

SRS Ecology

Environmental Information Document

Westinghouse Savannah River Company
Savannah River Site
Aiken, SC 29808



Prepared for the U.S. Department of Energy under contract no. DE-AC09-96-SR18500

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Preface

The SRS Ecology: Environmental Information Document (EEID, WSRC-TR-97-0223), updates a document of the same title which was released both as a paper copy and compact disc in 1994 (WSRC-TR-93-497). The objective of the EEID is to provide a summary and overview of relevant environmental information and conditions at the Savannah River Site (SRS) at a level appropriate for incorporation into environmental documents, such as Environmental Impact Statements and Resource Conservation and Recovery Act (RCRA) Facility Investigation/Remedial Investigation (RFI/RI) reports. The original EEID covered research and monitoring data available through approximately 1992. This revised EEID covers data available primarily through 1996, though some data are from 1997.

Since its establishment in the 1950s, the mission of the SRS was production of plutonium and tritium to support the defense, research, and medical programs of the United States. Currently all five production reactors on the Site are permanently shut down, a reflection of the changing world, the end of the Cold War and the reduction in the size of the U.S. nuclear weapons stockpile. The SRS mission now is focused on national security work, recycling and reloading of tritium, environmental cleanup and legacy waste management. Because of the unique capabilities at SRS, the Site is frequently evaluated for new missions.

During the early 1990s, when the original EEID was being written, the U.S. Department of Energy (DOE) still planned to restart K Reactor and build a New Production Reactor; cold testing of the Defense Waste Processing Facility (DWPF) had begun; the water level of Par Pond had been drawn down for dam repairs; and the Federal Facilities Agreement (FFA), which would direct environmental restoration activities at SRS, had just been drafted. During the period 1993 through 1997, the status of the Site's facilities has changed dramatically. There are no further plans to operate existing reactors or build new ones, but an accelerator is being designed for tritium production. Par Pond has been filled again, DWPF is operating, and approximately 250 acres of waste sites have been put into remediation in accordance with the FFA. During this period, the focus of ecological and environmental research and monitoring has shifted from thermal and other reactor-related effects to waste site characterization and restoration, bioremediation, innovative natural resource management, and National Environmental Policy Act (NEPA) support.

The revised EEID reflects this shift in focus. The results of thermal effects studies are still included, but have been reduced in focus. Results from new studies, including toxicity studies, bioassessments, and urban wildlife studies have been added. Ongoing studies have been updated where new data exists; in many cases, however, the data in the original EEID are the most recent data available.

The EEID is not meant to be an exhaustive account of all ecological information related to the Savannah River Site. Reports on other studies are available through the Savannah River Technology Center, Savannah River Ecology Laboratory, Savannah River Forest Station and other organizations.

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Executive Summary

The purpose of the SRS Ecology: Environmental Information Document (EEID) is to provide a source of information on the ecology of Savannah River Site (SRS). The SRS is a U.S. Department of Energy (DOE) - owned property on the upper Atlantic Coastal Plain of South Carolina, centered approximately 40 kilometers (25 miles) southeast of Augusta, Georgia. The entire site was designated a National Environmental Research Park in 1972 by the Atomic Energy Commission, the predecessor of DOE. This document summarizes and synthesizes ecological research and monitoring conducted on the three main types of ecosystems found at SRS: terrestrial, wetland and aquatic. It also summarizes the available information on the threatened and endangered species found on the Savannah River Site.

SRS is located along the Savannah River and encompasses an area of 80,267 hectares (310 square miles) in three South Carolina counties. It contains diverse habitats, flora, and fauna. Habitats include upland terrestrial areas, wetlands, streams, reservoirs, and the adjacent Savannah River. These diverse habitats support a variety of plants and animals, including many commercially or recreationally valuable species and several rare, threatened, or endangered species.

Soils are the basic terrestrial resource, influencing the development of terrestrial biological communities. Many different soils exist on the SRS, from hydric to well-drained, and from sand to clay. In general, SRS soils are predominantly well-drained loamy sands. Chapter 1, Soils, provides descriptions and shows the locations of the various soil types at SRS.

The SRS has 1,322 documented plant species, representing 151 separate taxonomic families. Chapter 2, Vegetation, discusses terrestrial land cover types found on the SRS including: landscaped areas around administrative and production facilities; grassland/forb/scrub-shrub communities, found in power line rights-of-way, forest openings, wildlife food plots, and recently clear cut or block-planted areas; natural pine or deciduous forests and pine plantations; bottomland hardwood forests along streams and within the Savannah River swamp; and the swamp forest along the Savannah River. The Savannah River Forest Station (SRFS), an office of the U. S. Forest Service, manages nearly 182,000 acres of pine plantations for commercial timber production. Thirty areas of the site, comprising 569 ha (1406 acres), have been protected as “set-aside” areas because they support unique vegetation communities, including natural pine stands, hardwood forests, riparian areas, swamp forests, and Carolina bays.

Chapter 3, Wildlife, describes the diverse and abundant fauna found at the SRS due to its temperate climate and numerous habitats. Herpetofauna on the SRS include 17 salamanders, 27 frogs and toads, one crocodilian, 13 turtles, 9 lizards, and 36 snakes. SRS supports a diverse avifauna that includes migrant, seasonal, and permanent residents. Surveys have identified 255 species of birds, including five non-native or exotic species. Fifty-four of the 61 species of mammals found in South Carolina may occur on SRS. Developed areas on the site are utilized by 144 species, including amphibians, birds and mammals. Potentially valuable commercial and recreational wildlife resources are present on the SRS, but generally are not available for exploitation due to restricted access to the Site. Public hunts of white-tailed deer and wild hogs are the only available public recreational use of SRS wildlife. From 1965 to 1996, 35,690 deer and 2,489 hogs were killed during

organized public hunts. Other game management activities at the SRS include trapping and removing wild hogs and beavers, and propagation of wild turkeys to stock other areas of the country.

Chapter 4, *Threatened and Endangered Species*, discusses the status of species of concern at SRS. The bald eagle, wood stork, red-cockaded woodpecker, shortnose sturgeon, and smooth purple cone flower, which are listed by the federal government as endangered, have been found on or in the vicinity of SRS. The brother spike mussel, American swallow-tailed kite, and gopher tortoise, which are listed as endangered species by the State of South Carolina, have been found on or in the vicinity of SRS. The American alligator, listed as threatened by similarity of appearance, is a common inhabitant of SRS aquatic systems. In addition, there are many other plants and animals found on the SRS that are considered species of special concern by state or federal government agencies.

The bald eagle, wood stork, red-cockaded woodpecker, shortnose sturgeon, and alligator are the most studied of these species of concern found on the SRS. The bald eagle is a permanent breeding resident of South Carolina and has been recorded as occurring in the SRS area since 1904. Three bald eagle nests are located on SRS, and between 1986 and 1997, 25 nestlings were fledged. Wood storks from the Birdsville colony near Millen, Georgia, and from additional colonies near the Birdsville colony forage at SRS. Data from studies begun in 1983 indicate that while SRS discharges to the Savannah River swamp may have adversely affected wood stork foraging areas, the constructed Kathwood Lake facilities more than compensated for any potential adverse effects. Since 1985, one component of the SRS's wildlife management program has focused on improving red-cockaded woodpecker habitat. The 1997 population comprised 109 individuals, including 21 breeding pairs, in the 65 active or potential breeding areas monitored by the SRS. Shortnose sturgeon spawn in the Savannah River upstream and downstream of SRS. However, there is no evidence that the population of shortnose sturgeon in the Savannah River is negatively impacted by SRS operations. The American alligator, due to its previous endangered status, has been extensively studied at the SRS. Recent research indicates that the alligator population on the SRS is increasing.

The fifth and largest chapter of this document, *Streams, Reservoirs and the Savannah River*, describes the physical and biological characteristics of SRS's aquatic resources and summarizes information from the many aquatic studies conducted through the years at SRS. Aquatic systems have been the major focus of ecological research at SRS primarily because of the impacts to them from reactor operations. From the middle 1950s until the late 1980s, cooling water from SRS nuclear reactors was released directly to small tributary streams or cooling reservoirs at temperatures in excess of 35° to 40°C (95° to 104°F) and frequently as high as 65° to 70°C (149° to 158°F).

Aquatic habitats at the SRS include six major streams, two large reservoirs, the Savannah River, and the Savannah River swamp system. The five streams that originate on, or pass through the SRS before flowing into the Savannah River are: Upper Three Runs, Beaver Dam Creek, Fourmile Branch, Steel Creek, and Lower Three Runs. A sixth stream, Pen Branch, does not flow directly into the Savannah River but joins Steel Creek in the Savannah River floodplain swamp. The upper reaches of Lower Three Runs were impounded in 1958 to form Par Pond, a recirculating cooling reservoir for cooling water from P and R Reactors. L Lake was formed in 1985 by damming Steel Creek above the Meyers Branch confluence to receive cooling water from L Reactor. Sections in Chapter 5 are devoted to

each of the six streams, the two impoundments and the Savannah River, describing their hydrology, water chemistry and biota.

Upper Three Runs has the largest watershed of the six major SRS streams. It is the only stream to originate offsite and the only one that never received major thermal discharges, though it does receive discharges from a variety of industrial facilities. Beaver Dam Creek, with the smallest watershed and the lowest mean flows, received cooling water discharges from the heavy water facility and continues to receive discharges from a coal-fired power plant and its associated ash ponds. Fourmile Branch and Pen Branch have similar sized watersheds, lengths, and headwater characteristics. These streams received reactor cooling water from C and K reactors, respectively, at peak flows of approximately 11 m³/s, though the 1995 flows of 1 - 2 m³/s are more representative of natural flows. Steel Creek received cooling water discharges from P and L Reactors. Stream flow reached 24 m³/s when both reactors were discharging, but the 1995 flow of 2.4 m³/s is more representative of natural flows. Flows in Steel Creek downstream of the L-Lake dam are controlled to meet or exceed regulated minimum flows downstream. Lower Three Runs has the second largest watershed of the site streams and has received effluent from P and R Reactors. Flows in Lower Three Runs downstream from Par Pond have not fluctuated as greatly as those in Steel Creek.

SRS surface water quality is monitored by routine and nonroutine programs. Intake and discharge of cooling water historically have been the main SRS activities affecting site surface water quality. Since cessation of reactor operations, the SRS waterways receive only permitted industrial discharges. Physical factors once affected by the high discharge flows associated with reactor operations, such as erosion, sediment load, and channel morphology, are no longer the issues. Recent studies have focused on chemical and biological systems related to specific effluents or waste sites and toxicity assessments of outfalls. In L Lake and Par Pond, recent efforts have focused on characterizing contaminants in the water and sediments related to the Par Pond drawdown, and to the potential shutdown of the river water pumping system.

Historic discharges of reactor cooling water influenced the algae and zooplankton communities in site waters by increasing flow, temperature, and nutrients relative to ambient conditions. Effects on stream systems included changes in species composition and increased productivity compared to non-thermal streams. Since studies began, the principal effect from P-Reactor operation on the lower food chain organisms of Par Pond was increased productivity. Species observed since the reactors ceased operating are primarily the same as those observed during operations, indicating that the algal community remained stable. Thermal input and nutrient enrichment from once-through cooling water discharges to L Lake resulted in algal communities dominated by blue-green algae during the first two years after the lake was constructed. Since L Reactor ceased operating in 1988, the algal community has stabilized and become more typical of southeastern reservoirs.

Macroinvertebrates have been studied to assess the impacts of SRS discharges on aquatic systems. Macroinvertebrates in Upper Three Runs and its tributaries include rare species or combinations of species and the stream exhibits high species diversity. During reactor operation, fewer numbers and species of macroinvertebrates were found in the thermal portions of the affected streams than in the non-thermal areas of the same streams. Following final shutdown of individual reactors, macroinvertebrates recolonized the receiving streams to varying degrees. The L Lake macroinvertebrate populations fluctuated and were adversely affected by thermal discharges, but have become similar to those in other southeastern reser-

voirs since L Reactor ceased operating. The Par Pond macroinvertebrate community also showed evidence of thermal impacts during reactor operations, but has not been studied since 1989.

The SRS supports a diverse fish fauna in a variety of aquatic habitats. Fish assemblages in Upper Three Runs, the reaches of Pen Branch and Fourmile Branch above the reactors and Lower Three Runs are typical for unimpacted streams of similar size in the Southeast. Areas in Fourmile Branch and Pen Branch downstream of C and K Reactors largely were devoid of fish during reactor operations due to the high cooling water discharge flows and temperatures. These areas have been recolonized since the reactors ceased operating. The Steel Creek fish assemblage below the newly constructed reservoir was not significantly influenced by L-Reactor restart and operations except for the reach directly below L Lake, where increased discharges and emigration of L-Lake fish altered community structure.

The fish community in the lower half of L Lake developed as expected during the lake's early years, though the warmer temperatures near the reactor discharge point precluded normal community development in the upper half. Since L Reactor has ceased operating and nutrient loading as a result of Savannah River input has been reduced, the L Lake fish community has continued to change. Currently the community includes successfully reproducing, self sustaining populations of species common in southeastern reservoirs.

Apart from the congregation of some species in thermal areas and lower than average condition among adult largemouth bass, the Par Pond fish community has been typical of southeastern reservoirs. The Par Pond drawdown between 1991 and 1995 severely disturbed the fish community, reducing the density and number of species, and altering the size structure of individual species as a result of decreased habitat size and quality. However, the fish community rapidly recovered following refill.

Chapter 6 covers Wetlands and Carolina Bays of the SRS. Twenty percent of the SRS is classified as wetlands. The majority of these wetlands are bottomland hardwoods or cypress-tupelo forests. The remaining areas include wetlands surrounding the two large reservoirs (Par Pond and L Lake), scrub-shrub areas primarily along former thermal creeks and swamps, and 299 isolated upland wetland depressions or Carolina bays. Thermal releases to streams and impoundments degraded the wetlands along the creek corridors and portions of the SRS Savannah River swamp. The most obvious effect of the cooling water releases on wetland plant communities was canopy loss of wetland tree species. About 1020 ha of wetland tree canopy exhibited some degree of alteration as a result of SRS cooling water releases. Following cessation of cooling water releases to creeks and swamps, successional revegetation by scrub-shrub communities and a variety of persistent and non-persistent wetland species began and continues today. However, the developing wetland communities do not resemble the original cypress-tupelo forests.

Chapter 7, Additional Information, identifies additional investigations and sources of data on the SRS natural environment. These include remote sensing data from the 1950s through the 1990s, ecological investigations at the Mixed Waste Management Facility, aquatic toxicity testing, and stream bioassessments.

Chapter 1

Soils

The Savannah River Site is composed of an area of 80,267 hectares (310 square miles) in portions of Aiken, Allendale, and Barnwell counties of South Carolina, and is located along the Savannah River. This area has a wide range of habitats, ranging from well-drained upland forests to swamps, wetlands, and river systems. The entire Site has been designated as a National Environmental Research Park by the U.S. Department of Energy. The purpose of Chapter 1 and Chapter 2 is to describe the soils and terrestrial vegetation cover types, that are commonly found on SRS.

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Soils

Soils are a basic terrestrial resource. They influence nearly all other environmental components and can affect the decisions made in many disciplines. Foresters and agronomists use soils information as a guide to production potential; planners, engineers, research scientists, and waste management and environmental compliance personnel also have to consider the geochemical and physical properties of soils. Soil is the natural, three-dimensional body of the earth's surface, which contains minerals, organic matter, air, and water. The integrated effect of the climate and living things on soil and conditioning over time affects soil properties. The Soil Survey of Savannah River Plant Area (Rogers 1990) and studies on the geochemical and physical properties of upland soils (Looney et al. 1990) and wetland soils (Dixon et al. 1997) of the Savannah River Site (SRS) are excellent sources of information on SRS soils.

SRS Soils

Geological Origin

Cooke (1936) identified the Pleistocene marine terraces on SRS. This group of terraces represents successive recessions of the ocean during the glacial epoch about 10 thousand to 1 million years ago (Figure 1-1). The Brandywine Terrace is the highest and oldest. It lies adjacent to the Aiken Plateau and parallels the Savannah River at elevations between 45 and 76 m (150 and 250 ft) above sea level. The Sunderland Terrace, the second oldest, lies between 27 and 45 m (90 and 150 ft) above sea level. The Wicomico Terrace, the youngest, is along the floodplain between the river and about 27 m (90 ft) above sea level (Cooke 1936; Langley and Marter 1973). Because the soils have been worked by water, they are naturally low in nutrients and have low cation-exchange capacity.

SRS soils formed in deep beds of marine sediments. The Aiken Plateau is between 10 and 50 million years old. The area generally has surface deposits of varying thickness, commonly called the Pinehurst Upland Unit, Tobacco Road Unit, and Dry Branch Unit, which overlie the Barnwell Formation, McBean Formation, and Congaree Formation at descending depths below the soil surface. The Congaree Formation is near sea level and is just above the Ellenton Formation. Surface deposits over the entire site have eroded, and some areas have exposed lower formations, such as the McBean.

Soil Texture

Particle size, referred to as soil texture, is an important descriptor of soil character. Soil texture is the relative proportion of sand, silt, and clay particles in a soil mass. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, and clay. The

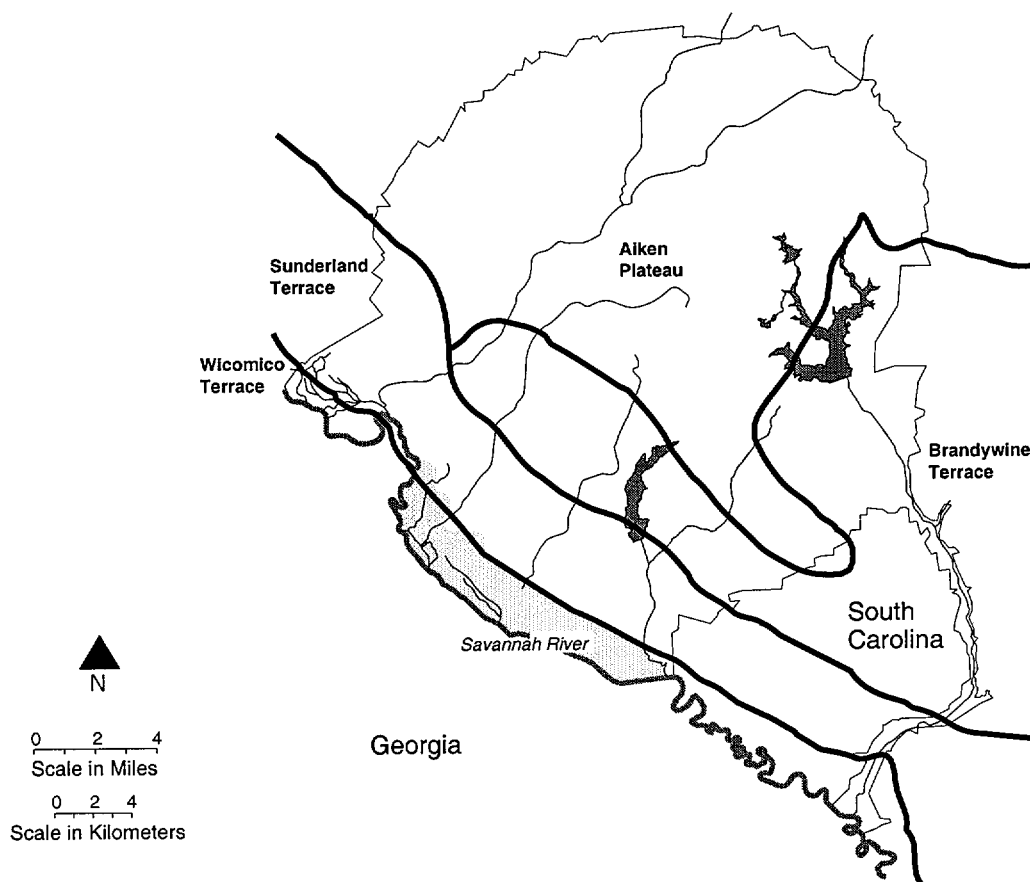


Figure 1-1. Location of Pleistocene Marine Terraces on SRS (Source: Langley and Marter 1973)

most common surface textures on SRS are sand and loamy sand, while the subsoil textures are usually sandy loam or sandy clay loam. Soil texture can have a significant impact on the physical and chemical characteristics of a soil series.

Inorganic and Radionuclide Concentrations

Data from Looney et al. (1990) and from investigations at SRS waste sites as part of the environmental remediation program were compared statistically. Differences between the two data sets were essentially insignificant; therefore, the data sets were combined to produce SRS-wide range of soil constituent concentrations (Table 1-1).

Table 1-1. Inorganic and Radionuclide Concentration Ranges for the Southeastern United States, Nationwide, and SRS.

| Constituents | Southeastern U.S. ^a | Nationwide ^{b,c} | SRS |
|------------------------------|--------------------------------|---------------------------|-------------------|
| Metals (mg/kg) | | | |
| Aluminum | 900 to 46,000 | 700 to 100,000 | 715 to 53,530 |
| Antimony | N/A | NA | <0.21 to 20 |
| Arsenic | N/A | <0.1 to 97 | <0.25 to 15.2 |
| Barium | 63 to 350 | 10 to 5,000 | 0.33 to 3,210 |
| Beryllium | N/A | <1 to 15 | 0.02 to 5.9 |
| Cadium | N/A | N/A | <0.098 to 7.57 |
| Chromium | 11 to 60 | 1 to 2,000 | <0.41 to 116 |
| Iron | 500 to 21,000 | 100 to >100,000 | 635 to 79,600 |
| Lead | 2.8 to 26 | <10 to 700 | <0.16 to 35 |
| Manganese | 100 to 410 | <2 to 7,000 | <0.6 to 566 |
| Mercury | N/A | <0.01 to 4.6 | <0.0028 to 0.89 |
| Nickel | 2.8 to 18 | <5 to 700 | <0.1 to 228 |
| Selenium | N/A | <0.1 to 4.3 | <0.084 to 29.8 |
| Thallium | N/A | N/A | <0.84 to 49.83 |
| Vanadium | N/A | <7 to 500 | <2.25 to 61 |
| Zinc | <25 to 64 | <5 to 2,900 | <0.23 to 267 |
| Radionuclides (pCi/g) | | | |
| Carbon-14 | N/A | 0.01 to 2.5 | <0.0011 to 0.17 |
| Cesium-137 | N/A | 0.01 to 3.5 | <0.0003 to 2.21 |
| Iodine-129 | N/A | 1E-05 to 9E-05 | <7.69E-7 to <32.2 |
| Potassium-40 | N/A | 3 to 20 | 0.066 to 11.6 |
| Plutonium-239/240 | N/A | 0.009 to 0.04 | <0.0016 to 4.11 |
| Strontium-90 | N/A | 0.2 to 4.0 | <0.01 to 13.2 |
| Technetium-90 | N/A | N/A | <0.0016 to 9.76 |
| Thorium-232 and daughters | | | |
| Thorium-232 | N/A | 0.10 to 3.4 | 0.31 to 2.53 |
| Actinium-228 | N/A | N/A | <0.01 to 2.54 |
| Radium-228 | N/A | 0.1 to 3.4 | 0.34 to 2.9 |
| Thorium-228 | N/A | N/A | 0.21 to 17.9 |
| Lead-212 | N/A | N/A | 0.013 to 3.2 |
| Uranium-238 and daughters | | | |
| Uranium-238 | N/A | 0.12 to 3.8 | 0.18 to 2.42 |
| Uranium-234 | N/A | 0.12 to 3.8 | 1.0 to 1.2 |
| Thorium-230 | N/A | 0.12 to 3.8 | 0.18 to 2.27 |
| Radium-226 | N/A | 0.23 to 4.2 | 0.19 to 2.03 |
| Uranium-235 | N/A | 0.01 to 0.05 | <0.0019 to 0.13 |
| Gross alpha | N/A | N/A | <0.01 to 44.53 |
| Nonvolatile beta | N/A | N/A | <0.01 to 54.82 |

Notes:

Source: PRC 1996.

N/A = Not Available.

mg/kg = Milligram per kilogram.

pCi/g = Picocuries per gram.

^aConnor and Shacklette 1975.^bShacklette and Boerngen 1984 (for inorganics).^cEPA 1994 (for radionuclides).

SRS Soil Survey

General Characteristics of SRS Soils

Many different soils exist on SRS, and, in some areas change within a short distance. SRS soils range from seasonally wet and hydric to well-drained. Composition ranges from mostly sand-sized particles with high hydraulic conductivity rates to high clay content with moderately low to low hydraulic conductivity rates. These differences, where the areas are large enough, are shown as a soil series within a mapping unit. A mapping unit is an area dominated by one major kind of soil accompanied by other similar soils. Four orders and 28 soil series are recognized on SRS. A soil series classification describes the soil's history, evolution, and current characteristics. On SRS, there are sizable areas where the upper 2 m (6 ft) of soil has been altered to the extent that the soil profile cannot be identified. These areas are placed in the taxonomic system at a higher level; therefore, less specific characteristics are given (Rogers 1990).

Soil Maps

An extremely valuable part of the SRS soil report is the detailed soil map units which are included at the back of the survey on aerial photos at a scale of 1:15840 (4 in/mi). Map units are drawn on the photo and include the soil for which the unit was named, other similar associated soils, and, usually, small areas of dissimilar soils. Because of the possibility of small areas of dissimilar soils, a field investigation to identify such inclusions should always precede any commitment to manage or build on the soil area. There are 50 soil mapping units recognized on SRS that are large enough to be shown on the photos at the publication scale used in the SRS soil report (see Table 1-2). Special symbols on the map indicate other small but important soils, such as 1- to 3-acre wet areas (Rogers 1990).

Tabular Data

The SRS soil report gives soil classification in tabular form and describes each soil series in detail. Tables include climatic data for each area and information related to each map unit; acreage of each map unit within the individual counties; woodland productivity and wildlife-habitat management; building, sanitation, and construction limitations; water management; engineering, physical, and chemical properties; and soil and water features. By identifying the soil map unit of interest, the various tables can provide a great deal of preliminary information on the area and serve as a basis for a more detailed analysis of a specific site.

Table 1-2. Listing of Soil Mapping Units on SRS

| Soil Unit Name and Slope | Total Acres |
|--|-------------|
| Ailey sand, 2-6% slopes | 2,450 |
| Albany sand, 0-6% slopes | 940 |
| Blanton sand, 0-6% slopes | 38,767 |
| Blanton sand, 6-10% slopes | 3,200 |
| Chastain clay, frequently flooded, nearly level | 7,860 |
| Dorovan muck, frequently flooded, nearly level | 2,045 |
| Dothan sand, 0-2% slopes | 1,625 |
| Dothan sand, 2-6% slopes | 14,010 |
| Eunola fine sandy loam, 0-2% slopes | 310 |
| Fluvaquents, frequently flooded, nearly level | 4,550 |
| Fuquay sand, 0-2% slopes | 1,190 |
| Fuquay sand, 2-6% slopes | 20,674 |
| Fuquay sand, 6-10% slopes | 750 |
| Hornsville sandy loam, 0-2% slopes | 2,640 |
| Kinston loam, frequently flooded, nearly level | 600 |
| Lakeland sand, 0-6% slopes | 8,150 |
| Lakeland sand, 6-10% slopes | 320 |
| Lucy sand, 0-2% slopes | 400 |
| Lucy sand, 2-6% slopes | 1,590 |
| Lucy sand, 6-10% slopes | 440 |
| Neeses loamy sand, 2-6% slopes | 360 |
| Norfolk loamy sand, 0-2% slopes | 880 |
| Norfolk loamy sand, 2-6% slopes | 2,220 |
| Ochlockonee loamy sand, occasionally flooded, nearly level | 330 |
| Ocilla loamy sand, 0-2% slopes | 1,470 |
| Ogeechee sandy loam, nearly level | 1,780 |
| Orangeburg loamy sand, 0-2% slopes | 1,150 |
| Orangeburg loamy sand, 2-6% slopes | 5,110 |
| Orangeburg loamy sand, 6-10% slopes | 330 |
| Pickney sand, frequently flooded, nearly level | 10,290 |
| Rembert sandy loam, nearly level | 6,530 |
| Shellbluff loam, frequently flooded, nearly level | 2,000 |
| Smithboro loam, nearly level | 990 |
| Tawcaw silty clay, frequently flooded, nearly level | 2,750 |
| Toccoa loam, frequently flooded, nearly level | 310 |
| Troup sand, 0-6% slopes | 14,560 |
| Troup sand, 6-10% slopes | 1,920 |
| Troup sand, 10-15% slopes | 1,140 |
| Troup and Lucy sand, 15-25% slopes | 2,100 |
| Troup and Lucy sand, 25-40% slope | 650 |
| Udorthents, firm, variable slopes | 540 |
| Udorthents, friable, variable slopes | 5,940 |
| Udorthents-Urban land, gently sloping | 680 |
| Urban land, gently sloping | 510 |
| Vaocluse sandy loam, 2-6% slopes | 1,180 |
| Vaocluse-Ailey complex, 6-10% slopes | 6,580 |
| Vaocluse-Ailey complex, 10-15% slopes | 5,670 |
| Wagram sand, 0-2% slopes | 1,290 |
| Wagram sand, 2-6% slopes | 4,350 |
| Williman sand, nearly level | 1,977 |

Source: Rogers (1990).

Soil Groups

Introduction

The SRS general soil map contains seven broad soil-association groups (Figure 1-2). The groups are named to coincide with the major soil series within the group; however, many of the soil series occur in more than one group. The general soil map does not contain sufficient detail for making management decisions on small land areas, but it is helpful in comparing the suitability of larger areas for general land use. It is excellent for locating specific soil types when the special properties, such as particle size, clay mineralogy, and hydrology, are known. The following subsections give a general description of each group.

Chastain-Tawcaw-Shellbluff Association

The Chastain-Tawcaw-Shellbluff association consists of nearly level soils on the flood-plains along the major streams, mainly along the Savannah River. This association makes up about 6% of the survey area. The association is about 60% Chastain soils, 20% Tawcaw soils, 15% Shellbluff soils, and 5% soils of minor extent.

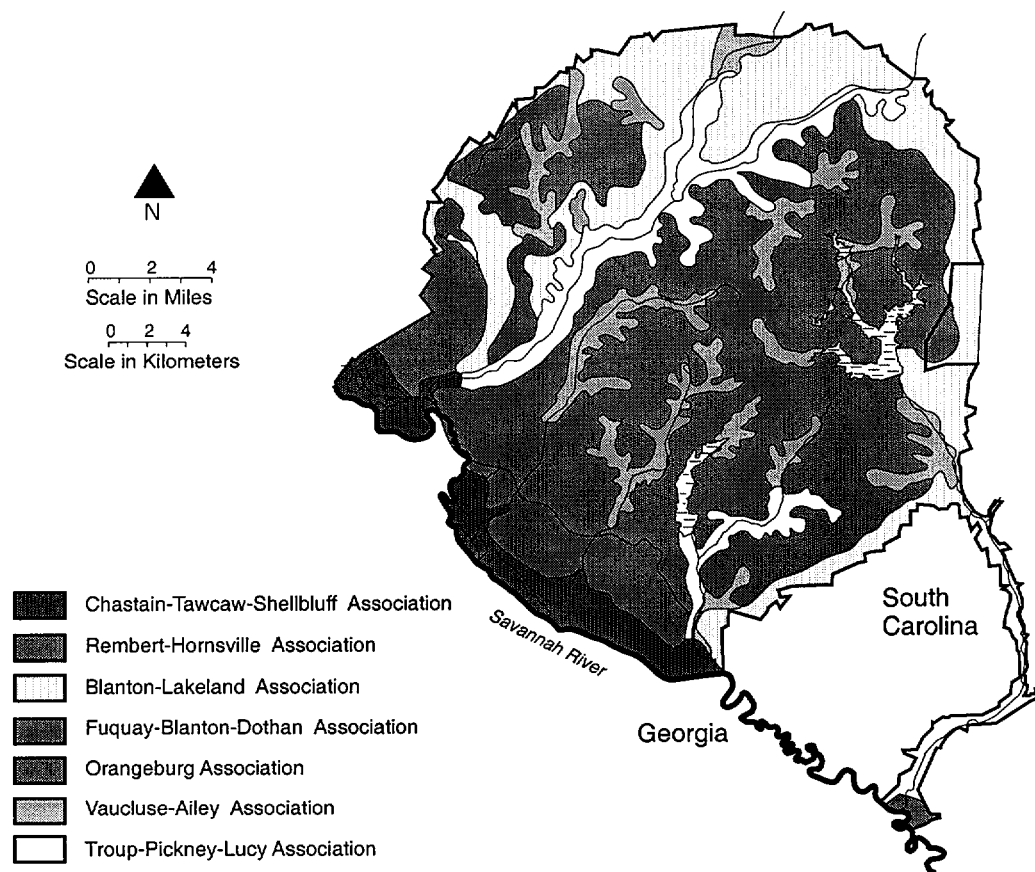


Figure 1-2. SRS General Soils Map

Chastain soils are poorly drained and clayey to a depth of about 100 cm (40 in). Tawcaw soils are somewhat poorly drained and clayey in the upper part and loamy in the lower part. Shellbluff soils are well-drained and loamy to a depth of about 100 cm (40 in).

All of the acreage in this association is wooded. The soils are suited for timber production but not for sanitary facilities or building sites because of flooding and wetness.

Rembert-Hornsville Association

The Rembert-Hornsville association consists of nearly level soils on stream terraces. Rembert soils are poorly drained, and Hornsville soils are moderately well-drained. A few dirt roads and a railroad cross areas of this association. This association makes up about 7% of the survey area. It is about 30% Rembert soils, 18% Hornsville soils, and 52% other soils of minor extent.

Most of the acreage in this association is woodland. The soils are well-suited for timber production. Generally, these soils are poorly suited for sanitary facilities and building sites because of wetness and slow permeability.

Blanton-Lakeland Association

The Blanton-Lakeland association consists of nearly level to sloping soils on uplands. Stands of longleaf (*Pinus palustris*) and loblolly pine (*P. taeda*) with an oak (*Quercus* spp.) understory grow on the broad sandy ridges. This association makes up about 18% of the survey area. It is about 40% Blanton soils, 20% Lakeland soils, and 40% other soils of minor extent.

Blanton soils are somewhat excessively drained. They have thick sandy surface and sub-surface layers and a loamy subsoil that is 100-200 cm (40-80 in) below the surface. These soils are commonly adjacent to more poorly drained soils. Lakeland soils are excessively drained and are sandy throughout. They are generally higher on the landscape than Blanton soils.

These soils are suited for timber production of species associated with drier sites. Because of the thick surface layer and subsurface layer, these soils are only fairly well-suited for sanitary facilities. In most areas the soils are suitable for building sites. The more sloping areas, however, are not as well-suited.

Fuquay-Blanton-Dothan Association

The Fuquay-Blanton-Dothan association consists of nearly level to sloping, well-drained soils on all of the broad upland ridges in the survey area, except for those in the northeastern section of SRS. This association makes up 47% of the survey area. It is about 20% Fuquay soils, 20% Blanton soils, 12% Dothan soils, and 48% other soils to a minor extent.

Fuquay soils are well-drained. They have moderately thick, sandy surface and subsurface layers and a loamy subsoil that contains iron-rich brittle nodules of plinthite. Blanton

soils are somewhat excessively drained. They have thick, sandy surface and subsurface layers and a loamy subsoil. Dothan soils are well-drained. They have thick, sandy surface and subsurface layers. They have a loamy subsoil that contains iron-rich nodules of plinthite.

These soils are suited for cultivated crops and are well suited for timber production. Most are suited for sanitary facilities. The sandy soils have moderate or severe limitations affecting some sanitary facilities. Most of the soils are suitable for building sites. The more sloping soils, however, are not as well-suited.

Orangeburg Association

The Orangeburg association consists mainly of soils on broad upland ridges and in nearly level to sloping areas northwest of Upper Three Runs. Slopes generally are smooth. Planted loblolly pine is the dominant vegetation on this soil type. This association makes up about 2% of the survey area. It is about 70% Orangeburg soils and 30% other soils of minor extent. The Orangeburg soils have a friable, red, loamy subsoil. The soils of this association are well-suited for woodlands, sanitary facilities, building sites, wildlife habitat, and other uses.

Vaocluse-Ailey Association

The Vaocluse-Ailey association consists of sloping and strongly sloping soils in scattered areas around the head and sides of small drainage ways in the uplands. The areas are long and narrow. The vegetation on this association is mixed pine and hardwoods. This association makes up about 10% of SRS. It is about 25% Vaocluse soils, 15% Ailey soils, and 60% other soils of minor extent.

Vaocluse soils have a loamy surface layer and subsurface layer that have a combined thickness of less than 50 cm (20 in). Ailey soils have moderately thick, sandy surface and subsurface layers. Both soils have a loamy subsoil with a brittle layer.

The soils are fairly well-suited for timber production. Because of slow permeability, these soils are poorly suited for sanitary facilities. The soils are poor building sites because of the slope.

Troup-Pickney-Lucy Association

The Troup-Pickney-Lucy association consists of moderately steep and steep soils on uplands and nearly level soils on the floodplains along streams. The steeper areas are on the southeast bank of Upper Three Runs and along both sides of Tinker Creek. Areas of this association are long and narrow. This association has soils with the steepest slopes on SRS. The soils on the floodplains have a higher organic content than the other soils. Their vegetation is mostly hardwoods mixed with loblolly pine. This association makes up about 10% of the survey area. It is about 45% Troup soils, 40% Pickney soils, 10% Lucy soils, and 5% other soils of minor extent.

Troup soils are well-drained. They have a thick, sandy surface and subsurface layers and a loamy subsoil at a depth of 100-200 cm (40-80 in). Pickney soils are poorly drained. They have a thick black surface soil and are sandy throughout. Lucy soils are well-drained. They have moderately thick sandy surface and subsurface layers and a loamy subsoil at a depth of 50-100 cm (20-40 in).

The soils are fairly well-suited for woodlands. These soils generally are poorly suited for sanitary facilities or building sites because of the steep slope and the flooding; however, some areas of more moderately sloping soils are available for such uses. The soils on floodplains are not suited for building sites.

Geochemical and Physical Properties of SRS Soils

Upland Soils

Metals, radionuclides, inorganic anions, organic compounds, and agricultural indicator parameters were analyzed for six representative upland soil series found on SRS.

The soils from unimpacted areas of the SRS are typical of soils found in moderately aggressive weathering conditions such as those found in the southeastern United States. The temperate climate and relatively high rainfall in the region result in leached soils with low concentrations of metals. In general, metal concentrations increase with depth and in proportion to the soil's clay content. Metal concentrations in this study were similar to those measured in previous studies and in regional, national, and global studies in similarly weathered environments. The mineralogy of the soil is dominated by quartz, and the primary clay material in SRS soils is kaolinite (Looney et al. 1990).

Specific soil characteristics that were evaluated were trace element concentrations, major element concentrations, bulk chemical properties that could affect the migration of chemicals through the soils, indicator parameters, physical properties, and mineralogy (Table 1-3). Detailed results of the study are presented in Looney et al. (1990).

Table 1-3. Soil Characteristics Measured in Upland Soils

| Metals | Radiological Parameters | Other Inorganic Constituents | Agricultural Parameters | Organics |
|-----------|-------------------------|------------------------------|--------------------------|------------------------|
| Aluminum | Gross alpha | Chloride | Cation exchange capacity | Total organic carbon |
| Arsenic | Gross beta | Cyanide | Exchangeable acidity | Total organic halogens |
| Barium | Strontium-90 | Fluoride | Exchangeable base metals | |
| Cadmium | Uranium | Nitrate | pH | |
| Chromium | | Nitrite | | |
| Copper | | Phosphate | | |
| Iron | | Sulfate | | |
| Lead | | | | |
| Lithium | | | | |
| Magnesium | | | | |
| Mercury | | | | |
| Nickel | | | | |
| Potassium | | | | |
| Selenium | | | | |
| Silver | | | | |
| Sodium | | | | |
| Zinc | | | | |

Source: Looney et al. (1990).

Wetland Soils

The SRS has 14,569 ha (36,000 acres) of wetlands and an additional 2,023 ha (5,000 acres) of bottomland that is subject to periodic flooding. Wetland soils representing five soil groups were analyzed for metals, organics, physical properties, and agricultural parameters (Table 1-4).

Overall, the chemical and physical composition of unimpacted SRS wetland soils is similar to those found in offsite wetland soils. The wetland soil compositions are broadly comparable to the upland soils characterized by Looney et al. (1990) (Dixon et al. 1997).

The study indicates that metal and inorganic concentrations are slightly higher in upland bays and depressional soils and distinctly higher in large stream floodplain soils than in the other soil groups sampled. Concentrations of metals and inorganics tend to decrease with increasing depth. More detailed results are presented in Dixon et al. (1997).

Table 1-4. Soil Characteristics Measured in Wetland Soils

| Metals | Radiological Parameters | Other Inorganic Constituents | Agricultural Parameters | Organic Compounds |
|---------------|--------------------------------|-------------------------------------|--------------------------------|---|
| Aluminum | Tritium | Fluoride | Cation exchange capacity | Total organic carbon |
| Antimony | | Nitrate + Nitrite | Percent solids | Total organic halogens |
| Arsenic | | Phosphates, total (as Phosphorus) | pH | Dioxins/furans ^a |
| Barium | | Silicon | | Volatile organic compounds ^a |
| Beryllium | | Sulfate | | Semivolatile organic compounds ^a |
| Cadmium | | | | Pesticide/herbicides ^a |
| Calcium | | | | PCBs ^a |
| Chromium | | | | |
| Cobalt | | | | |
| Copper | | | | |
| Iron | | | | |
| Lead | | | | |
| Lithium | | | | |
| Magnesium | | | | |
| Manganese | | | | |
| Mercury | | | | |
| Nickel | | | | |
| Potassium | | | | |
| Selenium | | | | |
| Silver | | | | |
| Sodium | | | | |
| Sulfide | | | | |
| Thallium | | | | |
| Tin | | | | |
| Vanadium | | | | |
| Zinc | | | | |

Source: Dixon et al. (1997).

^aResource Conservation and Recovery Act (RCRA) Appendix IX Analyses.

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Chapter 2

Vegetation

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Vegetation

The Savannah River Site's land cover reflects past disturbances and manipulations that have occurred since the land was acquired in 1950. At that time, approximately 40% of the site was farm land, and the remainder was forested. Land management by the U.S. Forest Service has focused largely on timber management and watershed protection, changing the site's land to predominately forested areas. Early changes due to development of SRS were detailed by Dukes (1984).

Terrestrial Land Cover Types

Introduction

The Savannah River Site lists 1,322 vegetation species, representing 151 separate taxonomic families (Batson et al. 1985). These species occur over many habitat types, from upland well-drained forests to swamps and Carolina bays. More detailed descriptions of the land cover types and their associated vegetation can be found in Workman and McLeod (1990), Gladden et al. (1985), Jones et al. (1981), and Whipple et al. (1981). Species nomenclature in this chapter is according to Radford et al. (1968).

Nonforested Cover Types

Industrial/Transportation-Related

The industrial land cover type includes administrative or production facilities and immediately contiguous surrounding areas (e.g., fly ash basins, borrow pits, and cleared areas). Roads, rights-of-way, and railroad facilities are transportation-related. The industrial land cover type includes utility corridors and electric substations; however, cleared utility corridors are included based on the land cover actually present (e.g., grassland/scrub-shrub), and electrical substations were mapped as industrial. Borrow pits are considered to be active or reclaimed covered with grasses/scrub-shrub vegetation.

Grassland/Forb/Scrub-Shrub

Nonwoody plants dominate grassland/forb cover type, with more than 50% of the vegetation cover grasses and forbs. This land cover type occurs primarily on power line rights-of-way and in a few forest openings. The grassland/forb cover includes SRS wildlife food plots. Grassland/forb also includes land from which trees have been cleared recently, resulting in less than 10% canopy or crown closure. These are primarily areas where there has been recent clear-cutting and block-planting of primarily loblolly (*Pinus taeda*) or longleaf pine (*P. palustris*). Scrub-shrub includes predominantly bare soil, a scrub-shrub canopy of less than 25% closure, or young pine seedlings and saplings less than 5 years old and less than 6 m (20 ft) tall.

Open Water

Open water consists of natural or man-made areas that are continuously covered by water. There are approximately 2000 ha (5000 acres) of open water on SRS. Chapter 5—Streams, Reservoirs, and the Savannah River, has a complete discussion of the open water areas of SRS.

Forested Cover Types

Evergreen Forests

The coniferous forest land cover type includes areas with predominately coniferous trees that are at least 6 m (20 ft) tall. Pines, primarily longleaf and loblolly pine, dominate the evergreen forested areas. Slash pine (*P. elliotii*) and shortleaf pine (*P. echinata*) are also common on SRS. The U.S. Forest Service Management Plan established much of this cover type, although some natural coniferous stands still exist. Broad-leaved species, such as those oaks (*Quercus* spp.) that are tardily deciduous (maintain some of their leaves throughout the season) are not included. This cover type is generally located on dry upland sites and includes former agricultural fields. Understory species include black cherry (*Prunus serotina*), various oaks, persimmon (*Diospyros virginiana*), and other species. The understory is generally sparse under densely planted pine stands. In areas that are more open, blackberry (*Rubus* spp.), dog-fennel (*Eupatorium compositifolium*), and broomsedge (*Andropogon* spp.) are common.

Areas that have had recent logging and regeneration planting occupy a transitional land-cover type. These areas, classified as scrub-shrub, include areas of evergreen and deciduous shrubs and small trees 6 m (20 ft) or less in height with a canopy cover of at least 25%. These areas are primarily old clear-cuts being managed for timber production and in the process of returning to productive forests. Most areas in this cover type will move into one of the forested types in 5-10 years, based on the growth rate of the trees.

Deciduous Forests

Upland hardwood cover types include areas where the dominant species are deciduous trees at least 6 m (20 ft) tall. An area is classified as a deciduous forest when deciduous trees compose at least 70% of the canopy layer. The deciduous forest class includes the upland hardwood forest and the mesic hardwood forest described by Whipple et al. (1981). On drier sites and sandy ridges, turkey, bluejack, and black-jack oaks (*Quercus laevis*, *Q. incana*, and *Q. marilandica*) dominate the canopy with longleaf pine present in various densities. In less xeric areas, other oaks and hickories (*Carya* spp.) also are present. Understory species at the drier sites include *Vaccinium* spp., hollies, (*Ilex* spp.) *Lespedeza* spp.; and various lichens. On mid- and lower slopes, the deciduous forest includes laurel oak (*Q. laurifolia*), yellow poplar (*Liriodendron tulipifera*), blackgum (*Nyssa sylvatica*), sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), hickories, and holly. Understory on the more mesic sites include vacciniums, hollies, various ferns, grapes (*Vitis* spp.), sassafras (*Sassafras albidum*), dogwood (*Cornus florida*), and greenbriers (*Smilax* spp.). Although stands comprising predominantly deciduous species are not abundant on SRS, there are windbreaks and hedgerows on former homesteads that are important wildlife habitat.

In addition to coniferous and deciduous forest stands, there are areas with both types of trees. Where more than a 30% intermixture of these two types occurs, they are generally classified as mixed forests.

Bottomland Hardwood Forests

Bottomland hardwood forests are found along SRS streams and on the “islands” or “ridges” of the Savannah River swamp and major drainages. Elevations of these ridges are high enough to avoid prolonged flooding during most years. Typical canopy species include water oak (*Q. nigra*), laurel oak, sweetgum, elms (*Ulmus alata* and *U. americana*), red maple, and yellow poplar (Good and Whipple 1982; Whipple et al. 1981; Jensen et al. 1984). Holly (*Ilex opaca*), redbay (*Persea borbonia*), sweet bay (*Magnolia virginiana*), hackberry (*Celtis laevigata*), and ironwood (*Carpinus caroliniana*) are common in the sub-canopy and understory. Greenbriers, grapes, and other vines are common in the shrub and ground layers. Herbaceous plants are less common due to the more dense shading.

Swamp Forests

The swamp forest is common along the western boundary of the site, adjacent to the Savannah River. This low-lying area is subject to prolonged inundation during one or several periods of the year. The Savannah River and, to a lesser extent, the several streams that empty into it control the hydrology of the swamp. Bald cypress (*Taxodium distichum*) and water tupelo (*Nyssa aquatica*) dominated the historic swamp forest on SRS. Reactor operations destroyed some areas of this cover type. In the sapling layer, occasional individuals of water ash and red ash (*Fraxinus caroliniana* and *F. pennsylvanica*), along with other water-tolerant bottomland hardwoods, may occur (Whipple et al. 1981). Vines and understory vegetation are generally sparse in the swamp forest.

Sections of the swamp forest that were impacted through increased siltation and thermal damage caused by reactor effluents are undergoing successional revegetation. These areas are covered in detail in Chapter 6—Wetlands and Carolina Bays of SRS.

Carolina Bays

Carolina bays occur throughout SRS. Currently, 299 confirmed or suspected Carolina bays have been identified (Kirkman et al. 1996) (Figure 2-1). Most are small; more than 80% are less than 3 ha (7 acres). The bays occur only in upland, interstream areas of the coastal plain of the Southeastern U.S. They are characterized by their elliptical or ovoid shape with a northwest/southeast orientation of their long axis. Often they will have a sandy rim around the margin. Most bays are continually or seasonally flooded and are generally partially filled with inorganic clays and silts and/or organic peats. These shallow depressions contain hydric or mesic plant communities and range from lakes to marshes, bogs, or swamp forests (Schalles et al. 1989). The plant communities in the bays are highly variable and often are controlled by the magnitude of flooding and recent history. When SRS land was farmed, many of the bays were ditched and drained; they currently support a different vegetation community than if they had no ditch. This habitat is presented in more detail in Chapter 6—Wetlands and Carolina Bays of SRS.

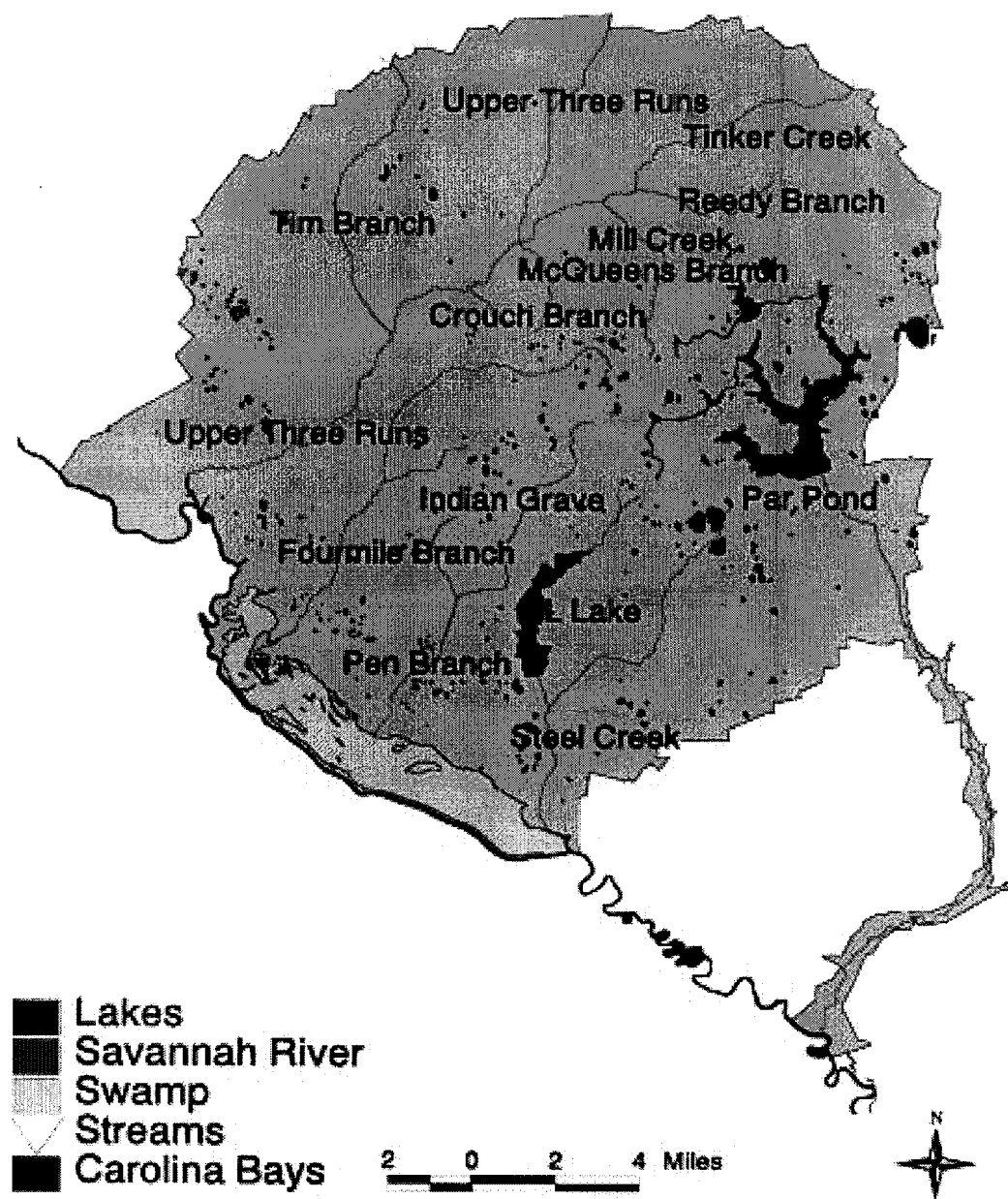


Figure 2-1. Locations of Carolina Bays on SRS (Kirkman et al. 1996)

Landcover Maps

Figure 2-2 is a general overview of the major vegetation types on SRS. Analysis of aerial photography using multispectral sensors has produced a more detailed assessment of cover type, which has been mapped on U.S. Geological Survey (USGS) quadrangle maps. These maps generally are produced at a scale of 1:24,000 and represent an area of approximately 14,750 ha (57 sq mi). Figure 2-3 shows the quadrangle map names for each section of SRS. These maps with detailed vegetation information are available through the Savannah River Technology Center.

“Nonforested Cover Types” and “Forested Cover Types” describe the more dominant land cover types. Chapter 5—Streams, Reservoirs, and the Savannah River covers areas dominated by water (streams, ponds, and reservoirs). Swamp forests and wetlands are covered in detail in Chapter 6—Wetlands and Carolina Bays of SRS.

Successional Patterns

The general references detail descriptions of some land cover types more extensively than others. The successional relationship of some of the communities has received limited research attention. Van Lear and Jones (1987) suggested the use of land type and vegetation as an indicator for site classification and potential successional direction for hardwood sites. Jones et al. (1981) suggested successional pathways for many of the major SRS forest communities. Areas such as thermally impacted swamp areas and Carolina bays, also have received attention regarding natural succession. Chapter 6—Wetlands and Carolina Bays of SRS discusses these studies in more detail. Further studies describing the relationship of community structure and environmental factors on succession are clearly needed for many of the cover types, especially the hardwood and nonswamp communities.

Commercial Timber

Timber Acreage

The SRS timber crop is of prime commercial value. The Savannah River Forest Station (SRFS) of the U.S. Forest Service manages this resource under an established timber management plan that specifies management requirements for nearly 73,654 ha (182,000 acres) of commercial forest and more than 4,856 ha (12,000 acres) of nonforest land. Commercial operation provides pine sawtimber, pine pulpwood, hardwood sawtimber, and pulpwood (Table 2-1). This resource has been developed since 1953 through the planting or replanting of nearly 53,015 ha (131,000 acres) with approximately 135 million seedlings of various tree species and the seeding of longleaf pine on some acres (Table 2-2 and Table 2-3) (SRFS 1997).



Figure 2-2. Major Vegetation Types and Approximate Areas on SRS

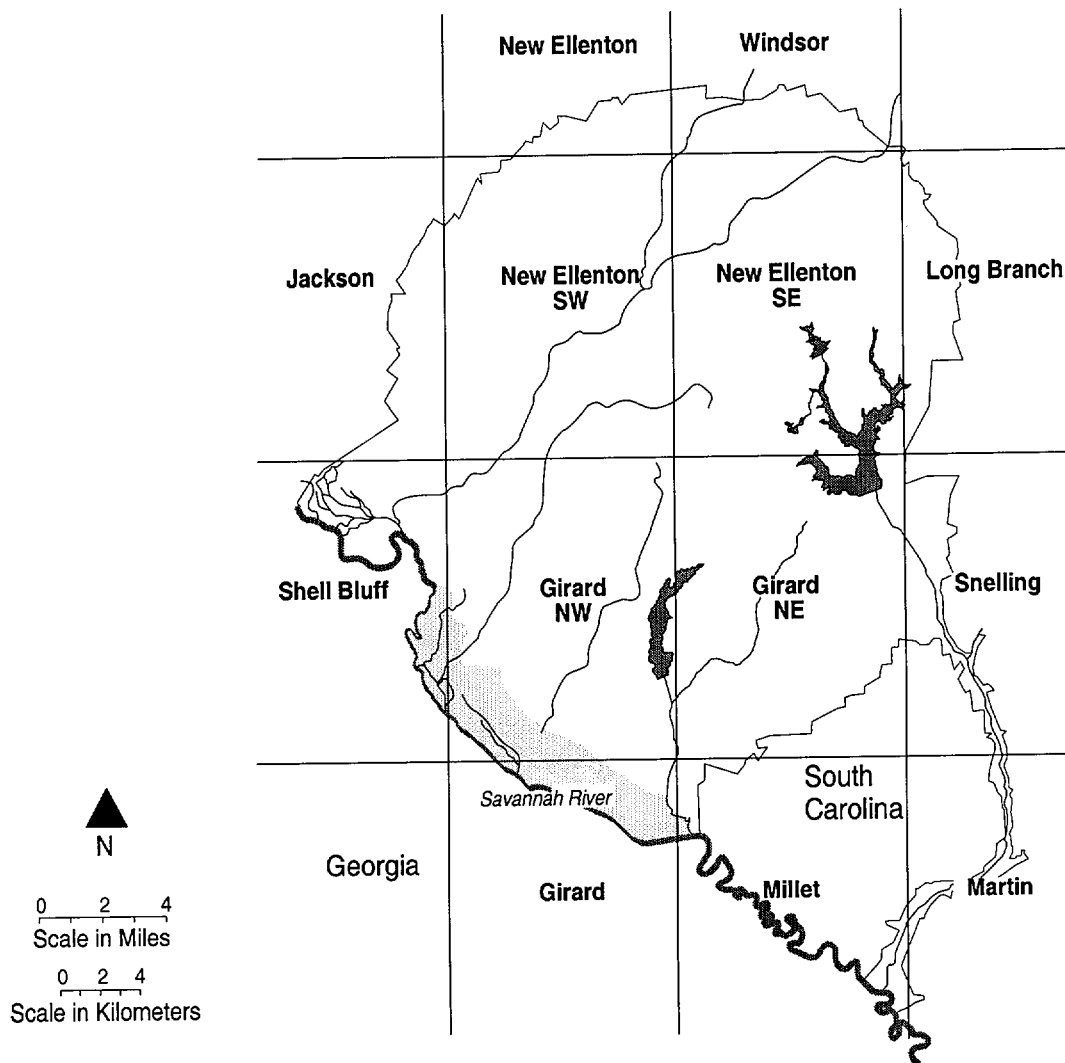


Figure 2-3. SRS Map Showing Names of USGS Quadrangle Maps

Table 2-1. Summary of SRFS Timber Management Plan, FY 1978-FY 1995

| Timber Management Plan Data | | |
|--|---------------|-----------|
| Management plan period FY 1978 through FY1991 completed and submitted: | | |
| Commercial forest land | 147,028 acres | |
| Nonforest land | 7,756 acres | |
| Water | 4,421 acres | |
| Total | 159,205 acres | |
| | | |
| Net Marketable Volume as of 9/30/95 (hundred cubic feet) | | |
| | Sawtimber | Pulpwood |
| Pine | 2,154,250 | 1,049,073 |
| Hardwood | 929,508 | 682,043 |
| Total | 3,083,758 | 1,731,116 |
| | | |
| Predicted Annual Net Growth - Including Ingrowth | | |
| Pine | 4% | 18% |
| Hardwood | 3% | 5% |

Source: SRFS 1997.

Table 2-2. Summary of Total Acres Planted and Seeded, FY 1953-FY 1996

| Fiscal Year | Planted Loblolly | Planted Slash | Planted Longleaf | Planted Hardwood | Direct Seeded Longleaf | Cumulative Total |
|------------------------|-----------------------------|--------------------------|-----------------------------|-----------------------------|-----------------------------------|-----------------------------|
| 1953-73 | 11,671 | 38,527 | 14,858 | - | 21,948 | 87,004 |
| 1974 | 1,051 | - | 101 | - | - | 88,156 |
| 1975 | 702 | - | 350 | 64 | - | 89,272 |
| 1976 | 620 | - | 468 | 12 | - | 90,372 |
| 1977 | 831 | - | 266 | - | - | 91,469 |
| 1978 | 1,033 | - | 310 | - | - | 92,812 |
| 1979 | 1,985 | - | - | - | - | 94,797 |
| 1980 | 1,994 | - | 160 | - | - | 96,951 |
| 1981 | 2,312 | - | 314 | - | - | 99,577 |
| 1982 | 2,537 | - | - | - | 41 | 102,155 |
| 1983 | 1,450 | - | 402 | - | 41 | 104,048 |
| 1984 | 1,913 | - | 239 | - | 31 | 106,231 |
| 1985 | 2,042 | - | 205 | - | 20 | 108,498 |
| 1986 | 2,026 | - | 221 | - | - | 110,745 |
| 1987 | 1,649 | - | 559 | - | - | 112,953 |
| 1988 | 2,148 | - | 540 | - | - | 115,641 |
| 1989 | 1,709 | - | 976 | - | - | 118,326 |
| 1990 | 1,995 | - | 821 | - | - | 121,142 |
| 1991 | 504 | - | 1,329 | - | - | 122,975 |
| 1992 | 566 | - | 1,183 | 54 | - | 124,778 |
| 1993 | 194 | - | 1,573 | 48 | - | 126,593 |
| 1994 | 297 | - | 1,672 | 121 | - | 128,683 |
| 1995 | 199 | - | 819 | 272 | - | 129,973 |
| 1996 | 399 | - | 463 | 189 | - | 131,024 |

Source: SRFS 1997.

Table 2-3. Planting Summary (Gross Seedlings Planted by Species in Thousands), FY 1953-FY 1996

| Fiscal Year | Loblolly | Slash | Longleaf | Hardwood | Cumulative Total (Thousands) |
|----------------------|---------------------|--------|----------|----------|---------------------------------|
| 1953-73 ^a | 12,228 ^b | 40,298 | 50,029 | - | 102,555 |
| 1974 | 546 | - | 50 | - | 103,151 |
| 1975 | 391 | - | 210 | 16 | 103,768 |
| 1976 | 337 | - | 255 | 6 | 104,366 |
| 1977 | 500 | - | 225 | - | 105,091 |
| 1978 | 550 | - | 225 | - | 105,866 |
| 1979 | 1,300 | - | - | - | 107,166 |
| 1980 | 1,530 | - | 160 | - | 108,856 |
| 1981 | 1,574 | - | 311 | - | 110,741 |
| 1982 ^a | 1,578 | - | 41 | - | 112,360 |
| 1983 ^a | 1,465 | - | 350 | - | 114,175 |
| 1984 ^a | 1,550 | - | 279 | - | 116,004 |
| 1985 ^a | 1,500 | - | 146 | - | 117,650 |
| 1986 | 1,500 | - | 200 | - | 119,350 |
| 1987 | 1,200 | - | 570 | - | 121,120 |
| 1988 | 1,517 | - | 477 | - | 123,114 |
| 1989 | 1,275 | - | 750 | - | 125,139 |
| 1990 | 1,400 | - | 750 | - | 127,289 |
| 1991 | 599 | - | 1,000 | - | 128,888 |
| 1992 | 500 | - | 910 | 14 | 130,312 |
| 1993 | 200 | - | 1,230 | 15 | 131,757 |
| 1994 | 223 | - | 1,254 | 39 | 133,273 |
| 1995 | 151 | - | 625 | 110 | 134,159 |
| 1996 | 289 | - | 347 | 71 | 134,866 |

Source: SRFS 1997.

^a1000 longleaf seedlings tabulated for each acre seeded.

^bIncludes 5000 cypress planted in FY 1972.

Timber Commercial Value

The commercial value of SRS standing timber in 1996, based on bids from previous years, was more than \$450 million (Table 2-4). The cumulative value of timber sold on SRS from 1955 through 1996 was more than \$54 million (timber sold may include uncut trees), and the cumulative value of timber cut for the same period was more than \$51 million (Table 2-5 and Table 2-6) (SRFS 1997).

Table 2-4. Summary of Standing Timber Value, FY 1962-FY 1996

| Fiscal Year | Dollar Value | Fiscal Year | Dollar Value |
|--------------------|---------------------|--------------------|---------------------|
| 1962 | \$15,976,230 | 1980 | \$70,234,047 |
| 1963 | 17,857,517 | 1981 | 83,930,420 |
| 1964 | 19,822,323 | 1982 | 92,108,240 |
| 1965 | 22,841,055 | 1983 ^a | 91,976,122 |
| 1966 | 25,169,794 | 1984 | 103,084,852 |
| 1967 | 25,308,675 | 1985 ^b | 94,812,504 |
| 1968 | 26,333,842 | 1986 | 117,481,333 |
| 1969 | 27,372,000 | 1987 | 118,898,339 |
| 1970 | 28,370,995 | 1988 | 134,872,708 |
| 1971 | 29,200,617 | 1989 | 151,465,057 |
| 1972 | 30,258,114 | 1990 | 169,909,264 |
| 1973 | 32,456,000 | 1991 | 170,248,875 |
| 1974 | 33,156,000 | 1992 | 228,362,034 |
| 1975 | 33,962,000 | 1993 | 374,199,885 |
| 1976 | 35,822,000 | 1994 | 411,090,620 |
| 1977 | 36,700,000 | 1995 | 501,701,630 |
| 1978 | 53,310,113 | 1996 | 450,251,376 |
| 1979 | 63,849,134 | | |

Source: SRFS 1997.

^aValue decreased due to change in unit value used. Value of products are determined by weighted average of preceding 12 months high bid.^bDecrease due to a drop in value of products.

Table 2-5. Summary of Type and Value of Timber Sold, FY 1955-FY 1996

| Fiscal Year | MBF/CCF ^a Pine S/T ^b | MBF/CCF Hdwd S/T ^b | Cords/CCF Pine | Cords/CCF Hdwd | Total Value | Cumulative Value |
|-------------|---|----------------------------------|---------------------|-------------------|-------------|------------------|
| 1955-72 | 18,802 | 22,314 | 319,020 | 14,525 | \$3,960,501 | \$3,960,501 |
| 1973 | 1,587 | 0 | 60,075 | 0 | 614,548 | 4,575,049 |
| 1974 | 546 | 0 | 45,792 | 0 | 686,144 | 5,261,193 |
| 1975 | 2,829 | 164 | 52,320 | 529 | 1,004,087 | 6,265,280 |
| 1976 | 542 | 41 | 62,139 | 773 | 931,870 | 7,197,150 |
| 1977 | 576 | 0 | 47,994 | 0 | 827,993 | 8,025,143 |
| 1978 | 3,901 | 230 | 34,360 | 738 | 1,096,620 | 9,121,763 |
| 1979 | 3,711 | 149 | 31,936 | 540 | 982,567 | 10,104,330 |
| 1980 | 8,338 | 1,362 | 27,641 | 1,565 | 1,369,259 | 11,473,589 |
| 1981 | 9,621 | 1,125 | 20,951 | 3,074 | 2,198,522 | 13,672,111 |
| 1982 | 8,361 | 958 | 21,432 | 2,976 | 1,701,463 | 15,373,574 |
| 1983 | 6,247 | 910 | 14,938 | 1,423 | 1,211,092 | 16,584,666 |
| 1984 | 10,756 | 1,532 | 20,789 | 4,661 | 2,380,124 | 18,964,790 |
| 1985 | 8,785 | 294 | 25,628 | 1,051 | 1,752,573 | 20,717,363 |
| 1986 | 5,519 | 181 | 15,257 | 1,203 | 1,139,573 | 21,856,936 |
| 1987 | 10,250 | 0 | 20,411 | 7,667 | 1,601,137 | 23,458,073 |
| 1988 | 9,121 | 397 | 19,584 | 1,299 | 2,115,273 | 25,573,346 |
| 1989 | 13,364 | 218 | 27,349 | 475 | 3,266,680 | 28,840,026 |
| 1990 | 6,705 | 209 | 26,010 ^c | 3,114 | 2,129,758 | 30,969,784 |
| 1991 | 9,832 | 0 | 23,087 | 1,869 | 3,138,369 | 34,108,153 |
| 1992 | 7,439 | 224 | 16,910 | 761 | 2,758,696 | 36,856,849 |
| 1993 | 10,538 | 190 | 16,116 | 165 | 4,716,780 | 41,536,629 |
| 1994 | 8,589 | 10 | 16,132 | 50 | 3,433,597 | 44,970,226 |
| 1995 | 8,490 | 10 | 23,573 | 92 | 4,394,088 | 49,364,314 |
| 1996 | 24,119 ^d | 167 ^d | 22,467 | 1,536 | 5,092,490 | 54,512,595 |

Source: SRFS 1997.

^aMBF = thousands board feet; CCF = hundred cubic feet.

^bS/T = sawtimber.

^cMeasurement of pulpwood changed from cords to hundreds of cubic feet in FY 1990.

^dMeasurement of sawtimber changed from thousand board feet (MBF) to hundred cubic feet (CCF) in FY 1996.

Table 2-6. Summary of Type and Value of Timber Cut, FY 1955-FY 1996

| Fiscal Year | MBF/CCF ^a Pine S/T ^c | MBF/CCF Hdwd S/T ^c | Cords/CCF ^b P/W ^d Pine | Cords/CCF P/W ^d Hdwd | Total Value | Cumulative Value |
|----------------------|---|----------------------------------|---|------------------------------------|-------------|------------------|
| 1955-73 ^b | 37,584 | - | 340,316 | - | \$4,245,160 | \$4,245,160 |
| 1974 | 2,510 | - | 49,599 | - | 704,134 | 4,949,294 |
| 1975 | 830 | - | 33,762 | - | 538,978 | 5,488,272 |
| 1976 | 1,239 | - | 46,963 | - | 772,572 | 6,260,844 |
| 1977 | 1,598 | - | 60,719 | - | 881,805 | 7,142,649 |
| 1978 | 1,159 | - | 53,763 | - | 969,466 | 8,112,115 |
| 1979 | 3,846 | - | 51,255 | - | 1,373,737 | 9,485,852 |
| 1980 | 7,601 | - | 43,879 | - | 1,548,117 | 11,033,969 |
| 1981 | 6,355 | - | 23,188 | - | 1,468,699 | 12,502,668 |
| 1982 | 7,066 | - | 18,865 | - | 56,058 | 13,758,726 |
| 1983 | 6,867 | 630 | 18,223 | 4,036 | 1,295,222 | 15,053,948 |
| 1984 | 12,929 | 2,216 | 15,720 | 4,247 | 2,000,451 | 17,054,399 |
| 1985 | 5,388 | 1,237 | 15,625 | 1,750 | 1,216,167 | 18,270,566 |
| 1986 | 10,279 | 383 | 25,358 | 4,102 | 2,072,245 | 20,342,811 |
| 1987 | 11,143 | 181 | 27,147 | 3,513 | 2,261,324 | 22,604,135 |
| 1988 | 9,428 | 282 | 23,650 | 2,643 | 1,982,695 | 24,586,830 |
| 1989 | 10,353 | 115 | 19,651 | 35 | 2,399,602 | 26,986,432 |
| 1990 | 1,542 | 209 | 22,093 ^e | 2,699 ^e | 1,481,852 | 28,468,284 |
| 1991 | 15,358 | 1,969 | 29,084 | 769 | 4,378,618 | 32,846,902 |
| 1992 | 10,579 | 0 | 18,148 | 11 | 2,880,158 | 35,727,060 |
| 1993 | 9,545 | 0 | 17,569 | 104 | 3,460,011 | 39,187,071 |
| 1994 | 9,067 | 0 | 14,771 | 109 | 2,750,729 | 41,737,800 |
| 1995 | 9,732 | 84 | 23,793 | 177 | 4,783,568 | 46,521,368 |
| 1996 | 21,182 ^f | 199 ^f | 18,966 | 910 | 5,092,490 | 51,613,858 |

Source: SRFS 1997.

^aMBF = thousands board feet; CCF = hundred cubic feet.^bPine and hardwood for both sawtimber and pulpwood were consolidated for statistical purposes prior to FY 1983.^cS/T = sawtimber.^dP/W = pulpwood.^eMeasurement of pulpwood changed from cords to hundred cubic feet (CCF) in FY 1990.^fMeasurement of sawtimber changed from thousand board feet (MBF) to hundred cubic feet (CCF) in FY 1996.

Set-Aside Areas

The U.S. Department of Energy (DOE) designated a series of set-aside areas on SRS. The Savannah River Ecology Laboratory (SREL) selects and manages these sites as representative of major or unique vegetational communities on site. A set-aside task group comprising representatives from many SRS organizations, including DOE, Westinghouse Savannah River Company, SREL, U.S. Forest Service, and the Natural Resources Conservation Service, is responsible for protecting the set-asides.

The set-aside program was initiated in 1967 to promote ecological research (Hillestad and Bennett 1982). The project began with 10 set-aside areas and now includes 30 designated areas and 5,668 ha (14,005 acres) (Figure 2-4). The set-aside program protects a variety of habitat types and includes examples of pine stands, hardwood forest, riparian areas, and swamp forest. Many of these areas contain Carolina bays and are the habitat for the site's threatened and endangered plants. Because the set-asides are within the SRS boundaries, they are subjects of long-term projects that are protected from routine public access. They also provide control areas for other ecological change studies, because they are subject to very few of the disturbances associated with other areas on SRS. More detailed information on the set-aside program and each set-aside can be found in Davis and Janecek (1997).

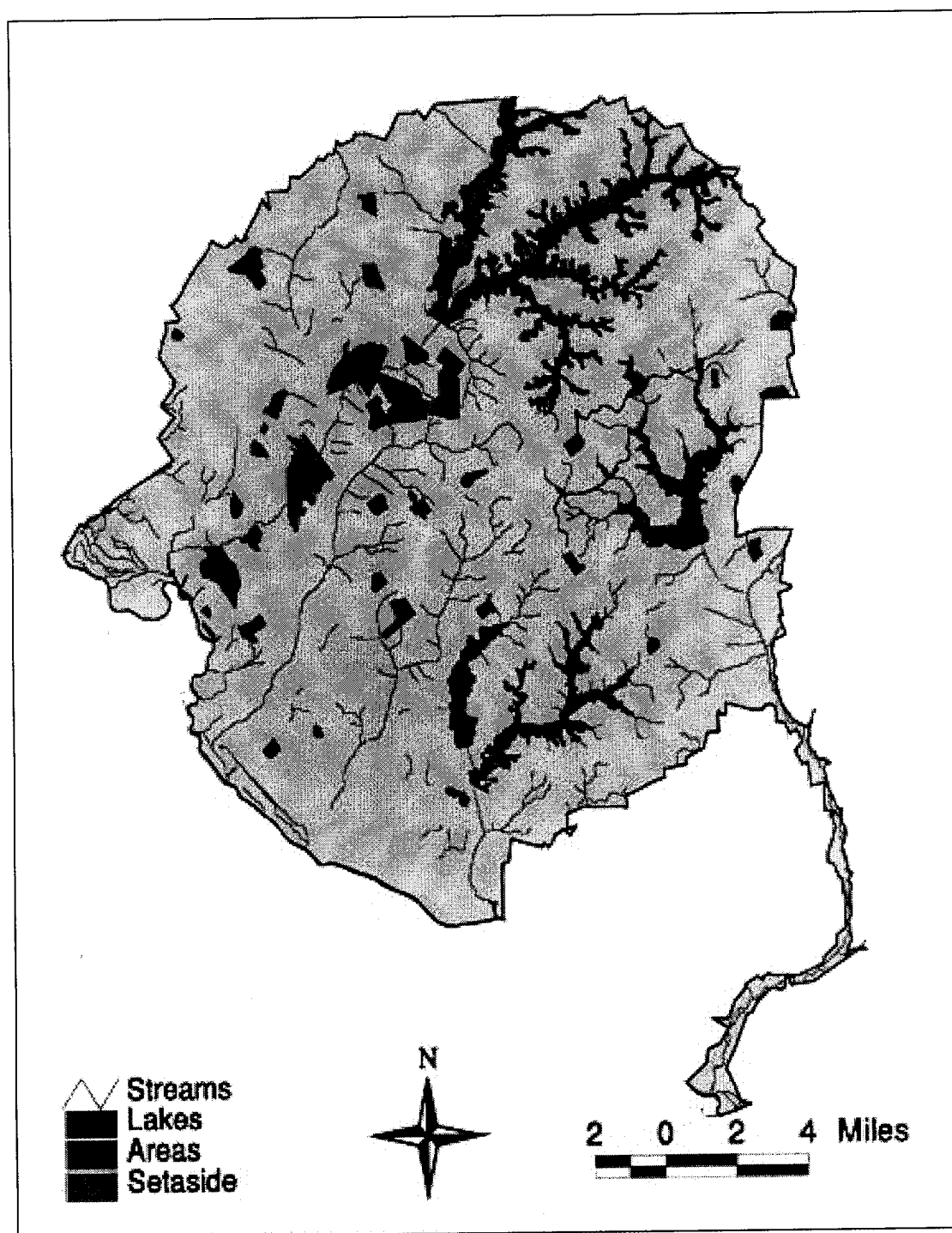


Figure 2-4. Locations of SRS Set-Asides

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Chapter 3

Wildlife and Savannah River Fishery

The SRS supports abundant terrestrial and semiaquatic wildlife species. Since the early 1950s, the site has changed from 67% forest and 33% agriculture to 94% forest, with the remainder in aquatic habitats and developed areas. The wildlife correspondingly shifted from forest-farm edge-utilizing species to a predominance of forest-dwelling species. The SRS now supports 44 species of amphibians, 59 species of reptiles, 255 species of birds, and 54 species of mammals. These populations include several commercially and recreationally important species, and a few threatened and endangered species. The purpose of Chapter 3 is to provide information on the terrestrial and semiaquatic species including “urban species” found on the SRS and to describe the commercial fishery in the Savannah River. Aquatic species are discussed in Chapter 5.

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Wildlife

The Savannah River Site comprises a variety of diverse habitat types that support terrestrial and semiaquatic wildlife species. Since the early 1950s, the site has changed from 67% forest and 33% agriculture to 94% forest, with the remainder in aquatic habitats and developed areas (Workman and McLeod 1990). The wildlife correspondingly shifted from forest-farm edge utilizing species to a predominance of forest-dwelling species. The SRS now supports 44 species of amphibians, 59 species of reptiles, 255 species of birds, and 54 species of mammals. These populations include several commercially and recreationally important species, and a few threatened and endangered species.

Herpetofauna

Introduction

SRS supports abundant herpetofauna because of its temperate climate and diverse habitats. The herpetofauna includes 17 salamanders, 27 frogs and toads, 1 crocodilian, 13 turtles, 9 lizards, and 36 snakes (Table 3-1). Gibbons and Semlitsch (1991) provide an overview, description, and identification keys to the herpetofauna of SRS.

Taxonomic Listing of SRS Herpetofauna

Within the State of South Carolina, the total number of species and subspecies of amphibians and reptiles are 69 and 76, respectively (Conant and Collins 1991). Most of these occur on the SRS. The class Amphibia is represented on site by 2 orders, 11 families, 16 genera, and 44 species. The Reptilia are represented by 3 orders, 12 families, 41 genera, and 59 species. Except for the salamanders, 75% or more of the amphibian and reptilian orders found in South Carolina occur on the SRS. The reduced percentage of South Carolina salamanders on SRS (44.7%) is because many species are found only in the mountainous and Upper Piedmont regions of the state.

A few species of amphibians and reptiles, reported in earlier studies, have not been found in more recent efforts. Explanations for these apparent inconsistencies range from misidentifications to temporal changes in species distributions (Gibbons and Semlitsch 1991). These problematic species include the dusky salamander, Woodhouse's/Fowler's toad, gray tree-frog, Brimley's chorus frog, striped chorus frog, and northern water snake.

There are several amphibian and reptile species found in South Carolina and Georgia that have geographic ranges that encompass or closely approach the SRS. However, none of these species has been documented as being found on SRS (Table 3-2) (Gibbons and Semlitsch 1991).

Table 3-1. Taxonomic Listing of Amphibians and Reptiles of the SRS

| Class | Order | Family | Scientific Name | Common Name |
|----------|---------|----------------|----------------------------------|---------------------------------------|
| Amphibia | Caudata | Proteidae | <i>Necturus punctatus</i> | dwarf waterdog |
| | | Amphiumidae | <i>Amphiuma means</i> | two-toed amphiuma |
| | | Sirenidae | <i>Siren lacertina</i> | greater siren |
| | | | <i>S. intermedia</i> | lesser siren |
| | | Ambystomatidae | <i>Ambystoma talpoideum</i> | mole salamander |
| | | | <i>A. opacum</i> | marbled salamander |
| | | | <i>A. maculatum</i> | spotted salamander |
| | | | <i>A. tigrinum</i> | tiger salamander |
| | | Salamandridae | <i>Notophthalmus viridescens</i> | eastern (red-spotted) newt |
| | | Plethodontidae | <i>Desmognathus fuscus</i> | duffy salamander ^a |
| | | | <i>D. auriculatus</i> | southern dusky salamander |
| | | | <i>Plethodon glutinosus</i> | slimy salamander |
| | | | <i>Pseudotriton montanus</i> | mud salamander |
| | | | <i>P. ruber</i> | red salamander |
| | | | <i>Eurycea cirrigera</i> | two-lined salamander |
| | | | <i>E. longicauda</i> | long-tailed (three-lined) salamander |
| | | | | |
| | | | <i>E. quadridigitata</i> | dwarf salamander |
| | | | <i>Scaphiopus holbrookii</i> | eastern spadefoot toad |
| | Anura | Pelobatidae | | |
| | | Bufonidae | <i>Bufo terrestris</i> | southern toad |
| | | | <i>B. quercicus</i> | oak toad |
| | | | <i>B. woodhousei</i> | Woodhouse toad ^a |
| | | | | |
| | | Hylidae | <i>Acris gryllus</i> | southern cricket frog |
| | | | <i>A. crepitans</i> | northern cricket frog |
| | | | <i>Hyla cinerea</i> | green treefrog |
| | | | <i>H. gratiosa</i> | barking treefrog |
| | | | <i>H. femoralis</i> | pine woods treefrog |
| | | | <i>H. squirella</i> | squirrel treefrog |
| | | | <i>H. chrysoscelis</i> | Cope's gray treefrog |
| | | | <i>H. avivoca</i> | bird-voiced treefrog |
| | | | <i>H. versicolor</i> | gray treefrog |
| | | | <i>Pseudacris triseriata</i> | striped chorus frog ^a |
| | | | <i>P. nigrita</i> | southern chorus frog |
| | | | <i>P. ornata</i> | ornate chorus frog |
| | | | <i>P. crucifer</i> | spring peeper |
| | | | <i>P. brimleyi</i> | Brimley's chorus frog ^a |
| | | | <i>P. ocularis</i> | little grass frog |
| | | Microhylidae | <i>Gastrophryne carolinensis</i> | eastern narrow-mouthed toad |
| | | Ranidae | | |
| | | | <i>Rana catesbeiana</i> | bullfrog |
| | | | <i>R. virgatipes</i> | carpenter frog |
| | | | <i>R. clamitans</i> | bronze or green frog |
| | | | <i>R. palustris</i> | pickerel frog |
| | | | <i>R. areolata</i> | Carolina gopher frog or crawfish frog |
| | | | | |
| | | | <i>R. grylio</i> | pig frog |
| | | | <i>R. sphenoccephala</i> | southern leopard frog |

Table 3-1. (cont)

| Class | Order | Family | Scientific Name | Common Name |
|----------|------------|-----------------|-----------------------------------|-----------------------------------|
| Reptilia | Crocodilia | Alligatoridae | <i>Alligator mississippiensis</i> | American alligator |
| | | Chelydridae | <i>Chelydra serpentina</i> | common snapping turtle |
| | Chelonia | Kinosternidae | <i>Sternotherus odoratus</i> | common musk turtle |
| | | | <i>Kinosternum subrubrum</i> | eastern mud turtle |
| | Squamata | Emydidae | <i>K. bauri</i> | striped mud turtle |
| | | | <i>Chrysemys picta</i> | painted turtle |
| | | | <i>Clemmys guttata</i> | spotted turtle |
| | | | <i>Terrapene carolina</i> | eastern box turtle |
| | | | <i>Pseudemys concinna</i> | river cooter |
| | | | <i>P. floridana</i> | Florida cooter |
| | | | <i>Deirochelys reticularia</i> | chicken turtle |
| | | | <i>Trachemys scripta</i> | slider turtle |
| | | | <i>Gopherus polyphemus</i> | gopher tortoise |
| | | | <i>Apalone spinifera</i> | spiny softshell turtle |
| | | Polychridae | <i>Anolis carolinensis</i> | green anole |
| | | Phrynosomatidae | <i>Sceloporus undulatus</i> | eastern fence lizard |
| | | Teiidae | <i>Cnemidophorus sexlineatus</i> | six-lined racerunner |
| | | Scincidae | <i>Scincella lateralis</i> | ground skink |
| | | | <i>Eumeces fasciatus</i> | five-lined skink |
| | | | <i>E. laticeps</i> | broad-headed skink |
| | | | <i>E. inexpectatus</i> | southeastern five-lined skink |
| | | Anguidae | <i>Ophisaurus ventralis</i> | eastern glass lizard |
| | | | <i>O. attenuatus</i> | slender glass lizard |
| | | Colubridae | <i>Nerodia cyclopion</i> | green water snake |
| | | | <i>N. taxispilota</i> | brown water snake |
| | | | <i>N. erythrogaster</i> | redbelly water snake |
| | | | <i>N. fasciata</i> | banded water snake |
| | | | <i>N. sipedon</i> | northern water snake ^a |
| | | | <i>Carphophis amoenus</i> | worm snake |
| | | | <i>Cemophora coccinea</i> | scarlet snake |
| | | | <i>Lampropeltis getula</i> | common kingsnake |
| | | | <i>L. triangulum</i> | scarlet kingsnake |
| | | | <i>Pituophis melanoleucus</i> | pine snake |
| | | | <i>Regina rigida</i> | glossy crayfish snake |
| | | | <i>R. septemvittata</i> | queen snake |
| | | | <i>Rhadinaea flavilata</i> | yellow-lipped snake |
| | | | <i>Tantilla coronata</i> | southeastern crowned snake |
| | | | <i>Seminatrix pygaea</i> | black swamp snake |
| | | | <i>Storeria dekayi</i> | brown snake |
| | | | <i>S. occipitamaculata</i> | redbelly snake |
| | | | <i>Thamnophis sirtalis</i> | common garter snake |
| | | | <i>T. sauritus</i> | eastern ribbon snake |
| | | | <i>Virginia valeriae</i> | smooth earth snake |
| | | | <i>V. striatula</i> | rough earth snake |
| | | | <i>Heterodon platirhinos</i> | eastern hognose snake |
| | | | <i>H. simus</i> | southern hognose snake |
| | | | <i>Diadophis punctatus</i> | ringneck snake |
| | | | <i>Farancia abacura</i> | mud snake |
| | | | <i>F. erythrogramma</i> | rainbow snake |
| | | | <i>Coluber constrictor</i> | black racer |

Table 3-1. (cont)

| Class | Order | Family | Scientific Name | Common Name |
|-------|-------|-----------|-------------------------------|--------------------------------------|
| | | | <i>Masticophis flagellum</i> | coachwhip |
| | | | <i>Opheodrys aestivus</i> | rough green snake |
| | | | <i>Elaphe guttata</i> | corn snake |
| | | | <i>E. obsoleta</i> | rat snake |
| | | Elapidae | <i>Micrurus fulvius</i> | eastern coral snake |
| | | Viperidae | <i>Agkistrodon contortrix</i> | copperhead |
| | | | <i>A. piscivorus</i> | cottonmouth |
| | | | <i>Sistrurus miliarius</i> | pygmy rattlesnake |
| | | | <i>Crotalus horridus</i> | timber or canebrake rattle- snake |

Sources: Collins 1990; Conant and Collins 1991; Gibbons and Semlitsch 1991; Beltz 1995; Gibbons et al. 1997.

^bSpecies whose presence on SRS has been reported but not recently confirmed or species with which taxonomic problems are associated.

Table 3-2. Species of Amphibians and Reptiles Whose Ranges Overlap or Approach the SRS, But Which Have Not Been Documented to Occur on The Site

| Scientific Name | Common Name |
|---------------------------------|---------------------------------|
| Amphibians | |
| <i>Ambystoma cingulatum</i> | flatwoods salamander |
| <i>A. mabeei</i> | Mabee's salamander |
| <i>Hemidactylium scutatum</i> | four-toed salamander |
| <i>Plethodon websteri</i> | Webster's salamander |
| <i>Pseudobranchius striatus</i> | dwarf siren |
| <i>Stereochilus marginatus</i> | many-lined salamander |
| <i>Bufo americanus</i> | American toad |
| <i>Hyla andersoni</i> | pine barrens treefrog |
| <i>Rana heckscheri</i> | river frog |
| Reptiles | |
| <i>Apalone ferox</i> | Florida softshell |
| <i>Eumeces egregius</i> | northern mole skink |
| <i>Lampropeltis calligaster</i> | mole snake |
| <i>Crotalus adamanteus</i> | eastern diamondback rattlesnake |

Source: Gibbons and Semlitsch 1991.

Habitat Utilization

The amphibians and reptiles on SRS are year-round residents. SRS herpetofauna use a variety of aquatic and terrestrial SRS habitats (Table 3-3). Although some species are probably more widespread than indicated in Table 3-3, the documentation to support their presence in other habitats does not exist. Because of the lack of any habitat data on them, the striped chorus frog, Brimley's chorus frog, gray treefrog, gopher tortoise, and northern water snake, are not included in this table.

The highest overall herpetofauna species diversity is in aquatic habitats. More than 70% of the site's amphibian and reptile species use stream corridors and Carolina bays. Only 9% have been documented in the Savannah River. On average, slightly more than half (54%) of the amphibian species have been found in aquatic habitats, while 51% of the reptiles have been found in these areas.

Between 35% and 50% of the species have been collected from terrestrial habitats. The highest diversity is in bottomland hardwood forests, and the lowest is in old fields and clearcuts. In all of the terrestrial habitats except bottomland hardwood forest, amphibian diversity is lower than that of the reptiles. This is most likely due to the increased moisture or presence of wetter areas in bottomland forests. Both amphibians and reptiles have lower overall mean numbers of species in the terrestrial areas than in aquatic.

Seasonal Movement Studies

The temperate climate at the SRS, with hot and humid summers and mild winters, is generally favorable for herpetofauna. However, as ectotherms, amphibians and reptiles do exhibit seasonal variation in activity. The movement behavior of herpetofauna, especially amphibians, is positively correlated with temperature and rainfall.

One of the most studied aspects of this seasonal behavior is the movement patterns of amphibians to and from small ponds and Carolina bays. Studies have looked at the specific migration patterns of salamander species, while others have surveyed for all local species of amphibians and reptiles (Tables 3-4, 3-5, 3-6, and 3-7).

Threatened and Endangered Herpetofauna

The Carolina gopher frog is listed as a Federal candidate species and is the only amphibian on SRS that can be considered to have any level of protection. Studies have been conducted on the American alligators on site, which is Federally listed as "Threatened due to Similarity of Appearance." The gopher tortoise is a state endangered species. Chapter 4—Threatened and Endangered Species, has more information on these species.

Table 3-3. Amphibian and Reptile Species Found in Ten Habitat Types at SRS

| Species | Carolina Bays | Open Water Lakes and Ponds | Stream Corridor | Man- made Basin or Pit | River Swamp | River | Pine Forest | Upland Hard- wood Forest | Bottom- land Hard- wood Forest | Old Field and Clearcut |
|------------------------------------|------------------|-------------------------------------|--------------------|---------------------------------|----------------|-------|----------------|-----------------------------------|--|---------------------------------|
| dwarf waterdog | | | X | | | X | | | | |
| two-toed amphiuma | X | X | X | | X | | | | | |
| greater siren | X | | X | | X | | | | | |
| lesser siren | X | X | X | | X | | | | | |
| mole salamander | X | X | X | X | | | X | X | X | X |
| marbled salamander | X | X | X | X | X | | X | X | X | X |
| spotted salamander | X | X | X | X | X | | | | X | |
| tiger salamander | X | X | | X | | | X | X | X | |
| eastern/red-spotted newt | X | X | X | X | X | X | X | X | X | X |
| dusky salamander | | | X | | | | | | X | |
| southern dusky sala- mander | | | X | | | | | | X | |
| slimy salamander | X | | | | | | X | X | X | |
| mud salamander | X | | X | | | | | | X | |
| red salamander | X | X | X | X | | | | | X | |
| two-lined salamander | | | X | | X | | | | X | |
| long-tailed salamander | | | X | | X | | | | X | |
| dwarf salamander | X | X | X | X | X | | | | X | |
| eastern spadefoot toad | X | X | X | X | | | X | X | | |
| southern toad | X | X | X | X | X | | X | X | X | X |
| oak toad | X | X | X | X | X | | X | X | X | X |
| Woodhouse toad | X | | | | | | | X | X | |
| southern cricket frog | X | X | X | X | X | | | | X | |
| northern cricket frog | | | X | | X | | | | | |
| green treefrog | X | X | X | | X | | X | X | X | |
| barking treefrog | X | X | X | X | X | | X | X | X | |
| pine woods treefrog | X | | X | X | X | | X | | X | |
| squirrel treefrog | X | | X | | | | X | X | | |
| Cope's gray treefrog | X | X | X | X | X | | X | | X | |
| bird-voiced treefrog | X | | X | | X | | | | X | |
| southern chorus frog | X | X | X | X | | | X | X | X | |
| ornate chorus frog | X | X | X | X | | | X | X | X | |
| spring peeper | X | X | X | X | X | | X | X | X | X |
| little grass frog | | | X | | X | | X | X | X | |
| eastern narrow-mouthed toad | X | X | X | X | X | | | | X | X |
| bullfrog | X | X | X | X | X | | | | | |
| carpenter frog | X | X | X | | X | | | | X | |
| bronze or green frog | X | X | X | X | X | | | | | |
| pickerel frog | X | X | X | X | X | | | | X | |
| Carolina gopher/craw- fish frog | X | X | | | | | | | X | |
| pig frog | X | X | X | | X | | | | X | |
| southern leopard frog | X | X | X | X | X | | | | X | |
| American alligator | X | X | X | X | X | X | | | X | |
| common snapping turtle | X | X | X | X | X | X | X | X | X | X |

Table 3-3. (cont)

| Species | Carolina Bays | Open Water Lakes and Ponds | Stream Corridor | Man- made Basin or Pit | River Swamp | River | Pine Forest | Upland Hard- wood Forest | Bottom- land Hard- wood Forest | Old Field and Clearcut |
|----------------------------------|------------------|-------------------------------------|--------------------|---------------------------------|----------------|-------|----------------|-----------------------------------|--|---------------------------------|
| stinkpot | X | X | X | X | X | | | | X | |
| eastern mud turtle | X | X | X | X | X | | | | X | |
| striped mud turtle | X | | X | | X | | | | X | |
| painted turtle | X | | | | | | | | | |
| spotted turtle | X | X | X | | | | | | X | |
| eastern box turtle | X | X | X | X | | | X | X | X | X |
| river cooter | | | X | | X | X | | | | |
| Florida cooter | X | X | X | | X | X | | | | |
| chicken turtle | X | X | X | | X | | | | | |
| slider turtle | X | X | X | X | X | | | | | |
| spiny softshell turtle | | X | X | | | X | | | | |
| green anole | X | X | X | X | X | | X | X | X | X |
| eastern fence lizard | X | X | X | X | | | X | | | X |
| six-lined racerunner | X | X | X | X | | | X | X | X | X |
| ground skink | X | X | X | X | | | | | X | |
| five-lined skink | | X | X | | X | | | | X | |
| broad-headed skink | X | X | X | X | X | | X | X | X | X |
| southeastern five-lined skink | | X | X | | | | X | X | X | X |
| eastern glass lizard | | | X | | | | X | X | | X |
| slender glass lizard | | | X | | | | X | X | | X |
| green water snake | X | X | | | | | | | | |
| brown water snake | | X | X | | X | X | | | | |
| red-bellied water snake | X | X | X | | X | | | | X | |
| banded water snake | X | X | X | X | X | X | | | X | |
| worm snake | | | X | | | | | | X | |
| scarlet snake | X | X | X | X | | | X | X | X | X |
| common kingsnake | X | X | X | | X | | | X | X | |
| scarlet kingsnake | X | X | X | X | | | X | X | | X |
| pine snake | | | | | | | X | X | | |
| glossy crayfish snake | X | | X | | | | | | | |
| queen snake | | | X | | | | | | | |
| yellow-lipped snake | X | | | | | | | | | |
| southeastern crowned snake | X | X | X | X | | | X | X | X | |
| black swamp snake | X | | X | | | | | | | |
| brown snake | X | | X | X | X | | X | X | X | |
| red-bellied snake | X | X | X | X | | | | X | X | |
| common garter snake | X | X | X | X | | | | X | X | |
| eastern ribbon snake | X | X | X | | X | | | | | |
| smooth earth snake | X | X | | X | | | | X | | |
| rough earth snake | X | | X | | | | | | | |
| eastern hognose snake | X | X | X | X | | | X | X | | X |
| southern hognose snake | X | X | X | X | | | X | X | | |
| ringneck snake | X | X | X | X | | | X | X | X | |
| mud snake | X | X | X | X | X | | | | X | |

Table 3-3. (cont)

| Species | Carolina Bays | Open Water Lakes and Ponds | Stream Corridor | Man- made Basin or Pit | River Swamp | River | Pine Forest | Upland Hard- wood Forest | Bottom- land Hard- wood Forest | Old Field and Clearcut |
|-----------------------------------|------------------|-------------------------------------|--------------------|---------------------------------|----------------|-------|----------------|-----------------------------------|--|---------------------------------|
| rainbow snake | X | X | X | | X | | | | X | |
| black racer | X | X | X | X | X | | X | X | X | X |
| coachwhip | | X | | | | | X | X | | X |
| rough green snake | | X | X | | X | | | X | X | |
| corn snake | | X | X | | | | X | X | X | X |
| rat snake | | | X | | X | | X | X | X | X |
| eastern coral snake | X | | | | | | X | X | | |
| copperhead | | | X | | X | | X | X | X | X |
| cottonmouth | X | X | X | X | X | X | | | X | |
| pygmy rattlesnake | | | | | | | X | X | X | X |
| timber/canebrake rattle- snake | X | X | X | | X | | X | X | X | X |

Based on data compiled from: Smith et al. 1982; Vitt et al. 1982; Mayer et al. 1984; Wilde 1985; Patterson and Giffin 1988; Scott et al. 1988; Gibbons and Semlitsch 1991; Bowers 1997.

Table 3-4. Direction of Movement of All Species of Amphibians and Reptiles Captured (original and recaptured) in Drift Fence and Pitfall Traps at Rainbow Bay and Sun Bay on SRS, April 1, 1981-March 31, 1982

| Species | Rainbow Bay | | | | Sun Bay ^a | | | |
|----------------------------------|----------------|-------------------|---------------|------------------|----------------------|-------------------|---------------|------------------|
| | Entering Adult | Entering Juvenile | Exiting Adult | Exiting Juvenile | Entering Adult | Entering Juvenile | Exiting Adult | Exiting Juvenile |
| Class Amphibia | | | | | | | | |
| Order Caudata | | | | | | | | |
| <i>Ambystoma talpoideum</i> | 929 | 1 | 527 | 3 | 1,970 | 0 | 697 | 1 |
| <i>A. opacum</i> | 26 | 2 | 22 | 12 | 15 | 3 | 18 | 30 |
| <i>A. tigrinum</i> | 123 | 0 | 97 | 1 | 26 | 0 | 14 | 0 |
| <i>Notophthalmus viridescens</i> | 1,648 | 0 | 727 | 0 | 517 | 0 | 507 | 0 |
| <i>Plethodon glutinosus</i> | 2 | 0 | 3 | 0 | 2 | 0 | 1 | 1 |
| <i>Pseudotriton ruber</i> | 2 | 0 | 0 | 0 | 8 | 0 | 2 | 0 |
| <i>P. montanus</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Eurycea quadridigitata</i> | 166 | 2 | 30 | 23 | 1 | 0 | 1 | 0 |
| Total | 2,896 | 5 | 1,406 | 39 | 2,539 | 3 | 1,240 | 32 |
| Order Anura | | | | | | | | |
| <i>Scaphiopus holbrooki</i> | 56 | 2 | 50 | 0 | 26 | 1 | 20 | 0 |
| <i>Bufo terrestris</i> | 314 | 0 | 313 | 0 | 138 | 0 | 95 | 0 |
| <i>B. quercicus</i> | 13 | 0 | 11 | 0 | 10 | 0 | 9 | 0 |
| <i>Acris gryllus</i> | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| <i>Hyla cinerea</i> | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>H. crucifer</i> | 72 | 124 | 34 | 784 | 56 | 10 | 21 | 75 |
| <i>H. gratiosa</i> | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| <i>H. femoralis</i> | 3 | 0 | 0 | 0 | 2 | 0 | 1 | 0 |
| <i>H. chrysoscelis</i> | 1 | 0 | 0 | 0 | 2 | 1 | 2 | 0 |
| <i>Pseudacris nigrita</i> | 109 | 0 | 72 | 3 | 3 | 0 | 1 | 0 |
| <i>P. ornata</i> | 580 | 57 | 303 | 3,107 | 207 | 2 | 128 | 55 |
| <i>Gastrophryne carolinensis</i> | 2,299 | 0 | 1,477 | 0 | 316 | 0 | 327 | 0 |
| <i>Rana catesbeiana</i> | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 |
| <i>R. clamitans</i> | 2 | 1 | 2 | 1 | 40 | 43 | 28 | 38 |
| <i>R. utricularia</i> | 120 | 0 | 36 | 4 | 8 | 0 | 2 | 0 |
| Total | 3,571 | 184 | 2,300 | 3,899 | 811 | 58 | 634 | 168 |
| Class Reptilia | | | | | | | | |
| Order Chelonia | | | | | | | | |
| <i>Chelydra serpentina</i> | 0 | 0 | 0 | 0 | 4 | 0 | 2 | 3 |
| <i>Sternotherus odoratus</i> | 0 | 0 | 0 | 0 | 32 | 2 | 16 | 7 |
| <i>Kinosternon subrubrum</i> | 20 | 2 | 11 | 1 | 0 | 0 | 0 | 0 |
| <i>Terrapene carolina</i> | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| <i>Trachemys scripta</i> | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Deirochelys reticularia</i> | 3 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| Total | 25 | 2 | 13 | 1 | 38 | 2 | 20 | 10 |
| Order Squamata | | | | | | | | |
| Suborder Lacertilia | | | | | | | | |
| <i>Anolis carolinensis</i> | 31 | 5 | 28 | 14 | 15 | 1 | 14 | 1 |
| <i>Sceloporus undulatus</i> | 2 | 3 | 0 | 0 | 3 | 10 | 6 | 4 |
| <i>Cnemidophorus sexlineatus</i> | 3 | 1 | 2 | 0 | 22 | 6 | 32 | 1 |
| <i>Scincella laterale</i> | 2 | 3 | 4 | 0 | 1 | 0 | 1 | 0 |
| <i>Eumeces laticeps</i> | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| Total | 38 | 13 | 34 | 14 | 41 | 18 | 53 | 6 |

Table 3-4. (cont)

| Species | Rainbow Bay | | | | Sun Bay ^a | | | |
|-------------------------------|----------------|-------------------|---------------|------------------|----------------------|-------------------|---------------|------------------|
| | Entering Adult | Entering Juvenile | Exiting Adult | Exiting Juvenile | Entering Adult | Entering Juvenile | Exiting Adult | Exiting Juvenile |
| Suborder Serpentes | | | | | | | | |
| <i>Nerodia erythrogaster</i> | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| <i>N. fasciata</i> | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| <i>Storeria dekayi</i> | 1 | 3 | 6 | 0 | 1 | 0 | 0 | 0 |
| <i>S. occipitomaculata</i> | 24 | 1 | 11 | 0 | 5 | 0 | 3 | 0 |
| <i>Thamnophis sirtalis</i> | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 0 |
| <i>Diadophis punctatus</i> | 3 | 1 | 8 | 0 | 5 | 0 | 3 | 0 |
| <i>Farancia abacura</i> | 3 | 11 | 4 | 1 | - | - | - | - |
| <i>Lampropeltis getula</i> | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| <i>L. triangulum</i> | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| <i>Heterodon playrhinos</i> | 0 | 0 | 0 | 0 | 3 | 2 | 1 | 0 |
| <i>H. simus</i> | 0 | 0 | 0 | 0 | 6 | 0 | 2 | 0 |
| <i>Coluber constrictor</i> | 5 | 3 | 0 | 2 | 3 | 1 | 3 | 1 |
| <i>Cemophora coccinea</i> | 2 | 0 | 2 | 0 | 5 | 0 | 6 | 0 |
| <i>Tantilla coronata</i> | 28 | 0 | 25 | 0 | 59 | 0 | 42 | 0 |
| <i>Virginia valeriae</i> | 8 | 0 | 7 | 0 | 2 | 0 | 3 | 0 |
| <i>Agkistrodon piscivorus</i> | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Total | 78 | 23 | 62 | 9 | 91 | 3 | 64 | 2 |
| Grand Total | 6,608 | 227 | 3,815 | 3,962 | 3,520 | 84 | 2,011 | 218 |

Source: Vittell et al. 1982.

^aNo longer exists.

Table 3-5. Direction of Movement of All Species of Amphibians and Reptiles Captured (original and recaptured) in Drift Fence and Pitfall Traps at Peripheral Areas Associated with Rainbow Bay on the Savannah River Site in South Carolina, April 1, 1981-March 31, 1982

| Species | Linda's Pond | | | | Pickerel Pond | | | |
|---|----------------|-------------------|---------------|------------------|----------------|-------------------|---------------|------------------|
| | Entering Adult | Entering Juvenile | Exiting Adult | Exiting Juvenile | Entering Adult | Entering Juvenile | Exiting Adult | Exiting Juvenile |
| Class Amphibia | | | | | | | | |
| Order Caudata | | | | | | | | |
| <i>Ambystoma talpoideum</i> | 236 | 0 | 187 | 0 | 226 | 0 | 140 | 0 |
| <i>A. opacum</i> | 21 | 0 | 26 | 0 | 3 | 0 | 2 | 2 |
| <i>Notophthalmus viridescens</i> | 9 | 0 | 0 | 0 | 32 | 0 | 23 | 1 |
| <i>Plethodon glutinosus</i> | 4 | 0 | 3 | 0 | 12 | 8 | 28 | 1 |
| <i>Pseudotriton ruber vioscai</i> | 0 | 0 | 1 | 0 | 7 | 0 | 29 | 0 |
| <i>Eurycea quadridigitata</i> | 0 | 0 | 0 | 0 | 7 | 0 | 3 | 0 |
| Total | 270 | 0 | 217 | 0 | 287 | 8 | 225 | 4 |
| Order Anura | | | | | | | | |
| <i>Scaphiopus holbrooki</i> | 5 | 0 | 18 | 0 | 8 | 0 | 36 | 0 |
| <i>Bufo terrestris</i> | 12 | 0 | 26 | 0 | 20 | 0 | 44 | 0 |
| <i>B. quercicus</i> | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| <i>Hyla crucifer</i> | 0 | 0 | 1 | 0 | 1 | 0 | 17 | 7 |
| <i>H. femoralis</i> | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| <i>Pseudacris n. nigrita</i> | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| <i>P. ornata</i> | 6 | 0 | 5 | 0 | 5 | 1 | 5 | 6 |
| <i>Gastrophryne carolinensis</i> | 89 | 3 | 456 | 0 | 19 | 0 | 103 | 0 |
| <i>Rana catesbeiana</i> | 2 | 0 | 2 | 5 | 0 | 0 | 0 | 0 |
| <i>R. clamitans</i> | 2 | 0 | 0 | 0 | 6 | 1 | 2 | 1 |
| <i>R. ultriculata</i> | 0 | 0 | 0 | 0 | 6 | 0 | 9 | 0 |
| Total | 116 | 3 | 511 | 5 | 65 | 2 | 218 | 14 |
| Order Chelonina | | | | | | | | |
| <i>Sternotherus odoratus</i> | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| <i>Kinosternon subrubrum</i> | 3 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| <i>Terrapene carolina</i> | 0 | 0 | 2 | 0 | 4 | 0 | 1 | 0 |
| <i>Trachemys scripta</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Order Squamata | | | | | | | | |
| Suborder Lacertilia | | | | | | | | |
| <i>Anolis carolinensis</i> | 0 | 0 | 1 | 0 | 4 | 1 | 5 | 1 |
| <i>Sceloporus undulatus</i> | 1 | 0 | 6 | 0 | 0 | 0 | 2 | 0 |
| <i>Cnemidophorus sexlineatus</i> | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| <i>Scincella laterale</i> | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| <i>Eumeces laticeps</i> | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Total | 2 | 0 | 7 | 0 | 5 | 1 | 10 | 1 |
| Suborder Serpentes | | | | | | | | |
| <i>Storeria dekayi</i> | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| <i>S. occipitomaculata</i> | 0 | 0 | 2 | 0 | 1 | 0 | 7 | 0 |
| <i>Thamnophis sirtalis</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| <i>Diadophis punctatus</i> | 1 | 0 | 1 | 0 | 3 | 0 | 5 | 0 |
| <i>Farancia abacura</i> | 0 | 1 | 0 | 3 | 0 | 0 | 0 | 0 |
| <i>Heterodon platyrhinos</i> | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| <i>H. simus</i> | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Lampropeltis triangulum elapsoides</i> | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |

Table 3-5. (cont)

| Species | Linda's Pond | | | | Pickerel Pond | | | |
|----------------------------|----------------|-------------------|---------------|------------------|----------------|-------------------|---------------|------------------|
| | Entering Adult | Entering Juvenile | Exiting Adult | Exiting Juvenile | Entering Adult | Entering Juvenile | Exiting Adult | Exiting Juvenile |
| <i>Coluber constrictor</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| <i>Cemophora coccinea</i> | 1 | 0 | 3 | 0 | 0 | 0 | 2 | 0 |
| <i>Tantilla coronata</i> | 8 | 0 | 20 | 1 | 3 | 0 | 8 | 0 |
| <i>Virginia valeriae</i> | 3 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| Total | 14 | 1 | 28 | 4 | 8 | 0 | 25 | 3 |
| Grand total | 405 | 5 | 766 | 9 | 370 | 11 | 479 | 22 |

Source: Vitt et al. 1982.

Table 3-6. Number of Adult Amphibians Captured Entering the DWPF Refuge Ponds During Their Breeding Season (total for all four ponds 1984 to 1988)

| Species | 1984 | 1985 | 1986 | 1987 | 1988 |
|----------------------------------|------|------|------|------|------|
| Salamanders | | | | | |
| <i>Ambystoma talpoideum</i> | 9 | 4 | 62 | 59 | 33 |
| <i>A. tigrinum</i> | 0 | 0 | 1 | 1 | 0 |
| <i>Notophthalmus viridescens</i> | 3 | 0 | 9 | 8 | 5 |
| <i>Eurycea quadridigitata</i> | 1 | 1 | 0 | 0 | 0 |
| Total | 13 | 5 | 72 | 68 | 38 |
| Frogs and Toads | | | | | |
| <i>Scaphiopus holbrookii</i> | 18 | 11 | 7 | 12 | 5 |
| <i>Bufo terrestris</i> | 34 | 156 | 161 | 53 | 62 |
| <i>B. quercicus</i> | 4 | 0 | 0 | 0 | 0 |
| <i>Hyla crucifer</i> | 17 | 27 | 121 | 5 | 28 |
| <i>H. femoralis</i> | 1 | 1 | 0 | 0 | 0 |
| <i>H. chrysoscelis</i> | 3 | 2 | 1 | 3 | 0 |
| <i>Pseudacris nigrita</i> | 0 | 2 | 2 | 0 | 0 |
| <i>P. ornata</i> | 4 | 4 | 6 | 0 | 10 |
| <i>Gastrophryne carolinensis</i> | 68 | 69 | 36 | 34 | 29 |
| <i>Rana catesbeiana</i> | 1 | 0 | 1 | 0 | 0 |
| <i>R. clamitans</i> | 13 | 5 | 7 | 0 | 0 |
| <i>R. utricularia</i> | 24 | 14 | 98 | 20 | 21 |
| Total | 187 | 291 | 440 | 127 | 155 |
| Grand total | 200 | 296 | 512 | 195 | 193 |

Source: Scott et al. 1988.

DWPF = Defense Waste Processing Facility.

Table 3-7. Number of Amphibian Juveniles Produced at DWPF Refuge Ponds, 1985-1988

| Species | Pond A | | | | Pond B | | | | Pond D | | | | Total | | | |
|-----------------------------------|--------|------|------|------|--------|------|------|------|--------|------|------|------|-------|------|------|------|
| | 1985 | 1986 | 1987 | 1988 | 1985 | 1986 | 1987 | 1988 | 1985 | 1986 | 1987 | 1988 | 1985 | 1986 | 1987 | 1988 |
| <i>Ambystoma talpoideum</i> | 0 | 6 | 1 | 0 | 0 | 32 | 29 | 60 | 0 | 5 | 202 | 142 | 0 | 43 | 232 | 202 |
| <i>Notophthalmus viride-scens</i> | 0 | 11 | 41 | 85 | 0 | 0 | 2 | 0 | 0 | 8 | 1 | 57 | 0 | 19 | 44 | 142 |
| Total salamanders | 0 | 17 | 42 | 85 | 0 | 32 | 31 | 60 | 0 | 13 | 203 | 199 | 0 | 62 | 276 | 344 |
| <i>Bufo terrestris</i> | 50 | 1 | 0 | 3 | 16 | 1 | 0 | 0 | 0 | 14 | 0 | 298 | 66 | 16 | 0 | 301 |
| <i>Acris gryllus</i> | - | - | 5 | 0 | - | - | 0 | 0 | - | - | 13 | 27 | 0 | 0 | 18 | 27 |
| <i>Hyla crucifer</i> | 306 | 0 | 0 | 97 | 85 | 3 | 0 | 147 | 640 | 1 | 1 | 8 | 1031 | 4 | 1 | 252 |
| <i>H. gratiosa</i> | 24 | 10 | 31 | 2 | 100 | 15 | 17 | 16 | 41 | 98 | 5 | 65 | 165 | 123 | 53 | 83 |
| <i>H. chrysoscelis</i> | 59 | 0 | 2 | 0 | 77 | 0 | 2 | 0 | 6 | 1 | 0 | 1 | 142 | 1 | 4 | 1 |
| <i>Pseudacris ornata</i> | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 6 | 0 | - | 0 | 0 | 0 | - | 0 | 7 |
| <i>Rana catesbeiana</i> | - | - | 0 | - | - | 9 | 1 | - | - | 0 | 0 | - | - | - | 9 | 1 |
| <i>R. utricularia</i> | 19 | 1 | 21 | 287 | 646 | 6 | 0 | 72 | 0 | 7 | 0 | 0 | 665 | 14 | 21 | 359 |
| Total frogs and toads | 458 | 12 | 59 | 390 | 924 | 24 | 20 | 241 | 687 | 121 | 19 | 399 | 2069 | 158 | 106 | 1031 |

Source: Scott et al. 1988.

Avifauna

Introduction

SRS supports a diverse avifauna that includes migrant, seasonal, and permanent residents (Norris 1963). The documented avifauna of SRS includes 1 loon, 2 grebes, 1 cormorant, 1 anhinga, 14 wading birds, 28 waterfowl, 16 raptors, 1 wild turkey, 1 quail, 6 rails, 18 shorebirds, 10 gulls or terns, 4 doves, 2 cuckoos, 6 owls, 3 goatsuckers, 1 swift, 1 hummingbird, 1 kingfisher, 8 woodpeckers, 9 flycatchers, 1 horned lark, 5 swallows, 1 jay, 2 crows, 3 chickadees, 3 nuthatches, 1 creeper, 6 wrens, 3 mockingbirds, 7 thrushes, 3 gnatcatchers, 2 pipits, 1 waxwing, 1 shrike, 1 starling, 5 vireos, 37 warblers, 1 old world sparrow, 10 blackbirds or orioles, 2 tanagers, 1 cardinal, 10 grosbeaks or buntings, and 15 sparrows (Table 3-8) (Norris 1963; Mayer et al. 1997). Mayer et al. (1997) provides an annotated checklist to the birds of the SRS.

Taxonomic Listing of Birds Found on the SRS

Sprunt and Chamberlain (1970) list 423 avian species documented for South Carolina. Approximately 60% of these species are known from the SRS. The class Aves is represented on SRS by 17 orders, 59 families, 152 genera, and 255 species. The major taxa not found on SRS are the lower Coastal Plain and shore bird guilds.

Several species documented for the SRS are based on a single observation and are mostly of birds not typically found in this region except as either rare transient visitors or accidental occurrences. These include the white-fronted goose, surf scooter, black scooter, peregrine falcon, American oystercatcher, sooty tern, white-winged dove, northern saw-whet owl, Bewick's wren, Sprague's pipit, Philadelphia vireo, Kirtland's warbler, and western meadowlark (Mayer et al. 1997).

Habitat Utilization

Because they are highly mobile, birds may utilize almost any habitat on SRS (Table 3-9). Pine forests (41% of the species), are most often used by birds, followed closely by upland hardwood forest (40%). Open terrestrial habitats (i.e., old fields, cleared rights-of-way and clearcuts) are used less frequently (27%).

Waterfowl and wading birds, as well as many upland species, use SRS aquatic habitats year-round. Sixty-seven percent use Carolina bays and emergent marshes. Sixty-eight percent of the upland species use this habitat type. Edge or shoreline areas accounted for high numbers of upland birds at Carolina bays and emergent marshes, stream, and small drainage corridors, and river swamp habitats. The aquatic birds are most common in large and small open water habitat (88% of the species).

Table 3-8. Taxonomic Listing of Birds of the SRS

| Order | Family | Scientific Name | Common Name |
|------------------|-------------------|------------------------------|-----------------------------|
| Gaviiformes | Gaviidae | <i>Gavia immer</i> | Common Loon |
| Podicipediformes | Podicipedidae | <i>Podiceps auritus</i> | Horned Grebe |
| | | <i>Podilymbus podiceps</i> | Pied-Billed Grebe |
| Pelecaniformes | Phalacrocoracidae | <i>Phalacrocorax auritus</i> | Double-Crested Cormorant |
| | Anhingidae | <i>Anhinga anhinga</i> | Anhinga |
| Ciconiiformes | Ardeidae | <i>Ardea herodias</i> | Great Blue Heron |
| | | <i>Butorides striatus</i> | Green Heron |
| | | <i>Egretta caerulea</i> | Little Blue Heron |
| | | <i>Bubulcus ibis</i> | Cattle Egret |
| | | <i>Casmerodius albus</i> | Great Egret |
| | | <i>Egretta thula</i> | Snowy Egret |
| | | <i>E. tricolor</i> | Tricolor Heron |
| | | <i>Nycticorax nycticorax</i> | Black-Crowned Night Heron |
| | | <i>N. violaceus</i> | Yellow-Crowned Night Heron |
| | | <i>Ixobrychus exilis</i> | Least Bittern |
| | | <i>Botaurus lentiginosus</i> | American Bittern |
| | Ciconiidae | <i>Mycteria americana</i> | Wood Stork |
| | Threskiornithidae | <i>Eudocimus albus</i> | White Ibis |
| Anseriformes | Cygninae | <i>Cygnus columbianus</i> | Tundra Swan |
| | Anserinae | <i>Branta canadensis</i> | Canada Goose |
| | | <i>Anser albifrons</i> | Greater White-Fronted Goose |
| | | <i>Chen caerulescens</i> | Snow/Blue Goose |
| | Anatinae | <i>Anas platyrhynchos</i> | Mallard |
| | | <i>A. rubripes</i> | American Black Duck |
| | | <i>A. acuta</i> | Northern Pintail |
| | | <i>A. crecca</i> | Green-Winged Teal |
| | | <i>A. discors</i> | Blue-Winged Teal |
| | | <i>A. americana</i> | American Widgeon |
| | | <i>A. strepera</i> | Gadwall |
| | | <i>A. clypeata</i> | Northern Shoveler |
| | | <i>Aix sponsa</i> | Wood Duck |
| | Aythiinae | <i>Aythya americana</i> | Redhead |
| | | <i>A. collaris</i> | Ring-Necked Duck |
| | | <i>A. valisineria</i> | Canvasback |
| | | <i>A. marila</i> | Greater Scaup |
| | | <i>A. affinis</i> | Lesser Scaup |
| | | <i>Bucephala clangula</i> | Common Goldeneye |
| | | <i>B. albeola</i> | Bufflehead |
| | | <i>Clangula hyemalis</i> | Oldsquaw |
| | | <i>Melanitta fusca</i> | White-Winged Scooter |
| | | <i>M. perspicillata</i> | Surf Scooter |
| | | <i>M. nigra</i> | Black Scooter |
| | Erismaturinae | <i>Oxyura jamaicensis</i> | Ruddy Duck |
| | Merginae | <i>Lophodytes cucullatus</i> | Hooded Merganser |
| | | <i>Mergus merganser</i> | Common Merganser |
| | | <i>M. serrator</i> | Red-breasted Merganser |

Table 3-8. (cont)

| Order | Family | Scientific Name | Common Name |
|-----------------|----------------|---------------------------------|------------------------|
| Falconiformes | Cathartidae | <i>Cathartes aura</i> | Turkey Vulture |
| | | <i>Coragyps atratus</i> | Black Vulture |
| | Elaninae | <i>Elanoides forficatus</i> | Swallow-Tailed Kite |
| | | <i>Ictinia mississippiensis</i> | Mississippi Kite |
| | Accipitrinae | <i>Accipiter striatus</i> | Sharp-Shinned Hawk |
| | | <i>A. cooperi</i> | Cooper's Hawk |
| | Buteoninae | <i>Buteo jamaicensis</i> | Red-Tailed Hawk |
| | | <i>B. lineatus</i> | Red-Shouldered Hawk |
| | | <i>B. platypterus</i> | Broad-Winged Hawk |
| | | <i>Aquila chrysaetos</i> | Golden Eagle |
| | | <i>Haliaeetus leucocephalus</i> | Bald Eagle |
| | Circinae | <i>Circus cyaneus</i> | Northern Harrier |
| | Pandionidae | <i>Pandion haliaetus</i> | Osprey |
| | Falconinae | <i>Falco peregrinus</i> | Peregrine Falcon |
| | | <i>F. columbarius</i> | Merlin |
| | | <i>F. sparverius</i> | American Kestrel |
| Galliformes | Phasianidae | <i>Colinus virginianus</i> | Northern Bobwhite |
| | Meleagrididae | <i>Meleagris gallopavo</i> | Eastern Wild Turkey |
| Gruiformes | Rallidae | <i>Rallus elegans</i> | King Rail |
| | | <i>R. limicola</i> | Virginia Rail |
| | | <i>Porzana carolina</i> | Sora |
| | | <i>Porphyryla martinica</i> | Purple Gallinule |
| | | <i>Gallinula chloropus</i> | Common Moorhen |
| | | <i>Fulica americana</i> | American Coot |
| | | <i>Pluvialis squatarola</i> | Black-Bellied Plover |
| Charadriiformes | Charadriidae | <i>Charadrius vociferus</i> | Killdeer |
| | | <i>Haematopus palliatus</i> | American Oystercatcher |
| | Scolopacidae | <i>Scolopax minor</i> | American Woodcock |
| | | <i>Gallinago gallinago</i> | Common Snipe |
| | | <i>Limnodromus griseus</i> | Short-Billed Dowitcher |
| | | <i>L. scolopaceus</i> | Long-Billed Dowitcher |
| | | <i>Actitis macularia</i> | Spotted Sandpiper |
| | | <i>Tringa solitaria</i> | Solitary Sandpiper |
| | | <i>T. melanoleuca</i> | Greater Yellowlegs |
| | | <i>T. flavipes</i> | Lesser Yellowlegs |
| | | <i>Calidris fuscicollis</i> | White-Rumped Sandpiper |
| | | <i>C. minutilla</i> | Least Sandpiper |
| | | <i>C. melanotos</i> | Pectoral Sandpiper |
| | | <i>C. alpina</i> | Dunlin |
| | | <i>C. mauri</i> | Western Sandpiper |
| | | <i>C. alba</i> | Sanderling |
| | Phalaropodidae | <i>Phalaropus lobatus</i> | Red-Necked Phalarope |
| | Larinae | <i>Larus delawarensis</i> | Ring-billed Gull |
| | | <i>L. atricilla</i> | Laughing Gull |
| | | <i>L. philadelphia</i> | Bonaparte's Gull |
| | | <i>L. argentatus</i> | Herring Gull |
| | Sterninae | <i>Sterna forsteri</i> | Forster's Tern |
| | | <i>S. antillarum</i> | Least Tern |
| | | <i>S. fuscata</i> | Sooty Tern |

Table 3-8. (cont)

| Order | Family | Scientific Name | Common Name |
|------------------|---------------|-----------------------------------|-------------------------------|
| Columbiformes | Columbidae | <i>S. caspia</i> | Caspian Tern |
| | | <i>S. hirundo</i> | Common Tern |
| | | <i>Chlidonias niger</i> | Black Tern |
| | | <i>Columba livia</i> | Rock Dove |
| | | <i>Zenaidura macroura</i> | Mourning Dove |
| | | <i>Z. asiatica</i> | White-Winged Dove |
| Cuculiformes | Cuculidae | <i>Columbina passerina</i> | Common Ground Dove |
| | | <i>Coccyzus americanus</i> | Yellow-Billed Cuckoo |
| | | <i>C. erythrophthalmus</i> | Black-Billed Cuckoo |
| Strigiformes | Tytonidae | <i>Tyto alba</i> | Barn Owl |
| | Strigidae | <i>Otus asio</i> | Screech Owl |
| | | <i>Bubo virginianus</i> | Great Horned Owl |
| | | <i>Strix varia</i> | Barred Owl |
| | | <i>Aegolius acadicus</i> | Northern Saw-Whet Owl |
| Caprimulgiformes | Caprimulgidae | <i>Asio flammeus</i> | Short-eared Owl |
| | | <i>Caprimulgus carolinensis</i> | Chuck-Wills-Widow |
| | | <i>C. vociferus</i> | Whip-Poor-Will |
| | | <i>Chordeiles minor</i> | Common Nighthawk |
| Apodiformes | Apodidae | <i>Chaetura pelagica</i> | Chimney Swift |
| | Trochilidae | <i>Archilochus colubris</i> | Ruby-Throated Hummingbird |
| Coraciiformes | Alcedinidae | <i>Ceryle alcyon</i> | Belted Kingfisher |
| Piciformes | Picidae | <i>Colaptes auratus</i> | Common Flicker |
| | | <i>Dryocopus pileatus</i> | Pileated Woodpecker |
| | | <i>Melanerpes carolinus</i> | Red-Bellied Woodpecker |
| | | <i>M. erythrocephalus</i> | Red-Headed Woodpecker |
| | | <i>Sphyrapicus varius</i> | Yellow-Bellied Sapsucker |
| | | <i>Picoides villosus</i> | Hairy Woodpecker |
| | | <i>P. pubescens</i> | Downy Woodpecker |
| | | <i>P. borealis</i> | Red-Cockaded Woodpecker |
| | | <i>Tyrannus tyrannus</i> | Eastern Kingbird |
| | | <i>T. dominicensis</i> | Gray Kingbird |
| | | <i>T. verticalis</i> | Western Kingbird |
| | | <i>Myiarchus crinitus</i> | Great Crested Flycatcher |
| | | <i>Sayornis phoebe</i> | Eastern Phoebe |
| Passeriformes | Tyrannidae | <i>Empidonax virens</i> | Acadian Flycatcher |
| | | <i>E. traillii</i> | Willow Flycatcher |
| | | <i>E. minimus</i> | Least Flycatcher |
| | | <i>Contopus virens</i> | Eastern Wood Pewee |
| | | <i>Eremophila alpestris</i> | Horned Lark |
| | | <i>Tachycineta bicolor</i> | Tree Swallow |
| | | <i>Riparia riparia</i> | Bank Swallow |
| | | <i>Stelgidopteryx serripennis</i> | Northern Rough-Winged Swallow |
| | | <i>Hirundo rustica</i> | Barn Swallow |
| | | <i>Progne subis</i> | Purple Martin |
| | | <i>Cyanocitta cristata</i> | Blue Jay |
| | | <i>Corvus brachyrhynchos</i> | Common Crow |
| | | <i>C. ossifragus</i> | Fish Crow |
| | Alaudidae | <i>Parus atricapillus</i> | Black-Capped Chickadee |
| | | <i>P. carolinensis</i> | Carolina Chickadee |
| | | <i>P. bicolor</i> | Tufted Titmouse |
| | | | |
| | Hirundinidae | | |
| | | | |
| | Corvidae | | |
| | | | |
| | | | |
| | Paridae | | |
| | | | |

Table 3-8. (cont)

| Order | Family | Scientific Name | Common Name |
|-------|---------------|---------------------------------|------------------------------|
| | Sittidae | <i>Sitta carolinensis</i> | White-Breasted Nuthatch |
| | | <i>S. canadensis</i> | Red-Breasted Nuthatch |
| | | <i>S. pusilla</i> | Brown-Headed Nuthatch |
| | Certhiidae | <i>Certhia americana</i> | Brown Creeper |
| | Troglodytidae | <i>Troglodytes aedon</i> | House Wren |
| | | <i>T. troglodytes</i> | Winter Wren |
| | | <i>Thryomanes bewickii</i> | Bewick's Wren |
| | | <i>Thryothorus ludovicianus</i> | Carolina Wren |
| | | <i>Cistothorus palustris</i> | Marsh Wren |
| | | <i>C. platensis</i> | Sedge Wren |
| | | <i>Mimus polyglottos</i> | Northern Mockingbird |
| | Mimidae | <i>Dumetella carolinensis</i> | Gray Catbird |
| | | <i>Toxostoma rufum</i> | Brown Thrasher |
| | Turdidae | <i>Turdus migratorius</i> | American Robin |
| | | <i>Hylocichla mustelina</i> | Wood Thrush |
| | | <i>Catharus guttatus</i> | Hermit Thrush |
| | | <i>C. ustulatus</i> | Swainson's Thrush |
| | | <i>C. minimus</i> | Gray-Cheeked Thrush |
| | | <i>C. fuscescens</i> | Veery |
| | | <i>Sialia sialis</i> | Eastern Bluebird |
| | Sylviidae | <i>Poliophtila caerulea</i> | Blue-Gray Gnatcatcher |
| | | <i>Regulus satrapa</i> | Golden-Crowned Kinglet |
| | | <i>R. calendula</i> | Ruby-Crowned Kinglet |
| | Motacillidae | <i>Anthus spinoletta</i> | Water Pipit |
| | | <i>A. spragueii</i> | Sprague's Pipit |
| | Bombycillidae | <i>Bombycilla cedrorum</i> | Cedar Waxwing |
| | Laniidae | <i>Lanius ludovicianus</i> | Loggerhead Shrike |
| | Sturnidae | <i>Sturnus vulgaris</i> | European Starling |
| | Vireonidae | <i>Vireo griseus</i> | White-Eyed Vireo |
| | | <i>V. flavifrons</i> | Yellow-Throated Vireo |
| | | <i>V. solitarius</i> | Solitary Vireo |
| | | <i>V. olivaceus</i> | Red-Eyed Vireo |
| | | <i>V. philadelphicus</i> | Philadelphia Vireo |
| | Parulidae | <i>Mniotilta varia</i> | Black-and-White Warbler |
| | | <i>Prothonotaria citrea</i> | Prothonotary Warbler |
| | | <i>Limnothylops swainsonii</i> | Swainson's Warbler |
| | | <i>Helmitheros vermivorous</i> | Worm-Eating Warbler |
| | | <i>Vermivora chrysoptera</i> | Golden-Winged Warbler |
| | | <i>V. pinus</i> | Blue-Winged Warbler |
| | | <i>V. peregrina</i> | Tennessee Warbler |
| | | <i>V. celata</i> | Orange-Crowned Warbler |
| | | <i>V. ruficapilla</i> | Nashville Warbler |
| | | <i>Parula americana</i> | Northern Parula |
| | | <i>Dendroica petechia</i> | Yellow Warbler |
| | | <i>D. magnolia</i> | Magnolia Warbler |
| | | <i>D. tigrina</i> | Cape May Warbler |
| | | <i>D. caerulescens</i> | Black-Throated Blue Warbler |
| | | <i>D. coronata</i> | Yellow-Rumped Warbler |
| | | <i>D. virens</i> | Black-Throated Green Warbler |

Table 3-8. (cont)

| Order | Family | Scientific Name | Common Name |
|-------|--------------|-----------------------------------|-----------------------------|
| | | <i>D. cerulea</i> | Cerulean Warbler |
| | | <i>D. fusca</i> | Blackburnian Warbler |
| | | <i>D. dominica</i> | Yellow-Throated Warbler |
| | | <i>D. pennsylvanica</i> | Chestnut-Sided Warbler |
| | | <i>D. castanea</i> | Bay-Breasted Warbler |
| | | <i>D. striata</i> | Blackpoll Warbler |
| | | <i>D. pinus</i> | Pine Warbler |
| | | <i>D. kirtlandii</i> | Kirtland's Warbler |
| | | <i>D. discolor</i> | Prairie Warbler |
| | | <i>D. palmarum</i> | Palm Warbler |
| | | <i>Seiurus aurocapillus</i> | Ovenbird |
| | | <i>S. noveboracensis</i> | Northern Waterthrush |
| | | <i>S. motacilla</i> | Louisiana Waterthrush |
| | | <i>Oporornis formosus</i> | Kentucky Warbler |
| | | <i>O. agilis</i> | Connecticut Warbler |
| | | <i>Geothlypis trichas</i> | Common Yellowthroat |
| | | <i>Icteria virens</i> | Yellow-Breasted Chat |
| | | <i>Wilsonia citrina</i> | Hooded Warbler |
| | | <i>Wi. pusilla</i> | Wilson's Warbler |
| | | <i>Wi. canadensis</i> | Canada Warbler |
| | | <i>Setophaga ruticilia</i> | American Redstart |
| | Ploceidae | <i>Passer domesticus</i> | House Sparrow |
| | Icteridae | <i>Dolichonyx oryzivorus</i> | Bobolink |
| | | <i>Sturnella magna</i> | Eastern Meadowlark |
| | | <i>S. neglecta</i> | Western Meadowlark |
| | | <i>Agelaius phoeniceus</i> | Red-winged Blackbird |
| | | <i>Icterus spurius</i> | Orchard Oriole |
| | | <i>I. galbula</i> | Baltimore (Northern) Oriole |
| | | <i>Euphagus carolinus</i> | Rusty Blackbird |
| | | <i>E. cyanocephalus</i> | Brewer's Blackbird |
| | | <i>Quiscalus quiscula</i> | Common Grackle |
| | | <i>Molothrus ater</i> | Brown-Headed Cowbird |
| | Thraupidae | <i>Piranga olivacea</i> | Scarlet Tanager |
| | | <i>P. rubra</i> | Summer Tanager |
| | Fringillidae | <i>Cardinalis cardinalis</i> | Northern Cardinal |
| | | <i>Pheucticus ludovicianus</i> | Rose-Breasted Grosbeak |
| | | <i>Coccothraustes vespertinus</i> | Evening Grosbeak |
| | | <i>Guiraca caerulea</i> | Blue Grosbeak |
| | | <i>Passerina cyanea</i> | Indigo Bunting |
| | | <i>P. ciris</i> | Painted Bunting |
| | | <i>Carpodacus purpureus</i> | Purple Finch |
| | | <i>C. mexicanus</i> | House Finch |
| | | <i>Carduelis pinus</i> | Pine Siskin |
| | | <i>C. tristis</i> | American Goldfinch |
| | | <i>Pipilo erythrophthalmus</i> | Rufous-sided Towhee |
| | | <i>Passerculus sandwichensis</i> | Savannah Sparrow |
| | | <i>Ammodramus savannarum</i> | Grasshopper Sparrow |
| | | <i>A. leconteii</i> | Le Conte's Sparrow |
| | | <i>A. henslowii</i> | Henslow's Sparrow |
| | | <i>Poocetes gramineus</i> | Vesper Sparrow |

Table 3-8. (cont)

| Order | Family | Scientific Name | Common Name |
|-------|--------|-------------------------------|------------------------|
| | | <i>Aimophila aestivalis</i> | Bachman's Sparrow |
| | | <i>Junco hyemalis</i> | Dark-Eyed Junco |
| | | <i>Spizella passerina</i> | Chipping Sparrow |
| | | <i>S. pusilla</i> | Field Sparrow |
| | | <i>Zonotrichia leucophrys</i> | White-Crowned Sparrow |
| | | <i>Z. albicollis</i> | White-Throated Sparrow |
| | | <i>Passerella iliaca</i> | Fox Sparrow |
| | | <i>Melospiza lincolnii</i> | Lincoln's Sparrow |
| | | <i>M. georgiana</i> | Swamp Sparrow |
| | | <i>M. melodia</i> | Song Sparrow |

Source: Mayer et al. 1997.

Waterfowl

Waterfowl use most of the suitable habitat available on SRS (Table 3-9). Mayer et al. (1986) present extensive information pertaining to waterfowl use of SRS. Large numbers of waterfowl have wintered at the site since public access was restricted in the early 1950s and particularly since the construction of Par Pond and L Lake. The Savannah River Ecology Laboratory (SREL) has been conducting waterfowl research and surveys onsite for the past 30 years. This research has included work on waterfowl use of SRS, wood duck reproductive ecology, radionuclide and heavy metal uptake and contamination, and waterfowl wintering ecology (Mayer et al. 1986).

Aerial surveys of the various impoundments and river swamp, and roost counts in the Steel Creek drainage have assessed waterfowl use of the SRS. The most abundant waterfowl species in the Savannah River swamp (determined by numbers counted) are consistently mallards and wood ducks. The four most abundant species of waterfowl at Par Pond and L Lake are lesser scaup, ring-necked ducks, buffleheads, and ruddy ducks.

Upland Game Birds

Several upland game bird species are found on SRS, including northern bobwhite, eastern wild turkey, woodcock, common snipe, and mourning dove. All except the common snipe are present on the SRS as permanent residents. The snipe is a common winter resident.

During the early 1960s there were many northern bobwhite on SRS. In the fall of 1961, the average covey size was 17 birds, and the density varied from 46 to 85 birds per 100 acres. Because of vegetation changes in site habitats (more pine forests and fewer old fields), Jenkins and Provost (1964) predicted that these numbers would decline. Although still common, there are fewer quail on site. The number of singing males has increased recently, based on surveys in the Crackerneck Wildlife Management Area in the northwest portion of the SRS Savannah River Swamp (SRFS 1992).

Table 3-9. Bird Species Found in Ten Habitat Types at SRS

| Species | Large and Small Open Water- Habitat ^a | Carolina Bays and Emergent Marsh ^a | Stream and Small Drainage Corridor ^a | Man Made Basins ^a | River Swamp | Large River Corri- dor | Pine Forest | Upland Hardwood Forest | Bottomland Hardwood Forest | Old Field, Cleared- Right-of-way, and Clearcut |
|---------------------------------|--|--|--|------------------------------------|----------------|---------------------------------|----------------|------------------------------|----------------------------------|---|
| Common Loon | X | | | | X | | | | | |
| Horned Grebe | X | X | | | | | | | | |
| Pied-Billed Grebe | X | X | | X | X | | | | | |
| Double-Crested Cormorant | X | | | X | | | | | | |
| Anhinga | X | X | X | | X | X | | | | |
| Great Blue Heron | X | X | X | X | X | | | | | |
| Green Heron | X | X | X | X | X | | | | | |
| Little Blue Heron | X | | X | | | | | | | |
| Cattle Egret | X | X | | | | | | | | |
| Great Egret | X | X | X | X | X | | | | | |
| Snowy Egret | X | | | | X | | | | | |
| Tricolor Heron | X | | | X | | | | | | |
| Black-Crowned Night Heron | X | | | | | | | | | |
| Yellow-Crowned Night Heron | X | X | | X | X | | | | | |
| Least Bittern | X | X | | | | | | | | |
| American Bittern | X | X | | | | | | | | |
| Wood Stork | X | X | X | | X | | | | X | |
| White Ibis | X | X | X | | X | | | | | |
| Tundra Swan | X | X | | | | | | | | |
| Canada Goose | X | X | | X | | | | | | |
| Greater White- Fronted Goose | X | | | | | | | | | |
| Snow/Blue Goose | | X | | X | | | | | | |
| Mallard | X | X | | X | X | X | | | | |
| American Black Duck | X | X | | | X | | | | | |
| Northern Pintail | X | X | | | X | | | | | |
| Green-Winged Teal | X | X | | X | X | | | | | |
| Blue-Winged Teal | X | X | | X | X | | | | | |
| American Widgeon | X | X | | | X | | | | | |
| Gadwall | X | X | | X | X | | | | | |
| Northern Shoveler | X | X | | | X | | | | | |
| Wood Duck | X | X | X | X | X | X | | | | |
| Redhead | X | X | | X | | | | | | |
| Ring-Necked Duck | X | X | | X | X | | | | | |
| Canvasback | X | | | | | | | | | |
| Greater Scaup | X | | | | | | | | | |
| Lesser Scaup | X | | | X | X | | | | | |
| Common Goldeneye | X | X | | | | | | | | |
| Bufflehead | X | X | | X | X | | | | | |
| Oldsquaw | X | | | | | | | | | |
| White-Winged Scooter | X | | | | | | | | | |
| Surf Scooter | X | | | | | | | | | |

Table 3-9. (cont)

| Species | Large and Small Open Water- Habitat ^a | Carolina Bays and Emergent Marsh ^a | Stream and Small Drainage Corridor ^a | Man Made Basins ^a | River Swamp | Large River Corridor | Pine Forest | Upland Hardwood Forest | Bottomland Hardwood Forest | Old Field, Cleared- Right-of-way, and Clearcut |
|---------------------------|--|--|--|------------------------------------|----------------|----------------------------|----------------|------------------------------|----------------------------------|---|
| Black Scooter | X | | | | | | | | | |
| Ruddy Duck | X | X | | X | X | | | | | |
| Hooded Merganser | X | X | | X | X | | | | | |
| Common Merganser | X | | | | | | | | | |
| Red-breasted Merganser | X | | | X | | | | | | |
| Turkey Vulture | X | X | X | X | X | X | X | X | X | X |
| Black Vulture | X | X | X | X | X | X | X | X | X | X |
| Swallow-Tailed Kite | | | | | X | X | | | | |
| Mississippi Kite | | X | | | X | X | | | | |
| Sharp-Shinned Hawk | | X | X | | X | | X | X | X | |
| Cooper's Hawk | | X | X | | X | | X | X | X | |
| Red-Tailed Hawk | X | X | X | X | X | X | X | X | X | X |
| Red-Shouldered Hawk | | | | | X | | X | X | X | |
| Broad-Winged Hawk | | X | X | | X | | X | X | X | |
| Golden Eagle | X | | | | | | | | | |
| Bald Eagle | X | X | | | X | X | | | | |
| Northern Harrier | | X | | | | | | | | X |
| Osprey | X | X | | | X | X | | | | |
| Peregrine Falcon | X | | | | | | | | | |
| Merlin | | | | | | | X | | | |
| American Kestrel | | X | | | | | X | X | | X |
| Northern Bobwhite | | X | | | | | X | | | X |
| Eastern Wild Turkey | | X | X | | X | | X | X | X | X |
| King Rail | | X | X | | | | | | | |
| Virginia Rail | | X | | | | | | | | |
| Sora | | X | | | | | | | | |
| Purple Gallinule | X | X | X | | | | | | | |
| Common Moorhen | X | X | X | | | | | | | |
| American Coot | X | X | X | X | X | | | | | |
| Black-Bellied Plover | X | | | | | | | | | |
| Killdeer | X | X | | | | | | | | X |
| American Oystercatcher | X | | | | | | | | | |
| American Woodcock | | | X | | X | | | | X | |
| Common Snipe | X | X | | | | | | | | X |
| Short-Billed Dowitcher | X | | | | | | | | | |
| Long-Billed Dowitcher | X | | | | | | | | | |

Table 3-9. (cont)

| Species | Large and Small Open Water-Habitat ^a | Carolina Bays and Emergent Marsh ^a | Stream and Small Drainage Corridor ^a | Man Made Basins ^a | River Swamp | Large River Corridor | Pine Forest | Upland Hardwood Forest | Bottomland Hardwood Forest | Old Field, Cleared-Right-of-way, and Clearcut |
|---------------------------|---|---|---|------------------------------|-------------|----------------------|-------------|------------------------|----------------------------|---|
| Spotted Sandpiper | X | X | | | | | | | | |
| Solitary Sandpiper | X | X | | | | | | | | |
| Greater Yellowlegs | X | X | | | | | | | | |
| Lesser Yellowlegs | X | X | | | | | | | | |
| White-Rumped Sandpiper | | X | | | | | | | | |
| Least Sandpiper | | X | | X | | | | | | |
| Dunlin | X | | | | | | | | | |
| Pectoral Sandpiper | X | | | | | | | | | |
| Western Sandpiper | X | | | | | | | | | |
| Sanderling | | X | | | | | | | | |
| Northern Phalarope | | X | | | | | | | | |
| Ring-billed Gull | X | | | | | X | | | | |
| Laughing Gull | X | | | | | | | | | |
| Bonaparte's Gull | X | | | | | | | | | |
| Herring Gull | X | | | | | | | | | |
| Forster's Tern | X | X | | | | | | | | |
| Least Tern | X | X | | | | | | | | |
| Sooty Tern | X | | | | | | | | | |
| Caspian Tern | X | X | | | | | | | | |
| Common Tern | | X | | | | | | | | |
| Black Tern | X | X | | | | | | | | |
| Rock Dove | | | | X | | | | | | X |
| Mourning Dove | X | X | X | X | | | X | X | | X |
| White-Winged Dove | | | | | | | | | | X |
| Common Ground Dove | X | X | X | | | | | | | |
| Yellow-Billed Cuckoo | | X | | | | | | X | X | |
| Black-Billed Cuckoo | | | | | | | | X | X | |
| Barn Owl | | | | | | | X | X | | X |
| Screech Owl | | X | X | | | | X | X | X | |
| Great Horned Owl | | X | X | | | | X | X | X | |
| Barred Owl | | X | X | | X | | X | X | X | |
| Northern Saw-Whet Owl | | | | | | | | | | |
| Short-eared Owl | | X | | | | | | | | X |
| Chuck-Wills-Widow | | X | | | | | X | X | X | |
| Whip-Poor-Will | | X | | | | | | | | |
| Common Nighthawk | | X | | | | | X | X | | |
| Chimney Swift | | X | | | | | X | X | X | |
| Ruby-Throated Hummingbird | | X | X | | | | X | X | X | |
| Belted Kingfisher | X | X | X | X | X | | | | | |
| Common Flicker | | X | X | | X | | X | X | X | |

Table 3-9. (cont)

| Species | Large and Small Open Water- Habitat ^a | Carolina Bays and Emergent Marsh ^a | Stream and Small Drainage Corridor ^a | Man Made Basins ^a | River Swamp | Large River Corri- dor | Pine Forest | Upland Hardwood Forest | Bottomland Hardwood Forest | Old Field, Cleared- Right-of-way, and Clearcut |
|-----------------------------------|--|--|--|------------------------------------|----------------|---------------------------------|----------------|------------------------------|----------------------------------|---|
| Pileated Woodpecker | | X | X | | X | | | | X | |
| Red-Bellied Woodpecker | | X | X | | X | | X | X | X | |
| Red-Headed Woodpecker | | X | X | | | | X | X | | X |
| Yellow-Bellied Sapsucker | | X | X | | X | | | X | X | |
| Hairy Woodpecker | | X | X | | X | | | | X | |
| Downy Woodpecker | | X | X | | X | | X | X | X | |
| Red-Cockaded Woodpecker | | | | | | | X | | | |
| Eastern Kingbird | | X | X | | | | | | | X |
| Gray Kingbird | | | | | | | X | | | |
| Western Kingbird | | | | | | | X | | | |
| Great Crested Flycatcher | | X | X | | | | X | X | X | |
| Eastern Phoebe | | X | X | | | | | | | X |
| Acadian Flycatcher | | | X | | | | | | X | |
| Traill's Flycatcher | | | | | | | | | | X |
| Least Flycatcher | | X | | | | | | | | X |
| Eastern Wood Pewee | | X | X | | | | X | X | | |
| Horned Lark | | | | | | | | | | X |
| Tree Swallow | | | | | | | | | | X |
| Bank Swallow | | | X | | | | | | | X |
| Northern Rough- Winged Swallow | | X | | | | | | | | X |
| Barn Swallow | | X | X | | | | | | | X |
| Purple Martin | | X | | | | | | | | X |
| Blue Jay | | X | X | | X | | X | X | X | X |
| Common Crow | X | X | X | | X | | X | X | X | X |
| Fish Crow | X | X | X | | X | | X | X | X | X |
| Black-Capped Chickadee | | X | | | | | X | X | | |
| Carolina Chickadee | | X | X | | | | X | X | X | |
| Tufted Titmouse | | X | X | | | | X | X | X | |
| White-Breasted Nuthatch | | | X | | X | | | | X | |
| Red-Breasted Nuthatch | | | | | | | X | | | |
| Brown-Headed Nuthatch | | | | | | | X | | | |
| Brown Creeper | | X | | | | | X | X | X | |
| House Wren | | X | X | | | | X | X | | X |
| Winter Wren | | | | | | | X | X | X | |
| Bewick's Wren | | | | | | | X | X | | |
| Carolina Wren | | X | X | | X | | X | X | X | |
| Marsh Wren | | X | X | | | | | | | |

Table 3-9. (cont)

| Species | Large and Small Open Water-Habitat ^a | Carolina Bays and Emergent Marsh ^a | Stream and Small Drainage Corridor ^a | Man Made Basins ^a | River Swamp | Large River Corridor | Pine Forest | Upland Hardwood Forest | Bottomland Hardwood Forest | Old Field, Cleared-Right-of-way, and Clearcut |
|-------------------------|---|---|---|------------------------------|-------------|----------------------|-------------|------------------------|----------------------------|---|
| Sedge Wren | | X | | | | | | | | |
| Northern Mockingbird | | X | X | | | | X | X | | X |
| Gray Catbird | | X | X | | | | X | X | X | X |
| Brown Thrasher | | X | X | | | | X | X | X | X |
| American Robin | | X | X | | | | X | X | X | X |
| Wood Thrush | | X | X | | X | | X | X | X | |
| Hermit Thrush | | X | X | | X | | X | X | X | |
| Swainson's Thrush | | X | | | X | | X | X | X | |
| Gray-Cheeked Thrush | | | | | | | X | X | | |
| Veery | | | | | X | | X | X | X | |
| Eastern Bluebird | | X | X | | | | X | X | X | X |
| Blue-Gray Gnatcatcher | | X | X | | X | | X | X | X | |
| Golden-Crowned Kinglet | | X | | | | | X | X | | |
| Ruby-Crowned Kinglet | | X | | | | | X | X | X | X |
| Water Pipit | | | X | | | | | | | X |
| Sprague's Pipit | | | | | | | | | | X |
| Cedar Waxwing | | X | | | | | X | X | X | X |
| Loggerhead Shrike | | X | | | | | | | | X |
| European Starling | | | | | | | | | | X |
| White-Eyed Vireo | | X | X | | X | | X | X | X | |
| Yellow-Throated Vireo | | X | X | | | | X | X | X | |
| Solitary Vireo | | X | | | X | | X | X | X | |
| Red-Eyed Vireo | | X | | | X | | X | X | X | |
| Philadelphia Vireo | | X | | | | | | | | |
| Black-and-White Warbler | | X | X | | | | X | X | X | |
| Prothonotary Warbler | | X | X | | X | | X | X | X | |
| Swainson's Warbler | | | X | | X | | X | X | X | |
| Worm-Eating Warbler | | | | | | | X | X | | |
| Golden-Winged Warbler | | | | | | | X | X | X | |
| Blue-Winged Warbler | | | | | X | | X | X | X | |
| Tennessee Warbler | | | | | | | X | X | X | |
| Orange-Crowned Warbler | | X | | | | | | | | X |
| Nashville Warbler | | X | | | | | X | X | X | |
| Northern Parula | | X | X | | X | | X | X | X | |
| Yellow Warbler | | X | X | | | | | | | X |
| Magnolia Warbler | | | | | | | X | X | X | |
| Cape May Warbler | | | | | | | X | X | X | |

Table 3-9. (cont)

| Species | Large and Small Open Water- Habitat ^a | Carolina Bays and Emergent Marsh ^a | Stream and Small Drainage Corridor ^a | Man Made Basins ^a | River Swamp | Large River Corri- dor | Pine Forest | Upland Hardwood Forest | Bottomland Hardwood Forest | Old Field, Cleared- Right-of-way, and Clearcut |
|----------------------------------|--|--|--|------------------------------------|----------------|---------------------------------|----------------|------------------------------|----------------------------------|---|
| Black-Throated Blue Warbler | | | | | | | X | X | X | |
| Yellow-Rumped Warbler | | X | X | | | | X | X | X | |
| Black-Throated Green Warbler | | | | | X | | X | X | X | |
| Cerulean Warbler | | | | | | | X | X | X | |
| Blackburnian Warbler | | | | | | | X | X | X | |
| Yellow-Throated Warbler | | X | X | | X | | X | X | X | |
| Chestnut-Sided Warbler | | | | | | | X | X | X | X |
| Bay-Breasted Warbler | | | | | X | | X | X | X | |
| Blackpoll Warbler | | | | | | | X | X | X | |
| Pine Warbler | | X | X | | | | X | X | X | |
| Kirtland's Warbler | | | | | | | | X | | |
| Prairie Warbler | | X | X | | | | X | X | | |
| Palm Warbler | | X | | | | | | | | X |
| Ovenbird | | | X | | | | X | X | X | |
| Northern Waterthrush | | X | X | | | | X | X | X | |
| Louisiana Waterthrush | | X | X | | | | X | X | X | |
| Kentucky Warbler | | X | X | | X | | X | X | X | |
| Connecticut Warbler | | X | X | | | | | | X | |
| Common Yellowthroat | | X | X | | | | | | X | |
| Yellow-Breasted Chat | | X | X | | | | | | X | |
| Hooded Warbler | | X | X | | X | | | | X | |
| Wilson's Warbler | | | X | | | | | | X | |
| Canada Warbler | | | | | | | X | X | X | |
| American Redstart | | X | X | | | | X | X | X | |
| House Sparrow | | | | | | | | | | X |
| Bobolink | | | | | | | | | | X |
| Eastern Meadowlark | | X | X | | | | | | | X |
| Western Meadowlark | | | | | | | | | | X |
| Red-winged Blackbird | X | X | | | X | | | | | X |
| Orchard Oriole | | X | X | | | | | | | X |
| Baltimore (North- ern) Oriole | | X | X | | | | X | X | | |
| Rusty Blackbird | | X | | | X | | | | X | |
| Brewer's Blackbird | | X | | | | | | | | X |

Table 3-9. (cont)

| Species | Large and Small Open Water-Habitat ^a | Carolina Bays and Emergent Marsh ^a | Stream and Small Drainage Corridor ^a | Man Made Basins ^a | River Swamp | Large River Corridor | Pine Forest | Upland Hardwood Forest | Bottomland Hardwood Forest | Old Field, Cleared-Right-of-way, and Clearcut |
|------------------------|---|---|---|------------------------------|-------------|----------------------|-------------|------------------------|----------------------------|---|
| Common Grackle | | X | X | | | | | | | X |
| Brown-Headed Cowbird | | X | X | | | | | | | X |
| Scarlet Tanager | | X | | | | | X | X | X | |
| Summer Tanager | | X | X | | | | X | X | X | |
| Northern Cardinal | | X | X | | | | X | X | X | |
| Rose-Breasted Grosbeak | | | | | | | X | X | X | |
| Evening Grosbeak | | | | | | | X | X | | |
| Blue Grosbeak | | X | X | | | | | | | X |
| Indigo Bunting | | X | X | | | | X | X | X | |
| Painted Bunting | | X | X | | X | | X | X | X | |
| Purple Finch | | X | | | | | X | X | X | |
| House Finch | | | | | | | | | | X |
| Pine Siskin | | X | | | | | X | X | X | |
| American Goldfinch | | X | | | | | X | X | X | X |
| Rufous-sided Towhee | | X | X | | | | X | X | X | X |
| Savannah Sparrow | | X | | | | | | | | X |
| Grasshopper Sparrow | | | | | | | | | | X |
| Le Conte's Sparrow | | X | X | | | | | | | X |
| Henslow's Sparrow | | | | | | | | | | X |
| Vesper Sparrow | | | | | | | | | | X |
| Bachman's Sparrow | | X | X | | | | X | X | X | |
| Dark-Eyed Junco | | X | | | | | X | X | X | X |
| Chipping Sparrow | | X | X | | | | X | X | X | |
| Field Sparrow | | X | X | | | | | | | X |
| White-Crowned Sparrow | | X | | | | | | | | X |
| White-Throated Sparrow | | X | X | | | | X | X | X | |
| Fox Sparrow | | X | | | | | | | | X |
| Lincoln's Sparrow | | X | | | | | | | | X |
| Swamp Sparrow | | X | | | | | | | | |
| Song Sparrow | | X | | | | | | | | X |

Source: Mayer et al. 1997.

^aIncludes shore or edge areas.

In the winter of 1956-1957, mourning doves were estimated present in old field habitats at 7 birds per 100 acres. The local number of mourning doves increases during the fall and winter months because of the influx of migrants from the north (Jenkins and Provost 1964).

The eastern wild turkey was present in only very limited numbers in the early 1950s. In the late 1950s and early 1960s, the future survival of the wild turkey on the site was considered precarious (Jenkins and Provost 1964). In 1972, the South Carolina Department of Natural Resources initiated a program to propagate wild turkeys on SRS. Between 1973 and 1974, 48 birds from the Francis Marion National Forest were released on site. Eight hens and four gobblers were released at each of four locations. Food plots were established to supplement natural forage and facilitate trapping. Between 1977 and 1997, a total of 759 wild turkeys have been trapped on SRS (Table 3-10) and 728 have been used to stock areas in South Carolina, North Carolina, and Texas. The wild turkey is now common on the SRS.

Introduced Species

Five non-native or exotic species of birds are found on the SRS: cattle egret, rock dove (common pigeon), house finch, European starling, and house sparrow. With the exception of the cattle egret, all of these species were introduced into eastern North America by man. The cattle egret established itself in the Americas without direct human intervention. The house finch is a western North American species that was introduced into the northeastern United States in about 1940. It was documented to have reached South Carolina in 1966 (Sprunt and Chamberlain 1970). In general, all of these introduced species are considered to be rare over the site as a whole (Arnett et al. 1993). However, within the developed or industrialized areas on the SRS, most of these species are considered to be either common or abundant in occurrence (Mayer and Wike 1997).

Threatened and Endangered Avian Species

Federally protected birds documented as being found on the SRS include the red-cockaded woodpecker, bald eagle, peregrine falcon, Kirtland's warbler, and wood stork. State-protected avian species include the Federally listed species and golden eagle, American osprey, Cooper's hawk, swallow-tailed kite, loggerhead shrike, and Savannah sparrow. Chapter 4 — Threatened and Endangered Species, has more information on the red-cockaded woodpecker, bald eagle, and wood stork.

Mammals

Introduction

Habitats on SRS support most of the mammal species found in South Carolina. The site listing of mammals at the time of this revision includes 1 opossum, 3 shrews, 2 moles, 11 bats, 1 armadillo, 3 rabbits, 17 rodents, 14 carnivores, and 2 even-toed ungulates (Table 3-11). Cothran et al. (1991) provides a history of the study of mammals at the SRS, keys to the species, detailed species accounts, and an annotated bibliography on SRS mammals.

Table 3-10. Numbers of Eastern Wild Turkeys Trapped on and Removed from SRS by SCDNR, 1977-1997

| Year | Turkeys Trapped | | | Turkeys Removed | | |
|-------------------|-----------------|--------|-------|-----------------|--------|-------|
| | Male | Female | Total | Male | Female | Total |
| 1977 | 12 | 8 | 20 | 12 | 4 | 16 |
| 1978 | 12 | 0 | 12 | 12 | 0 | 12 |
| 1979 | 10 | 6 | 16 | 6 | 6 | 12 |
| 1980 | 7 | 4 | 11 | 7 | 4 | 11 |
| 1981 | 6 | 0 | 6 | 6 | 0 | 6 |
| 1982 | 0 | 1 | 1 | 0 | 0 | 0 |
| 1983 | 44 | 19 | 63 | 44 | 19 | 63 |
| 1984 | 27 | 38 | 65 | 26 | 38 | 64 |
| 1985 | 12 | 13 | 25 | 11 | 11 | 22 |
| 1986 | 4 | 8 | 12 | 4 | 8 | 12 |
| 1987 ^a | - | - | - | - | - | - |
| 1988 ^a | - | - | - | - | - | - |
| 1989 | 9 | 22 | 31 | 9 | 21 | 30 |
| 1990 | 8 | 0 | 8 | 8 | 0 | 8 |
| 1991 | 32 | 25 | 57 | 32 | 9 | 41 |
| 1992 | 38 | 66 | 104 | 38 | 66 | 104 |
| 1993 | 11 | 28 | 39 | 11 | 28 | 39 |
| 1994 | 43 | 39 | 82 | 43 | 39 | 82 |
| 1995 | 19 | 12 | 31 | 19 | 12 | 31 |
| 1996 | 17 | 50 | 67 | 17 | 50 | 67 |
| 1997 | 17 | 92 | 109 | 16 | 92 | 108 |
| Total | 328 | 431 | 759 | 321 | 407 | 728 |

Source: Caudell 1997.

^a Trapping not conducted during this year.

Table 3-11. Taxonomic Listing of Mammals of the SRS

| Order | Family | Scientific Name | Common Name |
|-------------|------------------|----------------------------------|--------------------------|
| Marsupialia | Didelphidae | <i>Didelphis virginiana</i> | Virginia Opossum |
| Insectivora | Soricidae | <i>Blarina carolinensis</i> | Short-Tailed Shrew |
| | | <i>Cryptotis parva</i> | Least Shrew |
| | | <i>Sorex longirostris</i> | Southeastern Shrew |
| | Talpidae | <i>Scalopus aquaticus</i> | Eastern Mole |
| | | <i>Condylura cristata</i> | Star-Nosed Mole |
| Chiroptera | Vespertilionidae | <i>Epitesicus fuscus</i> | Big Brown Bat |
| | | <i>Lasionycteris noctivigans</i> | Silver-Haired Bat |
| | | <i>Lasiurus borealis</i> | Red Bat |
| | | <i>L. cinereus</i> | Hoary Bat |
| | | <i>L. intermedius</i> | Northern Yellow Bat |
| | | <i>L. seminolus</i> | Seminole Bat |
| | | <i>Myotis austroriparius</i> | Southeastern Bat |
| | | <i>M. lucifugus</i> | Little Brown Bat |
| | | <i>Nycticeius humeralis</i> | Evening Bat |
| | | <i>Pipistrellus subflavus</i> | Eastern Pipistrelle |
| | | <i>Plecotus rafinesquii</i> | Big-Eared Bat |
| Xenarthra | Dasypodidae | <i>Dasypus novemcinctus</i> | Nine-Banded Armadillo |
| Lagomorpha | Leporidae | <i>Sylvilagus floridanus</i> | Eastern Cottontail |
| | | <i>S. aquaticus</i> | Swamp Rabbit |
| | | <i>S. palustris</i> | Marsh Rabbit |
| Rodentia | Sciuridae | <i>Sciurus carolinensis</i> | Gray Squirrel |
| | | <i>S. niger</i> | Fox Squirrel |
| | | <i>Glaucomys volans</i> | Southern Flying Squirrel |
| | Castoridae | <i>Castor canadensis</i> | Beaver |
| | Cricetidae | <i>Oryzomys palustris</i> | Marsh Rice Rat |
| | | <i>Rethrodontomys humulis</i> | Eastern Harvest Mouse |
| | | <i>Peromyscus polionotus</i> | Old Field Mouse |
| | | <i>P. leucopus</i> | White-Footed Mouse |
| | | <i>P. gossypinus</i> | Cotton Mouse |
| | | <i>Ochrotomys nuttallii</i> | Golden Mouse |
| | | <i>Sigmodon hispidus</i> | Hispid Cotton Rat |
| | | <i>Neotoma floridana</i> | Eastern Wood Rat |
| | | <i>Microtus pinetorum</i> | Pine Vole |
| | | <i>Ondatra zibethicus</i> | Muskrat |
| | Muridae | <i>Rattus norvegicus</i> | Norway or Brown Rat |
| | | <i>R. rattus</i> | Roof or Black Rat |
| | | <i>Mus musculus</i> | House Mouse |
| Carnivora | Canidae | <i>Canis latrans</i> | Coyote |
| | | <i>C. familiaris</i> | Feral Dog |
| | | <i>Urocyon cinereoargenteus</i> | Gray Fox |
| | | <i>Vulpes vulpes</i> | Red Fox |
| | Felidae | <i>Felis catus</i> | Feral Cat |
| | | <i>F. concolor</i> | Mountain Lion |
| | | <i>F. rufus</i> | Bobcat |
| | Mustelidae | <i>Lutra canadensis</i> | River Otter |
| | | <i>Mephitis mephitis</i> | Striped Skunk |
| | | <i>Spilogale putorius</i> | Spotted Skunk |
| | | <i>Mustela vison</i> | Mink |

Table 3-11. (cont)

| Order | Family | Scientific Name | Common Name |
|--------------|-------------|-------------------------------|--------------------|
| Artiodactyla | | <i>M. frenata</i> | Long-Tailed Weasel |
| | Procyonidae | <i>Procyon lotor</i> | Raccoon |
| | Ursidae | <i>Ursus americanus</i> | Black Bear |
| | Suidae | <i>Sus scrofa</i> | Wild Pig |
| | Cervidae | <i>Odocoileus virginianus</i> | White-Tailed Deer |

Source: Cothran et al. 1991.

Taxonomic Listing of Mammals Found on the SRS

Golley (1966) and Webster et al. (1985) collectively list 61 terrestrial or semiaquatic mammals in South Carolina. Eighty-nine percent of these are either documented or suspected on SRS. Mammals that do not occur on SRS are those restricted to the mountainous habitats in the western part of the state. The class Mammalia is represented on the SRS by 8 orders, 17 families, 40 genera, and 54 species.

Several SRS mammal listings are based on either anecdotal accounts or their potential occurrence based on range and habitat preference. These include the big brown bat, hoary bat, southeastern bat, little brown bat, swamp rabbit, and mountain lion (Cothran et al. 1991). At present, the status of these mammals on the SRS remains unconfirmed. In addition, there are several species of mammals that have been documented to occur on site, but which are either rare or transitory: the northern yellow bat, big-eared bat, marsh rabbit, long-tailed weasel, and black bear.

Habitat Utilization

Most of the mammals found on SRS utilize terrestrial habitats (Table 3-12). Only 15% of the site mammal species are semiaquatic. No truly aquatic mammals (Orders Cetacea, Pinnipedia, and Sirenia) occur on SRS.

Among the terrestrial-adapted species, the more mobile ones can be found in any of the major habitats (Table 3-12). The Virginia opossum, eastern cottontail, cotton mouse, golden mouse, and white-tailed deer are habitat generalists. The southeastern shrew, silver-haired bat, northern yellow bat, seminoe bat, evening bat, eastern pipistrelle, big-eared bat, fox squirrel, southern flying squirrel, hispid cotton rat, pine vole, eastern harvest mouse, eastern wood rat, red fox, long-tailed weasel, and black bear use more restricted habitats. Terrestrial SRS mammals use upland and lowland hardwoods most often, followed by old fields and clearcuts, pine plantations, and finally by scrub oak and longleaf pine habitats (Table 3-12).

The semiaquatic mammals of the SRS include the star-nosed mole, beaver, muskrat, rice rat, river otter, mink, and raccoon. The raccoon uses the broadest habitats. Beaver, muskrat, and river otter have the most restricted habitat requirements. The aquatic habitats used by these species include Carolina bays, emergent marshes, the river swamp, the edges of open water impoundments, and stream floodplains.

Table 3-12. Mammal Species Found in the Five Major Habitats at SRS

| Common Name | Old Fields and Clearcuts | Pine Plantations | Scrub Oak Longleaf Pine | Upland and Lowland Hardwoods | Aquatic and Semiaquatic |
|--------------------------|-----------------------------|------------------|----------------------------|------------------------------------|----------------------------|
| Virginia Opossum | X | X | X | X | |
| Short-Tailed Shrew | X | X | X | | |
| Least Shrew | X | X | | X | |
| Southeastern Shrew | X | X | | | |
| Eastern Mole | X | | X | X | |
| Star-Nosed Mole | X | | | | X |
| Silver-Haired Bat | | | | X | |
| Red Bat | X | X | | X | |
| Northern Yellow Bat | | | | X | |
| Seminole Bat | | X | | X | |
| Evening Bat | | X | | X | |
| Eastern Pipistrelle | | X | | X | |
| Big-Eared Bat | | | | X | |
| Eastern Cottontail | X | X | X | X | |
| Marsh Rabbit | | | | X | X |
| Gray Squirrel | | X | X | X | |
| Fox Squirrel | | X | X | | |
| Southern Flying Squirrel | | X | | X | |
| Beaver | | | | | X |
| Marsh Rice Rat | X | | | X | X |
| Eastern Harvest Mouse | X | X | | | |
| Old Field Mouse | X | X | X | | |
| Cotton Mouse | X | X | | X | |
| Golden Mouse | X | X | X | X | |
| Hispid Cotton Rat | X | | | | |
| Eastern Wood Rat | X | | | X | |
| Pine Vole | X | | | X | |
| Muskrat | | | | | X |
| Gray Fox | X | | X | X | |
| Red Fox | X | | | | |
| Bobcat | X | | X | X | |
| River Otter | | | | | X |
| Striped Skunk | X | X | | X | |
| Spotted Skunk | X | X | | X | |
| Mink | | | | X | X |
| Long-Tailed Weasel | X | | | X | |
| Raccoon | X | X | X | X | X |
| Black Bear | | | | X | |
| Wild Pig | X | X | | X | |
| White-Tailed Deer | X | X | X | X | |

Source: Cothran et al. 1991.

Game Species and Furbearers

Several SRS mammals are commercially important game species or furbearers, including the Virginia opossum, eastern cottontail, marsh rabbit, gray squirrel, fox squirrel, beaver, muskrat, coyote, red fox, gray fox, bobcat, river otter, mink, long-tailed weasel, striped skunk, spotted skunk, raccoon, black bear, white-tailed deer, and wild pig. Aside from the public hunts for white-tailed deer and wild pigs, and the beaver and wild pig control programs, none of the aforementioned species populations is exploited on the SRS.

Organized hunts for white-tailed deer and wild pigs are the only recreational hunting allowed on the SRS. These hunts are necessary to control the site's deer and wild pig populations, reduce animal-vehicle collisions, and reduce depredations to newly planted forest regeneration stands and research areas by the wild pigs.

The SRS deer herd, estimated to be 25 animals in 1951, increased rapidly after the site was closed to the public. The herd now is estimated to be in the thousands (Table 3-13). By the early 1960s, deer-vehicle collisions were frequent. This and the potential for habitat degradation prompted the initiation of controlled public hunts in 1965 (Langley and Marter 1973). The public hunts were managed by the Savannah River Forest Station (SRFS) from 1965 to 1980, E. I. du Pont de Nemours from 1981 to 1988, and Westinghouse Savannah River Company after 1989. From 1965 to 1996, 35,690 white-tailed deer were killed during the public hunts (Table 3-13); the average annual kill was 1115 animals.

The SRS wild pig population originated from free-ranging domestic swine that were abandoned after the resident farmers relocated in 1952. These animals reproduced and expanded their distribution throughout the southwestern portion of SRS, along the Savannah River. In the mid-1970s, a second, smaller population of wild pigs was discovered along the Upper Three Runs drainage corridor in the northern part of the site. Based on morphological criteria, this second population was determined not to be derived from the original feral population along the Savannah River. This second population subsequently expanded throughout the northern half of SRS and merged with the original population in the late 1980s. Wild pigs currently inhabit approximately 70% of the site (Mayer and Brisbin 1991). From 1965 to 1996, 2489 wild pigs were killed during the public hunts (Table 3-14); the average annual kill was 78 swine.

In 1985, SRFS began to control the numbers of these animals because of increases in both the size of the pig population and the damage they were wreaking on planted pine seedlings. Between 1985 and 1996, corral traps baited with corn were used. In 1992, trained dogs also were used to catch wild pigs for removal. Between 1985 and 1996, 4795 wild pigs were removed from SRS, with an average of 400 taken annually.

As a result of increases in damage to forests and nuisance reports, SRFS began a beaver control program in 1983. Trapping is conducted in specific locations where problems have been identified. Since the implementation of this program, 2414 beavers have been removed from the site (Table 3-15).

A census of small furbearers was initiated on the site in 1954 and continued annually through 1982. The trapping format was changed during the study, but the basic sampling format remained the same. A series of ten 10-trap lines was established and run along secondary roads on the Coastal Terrace (5 trap lines) and Aiken Plateau (5 trap lines). The

Table 3-13. Annual SRS White-tailed Deer Population Estimate and Harvest Data

| Year | Estimated Population | Deer/Vehicle Accidents | Animals Harvested | | Total Annual Harvest | Mean Age of Deer (in years) |
|--------|-------------------------|---------------------------|--------------------|-------------------|-------------------------|--------------------------------|
| | | | Number of Bucks | Number of Does | | |
| 1965 | 2591 | 19 | 80 | 118 | 198 | 2.00 |
| 1966 | 3074 | 16 | 244 | 297 | 541 | 1.85 |
| 1967 | 3081 | 30 | 481 | 551 | 1032 | 1.70 |
| 1968 | 2903 | 51 | 332 | 366 | 699 ^a | 1.63 |
| 1969 | 4070 | 63 | 443 | 445 | 888 | 1.54 |
| 1970 | 4248 | 58 | 417 | 447 | 864 | 1.67 |
| 1971 | 4475 | 48 | 418 | 446 | 864 | 1.68 |
| 1972 | 4677 | 50 | 403 | 405 | 808 | 1.70 |
| 1973 | 5250 | 62 | 511 | 570 | 1081 | 1.64 |
| 1974 | 5302 | 44 | 728 | 823 | 1551 | 1.80 |
| 1975 | 4701 | 48 | 519 | 519 | 1038 | 1.75 |
| 1976 | 4657 | 23 | 665 | 592 | 1257 | 1.81 |
| 1977 | 4089 | 35 | 620 | 651 | 1271 | 1.83 |
| 1978 | 3846 | 34 | 625 | 659 | 1284 | 1.75 |
| 1979 | 4163 | 25 | 550 | 528 | 1078 | 1.70 |
| 1980 | 4793 | 28 | 481 | 480 | 961 | 1.65 |
| 1981 | 5368 | 58 | 832 | 959 | 1791 | 1.64 |
| 1982 | 5157 | 49 | 987 | 1076 | 2063 | 1.68 |
| 1983 | 4247 | 41 | 732 | 865 | 1597 | 1.69 |
| 1984 | 3661 | 41 | 499 | 541 | 1040 | 1.75 |
| 1985 | 3770 | 38 | 487 | 532 | 1019 | 1.64 |
| 1986 | 3553 | 34 | 474 | 464 | 938 | 1.65 |
| 1987 | 3492 | 38 | 308 | 294 | 602 | 1.70 |
| 1988 | 3962 | 51 | 453 | 398 | 851 | 1.71 |
| 1989 | 4364 | 64 | 405 | 307 | 712 | 1.80 |
| 1990 | 4885 | 63 | 549 | 514 | 1063 | 1.89 |
| 1991 | 5375 | 104 | 576 | 516 | 1092 | 1.91 |
| 1992 | 5909 | 121 | 790 | 729 | 1519 | 1.70 |
| 1993 | 5364 | 111 | 739 | 813 | 1552 | -b |
| 1994 | 4848 | 128 | 826 | 765 | 1591 | -b |
| 1995 | 4381 | 99 | 564 | 591 | 1155 | -b |
| 1996 | -b | 66 | 815 | 875 | 1690 | -b |
| Totals | | 1740 | 17,553 | 18,136 | 35,690 | |

Sources: Cothran et al. 1991; Novak 1997; WSRC 1997.

^aSex of one deer was not determined.

^bData not available at time of publication.

Table 3-14. SRS Wild Pig Annual Harvest Data

| Year | Public Hunt Harvest | SRFS Subcontract Trapper Harvest | Total Combined Annual Harvest |
|-----------|------------------------|-------------------------------------|----------------------------------|
| 1965-1969 | 36 | - | 36 |
| 1970 | 34 | - | 34 |
| 1971 | 10 | - | 10 |
| 1972 | 17 | - | 17 |
| 1973 | 12 | - | 12 |
| 1974 | 38 | - | 38 |
| 1975 | 45 | - | 45 |
| 1976 | 176 | - | 176 |
| 1977 | 57 | - | 57 |
| 1978 | 28 | - | 28 |
| 1979 | 61 | - | 61 |
| 1980 | 32 | - | 32 |
| 1981 | 33 | - | 33 |
| 1982 | 189 | - | 189 |
| 1983 | 133 | - | 133 |
| 1984 | 104 | - | 104 |
| 1985 | 79 | 160 | 239 |
| 1986 | 123 | 238 | 361 |
| 1987 | 123 | 170 | 293 |
| 1988 | 146 | 326 | 472 |
| 1989 | 179 | 177 | 356 |
| 1990 | 134 | 302 | 436 |
| 1991 | 126 | 183 | 309 |
| 1992 | 168 | 503 | 671 |
| 1993 | 148 | 326 | 474 |
| 1994 | 105 | 627 | 732 |
| 1995 | 46 | 907 | 953 |
| 1996 | 107 | 876 | 983 |
| Total | 2489 | 4795 | 7284 |

Source: SRFS 1997.

Table 3-15. Number of Beaver Trapped Annually on SRS

| Year | Number of Beavers Trapped Per Year |
|-------|------------------------------------|
| 1983 | 196 |
| 1984 | 44 |
| 1985 | 192 |
| 1986 | 148 |
| 1987 | 84 |
| 1988 | - a |
| 1989 | - a |
| 1990 | - a |
| 1991 | - a |
| 1992 | 153 |
| 1993 | 262 |
| 1994 | 327 |
| 1995 | 489 |
| 1996 | 519 |
| Total | 2414 |

Source: SRFS 1997.

^a Trapping not conducted during year.

trapping was conducted for 7 consecutive rain-free nights for a total of 700 trap nights per census. The furbearers most commonly taken were gray fox, raccoons, opossums, and bobcats. Other species captured during this study were striped skunks, red foxes, eastern cottontails, gray squirrels, feral dogs, and feral cats. The number of animals caught each year during the 29-year census fluctuated widely (Table 3-16). The gray fox, common during the first 11 years of trapping, declined during the subsequent sampling periods. The red fox, although never common, has virtually disappeared (Cothran et al. 1991).

Nine-Banded Armadillo

One recent addition to the mammals found on SRS is the nine-banded armadillo (*Dasypus novemcinctus*). This species originated in the Neotropics and has been extending its distribution northward into the United States since the mid 1800s (Mayer 1989; McBee and Baker 1982; Cothran et al. 1991). It was introduced into Florida between 1915 and 1922, and was reported from South Carolina by the mid 1980s. The nine-banded armadillo was first found on SRS in 1985 (Mayer 1989). Between 1985 and the early 1990s, all of this species' sightings were in the vicinity of Upper Three Runs. Since then, the armadillo has expanded its local range to include most of the SRS. Little is known about the armadillo population on SRS. Scientists are concerned that, as the population increases, fossorial armadillos may disturb and possibly breach waste unit closure caps, causing increased rainwater infiltration. A general summary of the nine-banded armadillo's biology is provided by McBee and Baker (1982).

Table 3-16. Number of Furbearers Captured During the Annual Furbearers Census

| Year | Total Number | Gray Fox | Bobcat | Raccoon | Virginia Opossum | Striped Skunk | Red Fox |
|-------|--------------|----------|--------|---------|------------------|---------------|---------|
| 1954 | 123 | 73 | 14 | 20 | 4 | 2 | 10 |
| 1955 | 48 | 24 | 5 | 13 | 1 | 5 | 0 |
| 1956 | 71 | 35 | 12 | 15 | 2 | 0 | 7 |
| 1957 | 47 | 32 | 2 | 7 | 1 | 2 | 3 |
| 1958 | 36 | 20 | 2 | 9 | 3 | 1 | 1 |
| 1959 | 38 | 21 | 3 | 10 | 12 | 1 | 1 |
| 1960 | 56 | 22 | 8 | 16 | 3 | 3 | 4 |
| 1961 | 45 | 19 | 7 | 12 | 0 | 0 | 7 |
| 1962 | 58 | 35 | 6 | 9 | 3 | 2 | 3 |
| 1963 | 35 | 26 | 3 | 4 | 0 | 1 | 1 |
| 1964 | 56 | 36 | 2 | 14 | 2 | 2 | 0 |
| 1965 | 70 | 41 | 3 | 18 | 6 | 0 | 2 |
| 1966 | 46 | 8 | 10 | 19 | 8 | 0 | 1 |
| 1967 | 39 | 18 | 10 | 5 | 6 | 0 | 0 |
| 1968 | 72 | 22 | 5 | 28 | 15 | 2 | 0 |
| 1969 | 49 | 18 | 7 | 10 | 4 | 9 | 1 |
| 1970 | 47 | 24 | 5 | 7 | 7 | 4 | 0 |
| 1971 | 18 | 6 | 2 | 1 | 8 | 1 | 0 |
| 1972 | 48 | 1 | 1 | 10 | 28 | 8 | 0 |
| 1973 | 29 | 5 | 3 | 6 | 15 | 0 | 0 |
| 1974 | 42 | 8 | 2 | 10 | 19 | 3 | 0 |
| 1975 | 40 | 16 | 0 | 8 | 16 | 0 | 0 |
| 1976 | 33 | 15 | 3 | 3 | 10 | 1 | 0 |
| 1977 | 47 | 5 | 0 | 11 | 30 | 1 | 1 |
| 1978 | 42 | 9 | 2 | 9 | 22 | 0 | 0 |
| 1979 | 77 | 18 | 4 | 12 | 41 | 2 | 0 |
| 1980 | 138 | 45 | 5 | 38 | 47 | 3 | 0 |
| 1981 | 50 | 9 | 8 | 8 | 25 | 0 | 0 |
| 1982 | 65 | 2 | 1 | 5 | 56 | 1 | 0 |
| Total | 1,565 | 613 | 135 | 337 | 383 | 55 | 42 |

Source: Cothran et al. 1991.

Introduced Species

Six SRS mammals are either non-native or exotic species: the Norway rat, black rat, house mouse, feral dog, feral cat, and wild pig. All of these species were either intentionally introduced or unintentionally released onto the site. Most of these introductions occurred prior to 1951. In some instances, domestic dogs and cats have been abandoned since the acquisition of the site. Of these introduced mammals, only the wild pig is considered to be abundant enough to be considered a nuisance.

Threatened and Endangered Mammal Species

Among the mammals found on the SRS either historically or currently eight species are listed as threatened or endangered on the Federal and/or state level. Chapter 4 — Threatened and Endangered Species, has more information on these species.

Urban Wildlife on SRS

Introduction

The presence of wildlife species in developed areas on the SRS is common. A total of 144 species have been documented that use developed areas of SRS to some degree (Table 3-17). This total includes 15 amphibians (35% of the total amphibian species on SRS), 22 reptiles, (38%), 87 birds (41%), and 20 mammals (37%) (Mayer and Wike 1997). Most (53%) of these species are uncommon in developed areas. Some (29%) are common. A smaller number (14%) are rare. Only a few (4%) are abundant.

Overall, the percent taxonomic composition of the urban species is similar to that of the overall taxonomic composition for SRS wildlife. This is true for the total percent species composition and for the order of species abundance (i.e., birds are most common and amphibians are least common).

Given the right circumstances, the potential exists for any SRS wildlife species to be in one of the site's developed areas. Depending on the species, some occurrences may not be very likely. With the exception of a few species (house sparrow, house finch, rock dove, house mouse, Norway rat, and feral cat), observations indicated that densities of most wildlife species are higher in undeveloped areas than in developed areas.

Approximately 2% of the birds and 5% of the mammals on the SRS are non-native or exotic species that are established in the local area. No non-native species of amphibians or reptiles is established on SRS. Such foreign species often are commensals with man's developed habitats, surviving and thriving better in urban subhabitats than in rural or undeveloped areas. The frequency of occurrence of exotic birds and mammals is more than double in developed areas than for the site as a whole (Mayer and Wike 1997).

Table 3-17. Species Listing of SRS Urban Wildlife

| Common Name | Scientific Name | Abundance in Developed Areas ^a | Area of Observation |
|-----------------------------|-----------------------------------|---|--|
| Class Amphibia | | | |
| Mole salamander | <i>Ambystoma talpoideum</i> | Uncommon | S, Z |
| Marbled salamander | <i>A. opacum</i> | Uncommon | Z |
| Eastern (red-spotted) newt | <i>Notophthalmus viridescens</i> | Uncommon | A, Z |
| Eastern spadefoot toad | <i>Scaphiopus holbrooki</i> | Uncommon | Z |
| Southern toad | <i>Bufo terrestris</i> | Common | A, B, F, H, N, S, Z |
| Cope's gray treefrog | <i>Hyla chrysoscelis</i> | Common | A, Z |
| Green treefrog | <i>H. cinerea</i> | Common | A, D |
| Barking treefrog | <i>H. gratiosa</i> | Common | A, Z |
| Squirrel treefrog | <i>H. squirrelia</i> | Uncommon | A |
| Spring peeper | <i>Pseudacris crucifer</i> | Uncommon | A |
| Eastern narrow-mouthed toad | <i>Gastrophryne carolinensis</i> | Uncommon | A, Z |
| Bullfrog | <i>Rana catesbeiana</i> | Common | B, D, N, R, Z |
| Bronze (green) frog | <i>R. clamitans</i> | Common | Z |
| Southern leopard frog | <i>R. utricularia</i> | Common | B, H, N, S, Z |
| Class Reptilia | | | |
| American alligator | <i>Alligator mississippiensis</i> | Uncommon | A, D, F, H, L, M, P, T |
| Common snapping turtle | <i>Chelydra serpentina</i> | Uncommon | A, B, C, D, F, H, K, L, M, N, P, R, S, T, Z |
| Eastern box turtle | <i>Terrepenne carolina</i> | Uncommon | A |
| Yellow-bellied turtle | <i>Trachemys scripta</i> | Common | A |
| Green anole | <i>Anolis carolinensis</i> | Common | A, B |
| Eastern fence lizard | <i>Sceloporus undulatus</i> | Common | A |
| Eastern hognosed snake | <i>Heterodon platyrhinos</i> | Uncommon | A, B, C, D, F, H, K, L, M, N, P, R, S, T, Z |
| Banded water snake | <i>Nerodia erythrogaster</i> | Common | A, B, C, D, F, H, K, L, M, N, P, R, S, T, Z |
| Scarlet snake | <i>Cemophora coccinea</i> | Uncommon | C, F, H, K, L, P |
| Scarlet kingsnake | <i>Lampropeltis triangulum</i> | Uncommon | A, C, F, H, K, L, P, R |
| Rainbow snake | <i>Farancia erythrogramma</i> | Rare | K |
| Rat snake | <i>Elaphe obsoleta</i> | Uncommon | A, B, C, D, F, H, K, L, M, N, P, R, S, T, Z |
| Corn snake | <i>E. guttata</i> | Uncommon | A, B, C, D, F, H, K, L, M, N, P, R, S, T, Z |
| Pine snake | <i>Pituophis melanoleucus</i> | Uncommon | C, F, H, K, L, P, R |
| Black racer | <i>Coluber constrictor</i> | Uncommon | E, H |
| Coachwhip | <i>Masticophis flagellum</i> | Uncommon | A |
| Ring-necked snake | <i>Diadophis punctatus</i> | Uncommon | A |
| Brown snake | <i>Storeria dekayi</i> | Uncommon | A |
| Pygmy rattlesnake | <i>Sistrurus miliarius</i> | Uncommon | A, B, H, P |
| Cottonmouth | <i>Agkistrodon piscivorus</i> | Uncommon | A, B, C, D, F, H, K, L, M, N, P, R, S, T, Z |
| Copperhead | <i>A. contortrix</i> | Uncommon | A, B, C, D, F, H, K, L, M, N, P, R, S, T, Z |
| Canebrake rattlesnake | <i>Crotalus horridus</i> | Uncommon | A, B, C, D, F, H, K, L, M, N, P, R, S, T, Z |

Table 3-17. (cont)

| Common Name | Scientific Name | Abundance in Developed Areas ^a | Area of Observation |
|----------------------------|---------------------------------|---|---|
| Class Aves | | | |
| Pied-billed grebe | <i>Podilymbus podiceps</i> | Uncommon | A, D, P, R |
| Double-crested cormorant | <i>Phalacrocorax auritus</i> | Uncommon | R |
| Great blue heron | <i>Ardea herodias</i> | Uncommon | N |
| Green heron | <i>Butorides striatus</i> | Uncommon | N |
| Great egret | <i>Casmerodius albus</i> | Common | N |
| Tricolor heron | <i>Egretta tricolor</i> | Rare | N |
| Yellow-crowned night heron | <i>Nycticorax violacea</i> | Rare | T |
| Canada goose | <i>Branta canadensis</i> | Rare | A |
| Lesser snow goose | <i>Chen caerulescens</i> | Rare | F, H |
| Mallard | <i>Anas platyrhynchos</i> | Uncommon | D |
| Pintail | <i>A. acuta</i> | Rare | D |
| Green-winged teal | <i>A. crecca</i> | Uncommon | D |
| Blue-winged teal | <i>A. discors</i> | Rare | F, H |
| American wigeon | <i>A. americana</i> | Rare | D |
| Gadwall | <i>A. strepera</i> | Rare | D |
| Northern shoveler | <i>A. clypeata</i> | Rare | D |
| Wood duck | <i>Aix sponsa</i> | Uncommon | A, S |
| Redhead | <i>Aythya americana</i> | Rare | D |
| Ring-necked duck | <i>A. collaris</i> | Uncommon | C, D, K, L, P, R |
| Lesser scaup | <i>A. affinis</i> | Common | D, T |
| Bufflehead | <i>Bucephala albeola</i> | Common | A, D, F, H, P |
| Ruddy duck | <i>Oxyura jamaicensis</i> | Rare | D, T |
| Hooded merganser | <i>Lophodytes cucullatus</i> | Common | D, P |
| Red-breasted merganser | <i>Mergus serrator</i> | Rare | D |
| Turkey vulture | <i>Cathartes aura</i> | Common | A, B, C, D, E, F, H, K, L, M, N, P, R, S, T, Z |
| Black vulture | <i>Coragyps atratus</i> | Common | A, B, C, D, E, F, H, K, L, M, N, P, R, S, T, Z |
| Mississippi kite | <i>Ictinia mississippiensis</i> | Uncommon | D, T |
| Cooper's hawk | <i>Accipiter cooperi</i> | Rare | A |
| Red-tailed hawk | <i>Buteo jamaicensis</i> | Uncommon | A, B, C, D, F, H, K, L, M, N, P, R, S, T, Z |
| Red-shouldered hawk | <i>Buteo lineatus</i> | Uncommon | A, D, T |
| Bald eagle | <i>Haliaeetus leucocephalus</i> | Rare | A, H |
| Northern harrier | <i>Circus cyaneus</i> | Uncommon | A, C, D, E, H, P, R, S, Z |
| American kestrel | <i>Falco sparverius</i> | Common | A, C, D, L |
| Northern bobwhite | <i>Colinus virginianus</i> | Uncommon | A |
| Eastern wild turkey | <i>Meleagris gallopavo</i> | Uncommon | A, B, C, K, P |
| American coot | <i>Fulica americana</i> | Uncommon | C, K, L, P, R |
| Killdeer | <i>Charadrius vociferus</i> | Common | A, B, E, F, H, N, S, Z |
| Least sandpiper | <i>Calidris minutilla</i> | Uncommon | B, H |
| Rock dove | <i>Columba livia</i> | Abundant | A, B, C, D, E, F, H, K, L, M, N, P, R, S, T, Z |
| Mourning dove | <i>Zenaida macroura</i> | Common | A, B, C, D, F, H, K, L, M, N, P, R, S, T, Z |
| White-winged dove | <i>Z. asiatica</i> | Rare | A |
| Barn owl | <i>Tyto alba</i> | Uncommon | C, N |

Table 3-17. (cont)

| Common Name | Scientific Name | Abundance in Developed Areas ^a | Area of Observation |
|-------------------------------|-----------------------------------|---|--|
| Screech owl | <i>Otus asio</i> | Uncommon | S |
| Barred owl | <i>Strix varia</i> | Uncommon | C |
| Common nighthawk | <i>Chordeiles minor</i> | Common | A |
| Chimney swift | <i>Chaetura pelagica</i> | Common | F |
| Ruby-throated hummingbird | <i>Archilochus colubris</i> | Uncommon | A |
| Belted kingfisher | <i>Ceryle alcyon</i> | Uncommon | Z |
| Common flicker | <i>Colaptes auratus</i> | Uncommon | A |
| Pileated woodpecker | <i>Dryocopus pileatus</i> | Uncommon | A |
| Red-bellied woodpecker | <i>Melanerpes carolinus</i> | Uncommon | A |
| Eastern kingbird | <i>Tyrannus tyrannus</i> | Common | A, B, H |
| Great crested flycatcher | <i>Myiarchus crinitus</i> | Common | A, C, F, H |
| Horned lark | <i>Eremophila alpestris</i> | Uncommon | A |
| Barn swallow | <i>Hirundo rustica</i> | Common | A, B, C, E, F, K, H, L, P, R, S, Z |
| Northern rough-winged swallow | <i>Stelgidopteryx serripennis</i> | Common | A, B, E, H |
| Purple martin | <i>Progne subis</i> | Common | A |
| Blue jay | <i>Cyanocitta cristata</i> | Uncommon | A, E, H |
| Common crow | <i>Corvus brachyrhynchos</i> | Abundant | A, B, C, D, E, F, H, K, L, M, N, P, R, S, T, Z |
| Fish crow | <i>C. ossifragus</i> | Common | A, B, C, D, F, H, K, L, M, N, P, R, S, T, Z |
| Brown-headed nuthatch | <i>Sitta pusilla</i> | Uncommon | A |
| House wren | <i>Troglodytes aedon</i> | Uncommon | B |
| Bewick's wren | <i>Thryomanes bewickii</i> | Rare | B |
| Carolina wren | <i>Thryothorus ludovicianus</i> | Uncommon | A |
| Northern mockingbird | <i>Mimus polyglottos</i> | Abundant | A, B, C, D, E, F, H, K, L, M, N, P, R, S, T, Z |
| Gray catbird | <i>Dumetella carolinensis</i> | Uncommon | A |
| Brown thrasher | <i>Toxostoma rufum</i> | Uncommon | A |
| American robin | <i>Turdus migratorius</i> | Abundant | A, B, C, D, E, F, H, K, L, M, N, P, R, S, T, Z |
| Eastern bluebird | <i>Sialia sialis</i> | Common | A, B, E |
| Cedar waxwing | <i>Bombycilla cedrorum</i> | Uncommon | A |
| Loggerhead shrike | <i>Lanius ludovicianus</i> | Common | A, B, E, H, N, S, Z |
| European starling | <i>Sturnus vulgaris</i> | Abundant | A, B, C, D, E, F, H, K, L, M, N, P, R, S, T, Z |
| White-eyed vireo | <i>Vireo griseus</i> | Uncommon | A |
| House sparrow | <i>Passer domesticus</i> | Abundant | A, B, C, D, H, K, L, M, N, P, R, S, T, Z |
| Eastern meadowlark | <i>Sturnella magna</i> | Uncommon | A, B, E |
| Red-winged blackbird | <i>Agelaius phoeniceus</i> | Common | A, H, S, Z |
| Common grackle | <i>Quiscalus quiscula</i> | Common | A, E, F, S, Z |
| Brown-headed cowbird | <i>Molothrus ater</i> | Uncommon | A, B, E |
| Northern cardinal | <i>Cardinalis</i> | Uncommon | A, B |
| Indigo bunting | <i>Passerina cyanea</i> | Rare | A |
| House finch | <i>Carpodacus mexicanus</i> | Common | A |
| Pine siskin | <i>Carduelis pinus</i> | Uncommon | A |
| American goldfinch | <i>C. tristis</i> | Common | A |
| Rufous-sided towhee | <i>Pipilo erythrophthalmus</i> | Uncommon | A |

Table 3-17. (cont)

| Common Name | Scientific Name | Abundance in Developed Areas ^a | Area of Observation |
|-----------------------------|---------------------------------|---|--|
| Dark-eyed junco | <i>Junco hyemalis</i> | Uncommon | A |
| Chipping sparrow | <i>Spizella passerina</i> | Common | A |
| White-throated sparrow | <i>Zonotrichia albicollis</i> | Uncommon | A |
| Class Mammalia | | | |
| Virginia opossum | <i>Didelphis virginiana</i> | Common | A, B, C, D, E, F, H, K, L, M, N, P, R, S, T, Z |
| Eastern mole | <i>Scalopus aquaticus</i> | Uncommon | B, K |
| Southern short-tailed shrew | <i>Blarina carolinensis</i> | Uncommon | H |
| Least shrew | <i>Cryptotis parva</i> | Uncommon | E |
| Little brown bat | <i>Myotis lucifugus</i> | Uncommon | B, F, K, M |
| Eastern cottontail | <i>Sylvilagus floridanus</i> | Common | A, B, E, F, H |
| Eastern gray squirrel | <i>Sciurus carolinensis</i> | Uncommon | A |
| Cotton mouse | <i>Peromyscus gossypinus</i> | Common | A, E |
| Cotton rat | <i>Sigmodon hispidus</i> | Uncommon | A |
| House mouse | <i>Mus musculus</i> | Common | A, B, C, D, E, F, H, K, L, M, N, P, R, S, T, Z |
| Norway rat | <i>Rattus norvegicus</i> | Uncommon | A, B, C, D, F, H, K, L, M, N, P, R, S |
| Coyote | <i>Canis latrans</i> | Uncommon | A, B, E, P, T |
| Feral dog | <i>C. familiaris</i> | Uncommon | A, B, C, D, E, F, H, K, L, M, N, P, R, S, T, Z |
| Gray fox | <i>Urocyon cinereoargenteus</i> | Uncommon | A, B, C, D, E, F, H, K, L, M, N, P, R, S, T, Z |
| Bobcat | <i>Felis rufus</i> | Rare | D |
| Feral cat | <i>Felis catus</i> | Common | A, B, C, D, E, F, H, K, L, M, N, P, R, S, T, Z |
| Striped skunk | <i>Mephitis mephitis</i> | Common | A, B, C, D, E, F, H, K, L, M, N, P, R, S, T, Z |
| Raccoon | <i>Procyon lotor</i> | Common | A, B, C, D, E, F, H, K, L, M, N, P, R, S, T, Z |
| Wild pig | <i>Sus scrofa</i> | Uncommon | F, S |
| White-tailed deer | <i>Odocoileus virginianus</i> | Uncommon | A, Z |

Source: Mayer and Wike 1997.

^aAbundance refers to the presence in the appropriate subhabitat(s) within developed areas.

Development and Industrialized Subhabitat Utilization

Most of these species were found to use developed subhabitats with landscaping away from buildings and other structures. As the developed aspect of a subhabitat became more complex, the species diversity of urban wildlife decreased. Of the eight subhabitats surveyed, landscaped areas away from buildings had the most use by the broadest (69%) number of species (Table 3-18). The 186/183 basins had the lowest use (5%), based on the number of species recorded. The most common use of the urban subhabitats was for foraging and feeding (99% of the species). The least frequent use was for reproduction (courting or mating; 29% of the species) (Table 3-19).

Summary of Potential Impacts

The potential impacts from the presence of urban wildlife within developed areas can be either positive or negative, and can affect either humans or the wildlife. The potential impacts to humans from wildlife in urban subhabitats include contaminant transport, physical harm, disease transmission, and destruction of property. The potential impacts to wildlife include physical harm and contaminant exposure (Mayer and Wike 1997).

Commercial and Recreational Fishery of the Savannah River

Biota Found on SRS

Although aquatic and semiaquatic species of commercial or recreational importance exist in SRS waters, public use of SRS resources is not allowed. In addition to potentially valuable fisheries resources, the SRS also supports populations of alligators, bullfrogs, and several species of turtles (softshell, slider, Florida cooter, and snapping turtle) that could have some commercial or recreational value.

Biota Found in the Savannah River

The Savannah River supports both commercial and sports fisheries. Table 3-20 lists the species and catches of fish taken commercially from the river between 1970 and 1979. (Common and scientific names of all fish are given in Table 3-31.) Many of these fisheries are confined to the marine and brackish waters of the coastal regions of South Carolina and Georgia. Table 3-21 lists the total weight of shellfish caught in the lower Savannah River and adjacent coastal waters between 1972 and 1979.

Commercial Fishing

Introduction

The commercial fishes of significance near SRS are American shad (*Alosa sapidissima*), channel catfish (*Ictalurus punctatus*), and Atlantic sturgeon (*Acipenser oxyrinchus*).

Table 3-18. Summary of Wildlife Use of SRS Urban Subhabitats

| SRS Urban Subhabitat | Percent of Each Taxa | | | | Total (N=144) |
|---|----------------------|--------------------|-----------------|-------------------|------------------|
| | Amphibians (N=15) | Reptiles (N=22) | Birds (N=87) | Mammals (N=20) | |
| Interiors of buildings and structures | 6.7 | 68.2 | 10.3 | 50.0 | 24.3 |
| Exteriors of buildings and structures | 13.3 | 72.7 | 31.0 | 55.0 | 38.9 |
| Landscaped areas around buildings and structures | 20.0 | 90.9 | 42.5 | 75.0 | 52.1 |
| Landscaped areas and lawns | 13.3 | 95.5 | 67.8 | 85.0 | 68.8 |
| Construction laydown yards or salvage storage areas | 0.0 | 27.3 | 10.3 | 25.0 | 13.9 |
| Roads and parking lots | 13.3 | 31.9 | 37.9 | 60.0 | 37.5 |
| All terrestrial subhabitats | 11.1 | 64.4 | 40.0 | 70.0 | 47.1 |
| Storm water runoff or drainage ditches | 26.7 | 9.1 | 13.8 | 30.0 | 16.7 |
| Storm water runoff retention basins | 93.3 | 22.7 | 27.6 | 20.0 | 32.6 |
| Settling and seepage basins | 40.0 | 18.1 | 25.3 | 0.0 | 22.2 |
| Reactor 183/186 basins | 0.0 | 0.0 | 8.0 | 0.0 | 4.9 |
| All aquatic subhabitats | 40.0 | 12.5 | 18.7 | 12.5 | 19.1 |

Source: Mayer and Wike 1997.

Table 3-19. Summary of Specific Types of Use Observed for SRS Urban Wildlife

| Type of Use | Percent of Each Taxa | | | | Total (N=144) |
|---|----------------------|--------------------|-----------------|-------------------|------------------|
| | Amphibians (N=15) | Reptiles (N=22) | Birds (N=87) | Mammals (N=20) | |
| Foraging, feeding | 100.0 | 100.0 | 98.9 | 95.0 | 98.6 |
| Shelter | 100.0 | 86.4 | 48.3 | 80.0 | 63.9 |
| Courting, mating | 100.0 | 13.6 | 16.1 | 50.0 | 29.2 |
| Denning, nesting, egg-laying | 100.0 | 9.1 | 18.4 | 55.0 | 30.6 |
| Rearing or development of young | 100.0 | 9.1 | 18.4 | 55.0 | 30.6 |
| Loafing, resting, perching, roosting | 100.0 | 27.3 | 71.3 | 60.0 | 66.0 |
| Transient, dispersal | 100.0 | 86.4 | 77.0 | 85.0 | 81.9 |
| Presence only, no documented specific use | 0.0 | 0.0 | 1.2 | 0.0 | 0.7 |

Source: Mayer and Wike 1997.

Table 3-20. Commercial Landing Data for Fish Taken From Savannah River, 1970-1979

| Species | Combined Catches in Georgia and South Carolina | | | | | | | | | |
|-------------------|--|--------|--------|--------|--------|--------|-------|--------|--------|--------|
| | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 |
| carp | 0 | 250 | 252 | 1,503 | 590 | 998 | 136 | 453 | 136 | 363 |
| catfish | 544 | 157 | 222 | 518 | 726 | 1,814 | 1,043 | 1,043 | 363 | 1,043 |
| black drum | 0 | 0 | 0 | 0 | 0 | 227 | 272 | 0 | 0 | 0 |
| red drum | 0 | 0 | 0 | 0 | 45 | 0 | 181 | 499 | 136 | 0 |
| hickory shad | 318 | 384 | 291 | 725 | 91 | 227 | 91 | 136 | 181 | 91 |
| spotted sea trout | 0 | 0 | 0 | 324 | 227 | 2500 | 1800 | 181 | 181 | 0 |
| American shad | 43,591 | 25,568 | 25,439 | 33,912 | 26,263 | 20,412 | 8618 | 20,820 | 54,432 | 57,607 |
| sturgeon | 726 | 23 | 1967 | 551 | 136 | 45 | 363 | 862 | 454 | 227 |
| suckers | 0 | 0 | 0 | 0 | 0 | 0 | 91 | 0 | 0 | 0 |
| common eels | 0 | 0 | 0 | 0 | 0 | 91 | 0 | 45 | 0 | 45 |
| mullet | 0 | 0 | 0 | 0 | 0 | 227 | 0 | 91 | 0 | 0 |
| striped bass | 816 | 735 | 1,013 | 1,071 | 0 | 0 | 0 | 0 | 0 | 0 |

Source: du Pont 1983.

Table 3-21. Commercial Landing Data for Shellfish Taken from Coastal Regions of Savannah River, 1972-1979

| Year | Shellfish Catch (kg) | | | |
|------|----------------------|------------------------|---------------------|------------------------|
| | Clams | Blue Crabs | Oysters | Shrimp |
| 1972 | | 419,489 ^a | 1,451 ^b | 115,940 ^b |
| 1973 | 862 ^c | 543,957 ^a | 2,858 ^b | 222,128 ^b |
| 1974 | - | 1,252,072 ^d | 6,804 ^d | 1,141,530 ^d |
| 1975 | - | 17,237 ^a | 3,447 ^d | 1,264,818 ^d |
| 1976 | - | - | - | - |
| 1977 | - | 63,504 ^a | 19,051 ^d | 626,286 ^d |
| 1978 | 1,860 ^c | 68,040 ^a | - | 731,475 ^d |
| 1979 | 454 ^c | 104,781 ^a | 9072 ^a | - |

Sources: DOE 1984.

^aWassaw Sound plus Ossabaw Sound.^bDOE 1982.^cSavannah River landings.^dNorthern District, Georgia.

These species, except for sturgeon, are exploited to a limited degree by nonprofessional, local fishermen. Commercial and recreational fisheries for blueback herring (*Alosa aestivalis*) exist in South Carolina (Ulrich et al. 1978), but none is taken commercially in Georgia because of state netting restrictions.

American Shad

American shad stocks appear to be healthy and productive in the Savannah River. Music (1981) reported that commercial catches in 1980 in the Savannah River represented 51% of Georgia shad landings in that year; yet only 13% of Georgia's commercial shad fishermen operated in the Savannah River. Thus, American shad stocks in the Savannah River may be less heavily exploited and relatively more abundant than stocks in other Georgia rivers. Additionally, Schmitt and Hornsby (1985) reported the development of a previously undocumented sport fishery for American shad in the vicinity of the New Savannah Bluff Lock and Dam.

Striped Bass

Less is known concerning the status of striped bass (*Morone saxatilis*) in the Savannah River. Researchers have documented spawning upstream of tidally influenced regions of the river (Paller et al. 1984, 1985, 1986). Nevertheless, Gilbert et al. (1986) suggested that striped bass spawning occurs primarily in the tidally influenced portions of the river. It is not clear whether the current spawning of striped bass in upstream regions of the river represents a reestablishment of a spawning stock in this area or is a result of the increased intensity of sampling efforts during 1982-1985 relative to earlier sampling programs.

Sport Fishing

Introduction

Sport fishermen are the principal consumers of river fishes, mostly sunfish (*Lepomis* spp.) and crappie (*Pomoxis* spp.). Striped bass, which is classified as a game fish in South Carolina and Georgia (Ulrich et al. 1978), is a favorite quarry of fishermen in the Augusta area.

Schmitt and Hornsby (1985) evaluated the sport fishery resources in the Savannah River downstream of the New Savannah Bluff Lock and Dam during 1980-1982. The average annual sport-fishing harvest from the freshwater portions of the river (approximately River Mile 21-187 [River Km 34-300]) was estimated to range from 171,561 fish/yr in 1982 to 550,282 fish/yr in 1980 (3 yr average = 305,778 fish/yr). The dominant species in the sport harvest were redbreast sunfish (*Lepomis auritus*) (27.2%) and bluegill (*L. macrochirus*) (24.1%, Table 3-22). The composite category of "bream" (sunfishes) accounted for 64% of the total angler catch. The composite category of "catfish" also represented a substantial portion of the sport harvest (14.6%), with bullhead (*Ameiurus* spp.) (8.2%) the major reported taxon within this category. Crappie (8%) represented a substantial component of the sport harvest and was comparable to warmouth (*L. gulosus*) (7.3%). No other species (or species group) represented greater than 5% of the sport harvest. Notably, anadromous species (striped bass, 0.2%; American shad, 1.7%) did not contribute substantially to the angler's harvest. However, the authors noted that the American shad harvest may be underestimated because of the development of a fishery for this species near the New Savannah Bluff Lock and Dam, while the assessment for this species emphasized downstream areas of the river.

Table 3-22. Fish Species Preferred and Caught by Savannah River Sport Fishermen

| Taxon | Percent Angler Effort | Percent Angler Catch |
|-------------------|-----------------------|----------------------|
| bream | 24.9 | 64.0 ^a |
| redbreast sunfish | 8.7 | 27.2 |
| bluegill | 1.0 | 24.1 |
| warmouth | 0.1 | 7.3 |
| redeer sunfish | 0.4 | 4.4 |
| largemouth bass | 25.7 | 3.2 |
| crappie | 10.7 | 8.0 |
| yellow perch | 1.3 | 3.0 |
| catfish | 7.0 | 14.6 ^a |
| bullhead spp. | 0.4 | 8.2 |
| channel catfish | <0.1 | 4.2 |
| white catfish | 0.5 | 2.1 |
| chain pickerel | 0.5 | 0.9 |
| american shad | 7.8 | 1.7 |
| striped bass | 4.7 | 0.2 |
| hybrid bass | 4.4 | 0.3 |
| other | 1.9 | 4.1 |
| Total | 100.0 | 100.0 |

Sources: DOE 1988 adapted from Schmitt and Hornsby 1985.

^aSum of taxa within category.

Angler Preferences

Anglers in the freshwater section of the Savannah River fish predominantly for bream and largemouth bass (*Micropterus salmoides*) (Schmitt and Hornsby 1985). Based on electro-fishing studies, the relative abundance of bream in the freshwater section of the river is high, as is the actual angler success rate. The lower abundance of largemouth bass in the freshwater section results in a relatively low angler harvest of this species (Figure 3-1). Anglers in the estuarine section of the Savannah River fish predominantly for sea trout (*Cynoscion* spp.) and striped bass, but success rates for these species are low (Figure 3-2).

Angler Harvests

Species Preference versus Catch

The ratio of species caught to angler preferences frequently was skewed. Approximately 35% of angler fishing effort was directed toward bream (composite reporting category plus individual species), while 64% of the harvest was from this category (Table 3-22). The relationship between effort and harvest was even more disparate for largemouth bass; 25.7% of fishing effort was targeted toward this species, while it constituted only 3.2% of the catch. Overall, catfish (*Ictalurus* spp.) were not highly desired (approximately 7% of effort), but were caught in slightly greater proportion (14.6%). American shad (7.8% of effort) and striped bass (4.7% of effort) were caught in substantially lower abundances than desired by sport fishermen, the disparity being comparable to that exhibited for largemouth bass.

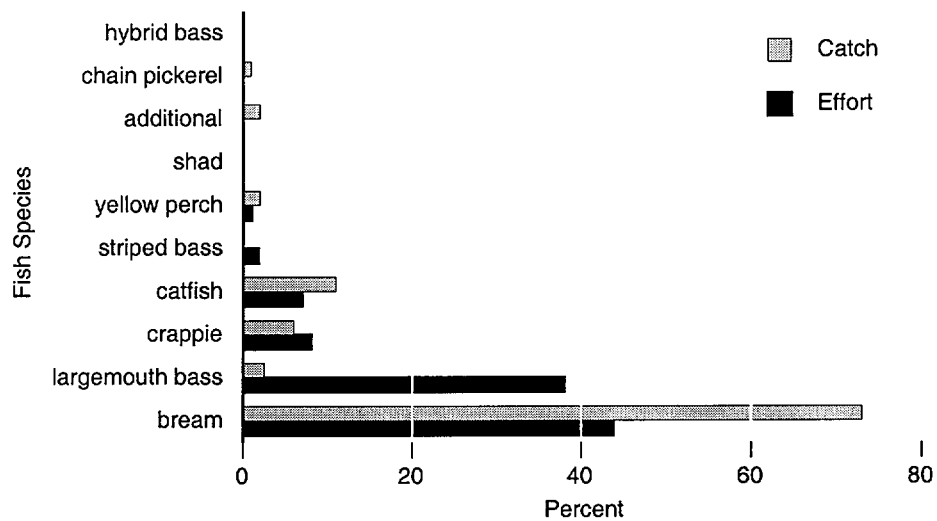


Figure 3-1. Comparison of Freshwater Angler Fishing Effort and Fish Harvest by Species (Source: Mackey et al. 1983)

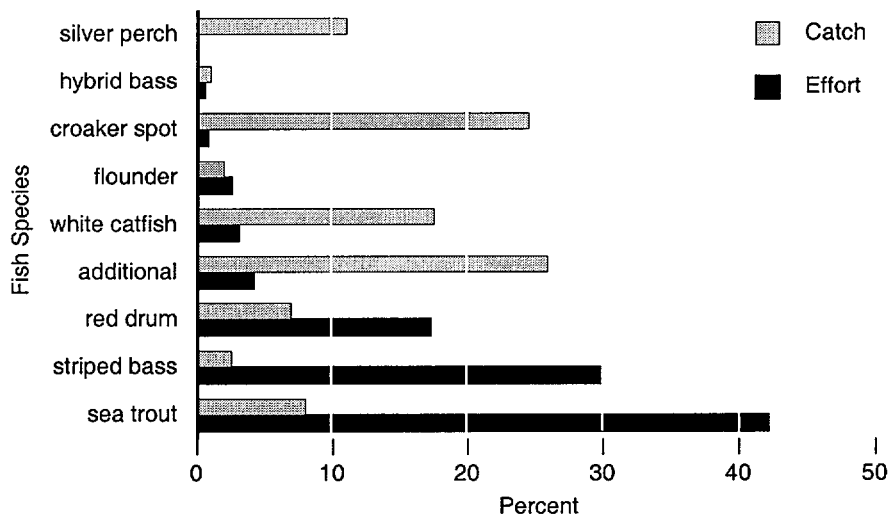


Figure 3-2. Comparison of Estuarine Angler Fishing Effort and Fish Harvest by Species (Source: Mackey et al. 1983)

Catch Versus Availability

Fish species caught by anglers in the Savannah River represent an extremely limited set of available species. Electrofishing collections by Schmitt and Hornsby (1985) throughout the freshwater sections of the lower Savannah River indicated that the taxa caught by anglers represented only 33.1% of the relative abundance (numerical) collected in their electrofishing effort. Similarly, those species that constitute 95.8% of the angler catch constitute only 27.8% of total impingement at the SRS intakes. The species caught by anglers represent 59.8% of the numbers of fish caught by electrofishing and 86.9% of hoopnet sampling from the Savannah River near SRS intakes. However, Paller and Osteen (1985) noted that the electrofishing collections near SRS do not accurately reflect the abundance of minnows and other small species; the same caution applies to hoop-net collections because the hoop nets used for the SRS collections had a maximum mesh size of 37 mm. Savannah River standard electrofishing results for 1993 and 1996 are presented in Table 3-23. No comparable angler information is available.

Bream represent the largest component of the anglers' catch in the Savannah River. Although centrarchids were a substantial component of SRS impingement collections, the species impinged were not predominantly those caught by anglers (Figure 3-3). Although redbreast sunfish are abundant in creel censuses (27.1%) and in the river near the SRS intakes (26.7%), they represented only 5.5% of fish impinged. Bluegill also show a much higher relative abundance in the anglers' catch than in the river (all methods) and impingement samples. Among the bream caught by anglers, only the spotted sunfish (*L. punctatus*) represents a higher relative abundance in impingement (3.5%) than in creels (1.1%), but the species relative abundance in impingement is less than the relative abundance in electrofishing collections (5.2%).

Table 3-23. Standard Electrofishing Results From all Regions of the Savannah River, 1993 and 1996

| Species | 1993 | | | 1996 | | |
|-------------------|--------------|------------------|-------|--------------|------------------|-------|
| | Total Number | Percent of Total | CPUE | Total Number | Percent of Total | CPUE |
| Chain pickerel | 31 | 3.30 | 1.72 | 27 | 1.4 | 1.52 |
| Channel catfish | 36 | 3.83 | 2.00 | 110 | 5.8 | 6.20 |
| Redbreast sunfish | 245 | 26.06 | 13.61 | 624 | 32.9 | 35.15 |
| Warmouth | 14 | 1.49 | 0.78 | 61 | 3.2 | 3.44 |
| Bluegill | 127 | 13.51 | 7.05 | 443 | 23.4 | 24.96 |
| Redear sunfish | 73 | 7.77 | 4.06 | 169 | 8.9 | 9.52 |
| Spotted sunfish | 61 | 6.49 | 3.39 | 119 | 6.3 | 6.70 |
| Largemouth bass | 281 | 29.89 | 15.61 | 202 | 10.6 | 11.38 |
| Black crappie | 28 | 2.98 | 1.56 | 55 | 2.9 | 3.10 |
| Yellow perch | 44 | 4.68 | 2.44 | 33 | 1.7 | 1.86 |
| White catfish | 0 | | | 49 | 2.6 | 2.76 |
| Stripped bass | 0 | | | 1 | 0.1 | 0.06 |
| Flier | 0 | | | 1 | 0.1 | 0.06 |
| Pumpkinseed | 0 | | | 1 | 0.1 | 0.56 |
| Smallmouth bass | 0 | | | 1 | 0.1 | 0.56 |
| Southern flounder | 0 | | | 1 | 0.1 | 0.56 |

Source: Barrett 1997.

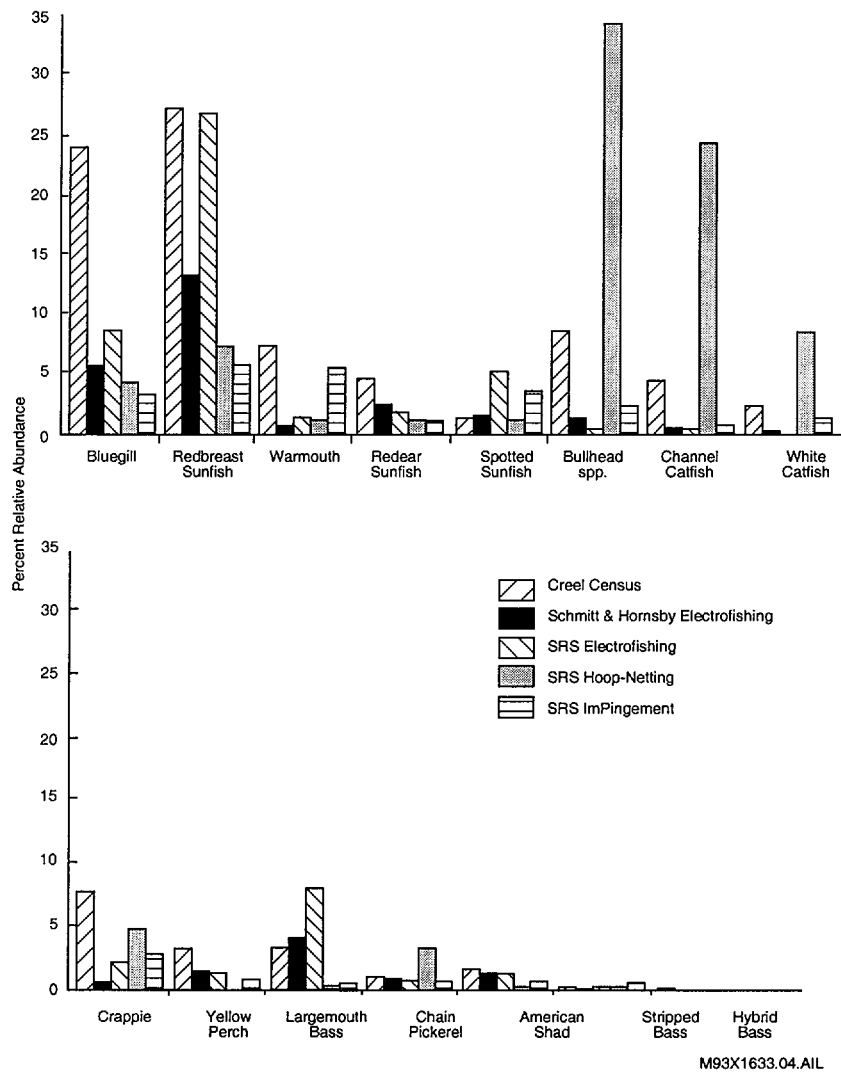


Figure 3-3. Relative Abundance of Fish Taxa in Creel, Electrofishing, Hoop-Net, and Impingement Collections

Crappie, Yellow Perch, and Largemouth Bass

Crappie, yellow perch (*Perca flavescens*), and largemouth bass all exhibit higher relative abundances in the creel (8.0%, 3.0%, and 3.2%, respectively) than on screen impingement (2.9%, 0.8%, and 0.5%, respectively [Figure 3-3]). All three species exhibit higher relative abundance in the river (by at least one collection method) than in impingement samples, and largemouth bass exhibited higher relative abundance in the river than in the creel. Chain pickerel (*Esox niger*) is a minor component of the creel (0.9%), with comparable abundance in impingement samples (0.7%).

Catfish

Impingement relative abundances for all taxa of catfish (*Ameiurus* spp. [2.1%], channel catfish [0.8%], and white catfish [*A. catus*] [1.3%]) were lower than relative abundances for those taxa in the creel (8.2%, 4.2%, and 2.1%, respectively [Figure 3-3]). However, the relative abundances of these taxa in hoop-net collections were substantially higher than for either impingement or angler catches. The disparity between relative abundances of catfish taxa in electrofishing and hoop-net collections suggests that catfish are a substantial component of the Savannah River ichthyofauna, and that electrofishing provides poor estimates of the abundance of these taxa.

American Shad, Striped Bass, and Hybrid Bass

American shad, striped bass, and hybrid bass were minor components in all of the collection methods (angling, electrofishing, hoop-netting, impingement [Figure 3-3]). The abundance of the anadromous American shad and striped bass in the Savannah River near the SRS was underestimated during the quarterly sampling program. Nevertheless, the low frequency of these species in impingement collections (approximately 100 collections throughout the year) is highly encouraging because it indicates adults and juveniles of these species are minimally influenced by impingement mortality associated with SRS operations.

Creel Surveys

During 1988, Schmitt (1989) monitored fishing activity from the New Savannah Bluff Lock and Dam downstream to the ocean using the same design as the previous study (Schmitt and Hornsby 1985). Another survey was done in 1994. Results of the surveys are presented in Table 3-24 through Table 3-28. Overall fishing pressure decreased between the studies, significantly in the estuarine area, but angler preference changed as indicated by fished-for effort (Table 3-24). Harvest rates were highest in 1988 and more fish were caught with less effort; however, most species were of lower average weights (Schmitt 1989). Total numbers for most freshwater species declined between the two early studies (Table 3-25), with the exception of crappie and channel catfish. Largemouth bass catch increased from 1988 to 1994, however the catch of most other species decreased. Significant declines in the estuarine harvest of striped bass, flounder (*Bothidae*), and black drum (*Pogonias cromis*) occurred. Take of silver perch (*Bairdiella chrysoura*) and spotted seatrout (*C. nebulosus*) increased (Table 3-26). Creel surveys were conducted in the estuarine areas of the Savannah and Ogeechee Rivers from October 1989 through

Table 3-24. Estimated Fished-for Effort (hours) in the Estuarine and Freshwater Sections of the Savannah River Creel Surveys, 1979-1982 and 1988

| Species | 1979-1982 | | | 1988 | | |
|----------------------|-----------|-----------------|---------|--------|-----------------|---------|
| | Hours | SE ^a | Percent | Hours | SE ^a | Percent |
| Estuary | | | | | | |
| spotted seatrout | 6,762 | 1,091 | 32.5 | 2,805 | 1,027 | 25.9 |
| striped bass | 6,640 | 1,175 | 32.0 | 81 | 8 | 0.8 |
| red drum | 1,887 | 559 | 9.1 | 5,737 | 1,689 | 53.0 |
| white catfish | 1,461 | 464 | 7.0 | 1,099 | 692 | 10.2 |
| croaker/spot | 620 | 264 | 3.0 | 152 | 82 | 1.4 |
| flounder | 590 | 213 | 2.8 | 246 | 251 | 2.3 |
| striped hybrid | 30 | 25 | 0.2 | 0 | 0 | 0 |
| others ^b | 2,794 | 1,918 | 13.4 | 697 | 383 | 6.4 |
| total | 20,784 | 2,625 | 100.0 | 10,817 | 2,131 | 100.0 |
| Freshwater | | | | | | |
| largemouth bass | 24,995 | 4,435 | 25.7 | 4,945 | 3,766 | 6.5 |
| bream ^c | 24,129 | 3,626 | 24.9 | 45,893 | 20,372 | 59.9 |
| crappie spp. | 10,404 | 1,922 | 10.7 | 4,580 | 1,950 | 6.0 |
| redbreast sunfish | 8,407 | 1,599 | 8.7 | 3,344 | 1,340 | 4.4 |
| American shad | 7,604 | 2,551 | 7.8 | 7,192 | 2,240 | 9.4 |
| catfish ^c | 6,772 | 1,023 | 7.0 | 6,924 | 3,128 | 9.0 |
| striped bass | 4,577 | 1,447 | 4.7 | 915 | 484 | 1.2 |
| striped hybrid | 4,296 | 1,959 | 4.4 | 0 | 0 | 0 |
| yellow perch | 1,241 | 471 | 1.3 | 25 | 18 | T |
| bluegill | 957 | 380 | 1.0 | NA | NA | NA |
| white catfish | 444 | 402 | 0.5 | NA | NA | NA |
| chain pickerel | 502 | 406 | 0.5 | 0 | 0 | 0 |
| redeer sunfish | 428 | 191 | 0.4 | NA | NA | NA |
| bullhead spp. | 367 | 158 | 0.4 | NA | NA | NA |
| warmouth | 70 | 73 | 0.1 | NA | NA | NA |
| channel catfish | 35 | 22 | T | 328 | 225 | 0.4 |
| others ^d | 1,864 | 1,004 | 1.9 | 2,444 | 1,882 | 3.2 |
| total | 97,092 | 7418 | 100.0 | 76,590 | 21,672 | 100.0 |

Source: Schmitt 1989.

^aApproximate standard error.

^bEstuarine "others" include hardhead catfish, channel catfish, crevalle jack, and striped mullet.

^cGeneral category indicated by anglers. "Bream" includes all sunfish, and "catfish" includes all Ictalurids.

^dFreshwater "others" includes bluegill, bullheads, striped mullet, redear sunfish, warmouth, and white catfish in the 1988 survey.

Table 3-25. Creel Harvest Estimates for the Combined Freshwater Portions of the Savannah River Creel Surveys of 1979-1982, 1988, and 1994

| | Number | | | Weight(kg) | | | Catch rate ^c | | | Harvest rate ^d | |
|------------------------|---------|-----------------|---------------|------------|-----------------|---------------|----------------------------------|--------|-------|---------------------------|-------|
| Species | Total | SE ^a | Percent total | Total | SE ^a | Percent total | Average weight (kg) ^b | No./hr | kg/hr | No./ha | kg/ha |
| 1979-1982 Creel Survey | | | | | | | | | | | |
| striped bass | 633 | 248 | 0.2 | 2,663 | 1,638 | 3.9 | 4.21 | 0.002 | 0.009 | 0.17 | 0.73 |
| redbreast sunfish | 83,277 | 12,305 | 27.2 | 11,088 | 1,951 | 16.2 | 0.13 | .0291 | .0039 | 22.92 | 3.05 |
| crappie | 24,467 | 3,280 | 8.0 | 4,942 | 639 | 7.2 | 0.20 | 0.085 | 0.017 | 6.73 | 1.36 |
| yellow perch | 9,188 | 2,152 | 3.0 | 1,309 | 314 | 1.9 | 0.14 | 0.032 | 0.005 | 2.53 | 0.36 |
| largemouth bass | 9,825 | 1,135 | 3.2 | 5,680 | 719 | 8.3 | 0.58 | 0.034 | 0.020 | 2.70 | 1.56 |
| channel catfish | 12,804 | 1,680 | 4.2 | 4,143 | 1,139 | 6.1 | 0.32 | 0.045 | 0.014 | 3.52 | 1.14 |
| American shad | 5,253 | 1,690 | 1.7 | 7,480 | 2,506 | 11.0 | 1.42 | 0.018 | 0.026 | 1.45 | 2.06 |
| chain pickerel | 2,880 | 557 | 0.9 | 1,239 | 162 | 1.8 | 0.43 | .0010 | 0.004 | 0.79 | 0.34 |
| others ^c | 157,451 | 16,702 | 51.6 | 29,726 | 2,670 | 43.6 | 0.19 | 0.550 | 0.104 | 43.33 | 8.18 |
| total | 305,778 | 21,286 | 100.0 | 68,270 | 4,773 | 100.0 | 0.22 | 1.067 | 0.236 | 84.14 | 18.77 |
| 1988 Creel Survey | | | | | | | | | | | |
| striped bass | 198 | 70 | 0.1 | 259 | 116 | 0.4 | 1.31 | 0.001 | 0.001 | 0.05 | 0.07 |
| redbreast sunfish | 109,440 | 44,061 | 30.7 | 10,604 | 4,168 | 18.6 | 0.10 | 0.472 | 0.046 | 30.12 | 2.92 |
| crappie | 20,952 | 5,899 | 5.9 | 3,927 | 1,212 | 6.9 | 0.19 | 0.090 | 0.017 | 5.77 | 1.08 |
| yellow perch | 7,269 | 1,411 | 2.0 | 920 | 169 | 1.6 | 0.13 | .0031 | 0.004 | 2.00 | 0.25 |
| largemouth bass | 3,409 | 760 | 1.0 | 1,979 | 579 | 3.5 | 0.58 | 0.015 | 0.009 | 0.94 | 0.54 |
| channel catfish | 43,344 | 20,881 | 12.1 | 7,800 | 2,927 | 13.7 | 0.18 | 0.187 | 0.034 | 11.93 | 2.15 |
| American shad | 2,500 | 680 | 0.7 | 3,902 | 1,146 | 6.8 | 1.56 | 0.011 | 0.017 | 0.69 | 1.07 |
| chain pickerel | 1,210 | 327 | 0.3 | 732 | 244 | 1.3 | 0.61 | 0.005 | 0.003 | 0.33 | 0.20 |
| others ^d | 168,678 | 48,942 | 47.2 | 26,986 | 9,920 | 47.2 | 0.16 | 0.727 | 0.116 | 46.42 | 7.43 |
| total | 357,000 | 69,359 | 100.0 | 57,109 | 11,294 | 100.0 | 0.16 | 1.539 | 0.246 | 98.24 | 15.72 |
| 1994 Creel Survey | | | | | | | | | | | |
| largemouth bass | 14,596 | f | 7 | 9,206 | f | 17 | 0.63 | 0.110 | 0.069 | 1.46 | 0.92 |
| striped bass | 1,974 | | 1 | 987 | | 2 | 0.49 | 0.015 | 0.007 | 0.01 | <0.01 |
| redbreast sunfish | 75,112 | | 40 | 8,968 | | 16 | 0.12 | 0.565 | 0.068 | 14.27 | 1.70 |
| redear sunfish | 8,479 | | 4 | 1,397 | | 3 | 0.16 | 0.064 | 0.011 | 2.31 | 0.38 |
| bluegill | 18,079 | | 9 | 2,540 | | 5 | 0.14 | 0.136 | 0.019 | 4.71 | 0.66 |
| black crappie | 13,534 | | 7 | 2,934 | | 5 | 0.22 | 0.102 | 0.022 | 2.67 | 0.57 |
| yellow perch | 1,169 | | <1 | 150 | | <1 | 0.13 | 0.009 | 0.001 | 0.32 | 0.04 |
| chain pickerel | 3,111 | | 2 | 2,111 | | 4 | 0.68 | 0.023 | 0.016 | 0.49 | 0.32 |
| channel catfish | 18,722 | | 10 | 12,506 | | 23 | 0.68 | 0.141 | 0.094 | 3.81 | 2.54 |
| bullhead catfish | 12,800 | | 7 | 2,649 | | 5 | 0.21 | 0.096 | 0.020 | 3.22 | 0.66 |
| white catfish | 6,734 | | 4 | 2,999 | | 5 | 0.44 | 0.051 | 0.023 | 1.84 | 0.82 |
| other | 15,115 | | 8 | 7,733 | | 14 | 0.51 | 0.114 | 0.058 | 3.03 | 1.55 |
| total | 189,425 | | | 54,181 | | | 0.29 | 1.426 | 0.408 | 38.1 | 10.19 |

Source: Schmitt 1989; Barrett 1997.

^aApproximate standard error.^bKilograms; to convert to pounds, multiply by 2.205.^cRates based on efforts of 286,215 hours (1979-82) and 232,026 hours (1988).^dRates based on creel area of 3,634 hectares.^ePrincipal species in the "others" category were bluegill, bullheads, striped mullet, warmouth, and redear sunfish.^fStandard error not given.

Table 3-26. Estuarine Harvest Estimates of Savannah River Roving Creel Surveys, 1979, 1982, and 1988

| | Number | | | Weight (kg) ^a | | | | Catch rate ^b | | Harvest rate ^c | |
|---------------------------------------|--------|-----------------|-----------------------|--------------------------|-----------------|-----------------------|------------------------|-------------------------|-------|---------------------------|-------|
| | | | Per- cent total | | | Per- cent total | | | | | |
| Species | Total | SE ^a | | Total | SE ^d | | Average weight (kg) | No./hr | kg/hr | No./ha | kg/ha |
| 1979-1982 Creel Survey | | | | | | | | | | | |
| striped bass | 1,139 | 270 | 2.9 | 1,528 | 319 | 9.5 | 1.34 | 0.02 | 0.03 | 0.38 | 0.51 |
| striped bass/ white bass hybrid | 353 | 81 | 0.9 | 340 | 86 | 2.1 | 0.96 | 0.01 | 0.01 | 0.12 | 0.11 |
| spotted seatrout | 3,586 | 637 | 9.0 | 1,502 | 239 | 9.3 | 0.42 | 0.06 | 0.02 | 1.19 | 0.50 |
| red drum | 2,144 | 506 | 5.4 | 1,701 | 353 | 10.5 | 0.79 | 0.04 | 0.03 | 0.71 | 0.56 |
| croaker/spot | 9,266 | 1,873 | 23.3 | 1,336 | 329 | 8.3 | 0.14 | 0.15 | 0.02 | 3.06 | 0.44 |
| silver perch | 3,916 | 1,129 | 9.9 | 377 | 98 | 2.3 | 0.10 | 0.06 | 0.01 | 1.29 | 0.12 |
| flounder | 886 | 173 | 2.2 | 468 | 123 | 2.9 | 0.53 | 0.01 | 0.01 | 0.29 | 0.15 |
| white catfish | 6,967 | 1,304 | 17.6 | 2,641 | 549 | 16.4 | 0.38 | 0.11 | 0.04 | 2.30 | 0.87 |
| black drum | 1,694 | 424 | NA | 3,598 | 2,807 | NA | 2.12 | 0.03 | 0.06 | 0.56 | 1.19 |
| others | 9,722 | 2,034 | 28.8 | 2,646 | 557 | 38.7 | 0.27 | 0.16 | 0.04 | 3.21 | 0.88 |
| total | 39,673 | 3,402 | 100.0 | 16,137 | 2,986 | 100.0 | 0.41 | 0.65 | 0.27 | 13.11 | 5.33 |
| 1988 Creel Survey | | | | | | | | | | | |
| striped bass | 6 | 6 | T | 3 | 3 | T | 0.50 | T | T | T | T |
| spotted seatrout | 5,843 | 3,167 | 17.8 | 2,895 | 1,587 | 24.6 | 0.50 | 0.15 | 0.07 | 1.93 | 0.96 |
| flounder | 276 | 89 | 0.8 | 93 | 32 | 0.8 | 0.34 | 0.01 | T | 0.09 | 0.03 |
| silver perch | 4,188 | 2,863 | 12.7 | 321 | 233 | 2.7 | 0.08 | 0.10 | 0.01 | 1.39 | 0.11 |
| red drum | 2,122 | 529 | 6.5 | 2,243 | 557 | 19.0 | 1.06 | 0.05 | 0.06 | 0.70 | 0.74 |
| croaker/spot | 6,891 | 2,000 | 20.9 | 908 | 229 | 7.7 | 0.13 | 0.17 | 0.02 | 2.28 | 0.30 |
| white catfish | 5,443 | 2,542 | 16.5 | 2,225 | 921 | 18.9 | 0.41 | 0.14 | 0.06 | 1.80 | 0.74 |
| black drum ^d | 521 | 256 | 1.6 | 233 | 135 | 2.0 | 0.45 | 0.01 | 0.01 | 0.17 | 0.08 |
| bluefish | 98 | 85 | 0.3 | 27 | 26 | 0.2 | 0.28 | T | T | 0.03 | 0.01 |
| others ^e | 7,519 | 2,389 | 22.9 | 2,848 | 943 | 24.1 | 0.38 | 0.19 | 0.07 | 2.49 | 0.94 |
| total | 32,907 | 6027 | 100.0 | 11,796 | 2,042 | 100.0 | 0.36 | 0.82 | 0.29 | 10.88 | 3.90 |

^aKilograms; to convert to pounds, multiply by 2.205.

^bRates based on estimated efforts of 60,964 hours (1977-1982) and 40,168 hours (1988).

^cRates based on creel area of 3,024 hectares.

^dApproximate standard error.

^eBlack drum percentages are represented in the "others" category because harvest listed only represents one year of harvest (1982).

^fPrincipal species in the "others" category were hardhead catfish, channel catfish, crevalle jack, and striped mullet.

T (trace) = values less than 0.05%, 0.005 No./h, kg/h, No./ha, or kg/ha.

NA = not any.

Table 3-27. Combined Annual Estimates of Angler Pressure, Harvest, and Catch Rate for the Freshwater and Estuarine Sections of the Savannah River between December 29, 1979 and December 24, 1982, and January 10, 1988 and December 24, 1988

| Section of River | Hectares ^a (no) | Fishing Trips | Angler Hours | Fishing Pressure | | Fish Harvest | | Catch Rate | |
|-----------------------|-------------------------------|------------------|-----------------|------------------|-------------------|--------------|-----------------|-------------------|-------------------|
| | | | | Trips/ ha | Hours/ ha | Number | Kg ^b | No./hour | Kg/hour |
| 1979-1982 Survey | | | | | | | | | |
| Freshwater | | | | | | | | | |
| lower | 1,476 | 24,726 | 117,445 | 16.8 | 79.6 | 102,125 | 22,737 | 0.87 | 0.19 |
| upper | 2,158 | 40,156 | 168,770 | 18.6 | 78.2 | 203,653 | 45,533 | 1.21 | 0.27 |
| both areas | 3,634 | 64,882 | 286,215 | 17.9 | 78.8 | 305,778 | 68,270 | 1.07 | 0.24 |
| Estuary | 3,024 | NE | 60,964 | NE | 20.2 | 38,542 | 13,737 | 0.63 | 0.23 |
| all sections combined | 6,658 | NE | 347,179 | NE | 52.2 ^c | 344,320 | 82,007 | 0.85 ^c | 0.23 ^c |
| 1988 Creel Survey | | | | | | | | | |
| Freshwater | | | | | | | | | |
| lower | 1,476 | 19,012 | 82,182 | 12.9 | 55.7 | 84,805 | 14,426 | 1.03 | 0.18 |
| upper | 2,158 | 35,489 | 149,844 | 16.4 | 69.4 | 272,194 | 42,683 | 1.82 | 0.28 |
| both areas | 3,634 | 54,501 | 232,026 | 15.0 | 63.8 | 356,999 | 57,109 | 1.54 | 0.25 |
| Estuary | 3,024 | NE | 40,168 | NE | 13.3 | 32,906 | 11,796 | 0.81 | 0.29 |
| all sections combined | 6,658 | NE | 272,194 | NE | 40.9 ^c | 389,905 | 68,905 | 1.21 ^c | 0.27 ^c |

Source: Schmitt 1990.

NE = not estimated.

^aTo convert to acres, multiply by 2.471.^bkilograms; to convert to pounds, multiply by 2.205.^cArea-weighted mean.

Table 3-28. Other Species Harvested in the 1979-1982 and 1988 Savannah River Creel Surveys

| Estuary | | | Freshwater | | |
|-----------------------------------|-----------|-----------------|-----------------------------------|-----------------|------|
| Percentage by number ^a | | | Percentage by number ^a | | |
| Species | 1979-1982 | 1988 | Species | 1979-1982 | 1988 |
| hardhead catfish | 30.6 | 36.4 | bluegill | NA ^b | 57.4 |
| bluefish | 19.7 | NA ^b | bullheads | NA ^b | 12.2 |
| channel catfish | 14.8 | 27.5 | striped mullet | 39.2 | 10.9 |
| crevalle jack | T | 6.0 | American eel | 20.2 | NA |
| striped mullet | 9.0 | 4.2 | bowfin | 19.0 | NA |
| American eel | 9.1 | 3.5 | flier | 10.5 | 0.1 |
| black drum | 3.8 | NA ^b | redear sunfish | NA ^b | 8.4 |
| pinfish | NA | 3.0 | warmouth | NA ^b | 4.8 |
| sheepshead | 2.9 | 2.1 | white catfish | NA ^b | 4.7 |
| bullheads | NA | 1.8 | sucker spp. | 3.8 | 0.5 |
| kingfish | T | 1.2 | red drum | T | 0.4 |
| black crappie | 1.2 | 1.2 | bowfin | 19.0 | 0.2 |
| largemouth bass | 2.6 | 0.9 | croaker/spot | 2.3 | 0.1 |
| toadfish | 0.9 | NA | hybrid striped bass | NA ^b | 0.1 |
| spotted gar | NA | 0.6 | golden shiner | 0.9 | NA |
| gaftopsail catfish | 0.9 | 0.3 | yellowtail | 0.8 | NA |
| black sea bass | 0.8 | NA | spot | 0.6 | NA |
| bluegill | 0.4 | 0.3 | gar | 0.5 | NA |
| redbreast sunfish | 0.4 | 0.3 | southern flounder | 0.2 | 0.1 |
| stingray spp. | 1.3 | 0.3 | black drum | NA | 0.1 |
| | | | redfin pickerel | 0.2 | T |
| | | | common carp | 0.8 | T |
| | | | spotted sunfish | NA ^b | T |

Source: Schmitt 1989.

^aPercentages are based on unexpanded creel data.

^bThese species were not included in "others" category for this survey, but were expanded as single species.

Trace (T) = less than 0.05%.

NA = not any.

March 1990 to provide comparative data and evaluation bases for regulatory changes in the harvest of striped bass (Schmitt 1990). The survey was repeated in 1992 and 1993-1994. Table 3-29 and Table 3-30 summarize the studies. Silver perch, spotted seatrout, and channel catfish were the dominant fish harvested from the Savannah River in 1989-1990; white catfish, spotted seatrout, red drum, and silver perch were the dominant fish harvested in 1992-1993.

SRS Impact to Savannah River Fisheries

Historically, SRS impacts to the populations of commercially and recreationally important fish species in the river were primarily from impingement and entrainment during the intake of cooling water. The overall rates of impingement at the SRS intakes were low relative to other cooling water intake facilities in the southeastern region, and impingement losses were concentrated among species of low commercial or recreational value (DOE 1988). Cessation of reactor operation and the concomitant lack of need for large cooling-water withdrawals from the Savannah River reduced impacts substantially.

Table 3-29. Savannah River Roving Creel Survey, Catch, and Harvest Estimates, October 8, 1989-March 10, 1990

| Fish Harvested | | | | | | | | | | | | | |
|-------------------|--------|--------|------------|-------|--------|-----------------|---------|-------------|-----------------|---------|----------------------------------|-------|-------|
| Total Catch | | | Catch Rate | | Number | | | Weight (kg) | | | Harvest rate ^c | | |
| Species | No. | kg | No/hr | kg/hr | Total | SE ^a | Percent | Total | SE ^a | Percent | Average Weight (kg) ^b | No/hr | kg/hr |
| 1989-1990 | | | | | | | | | | | | | |
| striped bass | 379 | 87.0 | T | T | 24 | 25 | 0.4 | 5 | 6 | 0.2 | 0.23 | 0.01 | T |
| spotted seatrout | 1,844 | 830.2 | 0.16 | 0.07 | 1,649 | 1,326 | 25.1 | 743 | 597 | 28.4 | 0.45 | 0.55 | 0.25 |
| flounder | 7 | 0.9 | T | T | 7 | 6 | 0.1 | 1 | 1 | T | 0.12 | T | T |
| silver perch | 1,735 | 111.9 | 0.16 | 0.01 | 1,667 | 871 | 25.4 | 108 | 55 | 4.1 | 0.06 | 0.55 | 0.04 |
| red drum | 946 | 700.3 | 0.09 | 0.06 | 905 | 554 | 13.8 | 670 | 452 | 25.6 | 0.74 | 0.30 | 0.22 |
| croaker/spot | 59 | 7.0 | T | T | 27 | 20 | 0.4 | 3 | 2 | 0.1 | 0.12 | 0.01 | T |
| white catfish | 161 | 135.7 | 0.02 | 0.01 | 161 | 56 | 2.5 | 136 | 46 | 5.2 | 0.84 | 0.05 | 0.04 |
| channel catfish | 1,621 | 792.0 | 0.15 | 0.07 | 1,576 | 562 | 24.0 | 770 | 405 | 29.5 | 0.49 | 0.52 | 0.25 |
| redbreast sunfish | 27 | 3.2 | T | T | 27 | 20 | 0.4 | 3 | 2 | 0.1 | 0.12 | 0.01 | T |
| others | 605 | 201.6 | 0.05 | 0.02 | 528 | 219 | 8.0 | 176 | 76 | 6.7 | 0.33 | 0.17 | 0.06 |
| totals | 7,384 | 2869.8 | 0.63 | 0.25 | 6,571 | 3,161 | 100.0 | 2,615 | 1,285 | 100.0 | 0.40 | 2.17 | 0.86 |
| 1992-1993 | | | | | | | | | | | | | |
| striped bass | 1,370 | d | 0.106 | 0.092 | 319 | e | 2.9 | 133 | e | 2.2 | 0.42 | 0.11 | 0.04 |
| black crappie | 58 | | 0.004 | 0.001 | 58 | | 0.5 | 11 | | 0.2 | 0.19 | 0.02 | 0.00 |
| channel catfish | 964 | | 0.075 | 0.007 | 471 | | 4.3 | 500 | | 8.3 | 1.06 | 0.16 | 0.17 |
| white catfish | 3,675 | | 0.284 | 0.170 | 3,094 | | 28.4 | 1,621 | | 26.9 | 0.52 | 1.02 | 0.54 |
| croaker/spot | 81 | | 0.006 | 0.003 | 43 | | 0.4 | 3 | | 0.0 | 0.07 | 0.01 | 0.00 |
| black drum | 468 | | 0.036 | 0.025 | 468 | | 4.3 | 319 | | 5.3 | 0.68 | 0.15 | 0.11 |
| red drum | 2,696 | | 0.209 | 0.179 | 1,955 | | 17.9 | 1,576 | | 26.1 | 0.81 | 0.65 | 0.52 |
| spotted sea trout | 3,430 | | 0.266 | 0.160 | 3,039 | | 27.9 | 1,680 | | 27.9 | 0.55 | 1.00 | 0.56 |
| silver perch | 1,408 | | 0.109 | 0.028 | 1,132 | | 10.4 | 92 | | 1.5 | 0.08 | 0.37 | 0.03 |
| others | 622 | | 0.048 | 0.031 | 314 | | 2.9 | 92 | | 1.5 | 0.29 | 0.10 | 0.03 |
| totals | 14,811 | | 1.147 | 0.770 | 10,893 | | 100.0 | 6,027 | | 100.0 | 0.55 | 3.60 | 1.99 |

Source: Schmitt 1989; Barrett 1997.

^aApproximate standard errors.

^bKilograms; to convert to pounds, multiply by 2.205.

^c1989-1990 rates based on estimated total fishing effort of 10,375 hours; 1992-1993 rates based on estimated total fishing effort of 12,918 hours.

^dWeights not provided.

^eNo standard error provided.

T (trace) = values less than 0.05 percent, 0.005 No./h, 0.005 kg/h, 0.005 No./ha, or 0.005 kg/ha.

Table 3-30. Savannah River Roving Creel Fished-For Estimates, October 8, 1989-March 10, 1990

| Species | Fished-for Effort | | Fished-for Success | | Percent of fished-for total harv. | Percent of species' total harv. | Average weight (kg) |
|-------------------|-------------------|--------------|--------------------|--------------|---|---------------------------------------|------------------------|
| | Hours | % Total | No. | kg | | | |
| striped bass | 316 | 8.7 | 0 | 0.0 | 0.0 | 0.0 | NA |
| spotted seatrout | 2,286 | 62.8 | 1,178 | 505.5 | 98.8 | 71.4 | 0.43 |
| red drum | 421 | 11.6 | 3 | 12.7 | 0.3 | 0.3 | 4.23 |
| croaker/spot | 0 | 0.0 | 0 | 0.0 | 0.0 | 0.0 | NA |
| white catfish | 0 | 0.0 | 0 | 0.0 | 0.0 | 0.0 | NA |
| channel catfish | 99 | 2.7 | 3 | 1.0 | 0.3 | 0.2 | 0.33 |
| flounder | 0 | 0.0 | 0 | 0.0 | 0.0 | 0.0 | NA |
| silver perch | 0 | 0.0 | 0 | 0.0 | 0.0 | 0.0 | NA |
| redbreast sunfish | 0 | 0.0 | 0 | 0.0 | 0.0 | 0.0 | NA |
| others | 516 | 14.2 | 7 | 7.2 | 0.6 | 1.3 | 1.03 |
| totals | 3,638 | 100.0 | 1,191 | 526.4 | 100.0 | 18.1 | 0.44 |

Source: Schmitt 1990.

NA = not any.

^aKilograms; to convert to pounds, multiply by 2.205.**Table 3-31.** Common and Scientific Names of Fishes^a

| Common Name | Scientific Name |
|--------------------|--------------------------------|
| American eel | <i>Anguilla rostrata</i> |
| American shad | <i>Alosa sapidissima</i> |
| Atlantic sturgeon | <i>Acipenser oxyrinchus</i> |
| black crappie | <i>Pomoxis nigromaculatus</i> |
| black drum | <i>Pogonias cromis</i> |
| bluefish | <i>Pomatomus saltatrix</i> |
| bluegill | <i>Lepomis macrochirus</i> |
| bowfish | <i>Amia calva</i> |
| chain pickerel | <i>Esox niger</i> |
| channel catfish | <i>Ictalurus punctatus</i> |
| common carp | <i>Cyprinus carpio</i> |
| crevalle jack | <i>Caranx hippos</i> |
| croaker/spot | <i>Leiostomus xanthurus</i> |
| flier | <i>Centrarchus macropterus</i> |
| gaftopsail catfish | <i>Bagre marinus</i> |
| golden shiner | <i>Notemigonus crysoleucas</i> |
| hardhead catfish | <i>Arius felis</i> |
| hickory shad | <i>Alosa mediocris</i> |
| kingfish | <i>Genyonemus lineatus</i> |
| largemouth bass | <i>Micropterus salmoides</i> |
| pinfish | <i>Lagodon rhomboides</i> |
| redbreast sunfish | <i>Lepomis auritus</i> |
| red drum | <i>Sciaenops ocellatus</i> |
| redear sunfish | <i>Lepomis microlophus</i> |

Table 3-31. (cont)

| Common Name | Scientific Name |
|---------------------------|------------------------------------|
| redfin pickerel | <i>Esox americanus</i> |
| sheepshead | <i>Archosargus probatocephalus</i> |
| silver perch | <i>Bairdiella chrysoura</i> |
| southern flounder | <i>Paralichthys lethostigma</i> |
| spotted gar | <i>Lepisosteus oculatus</i> |
| spotted sea trout | <i>Cynoscion nebulosus</i> |
| spotted sunfish | <i>Lepomis punctatus</i> |
| striped bass | <i>Morone saxatilis</i> |
| striped mullet | <i>Mugil cephalus</i> |
| striped/white bass hybrid | <i>Morone spp.</i> |
| toadfish | <i>Opsanus spp.</i> |
| warmouth | <i>Lepomis gulosus</i> |
| white catfish | <i>Ameiurus catus</i> |
| yellow perch | <i>Perca flavescens</i> |
| yellowtail | <i>Seriola lalandi</i> |

^a Nomenclature from Robins et al. 1991.

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