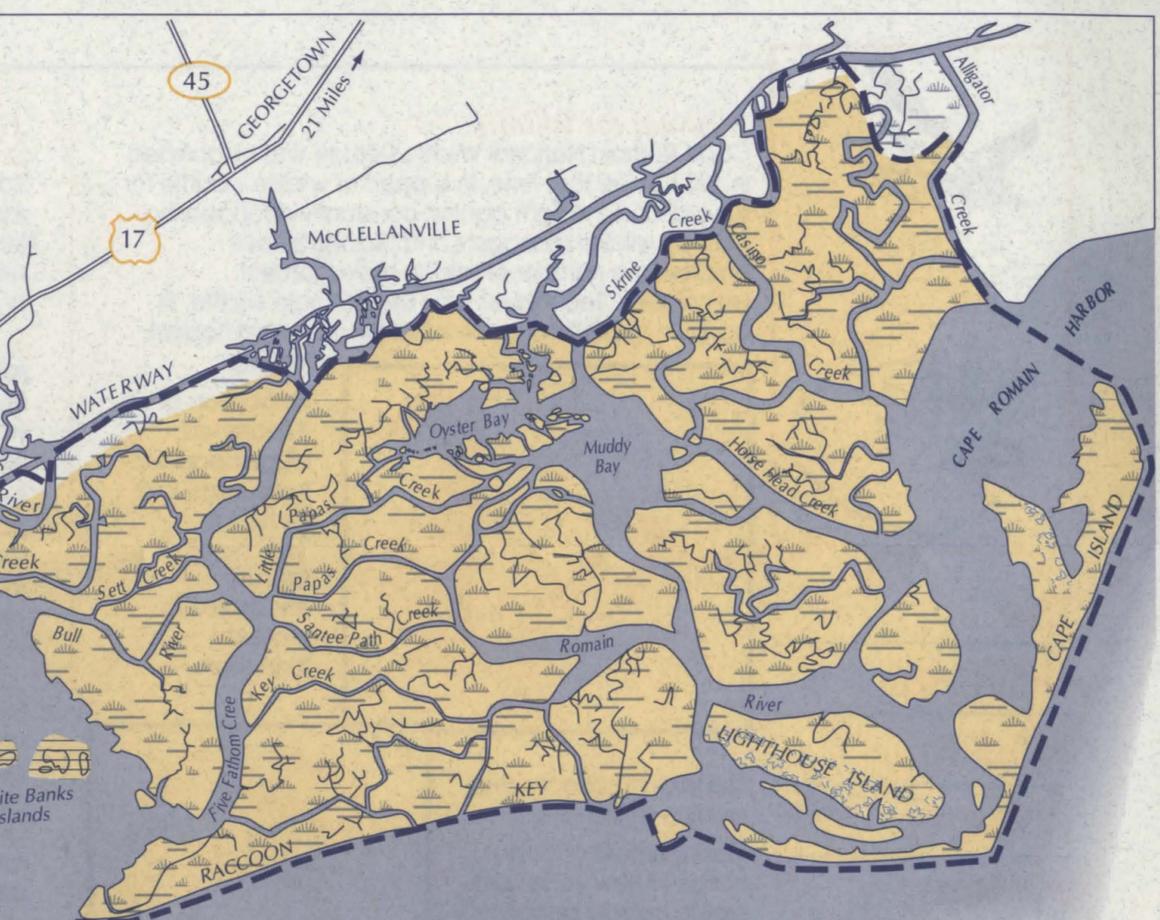
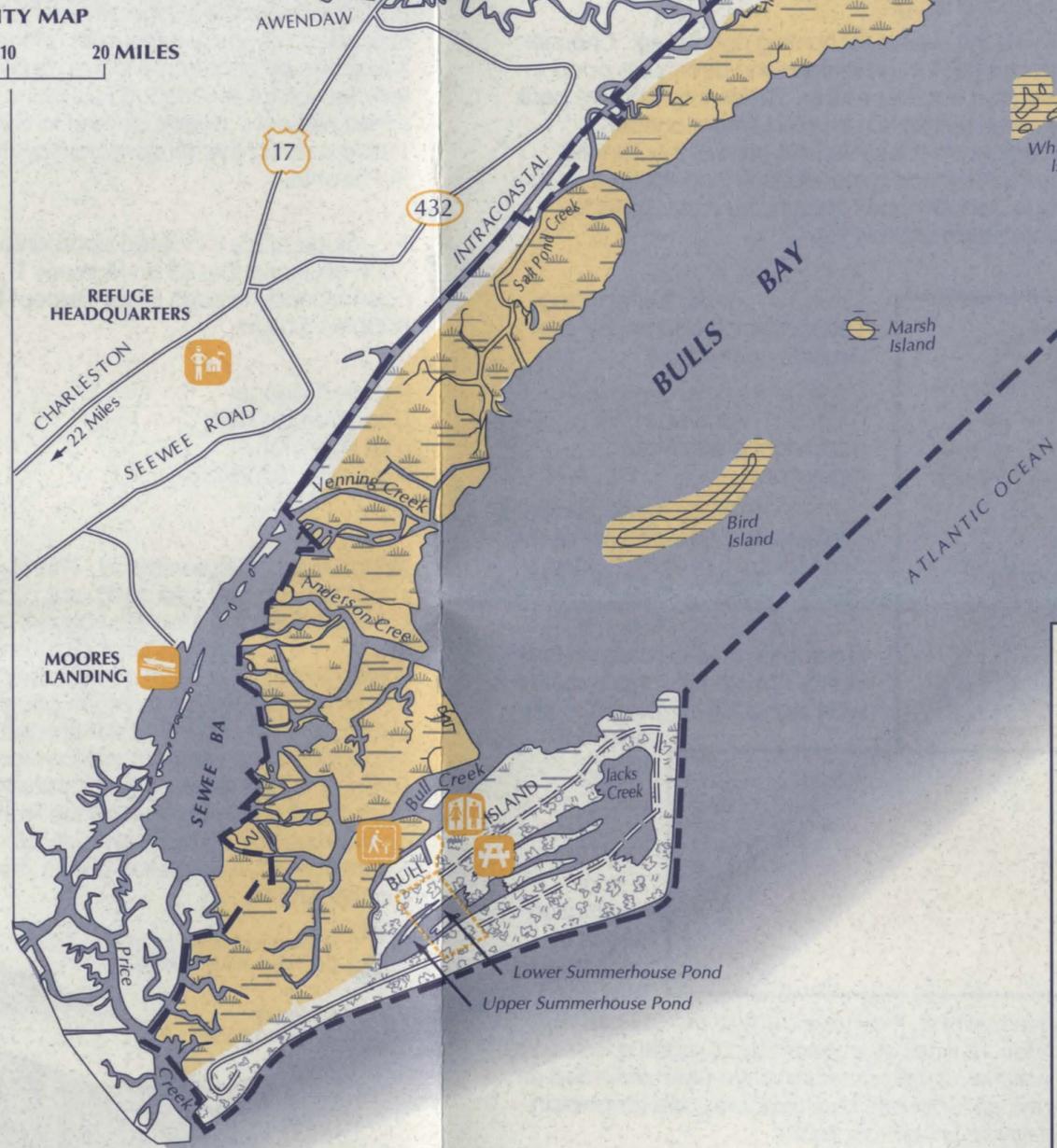
Tanagers, Cardinals, Grosbeaks, Buntings, Sparrows
Meadowlarks, Blackbirds, Orioles, Finches

Accidentals



VICINITY MAP

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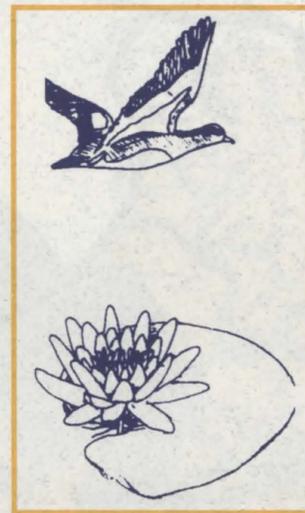
SCALE 0 1 2 MILES

CAPE ROMAIN

National Wildlife Refuge

LEGEND

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



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.



During a visit you may view some of the 262 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.

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.

Prohibited Refuge Activities

Camping - Camping facilities are located nearby on the Francis Marion National Forest. Call (803) 887-3257.

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 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.

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
5801 Hwy 17N
Awendaw, SC 29429
803/928-3368

Sewee Visitor Center

On the night of September 21, 1989 Hurricane Hugo swept through the area destroying nearly all old-growth timber and most recreational facilities on the refuge and the adjoining Francis Marion National Forest. Presently, a visitor center is envisioned offering much-needed services to inform and promote greater public appreciation of the natural and visual riches of the Cape Romain Refuge and the Francis Marion Forest. The center will be jointly operated by both agencies. It will be located on the Francis Marion Forest on U.S. Highway 17, approximately 18 miles north of Charleston, SC. Completion date is targeted for the summer of 1996.



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



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