

MASTER PLAN



GEORGIA
and
SOUTH CAROLINA



SAVANNAH NATIONAL WILDLIFE REFUGE



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MASTER PLAN

UNITED STATES DEPARTMENT OF INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE



PREFACE

This plan embodies a concise presentation of objectives, broad management guidelines, and development proposals sufficient to assure a systematic operation of the Savannah National Wildlife Refuge both as a major sanctuary for waterfowl and as an area for public enjoyment of the fish and wildlife and natural resources.

The principal wildlife management objectives are the protection of waterfowl and the preservation and improvement of breeding, migration, and wintering habitat. Management and development of the marsh and pool areas are directed toward provision of habitat capable of supporting peak populations of 100,000 ducks and six million or more days of use by waterfowl annually.

U. S. Highway 17, a major north-south thoroughfare, traverses the refuge, offering large numbers of people opportunities for seasonal observation of waterfowl and other migratory birds utilizing improved and natural habitat. Planned public use facilities include a visitor center, picnic area, and provisions for fishing, waterfowl hunting, and scenic drives along the pool areas where—in addition to migratory birds—alligators and other wildlife reside.

Establishment of the refuge on April 6, 1927 and subsequent additions through purchases, transfers, and land exchange for spoilage rights have secured the preservation of 13,136 acres of wetlands designated as a wintering ground and sanctuary for waterfowl, other migratory birds, and indigenous wildlife species.

The total acquisition cost over the years has amounted to \$47,173, including \$12,000 furnished from Duck Stamp funds. Thus far, estimated development costs on Savannah approximate \$225,000, and additional planned developments amount to \$2,399,000.

Savannah National Wildlife Refuge is administered under the authorities of the Migratory Bird Treaty Act, Migratory Bird Conservation Act, and Migratory Bird Hunting Stamp Act.



SURVEILLANCE. The anhinga, commonly called water turkey or snake bird, is one among many species of water and wading birds that are present year-round on Savannah National Wildlife Refuge.

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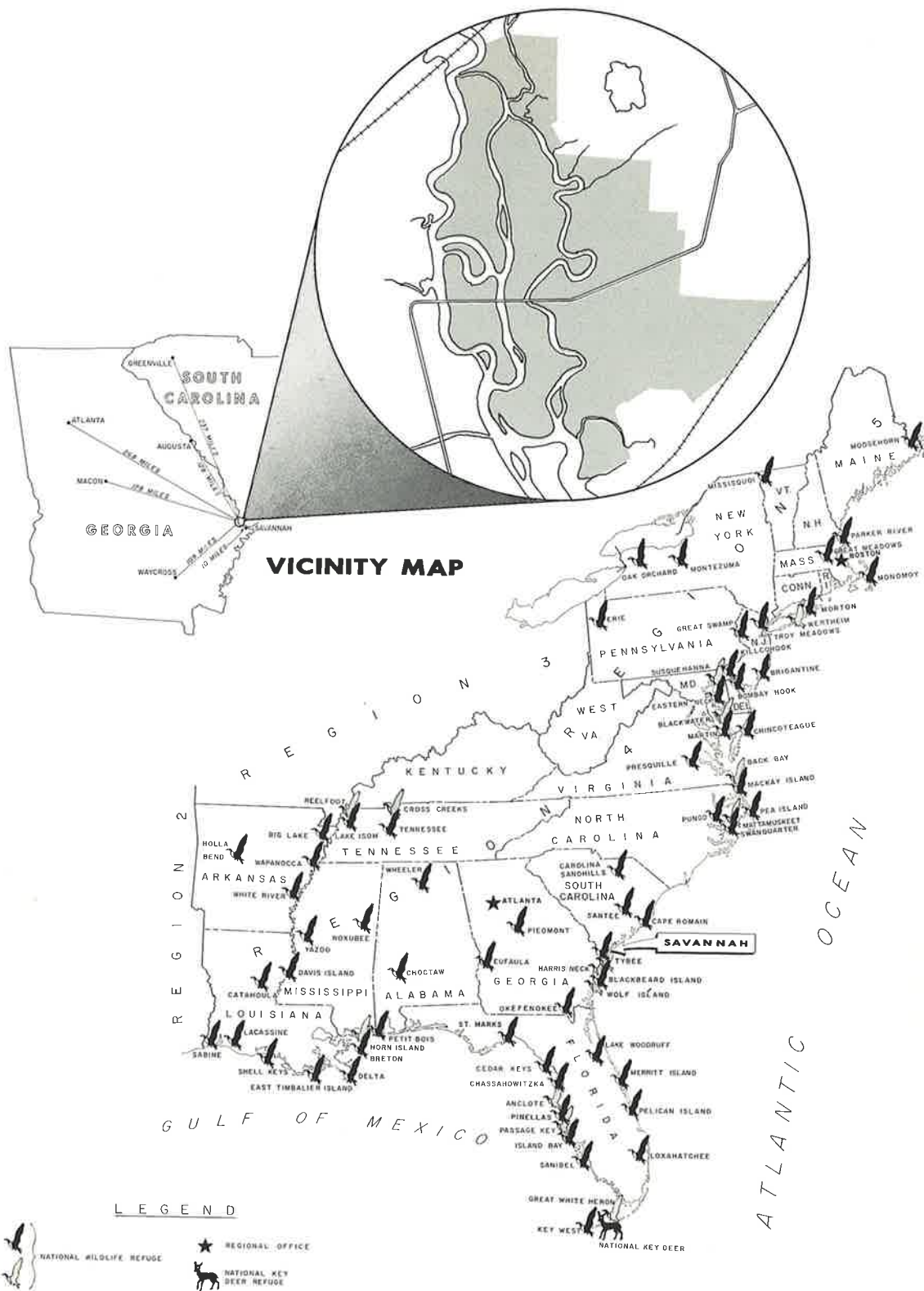
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NATIONAL WILDLIFE REFUGES IN REGIONS 4 AND 5

CHAPTER 1

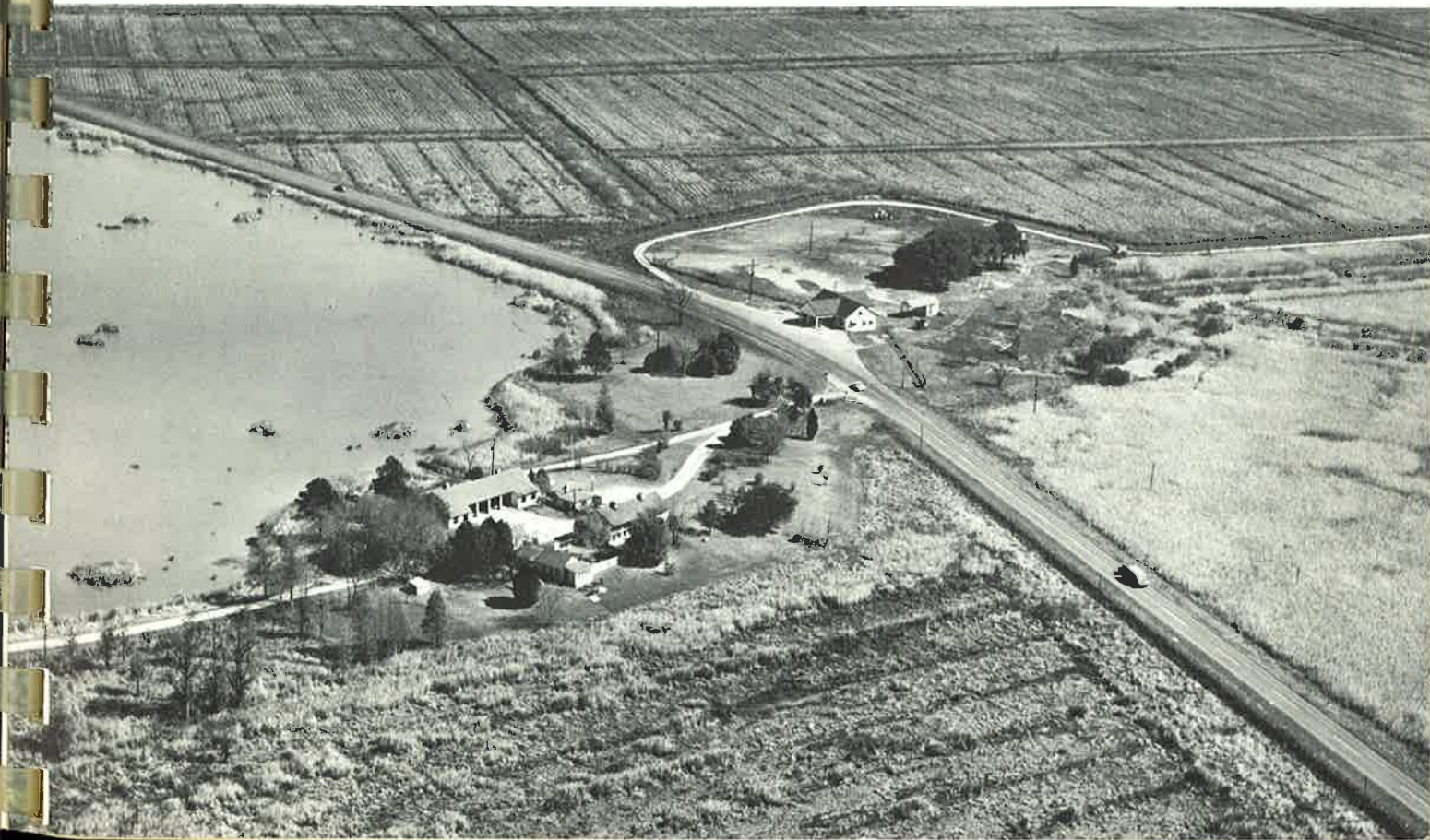
THE REFUGE

GEOGRAPHY

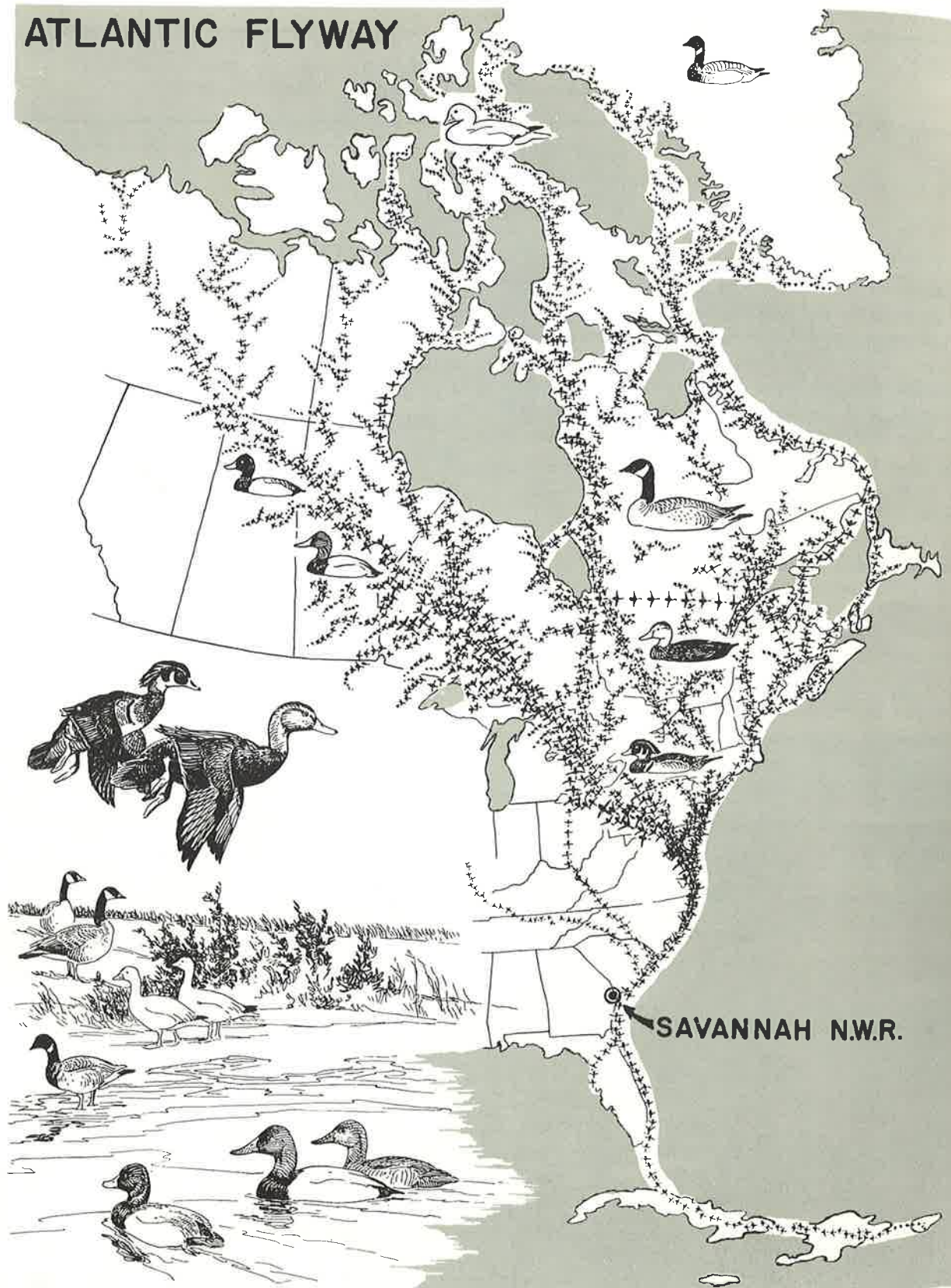
The Savannah National Wildlife Refuge, located a few miles north of the historic city of Savannah and approximately 20 miles up-river from the Atlantic Coast, lies astride the lower Savannah River with its area about equally divided between Chatham County, Georgia and Jasper County, South Carolina. During the greater part of the 19th Century, the area now the refuge was rice plantations of no small consequence, and remnants of by-gone days are nostalgic reminders still in existence. Deteriorated rice levees constructed by slave labor, foundations of slave

quarters, old rice mill sites, and small graveyards are inconspicuous evidences on several sites. Since the "great storm of 1893" which caused irreparable damage to many dikes, water-controls, and other rice culture facilities along the Georgia and South Carolina Coasts, interest in rice production has been spasmodic. Most of the old rice fields in the general area either have reverted to tidal marshes or have been converted to grazing lands. These changes have radically and adversely affected the waterfowl habitat.

REFUGE HEADQUARTERS BEFORE RENOVATION. The new office site lies between the entrance road and the pool area while the new residences will surround the oaks across Highway 17. The visitor center will occupy the area near the existing service building in the foreground. Extending off the photo to the left is the site for maintenance and storage buildings.

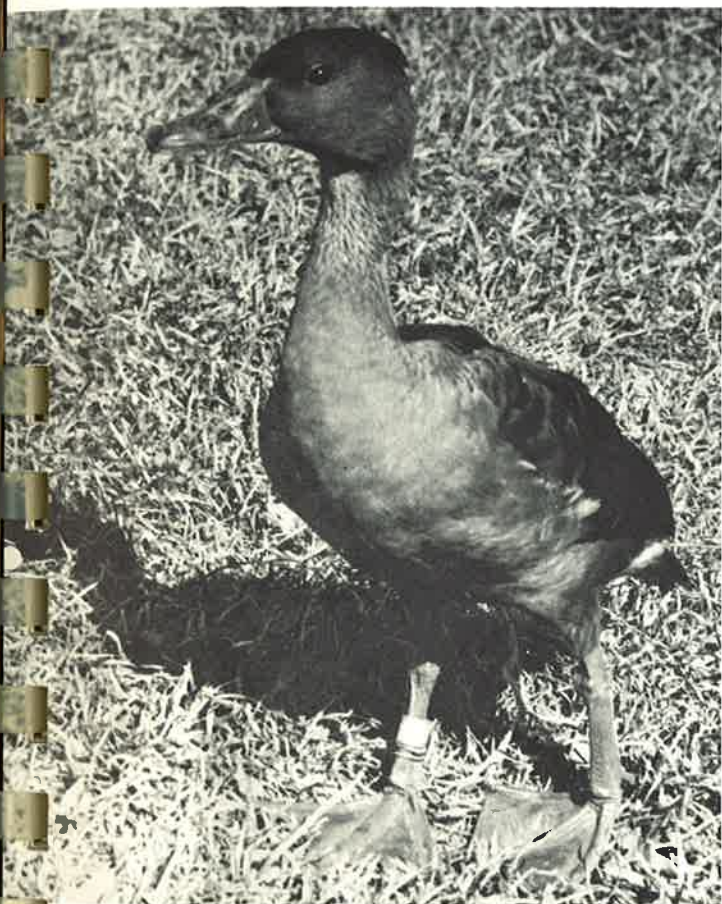
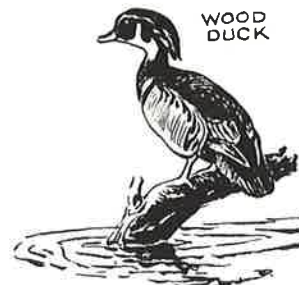


ATLANTIC FLYWAY



SAVANNAH'S PLACE IN THE FLYWAY

As southern traditions of the Savannah area are well established in American history, so is the refuge's position as an important Atlantic Flyway waterfowl winter-ground. The salt marshes, estuarine waters, and timbered swamps adjacent to the refuge attract numerous waterfowl each winter, but these areas are much less productive than the intensively managed refuge lands. The refuge provides food and sanctuary for winter migrants, including mallards, green-winged teal, pintails, ring-necks, wood ducks, blacks,



SOUTHERN ITINERANT. Although fulvous tree ducks normally breed and winter farther south or west than Georgia, small numbers often visit the Savannah Refuge.

gadwalls, and other species in smaller numbers. Coots and Florida gallinules are abundant while geese occur only occasionally and in small numbers. Wood ducks, king rails, and Florida and purple gallinules are common nesters.

Mallards, pintails, and green-winged teal that winter on the refuge come from the Prairie Provinces of Canada and migrate down the upper Mississippi Valley before crossing into the Atlantic Flyway. Possibly many of these birds pause for food and rest on National Wildlife Refuges in Tennessee, Alabama, and Georgia.

Other waterfowl species, particularly black ducks and wood ducks, normally originate in eastern Canada and northeastern United States. They then migrate down the Atlantic Seaboard where some of the more important Federal refuges are Blackwater, Back Bay, Mattamuskeet, Cape Romain, Carolina Sandhills, and Santee.

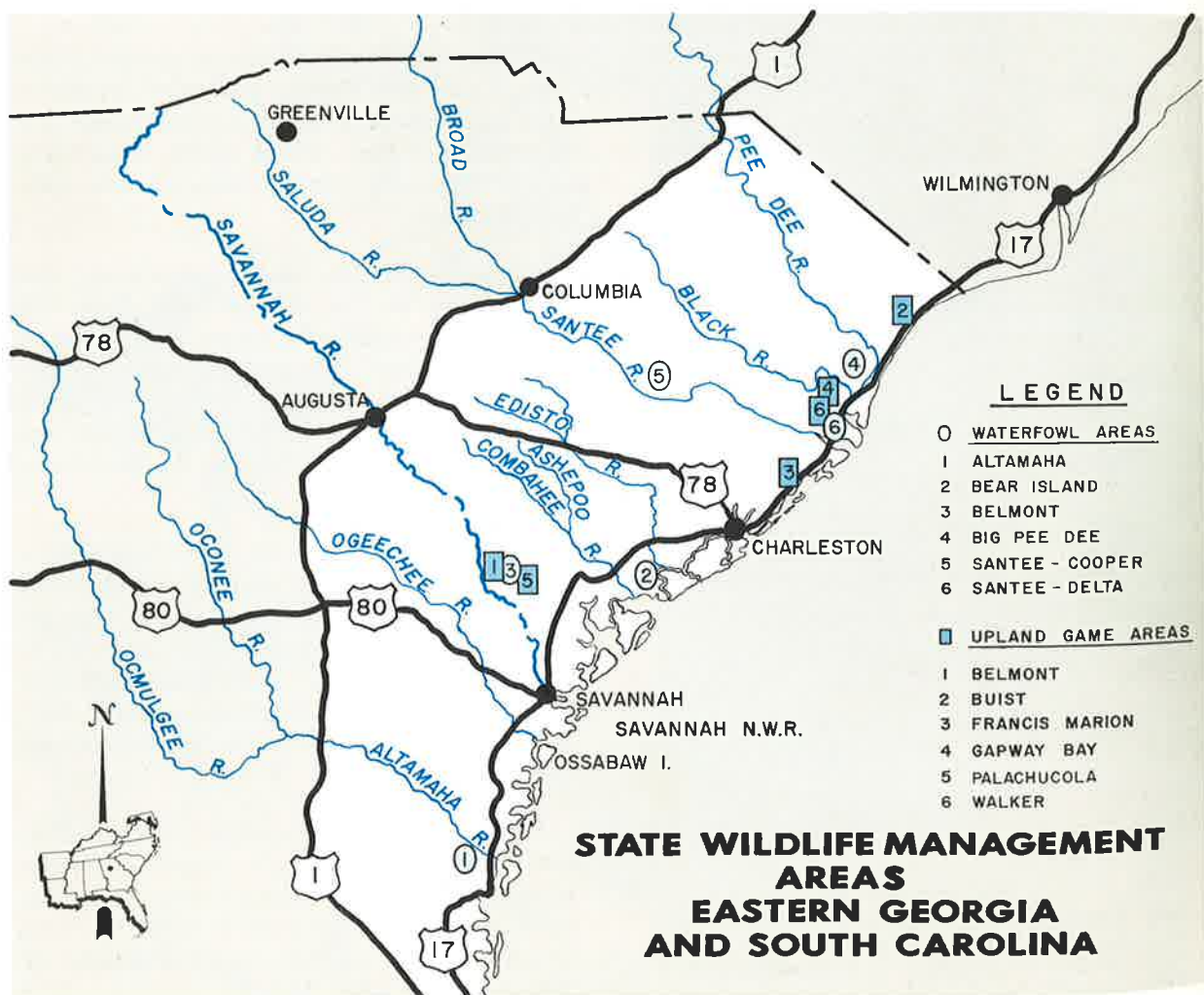
Savannah and its satellite refuges—Harris Neck and Blackbeard Island—are the terminus for fairly large numbers of waterfowl, while others migrate to more southern areas and such refuges as Okefenokee, St. Marks, and Loxahatchee.

STATE AND PRIVATE WATERFOWL AREAS

The thousands of unmanaged acres of marsh, swamp, and estuarine waters in coastal Georgia and South Carolina receive only light use by waterfowl. It is to the managed habitat areas along the coast where concentrations of dabbling ducks and certain species of diving ducks migrate during the fall, winter, and spring months. These managed areas are found on Federal and State refuges and on hunting clubs and private estates.

In Georgia, the State Game and Fish Com-

mission has developed the Altamaha Waterfowl Management Area, a Pittman-Robertson project—65 air miles south of the Savannah Refuge—comprising large acreages of both salt water and fresh water marshes. To the north in South Carolina, the State Wildlife Resources Department manages the Bear Island, Santee-Cooper, Santee Delta, and Big Pee Dee Waterfowl Areas, projects in various stages of development. In addition to waterfowl projects, South Carolina manages for public hunting a number of upland and big game areas.





BEAR ISLAND WATERFOWL MANAGEMENT AREA.
Saltmarsh bulrush, an excellent habitat for wild ducks,
occupies thousands of acres in the South Carolina marshes.

Those small portions of the Georgia coastal marshlands developed or managed by private interests for waterfowl shooting are limited to a few duck hunting clubs and privately-owned estates along the Savannah and Ogeechee Rivers and on Ossabaw and other smaller offshore islands. South Carolina—to the contrary—boasts numerous large privately-owned areas developed and managed for waterfowl hunting. The Combahee, Edisto, and Ashepoo Rivers, approximately 50 miles northeast of the refuge, claim some of the best natural marshes along the coast where a dozen or more privately-owned areas are developed and managed for waterfowl hunting. Still farther north, approximately 130 miles from Savannah Refuge near the mouth of the Santee River, the Santee Gun

Club operates one of the larger waterfowl projects along the coast, and nearby local residents own and manage two other equally well-developed waterfowl areas. Owners of private waterfowl developments in both Georgia and South Carolina restrict hunting on their areas primarily to club members, family groups, and friends. However, a relatively small number of areas are open to public hunting on a fee basis.

The degree of interchange between Savannah birds and those of nearby State and private waterfowl areas is difficult to ascertain, but interchanges do occur and consequently contribute to waterfowl hunting opportunities.

THE NATURAL FACTORS

Topography

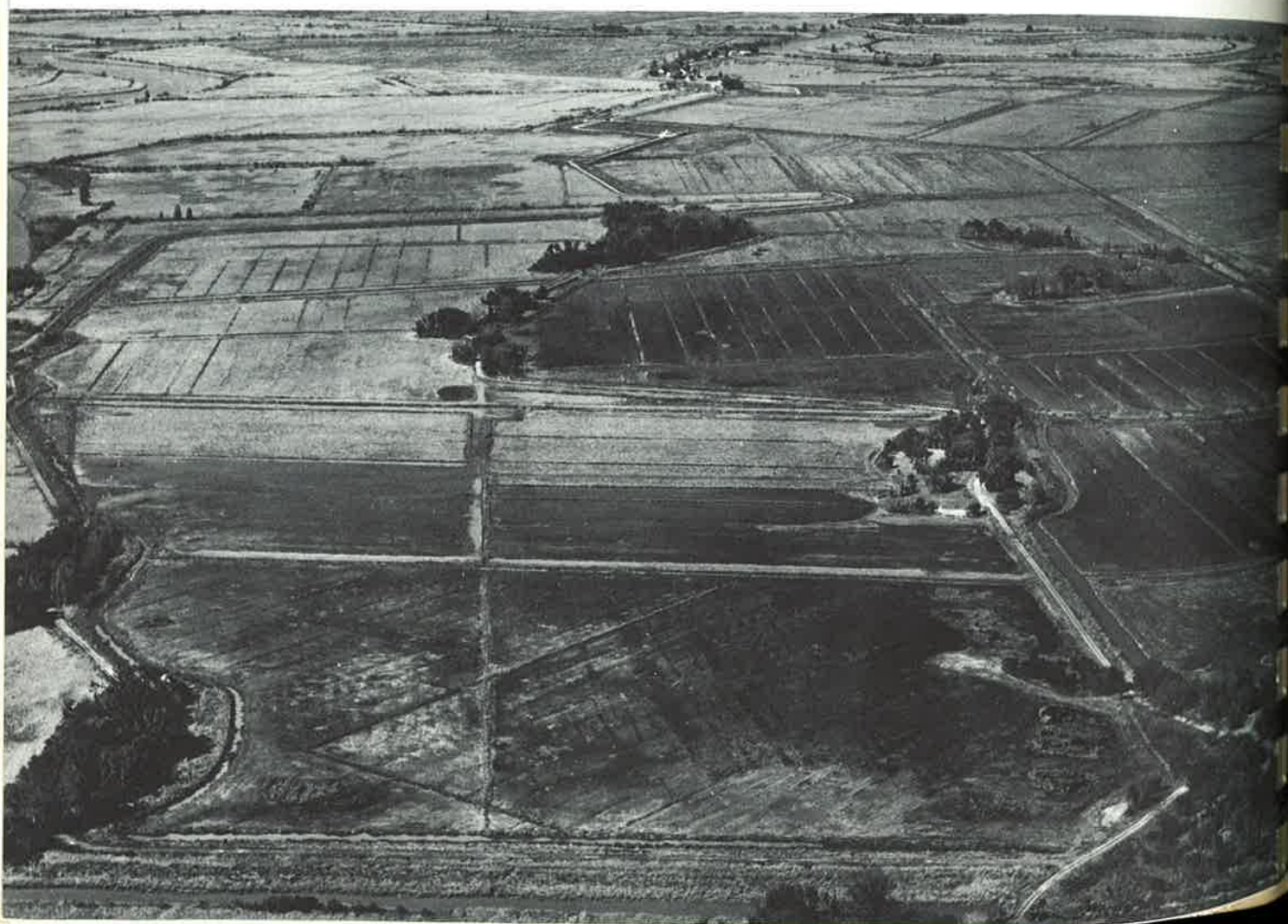
The refuge, lying within the Savannah River Delta, composes a rather low, flat topography with several small wooded islands that peer a few feet above the general terrain.

The surface water on the refuge marshes drains through tidal streams and canals leading into the Savannah River Channel which flows southeastward to the Atlantic Ocean. As a result of ocean tides, the river waters rise and fall approximately seven and one-half feet twice daily, thus covering the

refuge's open marshes and wooded swamps for several hours and furnishing a generous water supply for impoundments and managed marshes.

Land elevations generally range from two to four feet below these normal high water levels, leaving only the islands and certain fringe areas rising above the high tides. Most of the lowest marshes exist east of the Savannah Back River in South Carolina and now are developed into impoundments of various sizes, while the slightly higher marshes lie to the west and remain in their natural state.

SAVANNAH FROM THE COCKPIT. Refuge headquarters lies in the extreme background, and wooded islands and remnants of old rice levees exist throughout the terrain.





SOIL PROFILE. Most refuge soils consist of a top layer of partly decomposed organic matter over heavier materials of clay, loam, or sand with subsoils of peat, sand, or clay.

Geology and Soils

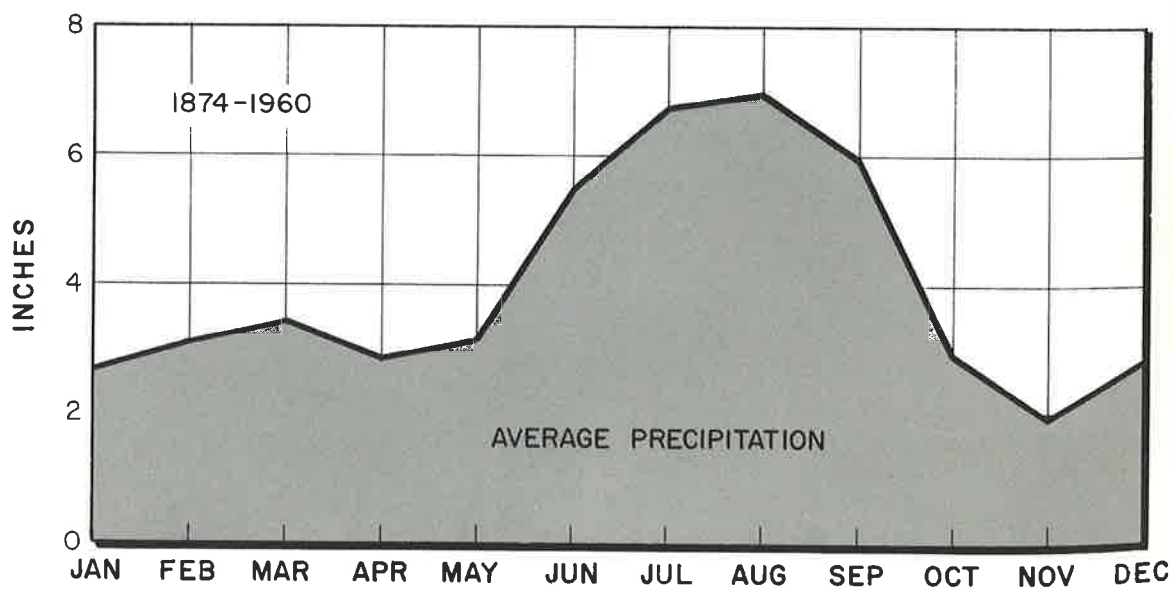
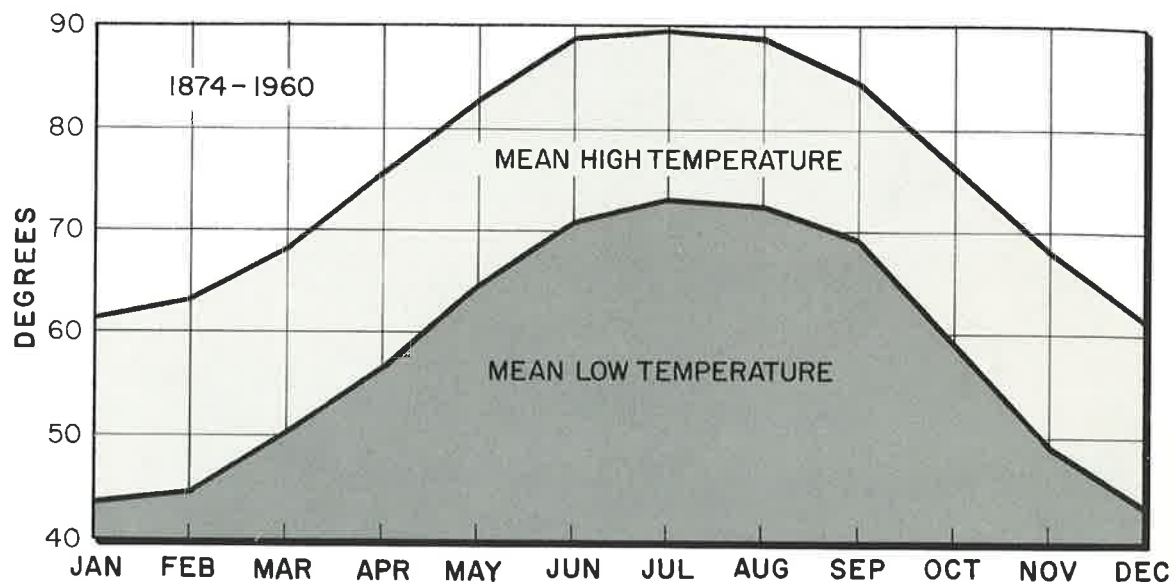
The Savannah Refuge lies wholly within the Atlantic Coastal Plains where the soil-forming materials represent marine deposits of the Pleistocene period and stream deposits more recently bestowed. The Savannah River continues to lay down upon its flood plain—which encompasses the refuge—estuarine deposits brought from the Appalachian and Piedmont provinces each time the current is checked by the incoming tide. These deposits represent freshwater material and hold a position intermediate between the ordinary first-bottom soils and tidal-marsh

deposits nearer the ocean. Refuge soils vary from clay or clay loam to sand or to peat, and may occur in widespread combinations. The surface soils consist of sand, clay, or partly decomposed organic matter and range from six inches to two feet or more in depth. Subsoil materials of heavy clay, sand, or peat may overlay other sands or clays at depths up to 84 inches, while peat seldom reaches such depth. Refuge soils drain slowly since the marshes are almost level and subsurface waters saturate the subsoils. The soil acidity is high, particularly where a portion of marsh is diked and maintained in a dry condition.

Climate

Savannah's annual growing season averages 273 days although heavy spring frost may occur so late as mid-April and autumn frost so early as October 25. The winters are normally mild and often escape severe freezes; however, extreme temperatures have dropped to 8 degrees in winter and have

climbed to 105 degrees in summer. Thunder-showers prevail during the summer months, normally producing approximately one-half of the 46 inch annual rainfall. Severe tropical storms affect the Savannah area about once every ten years, but minor storms occur almost every year.



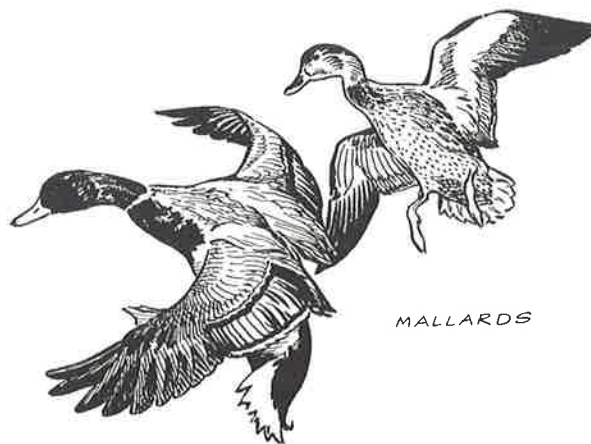
CHAPTER 2

MANAGEMENT OBJECTIVES

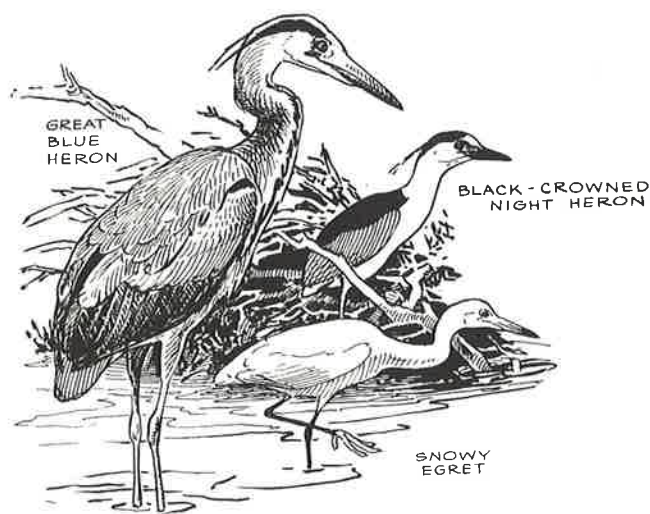
WILDLIFE RESOURCES

Savannah primarily is dedicated to a management that will benefit the waterfowl resource. However, white-tailed deer are popular refuge inhabitants that can be seen often from the impoundment dikes, and alligators are much in evidence during the mild spring, summer, and fall months.

The refuge provides a sanctuary and winter feeding ground for large numbers of migratory waterfowl as well as a year-round home for other birds and wildlife. Herons and egrets are well represented among the various birds that are present during all seasons, and the gaudy purple gallinule is



MALLARDS



GREAT
BLUE
HERON

BLACK-CROWNED
NIGHT HERON

SNOWY
EGRET

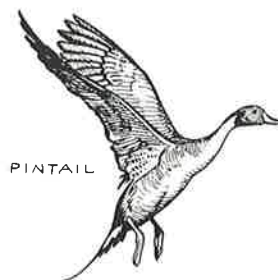
one of the most conspicuous birds during the summer months. The refuge's bird list includes well over 200 species.

The fishery resource attracts many sportsmen to Savannah each summer to catch such fishes as bream, bluegill, crappie, bass, and catfish in the several refuge impoundments and canals, while rockfish and redbreast are caught in the Back, Middle, and Front Rivers.

The irreparable loss of natural marshes and other wildlife habitat along the East Coast to industrial, agricultural, and recreational uses necessitates that public lands assume enlarged future roles in the provision of food, cover, and sanctuary for wildlife inhabitants of wetlands. The Savannah Refuge will assist in meeting this challenge.

Ducks

Although mallards appear in larger numbers than other waterfowl during the wintering season, a dozen species of ducks often can be seen at one time in a Savannah impoundment. Mallards, pintails, green-winged teal, ring-necks, and wood ducks account for 70 percent of the waterfowl use on the refuge. Black ducks, baldpates, gadwalls, shovelers, blue-winged teal, and others in that general order aggregate the remaining 30 percent. Refuge objectives do not change this ratio of use to any appreciable degree. Savannah's goals call for peak populations of 100,000 ducks of the several species and a total of 6,000,000 days of use annually.



Wood ducks are present during the entire year, and they nest on the refuge in fair numbers. The establishment of a nesting flock of semi-domestic mallards indicates that breeding populations of this species and possibly others may be achieved with success. Production objectives entail maintaining 200 to 400 pairs of resident wood ducks and promoting nesting populations of mallards and other species.

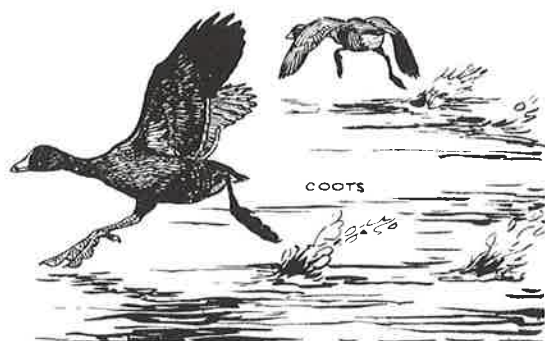
FREE OF THE FOWLER. Mallards account for slightly more than thirty percent of the waterfowl use on Savannah Refuge.



Coots and Gallinules

Coots and gallinules are common sights on Savannah during the winter months, subjecting about 255,000 days of use annually on the refuge. Both purple and common gallinules nest in the pool areas and produce approximately 400 young per season.

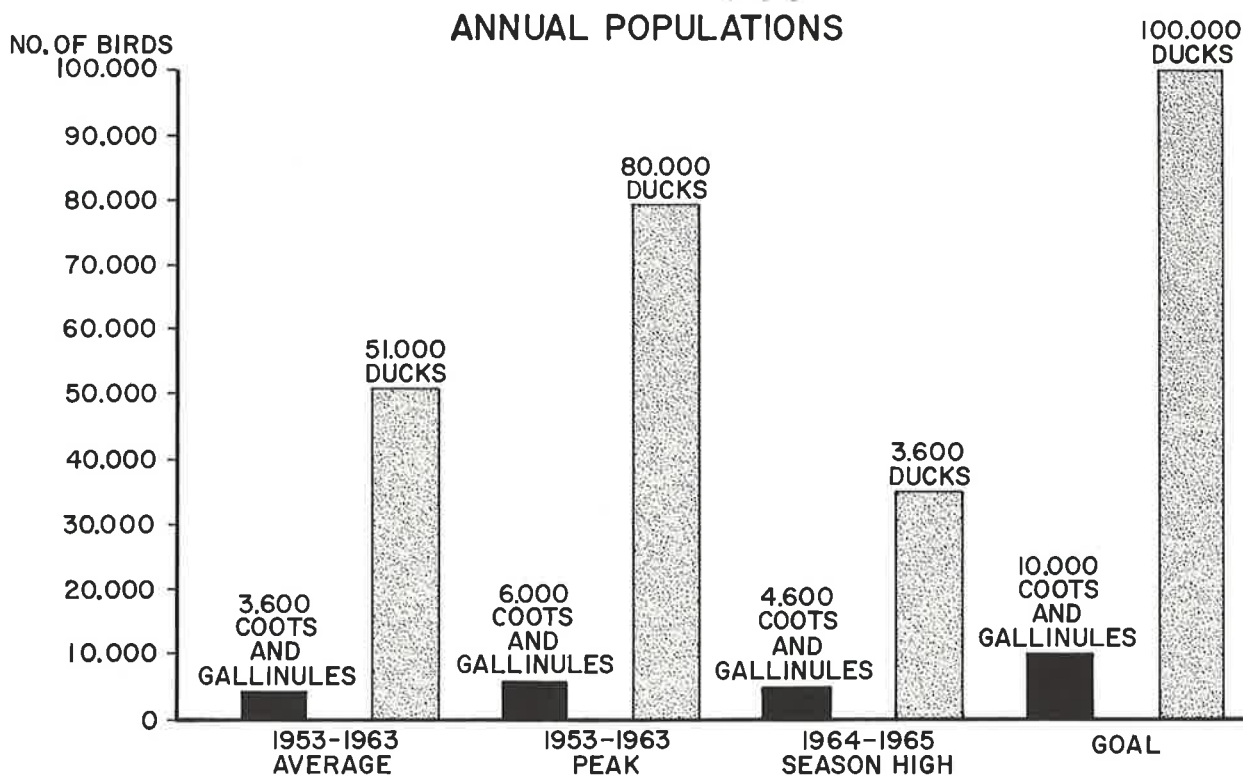
The refuge pools, although managed primarily for ducks, will provide adequate habitat for the anticipated populations of 10,000 or more coots and gallinules during their peak concentrations.



Geese

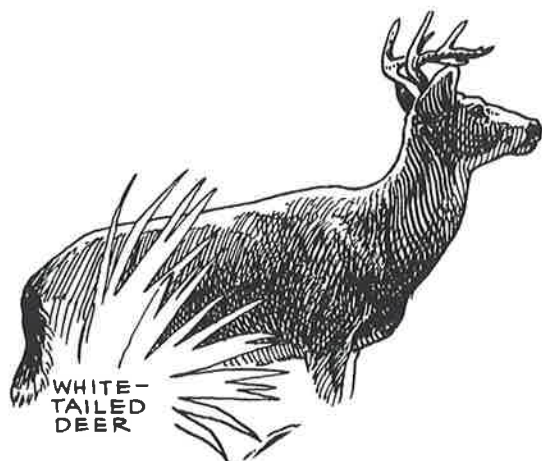
Canadas, blues, and snows in moderate numbers pass over the Savannah area during their migration southward as well as on their return trip; but only a few pause to rest, feed, or winter on the refuge. In recent years populations have not exceeded 2,000 days of annual use.

The refuge possesses habitat undeveloped for Canada geese, and past efforts to establish a wintering flock have been unsuccessful. Since Harris Neck National Wildlife Refuge—with its great potential for excellent Canada goose habitat—is of close propinquity to Savannah, the refuge objectives aim toward management practices that will render conditions conducive only to short stays by the various species of geese.



Migratory Birds (Other Than Waterfowl)

Many species of marsh and water birds inhabit the pools and marshes and render additional beauty to the refuge. Grebes, cormorants, anhingas, herons, egrets, bitterns, ibises, rails, snipes, sandpipers, gulls, and terns find contentment in the refuge's impoundments and natural marsh areas. Several kinds of herons and egrets and the pied-billed grebe, least bittern, and king rail are frequent nesters either on or near the refuge. Mourning doves nest on Savannah in relatively small numbers, and several thousand congregate on the refuge during fall and winter months. The refuge will attain another of its objectives by provision of suitable habitat for these numerous forms of bird life.



Upland Game Birds and Animals

With refuge management directed toward the improvement of habitat for migratory birds, marsh rabbits and bob-white quails will receive limited benefits. Numerous marsh rabbits and a small number of bob-whites reside along impoundment levees and on wooded uplands. As in the past, populations of 1,000 rabbits and 100 bob-whites are expected to enjoy the refuge.



Big Game

Often the white-tailed deer can be observed on the refuge as he scampers along the levees and through the marshes. Limited deer habitat on the refuge and the public hunting on nearby private lands influence adversely a large deer population. The management goal is to maintain for aesthetic values the existing size herd of about one hundred animals.



Alligators

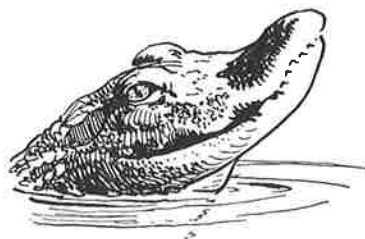
The alligator, now on the list of endangered species, finds protection and favorable habitat conditions on Savannah National Wildlife Refuge. Savannah is one of the few remaining areas in the southeastern States that hold a sizable population of these semi-tropical animals.

An estimated 600 alligators reside in the refuge impoundments, and another 200 sojourn the tidal marshes. These interesting animals are picturesquely conspicuous as they move about in the canals, borrow-pits, and other water areas. The alligator population has not fluctuated appreciably during the past few years; however, the number of large alligators consistently is increasing. Since alligators at Savannah provide aesthetic worth, the refuge will employ the precautionary measures necessary to retain an adequate population of the large individuals to frequent water areas along nature drives and certain other lands receiving public use.

While exercising management practices for the continuation of the resource, the future harvesting program stipulates annual removal of a small percentage of the population to restock other areas and enhance local economy through cooperative trapping.



RACCOON



ALLIGATOR

Furbearers

Playful otter in relatively small numbers reside on the refuge wherever they find a suitable environment. Numbers ranging from 100 to 150 should continue to find sanctum in the refuge's canals and streams.



OTTER

Raccoons are overly abundant on Savannah and seriously compete with waterfowl for food, particularly the agronomic crops. They are predacious in nature and devour the eggs of nesting wood ducks and other waterfowl and birds. Bobcats, foxes, and opossums are predators of more popular wildlife and—like the raccoon—will require control measures so as not to interfere with the attainment of other refuge objectives.

LAND USE

As swelling human populations exert their multiple influences upon the remaining wetland resources in the United States, the responsibilities of National Wildlife Refuges expand proportionately. Essential phases of refuge operations include the following: protection and provision of nesting, migration, and wintering habitats for waterfowl and other migratory birds through proper utilization of the land and water resources; protection and enhancement of habitat for indigenous wildlife; and provision of facilities for public use compatible with wildlife objectives. Savannah's place in the National

Wildlife Refuge Program is an extremely important one, as evidenced by past waterfowl usage on its more than 13,000 acres of wetland habitat. Diligent management and additional development on Savannah are essential if future waterfowl needs and other refuge obligations are to be met along the southern part of the Atlantic Flyway. The attainment of Savannah Wildlife Management Objectives is dependent upon development and a diversity of management that will maximize food production while rendering a wide variety of habitat.

WOODLANDS WITHIN THE TIDES. Swampland hardwoods furnish habitat for deer and squirrels and nesting sites for wood ducks.



WILD RICE. Although predominately cutgrass, the refuge's natural marshes produce scattered stands of wild rice, smartweeds, spike rushes, and other waterfowl food plants.





CORN FOR THE WINTER. Cultivated crop production occupies one phase of pool management. Corn will be flooded with the coming of the waterfowl season.



AQUATICS. High water level management in the pool areas produces food for both diving and dabbling ducks and coots.

Natural Marshes

The Savannah River divides into three separate south-flowing channels near the north refuge boundary. A series of marshy islands blanketed daily by river tides stretches between these channels. Refuge marsh elevations range from several feet below normal high tide water levels in the sloughs, drains, pot-holes, and low marsh areas to only a few inches below such tides on the higher marshes.

These marshes, inundated daily by river tides flowing across deteriorated rice levees and through rather deep drainage ditches extending into the marsh areas, demonstrate

a uniqueness of nature that must be preserved. Certain areas required for intensive management to attain waterfowl population goals will be developed as impoundments, but the major portions will be retained and improved under natural conditions. Scattered stands of wild rice, smartweeds, spike rushes, and other natural waterfowl food plants thriving in the predominantly cutgrass marshes furnish favorite foods and cover for wood ducks, mallards, blacks, and other waterfowl species that visit or reside on the refuge. The growth of these desirable plants will be encouraged and improvement measures will be employed as new techniques are introduced.

SANCTUM. Savannah's tidal marshes provide food and seclusion for ducks and wading birds.





BENEATH THE FLYWAY. Waterfowl migrate to the intensively managed pool areas to feed during the fall and winter months.

Man-Made Impoundments

East of the natural marshes and across the Savannah Back River lie the major areas for intensive management and development. These areas are defined into a series of man-made impoundments containing approximately 2,750 acres. Three proposed pools on Onslow, Isla, and Argyle Islands will provide 750 additional acres for intensive management. Normal high tides offer a water supply sufficient to maintain approximately a four-foot average water depth in the impoundments east of Back River as well as desirable water depths in the East Marsh and approximately two-foot depths in the proposed pools. These intensively managed areas furnish the food and water for two-thirds or more of the refuge's wintering waterfowl population, receive a large share of wading birds use, and provide excellent habitat for young broods of wood ducks, coots, gallinules, rails, and other marsh nesting species.

The heavy demands placed on the pool areas necessitate a rotation of management

practices that includes high water levels for production of aquatics and pest plant control, drawdowns to mud-flat conditions for seeding or natural reproduction of moist-soil waterfowl food plants, and complete drainage for production of corn and other agronomic crops. Rotation of pool management provides a variety of habitat to benefit diving ducks, puddle ducks, and colonial birds. Natural food production by both full pool and drawdown management is favored over dry land or tillage type operations. However, in order to render balance and security to the food production program and to aid in pest plant control, planted crops will continue to be an integral part of pool management.

The 2,000 acre East Marsh normally is inundated with one to two feet of water, and management entails production of aquatic and moist-soil plants. Water controls and drainage sufficient to enable burning and other cultural practices are essential for proper management of this marsh unit.

Forest Lands

Before the advent of rice farming days during the 19th century, the refuge area was—for the most part—a large cypress swamp. Most of the land cleared for rice subsequently reverted to giant cutgrass marsh. Present timberlands consist only of scattered small islands surrounded by cutgrass marsh or refuge pools, fringe areas along the eastern boundary, and a fairly large acreage on the north end of the refuge. The forested islands, several ridges on the north end, and an area on the eastern point of the refuge are above normal high tides while the remaining forests merge into swamplands.

"Uplands" shelter deer and other wildlife during periods of high water, and the flooded swamps receive considerable use by mallards and wood ducks. Low-lying hardwoods furnish the refuge's major nesting habitat for wood ducks and pileated woodpeckers as well as the principal habitat for grey squirrels.



AT THE THRESHOLD. Pileated woodpeckers, wood ducks, squirrels, and other wildlife utilize tree cavities as nesting sites.



ASYLUM. Savannah's wooded islands provide safe grounds for deer and other wildlife during flood periods.

The forest resource is of small commercial value since the individually timbered areas are isolated, are relatively small, and have poor accessibility. Forest objectives entail maintenance of a forest type offering waterfowl and wildlife benefits and worthwhile aesthetic values and management practices that will assure healthy stands of a desirable composition governed by the various sites.

Many of the small islands formerly were house sites occupied during the rice plantation days. Transplanted trees, such as the chinaberry, the cherry laurel, and varnish tree, still thrive on these sites. Live oaks as well as the laurel and willow oaks and other southern hardwoods contribute beauty to the wooded islands. The north end of the refuge contains small ridges of slash pine in almost virgin stands while the eastern tip offers the loblolly pine-hardwood type.

Black gum predominates in the low hardwoods, but small areas of bald cypress are present, and water tupelo, red maple, spruce pine, swamp chestnut oak, and associated species occur in mixed stands. River tides flood the low hardwoods daily, but the swamps are almost free of surface water during ebb tides.

SOIL AND WATER CONSERVATION

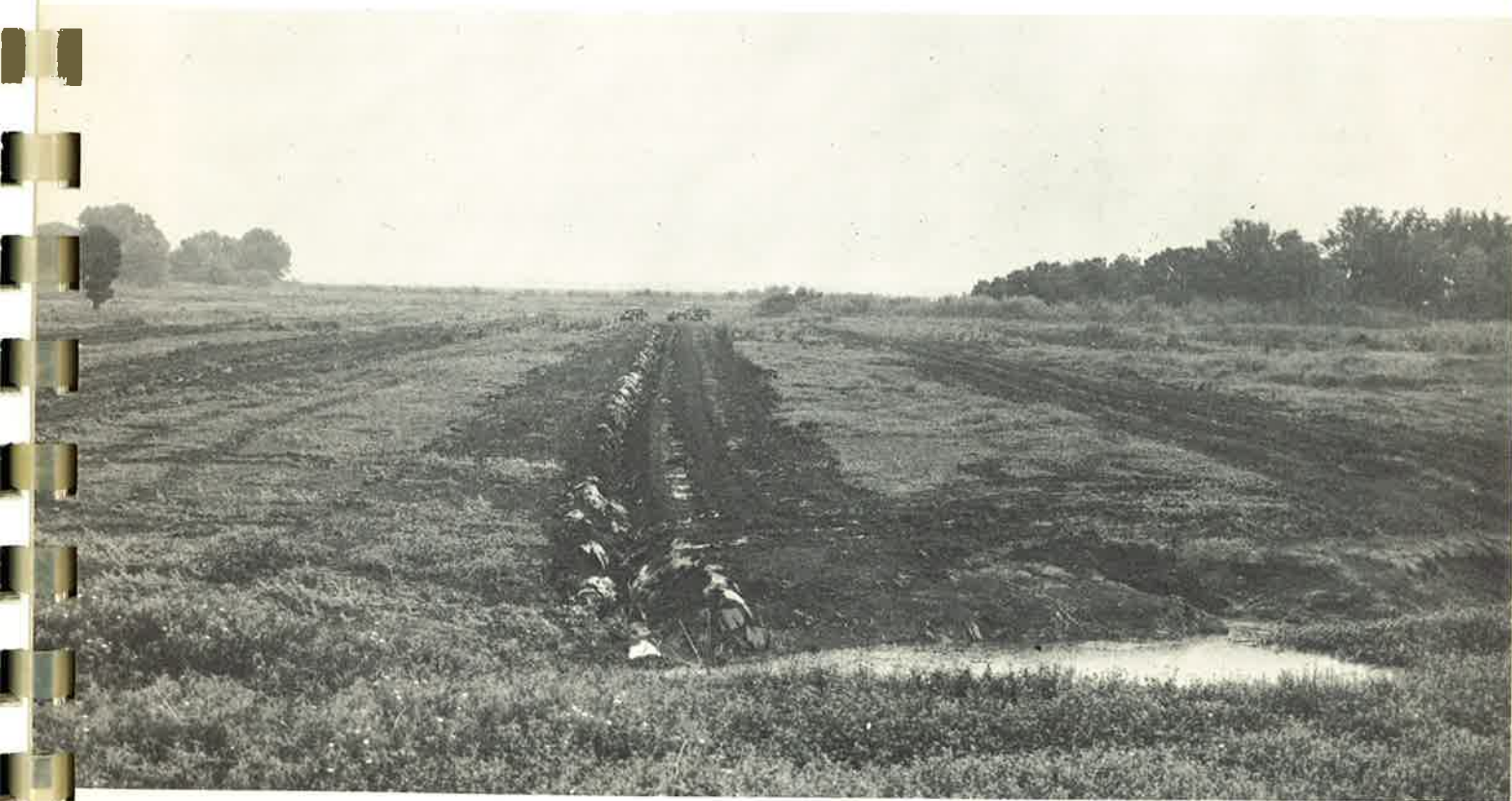
The most crucial soil and water problem lies within the responsibilities of the Corps of Engineers and involves maintenance of Savannah River's navigability without adversely affecting the river marshes or drainage and water supply of refuge impoundments. Future Savannah Harbor projects must neither hinder the tide flow in Savannah Back River nor decrease that source of water supply.

Pertinent soil and moisture problems evolved as results of waterfowl habitat de-

velopments. Pest plants invaded the various impoundments soon after construction. Drying of the pools and the subsequent farming operation induced high soil acidity and soil subsidence.

Soil and moisture objectives entail stabilization of the impoundment levees, reduction in the density of pest plants, surface drainage of the pool bottoms, correction of soil conditions, and retention of ground water in certain marsh areas.

CONSERVATION. Drainage is essential for proper pool management.



PUBLIC USE

Refuge resources offer recreational opportunities for sport fishing, waterfowl hunting, photography, wildlife and nature study, and picnicking. Public use on Savannah has increased almost three-fold in the five-year period preceding 1962 when 11,500 visitors were recorded. Here more and more people escape the confines of the normal day. An expanding population and the increasing number of tourists traveling U. S. Highway 17 stimulate public use on the refuge. It is anticipated that the number of visitors will soar as additional recreational facilities are provided.

Fishing, which accounts for approximately one-half of the present visitor use, will increase proportionately with high water level management of more pool areas. Waterfowling, an activity inherent to the Savannah River marshes, promises to be an important recreational activity with the opening of a portion of the refuge to public hunting. The visiting public already demonstrates a remarkable interest in the refuge's wildlife and management programs. Enhancing this interest will be photographic and narrative ex-

hibits of important wildlife species and major development and management programs displayed in a suitable visitor center. In addition, turnouts and parking areas along Highway 17 and a nature drive leading from the highway will provide visitors opportunities to observe and photograph representative portions of refuge habitat and wildlife species. The nature drive along the dike tops will encircle several pools where waterfowl, wading birds, alligators, and other interesting wildlife reside seasonally in open view.

A picnic area, to be located in a section of woods where U. S. Highway 17-A traverses the refuge, will include tables, fireplaces, a shelter, rest-rooms, and earthen piers extending into two small ponds to facilitate safe fishing conditions for children and family groups.

The refuge's conservation education program includes guided tours for various civic and youth groups, information for local newspapers on refuge fishing conditions, slide talks and lectures to interested groups, and educational devices for the visitor center.



THE FOWLERS. Waterfowling on Savannah promises to be an important recreational activity.



MEETING OF MINDS. The Atlantic Flyway Council disseminates waterfowl banding and duck population data during meeting at Savannah Refuge.



RECREATION FOR THE FISHERMAN. Fishing exceeds all other public use on the refuge.

DEVELOPMENT AND ANALYSIS

PLAN AT A GLANCE

Savannah's topographic features, climatic conditions, and generous water supply enhance the potential for waterfowl habitat improvements. The refuge as planned embodies approximately 3,500 acres in 22 separate impoundments including Duck Pond, 2,000 acres of manageable marshlands, 1,300 acres of timberlands, 6,300 acres of natural marshes, and 36 acres within headquarters and public use areas.

The completed refuge headquarters will consist of three residences, an office building, a boathouse, a service building, and ample storage and equipment buildings.

Recreational developments entail the construction of a visitor center, a nature drive where wildlife can be viewed in its habitat, boat launching facilities, parking areas for fishermen, and a picnic ground.

Planned refuge developments have a reciprocal relationship with the Corps of Engineers plan for the Savannah Harbor Project. Each proposed refuge facility is designed to be functional and managerially feasible with or without the Savannah Harbor Project system. However, the mitigation and enhancement features of the project plan complement refuge development and, when implemented, will render additional refuge water management opportunities.

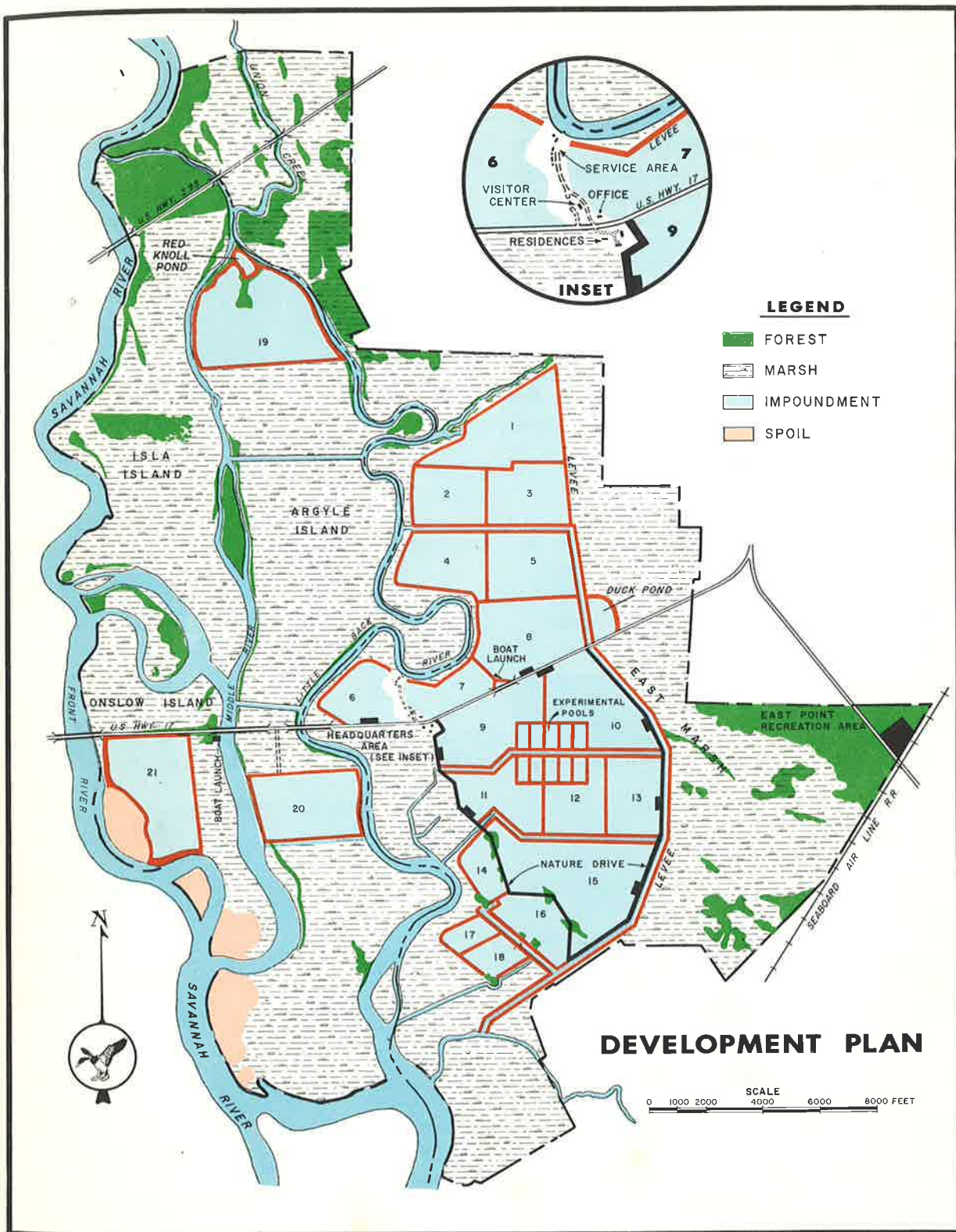
The Savannah Harbor Project Plan proposes the construction of a tide-gate structure and sediment basin in Back River, approximately two and one-half miles downstream from the refuge, and a canal on the refuge connecting Back River and Front River. The plan also calls for deepening McCombs Cut



and the upper reaches of Back and Middle Rivers. The tide gate, designed to offer little resistance to incoming tides, closes automatically during ebb tides and diverts all Back River flow into Front River through the proposed canal. The increased ebb flow velocities will carry a greater sediment load downstream, thus reducing shoaling in the harbor area, while the incoming tides will deposit sediment in the basin located immediately downstream from the tide gate. The Corps will dredge the sediment basin periodically to remove accumulated silt.

Model studies depict that the Back River water source to refuge impoundments below U. S. Highway 17 will change from fresh to saline with implementation of the project plan. Water salinities will range from approximately 20 percent sea strength at the south end of the refuge to 6 percent near Highway 17.

Back River then will offer a supply of brackish water; and a diversion canal leading from Back River above the brackish water zone, a planned mitigation feature, will provide a source of fresh water for refuge impoundments. Placement of dredging spoils from McCombs Cut and Middle and Back Rivers will be in a manner to retain low water levels on respective marshes during ebb tides and to benefit construction of additional impoundments by the Bureau.



WATER

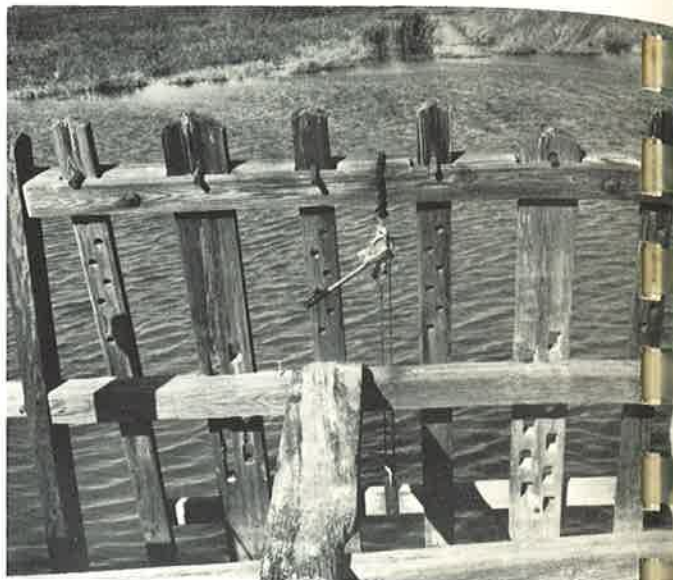
Water Rights

The Georgia and South Carolina water laws, based on riparian rights, allow water usage in any amount considered reasonable. There are no regulations on drilling of wells or impounding of water except for certain restrictions pertaining to malarial mosquito control. Each State requires the issuance of a temporary permit by the respective State Board of Health prior to construction of new impoundments or increased water levels of existing impoundments. Upon completion of construction and after inspection, the State Board of Health issues a permanent permit.

WATER SUPPLY. Back River tides rise and fall approximately seven and one-half feet twice daily, thus providing a water supply and drainage opportunities for the impoundment areas.



RELIC FROM THE PAST. Water control structures of concrete or other material of modern durability will replace obsolete wooden structures in the refuge's development program.



Water Supply

Natural water supply for management of impoundment areas on Savannah surpasses that of any waterfowl refuge in the Southeast. This water supply avails itself for all seasons of the year regardless of drought conditions, and it occurs for several hours each day with the build-up of the tides. When the Corps of Engineers project on the Savannah River and proposed refuge developments are completed, the Savannah Back River will carry a supply of slightly brackish water to more than two-thirds of the pool areas. Diversion canals will provide fresh water to all pools east of Back River including the East Marsh.

Impoundments

Many of the existing pools are too large to function properly because drainage is difficult, water depths and soil types vary, and rotation of pools for pest plant control is almost impossible. Excluding Red Knoll Pond and Duck Pond—which are small special purpose impoundments—and the 2,000 acre East Marsh, the twelve existing pools range from 38 acres to 342 acres in size. Perimeter dikes encompass these latter pools, while low interior levees form the individual impoundments. Original construction left the dikes with rather steep slopes and narrow tops. Subsequent deterioration from erosion and other factors have compounded these features. Perimeter dikes offer inadequate flood protection while the low interior levees necessitate maintenance of water depths that are insufficient for optimum aquatic waterfowl food production. Wooden water control structures necessitate frequent repairs or replacements, and their manual operation consumes valuable personnel time.

Restoring and improving waterfowl habitat to achieve refuge goals require the ac-

complishment of certain development work. Essentials include:

- (1) Rebuilding exterior dikes of such height and design necessary to render adequate protection against storm tides and flood water.
- (2) Rebuilding interior dikes sufficient to maintain four-foot water depths.
- (3) Subdividing a number of existing pools into smaller and more operable units.
- (4) Constructing additional canals to furnish a water supply for all pools including the East Marsh.
- (5) Replacing wooden water controls with concrete structures having automatic controls for water manipulation.
- (6) Constructing three additional impoundments of approximately 200 to 300 acres each.
- (7) Rehabilitating Red Knoll Pond and Duck Pond as nesting and rearing habitat for wood ducks.
- (8) Constructing 10 experimental pools, each approximately 10 acres in size and having individual water control structures and a supply of both fresh and slightly brackish water.

THE BOARDINGHOUSE REACH. Available water supply permits manipulation of water in refuge pools for waterfowl utilization and food production.



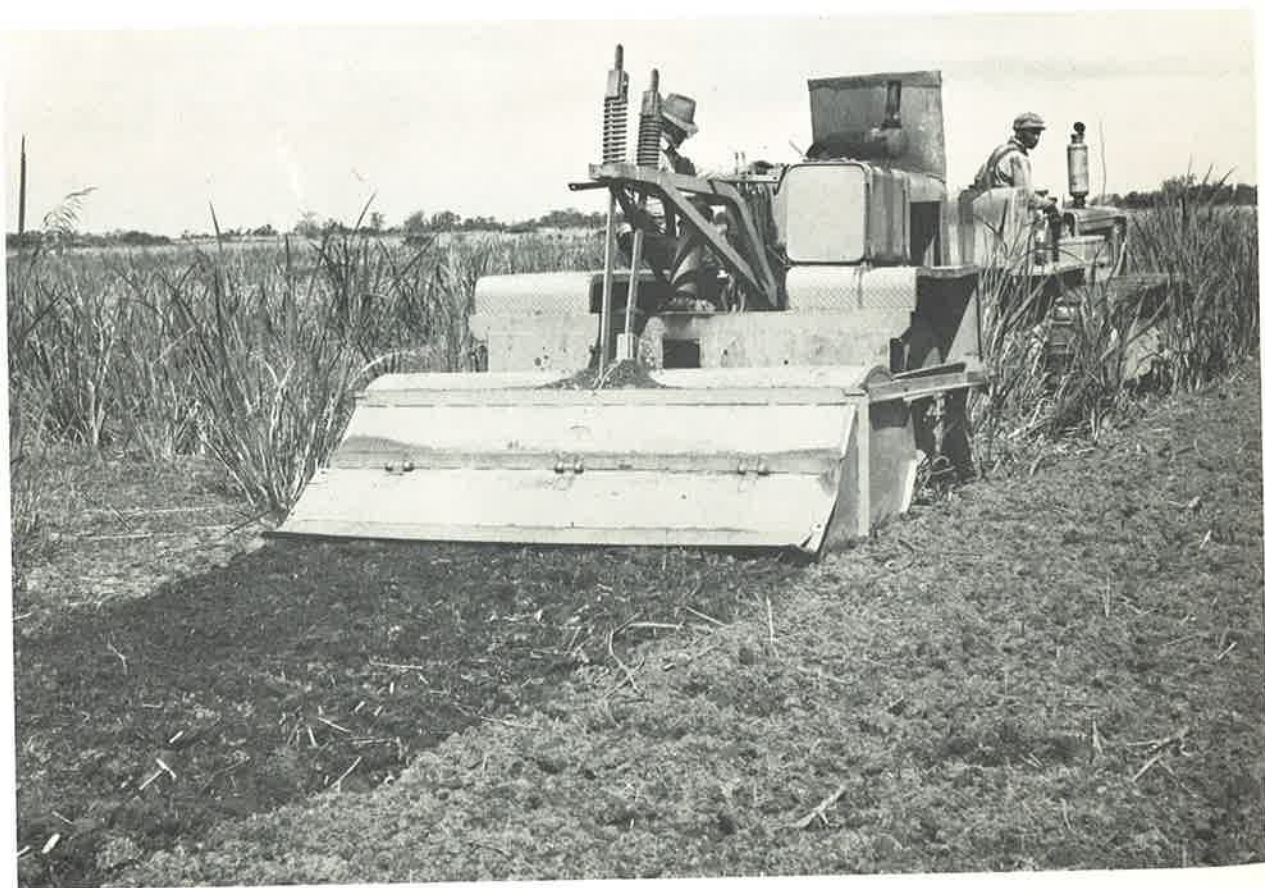
BIOLOGICAL IMPROVEMENTS

Biological problems and solutions interweave the refuge's development, soil and moisture, and management programs. High water level management discourages growth by many of Savannah's undesirable plants, while dry land farming offers an opportunity for mechanical control of other pest plants. Each phase in the rotational management of the pool areas may last from one to five or more years, depending upon the biological aim and success.

Frequently, the density of pest plants prevents successful management of an area for the production of waterfowl food plants. Approximately 1,000 acres within the pool areas will receive pest plant control as a development measure.

Because of land subsidence in the pool areas, many cypress logs and stumps that were buried when the land was first cleared now lie on the soil surface. Proper drainage and mechanical operations demand the removal of these obstructions. Biological development will furnish the surface drainage system and other land improvements essential for drawdown management and dry land farming operations.

REJUVENATION. Heavy tillage aids in pest plant control, aerates the soil, and increases production of desirable waterfowl food plants.



Year-round water in the East Marsh Pool is essential for breeding waterfowl and wading birds; and since management calls for dewatering and burning, shallow canals and potholes in this area are vital provisions to secure summer water and fire protection for controlled burning. Pothole blasting and plant conversion by other means on an experimental basis constitute the biological development in the natural marshes outside the pool areas.

Savannah's management program emphasizes production of wood ducks and—to a lesser extent—mallards and other duck species. The lack of natural nesting sites and predation by raccoons, alligators, turtles, and fish constitute the principal factors that limit successful nesting and rearing of these species on Savannah. As an experimental project, the development program calls for a predator-proof nesting and rearing pool. Duck Pond will be fenced on all sides against land predators and will be equipped with a water control structure designed to permit draining or filling and to prohibit entrance of fish, alligators, and turtles.

AFTER THE BLAST. Potholes retain water during ebb tides and increase waterfowl utilization of the river marshes.



BIRTH OF A POTHOLE. Ammonium nitrate and fuel oil mixture, as used here, offers an inexpensive explosive for blasting potholes to improve waterfowl habitat in dense marsh vegetation.

Additional improvements include erection of predator-proof nesting boxes in Duck Pond, Red Knoll Pond, and other suitable sites on the refuge.

The following summary lists the biological developments necessary to attain refuge objectives:

- (1) Control of pest plants on 1,000 acres.
- (2) Construction of surface drainage ditches on 5,500 acres.
- (3) Removal of logs and stumps on 1,000 acres.
- (4) Excavation or blasting of 200 potholes.
- (5) Equipment of Duck Pond with predator-proof fence and water control structure.
- (6) Erection of 200 nesting boxes for wood duck and mallards.

BUILDINGS

Buildings on Savannah are completely inadequate. With the exception of one residence, living quarters consist of old houses remodeled for temporary use, while most of the maintenance and storage buildings are of make-shift design including both new and old construction. The following buildings are necessary for the efficient operation of the refuge:

- (1) Three residences.
- (2) Office building.
- (3) Service building.
- (4) Equipment storage building.
- (5) Two open equipment sheds.
- (6) Paint and oil house.
- (7) Seed and grain house.
- (8) Boathouse.
- (9) Buildings necessary for utilities.

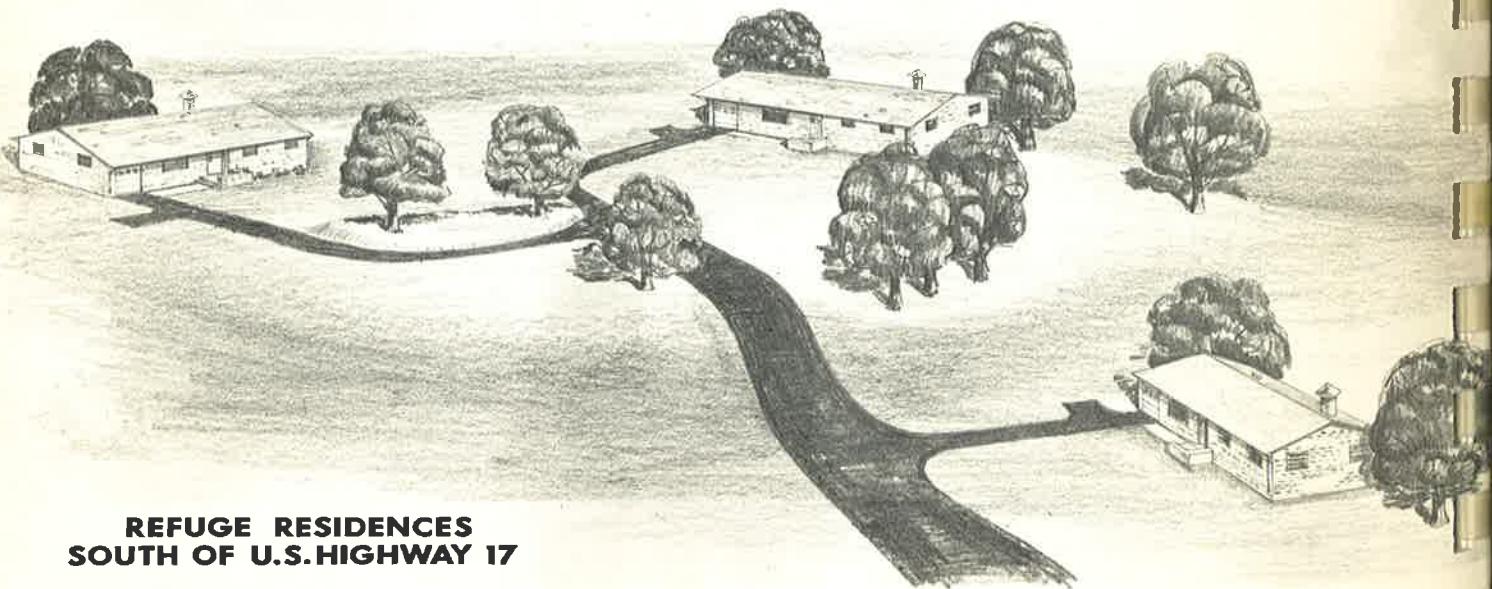
The City of Savannah and nearby areas offer sufficient rental and sale property from which refuge employees can secure comfortable living quarters. The three residences will assure adequate facilities for sufficient

personnel to live on the refuge for protection of wildlife and Government property. The office building will provide office space and facilities for refuge personnel and an East Coast biologist. Other buildings will house refuge equipment or supplies.

STRUCTURES AND UTILITIES

On a use-charge basis, the Southern Bell Telephone and Telegraph Company furnishes phone service to the refuge, and the South Carolina Electric and Gas Company provides 120 and 230 volt single phase electric current. Bottle gas constitutes the source of fuel for heating. In addition to the utilities associated with the required water supply, sewage disposal system, and domestic fuel supplies, proposed development consists of:

- (1) Base radio tower.
- (2) Fuel storage tanks and pumps.
- (3) Flag pole.



**REFUGE RESIDENCES
SOUTH OF U.S. HIGHWAY 17**

FENCING AND POSTING

Refuge signs rather than fences mark the refuge's boundary. Only portions of the headquarters area and an "old" cemetery require fencing. Although the refuge boundary is posted properly, there is a need for entrance, exit, informative, and instructional signs. These signs will be constructed at appropriate sites.

ROADS AND TRAILS

Access on the refuge other than through navigable streams consists of public highways, unimproved roads atop impoundment levees, and dead-end trails leading short distances into the refuge from the highways and levees. Dike construction, recreational development, and headquarters areas incorporate all proposed improvements in the refuge's road system.



DRAWDOWN. Impoundment levees provide the major portion of the refuge road system.

RECREATION

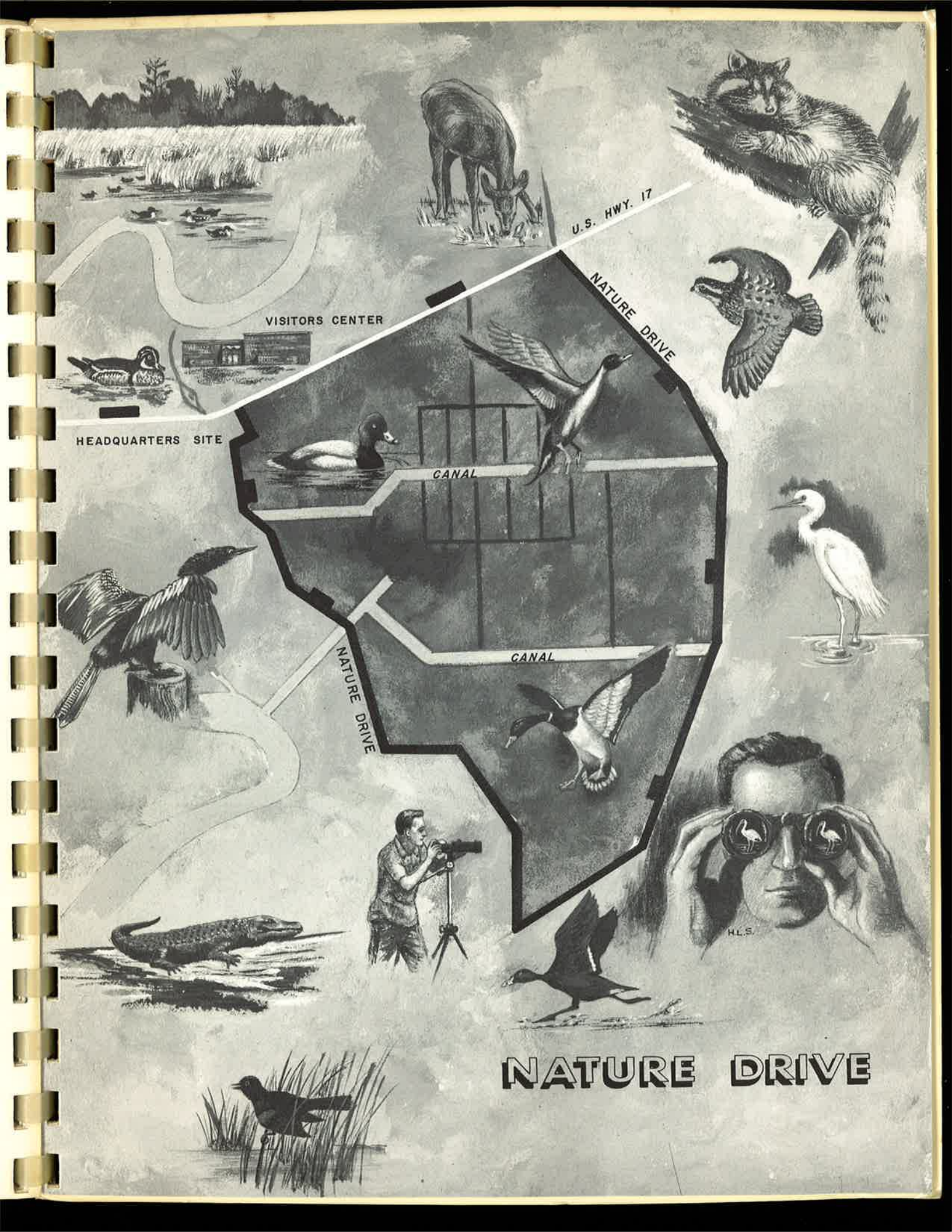
The planned public use program on Savannah clearly demonstrates one phase in the multiple use of a wildlife refuge. It exemplifies a correlation of compatible recreational activities with primary wildlife objectives which will render the maximum benefits to the community and nation. Planned recreational developments include the following facilities:

- (1) Boat ramp and parking area off Highway 17 on the west bank of Middle River.
- (2) Pool 7 boat ramp and parking area.
- (3) Pull-out type parking areas adjacent Highway 17 for observation points to Pools 6, 8, 9, and 10.

- (4) Nature drive surrounding Pools 9, 10, 11, 12, 13, and 15 and paralleling the east side of Pools 14 and 16.
- (5) East Point Picnic Area with shelter, tables and grills, rest-rooms, nature trail, and an earthen fishing pier into each of two borrow-pit lakes.
- (6) Visitor center aimed toward conservation-education.

The nature drive and observation points will provide for a circulation of public use through the heart of Savannah's finest wildlife habitat. The Middle River boat ramp will furnish access to the river waters for fishing and to the marsh for public hunting of waterfowl.





U.S. HWY. 17

VISITORS CENTER

HEADQUARTERS SITE

CANAL

CANAL

NATURE DRIVE

NATURE DRIVE

NATURE DRIVE

LAND STATUS

The Savannah Front River bounds the refuge on the west side while private holdings adjoin the north, east, and south sides. Inholdings consist only of navigable streams and thoroughfares.

The refuge was first established as the Savannah River Bird Refuge on April 6, 1927 by Executive Order No. 4626 which set aside 2,352 acres as a preserve and breeding ground for native birds. Executive Order No. 5748 revised the refuge boundaries to encompass 2,559 acres and renamed the area as the Savannah River Wildlife Refuge. Executive Order 7391 assigned to the refuge an additional 6,527 acres that were essentially acquired under the Rural Resettlement Program in the early 1930's. Later acquisition—using \$12,000 Duck Stamp money and \$35,173 from other funds—added 3,557 acres,

and Proclamation 2329, dated April 10, 1939, closed 929 acres of navigable waters within the refuge to taking or molesting of migratory birds. By Proclamation 2416, July 30, 1940, the area became the Savannah National Wildlife Refuge. Subsequently, an exchange of spoilage rights to Chatham County, Georgia for fee title to Hog Marsh Island and other lands to the north added another 459 acres. The Savannah Electric and Gas Company deeded 34 acres to the refuge in exchange for a powerline right-of-way, bringing the total refuge area excluding navigable waters to 13,136 acres.

The Bureau does not anticipate a need for future land acquisition except for mitigation of losses resulting from rights-of-way, spoilage areas, or similar uses.

THE UGLY AMERICAN. Visitors may observe wading birds, waterfowl, alligators, and other species of wildlife in their habitat from the refuge's nature drive.



BENEFITS AND COST

Benefits

Proposed development and management of the Savannah Refuge are sufficient for:

- (1) Increasing waterfowl by approximately 3,000,000 use-days over previous average use.
- (2) Improving habitat and nesting conditions for colonial and wading birds.
- (3) Establishing breeding flocks of wood ducks, mallards, and other species.
- (4) Maintaining representative populations of furbearers, alligators, white-tailed deer, quail, mourning doves, and non-game birds in keeping with the refuge's carrying capacity and objectives.

Although the principal objectives for Savannah are the protection of migratory fowl populations and the preservation and improvement of migration, breeding, and wintering habitats, many other tangible and intangible benefits are derived from the refuge's existence. Bona fide economic uses on the refuge are inconsequential, totaling only a few dollars annually, and waterfowl-ing benefits to hunters off the refuge cannot be accurately measured.

TABLE 1 expresses monetary values for the anticipated recreational use by fishermen, hunters, picnickers, and miscellaneous users of the refuge after final developments as compared to the present use.



TO PRESERVE AND PERPETU-
ATE. The photographer, sight-seer,
and naturalist as well as the hunter
can enjoy the many benefits of the
Savannah, Refuge.

TABLE 1
ESTIMATED VALUE OF RECREATIONAL USE

KIND	VALUE PER USE-DAY*	USE-DAYS ¹⁹⁶³	VALUE	POST DEVELOPMENT USE-DAYS	VALUE
Fishermen	\$1.50	6,000	\$9,000	10,000	\$15,000
Hunters	3.00			3,000	9,000
Picnickers	1.00			7,000	7,000
Misc. Users	1.00	5,000	5,000	40,000	40,000
TOTAL		11,000	\$14,000	60,000	\$71,000

*ORRRE Study Report 10

Cost

TABLE 2 presents summary of construction and estimated costs of refuge developments.



TABLE 2
RECAPITULATION OF PROPOSED CONSTRUCTION AND ESTIMATED COSTS

PROGRAM ITEMS	ESTIMATED COST				TOTAL
	1ST PHASE	2ND PHASE	3RD PHASE	FUTURE PHASE	
Water Facilities	1,105,000	565,000		175,000	1,845,000
Biological Development	34,000	14,000	6,000		54,000
Buildings	87,000	87,000			174,000
Fencing and Posting	1,500	500			2,000
Roads	3,000	38,000			41,000
Structures & Utilities	14,000	31,000			45,000
Recreation	38,500	37,500	122,000	40,000	238,000
TOTAL	\$1,283,000	773,000	128,000	215,000	2,399,000

CHAPTER 4

ADMINISTRATION OF REFUGE RESOURCES AND FACILITIES

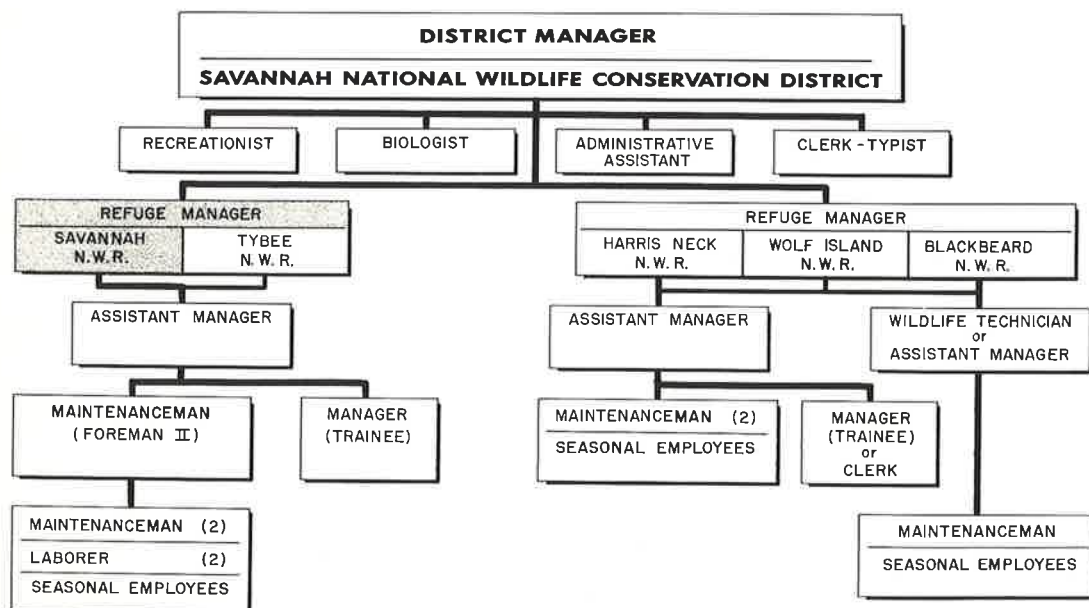
REFUGE STAFF

Savannah is the parent refuge of the Savannah National Wildlife Conservation District which also includes Harris Neck, Blackbeard, Wolf Island, and Tybee National Wildlife Refuges. The manager in charge of this complex assumes the responsibilities for directing and coordinating the overall management, development, and administration of all five refuges. The Staff Organization Chart for the District reflects the personnel assigned to Savannah.

The manager of Savannah will assume the responsibilities for supervising and implementing the refuge's management and development programs while receiving assistance from the Staff Specialist assigned to the

District. Savannah's intensive multiple land and water use programs, inherent biological problems, scope of development, and anticipated public use express the need for an assistant manager whose principal duties will be to plan and supervise field operations and law enforcement activities and conduct wildlife census and biological investigations. Operations and maintenance of farming, automotive, and boating equipment and upkeep of buildings, dikes, and recreational facilities will be largely the responsibilities of the maintenance foreman. Bookkeeping, filing, correspondence, and providing routine information to refuge visitors are responsibilities of the administrative assistant assigned to the Wildlife Conservation District.

STAFF ORGANIZATION



OPERATIONS

Maintenance

While refuge buildings, roads, and recreational facilities will add considerably to the overall maintenance cost, the 49 miles of impoundment levees and canals and the 40 water control structures constitute the principal maintenance workload.

Management

Water manipulation, the burning and farming programs, and pest plant control in refuge impoundments comprise the major management tasks and require intensive and thoughtful efforts. Although forest management and management of the natural marshes require small and inexpensive efforts, they remain important in the overall refuge program.

Protection

Refuge personnel assist in first-aid treatment and cooperate with local law enforcement authorities and specially trained emergency and rescue groups in cases of personal injury occurring on the refuge.

Sufficient law enforcement to protect refuge land and property and wildlife populations presents no outstanding problems because of the compactness of the area, the well-defined boundaries, and the access to major units.

Fire hazards are minor since the greater portions of the refuge either are subject to tidal action or included in impoundments. Although the several acres of peat soil pose certain problems in the refuge's burning program within the impoundment areas, the ready water supply minimizes the possibility of serious damages. Less than 100 acres of refuge timberlands are subject to forest fires.



Recreation

Public use of the anticipated magnitude demands a high standard of maintenance for recreational facilities and necessitates guidance and other considerations by the refuge staff. The distance of the East Point Picnic Area on Highway 17-A from refuge headquarters compounds the time required for policing and maintaining this major recreational area, and the waterfowl public hunting program adds appreciably to the recreational workload.

Population Management

Marsh and aquatic plant evaluations and surveys, wildlife and waterfowl censuses, waterfowl propagation, and animal control are important activities in overall refuge operations. The censusing of breeding waterfowl and wading birds and of winter populations composes an almost year-round job; and the control of predaceous animals, particularly raccoons, is pertinent to successful nesting of waterfowl and provision of adequate food supplies.

Soil and Moisture

Soil and moisture work—for the most part—is programmed either as development or management. However, technical soil and moisture services and such items as preparation of soil capability maps, surveys, fertilizing and liming of crop lands, surface drainage, and other minor practices are scheduled for accomplishment with soil and moisture funds. If future development and management programs are unable to contribute as planned to soil and water conservation, additional soil and moisture funds will be required.



BUDGET

Following completion of refuge development, funds required for the Savannah Refuge—as expressed in Table 3—will be those for maintenance, land and water management, protection, population management, recreation, soil and moisture, and conservation education.

TABLE 3
ESTIMATED ANNUAL COST

PROGRAM ITEM	1ST PHASE	2ND PHASE	3RD PHASE	FUTURE PHASE
Maintenance	\$ 63,100	\$ 95,000	\$ 97,100	\$101,600
Management	29,000	29,000	29,000	29,000
Protection	5,200	5,200	5,200	5,200
Recreation	5,000	7,500	15,000	15,000
Population Management	8,500	10,500	10,500	10,500
Conservation Education	1,000	2,000	3,000	5,000
SUBTOTAL	111,800	149,200	159,800	166,300
Soil and Moisture	5,000	5,000	5,000	5,000
TOTAL	116,800	154,200	164,800	171,300