CHAPTER 3 – NATURAL RESOURCES

INTRODUCTION

This element of the Comprehensive Plan provides an inventory and assessment of natural resources and consideration of the role of these resources in the future development of Orangeburg, including how they impact the development of the City and how they can be expected to continue to affect the City in the future. Natural resources do not recognize political boundaries, and it is difficult to address natural resources in the City unless you expand the boundaries of the discussion to include the county and region in which it is located.

The first known European settler in Orangeburg was George Sterling, an Englishman who established a trading post on the North Fork of the Edisto River in 1720. At that time, the natural environment was much the same as when Native Americans first arrived in the area to take advantage of the natural resources in the coastal plain. Natural resources were critical to Native American culture and became essential to the development of the region as Europeans and Americans developed trails and established commercial trade creating roads, homesteads, farms, stores, railroads and a modern community of industry and services. The land, water, wildlife, climate, and soils provided natural resources for modern men and women to create and define the City of Orangeburg as an attractive and livable place for commerce, employment, education, and transportation.

3.1 CLIMATE

Orangeburg summers are generally considered hot and humid. Frequent exchanges of warm and cold fronts bring moist maritime air, summer showers, and thunderstorms. In the summer, the average temperature is 79 degrees and the average daily maximum temperature is 89 degrees. The highest temperature recorded in Orangeburg, 106 degrees F, occurred on August 6, 1954.

Winters in Orangeburg are moderately cold, but usually short. The Appalachian Mountains to the west and the Atlantic Ocean to the east help mitigate protect the area against many cold waves. The average winter temperature is 46 degrees F, and the average daily minimum temperature is 34 degrees. The lowest temperature on record in Orangeburg occurred on December 13, 1962, when the temperature dropped to 6 degrees F. The spring season begins early, but early morning frosts may occur into late April.

Precipitation is relatively evenly distributed throughout the year. The total annual precipitation is 47 inches. Of this, 28 inches, or 60 percent, usually falls in April through September. Snowfall is rare and when it does occur, it is usually of short duration and no more than two inches. The heaviest one-day snowfall on record was more than 20 inches.

The average relative humidity in mid-afternoon is about 50 percent. Humidity is higher at night. The average at dawn is about 85 percent. The sun shines 65 percent of the time possible in summer and 60 percent in winter. The prevailing wind is from the southeast. Average wind speed is highest in spring.

The climate is favorable to farming and was a major attractor to the settlement of Orangeburg and the Edisto River valley. Agriculture continues to be a major element of the regional landscape. Temperate climatic conditions are also cited as a factor in the accelerated growth of the southeastern United States (the Sunbelt), due to warmer and more hospitable temperatures than the northern states (especially in light of the advent of air-conditioning).

In late summer and throughout the fall (typically June through November), the Carolina coastal plain may experience tropical cyclonic storms that form in relatively warm air over the Atlantic Ocean or in the Caribbean Sea. These cyclonic storms start as a tropical low. If they develop a clearly defined circulation and wind speeds up to 39mpiles per hour (MPH), they may be defined as a "tropical depression". A storms with sustained higher wind speeds between 39 and 63mph is designated a "tropical storm", and if the storm attains sustained wind speeds greater than 63 mph, the storm is designated a "hurricane". Significant damage can be created by any of these tropical cyclonic storms due to wind shear, tornado activity, and very heavy rains.

Major tropical storms and hurricanes in 1686, 1700, 1822, 1854, and 1893 are recognized from the historical records. Hazel (1954), Gracie (1959), and Hugo (1989) were large (category 3 and 4) hurricanes that did major damage throughout the South Carolina coast and Hurricane Floyd was a near miss in 1999. Tropical Storm Kyle (2002), Hurricane Gaston (2004), Hurricane Charley (2004), and Tropical Depression Bonnie (2016) also made landfall and caused significant damage in the state.

3.2 SOILS

This City of Orangeburg is located in "The Southern Coastal Plain" resources area which includes about 35 percent of the County, extending to Lake Marion. The soils are mostly well-drained or moderately well-drained, and consist of loamy or clay sediment. The elevation ranges from about 220 to 350 feet.

North of the City, about 11 percent of Orangeburg County is in "The Carolina and Georgia Sand Hills" resources area. The soils there are mostly well-drained and sandy.

Southeast of Orangeburg, the moderately well-drained to poorly drained soils were formed in loamy or clay sediment and are in "The Atlantic Coast Flatwoods" resources area. The North and South Forks of the Edisto River, Four Holes Swamp, and Lake Marion drain southeast towards the coast and provide a diversity of hunting and fishing activities.

The City of Orangeburg is built principally on Dothan, Neeses, Faceville, Orangeburg, and Ailey Soils. Most are suitable to development except for Dothan soils, which are characteristically wet and pose severe constraints to septic tank filter fields. They require community sewerage systems to overcome development constraints.

Much of the land bordering the west of the City is composed of Johnson and Lumbee soils, which underlie the Edisto and Caw Caw Swamps. These soils too are characteristically wet, but unlike the Dothan soils, are essentially unbuildable. As such they form a natural barrier to the extension of development immediately to the west of downtown Orangeburg.

Soil conditions and their constraints to development have been very important in defining the directions for the growth of the Orangeburg community. Site development has generally followed the path of least cost for construction of foundations and septic tanks, and primarily been towards the north and east of the City. The major constraints posed by existing soil conditions to the west and south have resulted in voluntary avoidance of poorly suited soils, and growth towards better suited soils. Regulatory prohibitions have been enacted to support the protection of investment.

Soil conditions will continue to influence and shape the urban community. From a land-planning standpoint, it is essential to identify and understand the location and characteristics of soils. Detailed data and maps identifying the location of various soils in the Orangeburg area are available in a Soil Survey of Orangeburg County, USDA, and SCS, dated June 1988.

3.3 WATERSHEDS AND WATER SUPPLY

Water Supply Watersheds

A water supply watershed identifies the area where rainfall runoff drains into a river, stream or reservoir used as a source of public drinking water supply. Limiting the amount of pollution that gets into the water supply allows a local government to reduce the costs of purification and helps ensure safeguards for public health. The protection criteria for water supply watersheds vary depending on whether the watershed is large (>100 square miles) or small (<100 square miles).

The City of Orangeburg is located along the North Fork of the Edisto River shortly before it turns south to join the South Fork. ,Map 3.1 (to the right) illustrates the Edisto River Basin. Additional resources regarding South Carolina water basins is available at the SC DHEC website: http://www.scdhec.gov/HomeAndEnvironment/Water/Watersheds/WatershedMap/EdistoWatershed/

Map 3.1: Orangeburg Watershed

Source: SC Department of Health and Environmental Control

The City of Orangeburg is within the North Fork of the Edisto River, which has been called the most recognizable and perhaps the most significant natural resource in the area. A Rivers Assessment Study was prepared by the South Carolina Department of Natural Resources for all of the rivers in South Carolina. The study evaluated each river in terms of its resource value, utility, and water quality. The North Fork of the Edisto River was found to be among the state's most pristine rivers (Class One).

The resource value of the North Fork of the Edisto River was assessed in terms of the following categories and assigned a value from one to four for each category.

Class One Value Category

Definition: Superior resource – rivers and river segments (and related corridors) with resource values that are of statewide or greater than statewide significance.

- ***Wildlife Habitat River****: river-related areas with furbearers, small mammals, endangered and habitat for migratory birds, resident birds, threatened species (federal and state), and non-game species of special concern.*
- ***Recreational Boating River****: flat waterboating and backcountry boating.*
- ***Undeveloped River****: undeveloped and free-flowing river segments.*
- ***Inland Fisheries River****: cold-water and warm-water fisheries, spawning, rearing and migration areas.*
- ***Water Quality River****: rivers with high water quality classifications presently attaining state standards.*

Class Two Value Category

Definition: Outstanding resources – river and river segments (and related corridors) with resource values that are of regional significance.

- ***Natural Features River****: endangered and threatened plants, unique plant communities and other recognized natural areas.*
- ***Recreational Fishing River****: prime recreational fishing rivers.*
- ***Timber Management River****: prime river-related timber areas.*
- ***Water Supply River****: significant drinking water supply rivers.*
- ***Utility River****: river-related utility sites.*

Class Three Value Category

Definition: Significant resources (rivers and river segments (and related corridors) with resource values that are of local significance.

- ***Agricultural River****: prime river-related farmlands.*
- ***Industrial River****: prime river-related industrial sites.*
- ***Urban River****: rivers flowing through urbanized areas, including urban recreation and urban river-related economic development.*

The resource value assessment by the state identifies that the North Fork of the Edisto River makes significant contributions to the community.

WETLANDS

The term "wetlands" identifies areas that are frequently inundated or saturated by surface or ground water sufficient to support vegetation typically adapted for life in saturated soil conditions. They generally include swamps, bogs, marshes, and similar areas. The principal criteria for determining wetlands are (1) hydrology, (2) soils, and (3) vegetation.

Wetlands are considered by state and federal governments to be important to the public interest, and are protected by state and federal laws. The federal Clean Water Act provides regulations to protect wetlands, and the South Carolina's Department of Health and Environmental Control (DHEC) and the Army Corps of Engineers regulate activities that fill, remove, dredge, drain, or alter wetlands. The definition of a wetlands area requires a" jurisdictional determination" by the US Army Corps of Engineers to determine the limits of the defined area of a wetlands and address any potential impacts created by development proposals.

Wetlands provide many important benefits, including:

- *Flood Control* – Wetlands act as natural sponges, absorbing and gradually releasing water from rain to groundwater and streams.
- *Water Quality Improvement* – Wetlands act as natural filters and remove sediment, nutrients, and pollution from runoff.
- *Groundwater Recharge* – Water migrates downward through wetlands to maintain groundwater levels.
- *Recreation* – Many recreational activities take place in and around wetlands, such as hunting, fishing, hiking, bird watching, and photography.
- *Ecological Habitat* – Wetlands provide an important natural habitat for a many types of birds, fish, and a variety of other species.

The wetlands found in the Orangeburg community are large, forming the southern border of the City, paralleling both sides of the Edisto River and forming finger-like protrusions from the Edisto River into the urban fabric along Caw Caw Swamp and Turkey Hill Branch. The Little Bull Creek (parallel to I-26), and Middle Pen Creek (parallel to US 301 on the northern side), and Grambling Creek (between 301 and I-26) also include wetlands on both sides to the streams. In addition, small, isolated pockets of wetlands are scattered about the community. In summary, the areas of wetlands in Orangeburg are a significant element of the community's natural resources, influence the City's development patterns, and affect the City's ambiance and lifestyle.

FLOODPLAINS

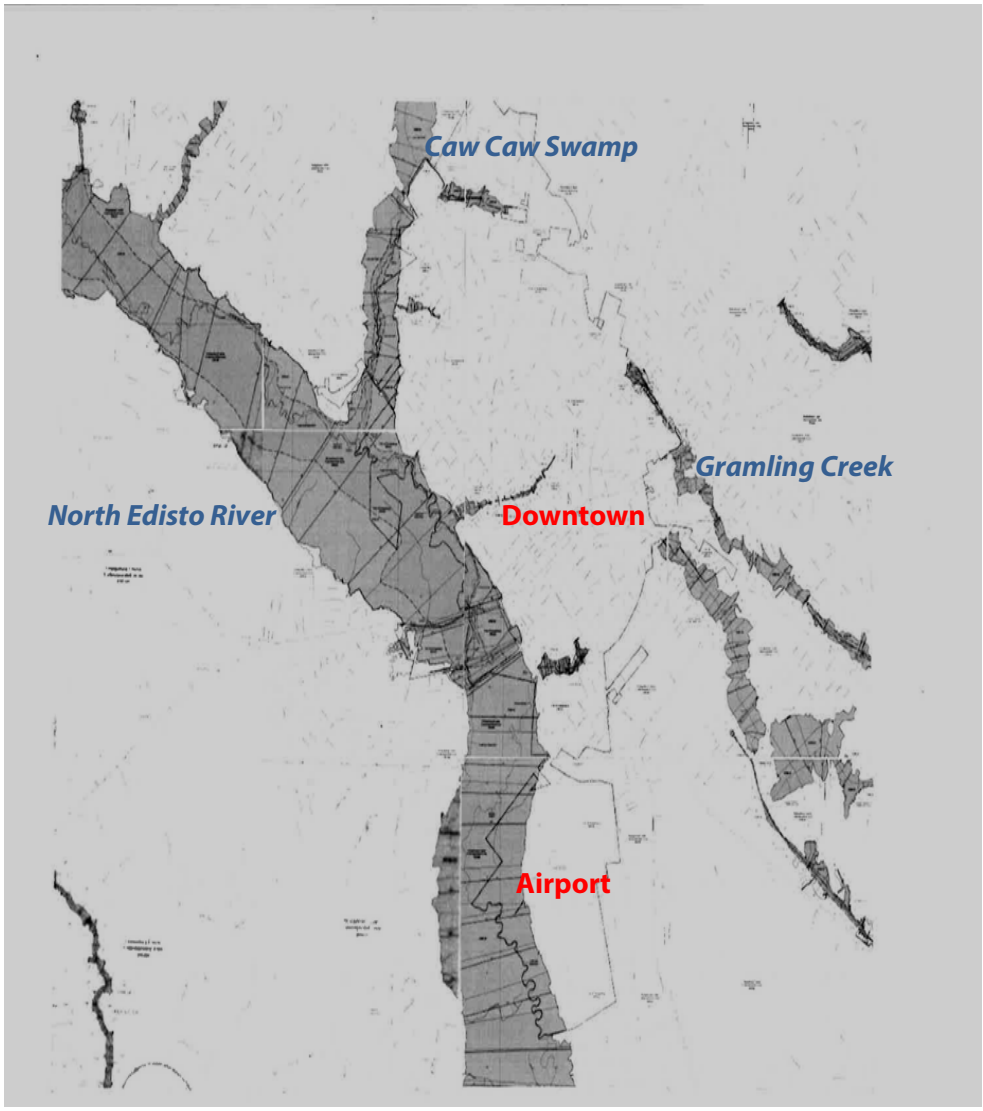
Small amounts of flooding occur frequently as thunderstorms or frontal showers may provide heavy rains in local areas or upstream of the City. The primary concern for a large flood is associated with a hurricane or tropical storm. A flooding event known as the 100-year flood is the maximum flood level expected to occur an average of once every 100 years (or a 1% chance of occurring in a given year). This is identified as the base flood elevation, which is the national standard on which floodplain management and insurance of the National Flood Insurance Program are based. The Federal Emergency Management Agency (FEMA) maintains flood maps, detailing the location of the following flood zones:

- *Zone A/AE* – Areas within the 100-year floodplain.
- *Zone B (or X-Shaded)* - Areas between the limits of the base flood and the 500-year flood.
- *Zone X* – Areas outside of the 100- and 500-year floodplain.

Development in areas zoned A/AE require flood insurance. It is important to keep development out of floodplains for the protection of life and property, but also for natural functions such as: natural water storage and conveyance, water quality and maintenance, and groundwater recharge. Additionally, floodplains and wetlands contain a variety of natural species and habitats that are unique to these types of ecosystems. Often these habitats are vulnerable to pollution, runoff, and other impacts from development within these areas.

Map 3.2 illustrates the generalized floodplain zones and wetland areas. Digital floodplain data for Orangeburg County was based on FEMA data. Floodplain maps are integrated into planning decisions upon approval. Building codes require that bottom floors of structures be elevated a minimum of one foot above the base flood elevation. It should be noted that this map is strictly for general planning decisions, and should not be used as an official guide for development or building permit decisions.

MAP 3.2: FLOOD ZONES AND WETLANDS



Source: FEMA Flood Map Service Center

Building codes require that bottom floors of structures be elevated a minimum of one foot above the base flood elevation.

BEST MANAGEMENT PRACTICES FOR WATER QUALITY

Best Management Practices (BMP's) are recommended practices for reducing runoff and other non-point source pollution that impact local water quality.

NATURAL TREATMENT TRAIN FOR STORMWATER

Floodplains provide an important role in nature's process system to reduce stream contaminants. The "Natural Treatment Train" practice uses natural elements such as vegetated floodplains, swales and marshland to serve as storm water filtration systems as an alternative to curb-and-gutter systems. The use of natural elements provides ecological bio-filtering of some potential contaminants, preservation of trees and existing habitat, water quality, and may create some cost benefits over traditional curb-and-gutter conveyance systems that expedite storm water flow (and any contaminants the water picks up) more directly into the surface streams and rivers. The Natural Treatment Train for Stormwater practice is encouraged by DHEC as a best practice for water quality management in urban areas to reduce impervious surfaces and storm water runoff.

RIPARIAN BUFFERS

Providing natural buffers around wetlands and streams helps protect water quality by leaving water flows undisturbed. Wetlands and streams are especially important in storm water filtration. Allowing storm water to naturally flow into and out of wetlands and streams helps maintain water quality and prevents toxic pollution of ecological marine habitats.

FRIENDS OF THE EDISTO RIVER

The North Fork of the Edisto River is an important element of what makes Orangeburg unique. It is the longest, free-flowing blackwater river in the US (310 miles) and the only one in South Carolina contained entirely within the State. The water has a dark tea color stained by tannins leached from tree leaves and other plant materials which decay in the surrounding swamps. The river basin contains productive farm and forest lands that contribute about 33% of the state's cash crops although comprising only 10% of the state's land area. The river provides numerous ecological community habitats and supports at least 87 freshwater and 120 saltwater fish species, including anadromous striped bass, American shad, shortnose sturgeon, Atlantic sturgeon, and American eel. Downstream, the Edisto is part of one of the most significant land conservation efforts in the eastern United States in the area known as the ACE Basin, a coastal wetland wilderness which lies at the mouth of the Edisto River.

Edisto Memorial Gardens is in the City of Orangeburg along the North Fork Edisto River. The gardens feature hundreds of species of roses, as well as wisteria, dogwoods, azaleas, and crape myrtle. The adjacent wetland park has a series of boardwalks through the riverside swamp. The Orangeburg Arts Center is adjacent to the gardens. The Edisto North Fork Blueway provides a 38-mile paddling corridor for experienced and

3.4 PLANT AND ANIMAL HABITATS

THREATENED OR ENDANGERED SPECIES

Specific locations of endangered and/or threatened species are not available to the public, in order to prevent poaching or disturbance of these species. However the U.S. Fish and Wildlife and the South Carolina Department of Natural Resources (DNR) provide county-by-county listings of these species to identify their presence and potential threats to their populations. The table on the following pages lists the threatened and endangered species for Orangeburg County, their preferred habitats, and the types of threats they are vulnerable to. The list is countywide, rather than specific to the city. Although the endangered and threatened species may not be found in the city, Orangeburg residents and decision -makers can have impacts on local populations and should be aware of these species within the region.

Species are listed with their federal, and where applicable, state status. Federal designations include:

- *Endangered Species* – any species in danger of extinction throughout all or a significant portion of its range.
- *Threatened Species* – any species which is likely to become and endangered species within the foreseeable future throughout all or a significant portion of its range;
- *BGEPA - Bald and Golden Eagle Protection Act-*
- *ARS - S*pecies that the FWS petitioned to list, a positive 90-day finding was issued, but Federal protections do not currently exist

There are four state designations:

- *Endangered*
- *Threatened*
- *Rare* – a species which may not be endangered or threatened, but which should be protected because of its rarity;
- *Unusual* – a species that has special or unique features that entitle it to special consideration to ensure its continued survival.

All South Carolina county lists can be found at the U.S. Fish and Wildlife Service website at: www.fws.gov/charleston/docs/county_lists.htm.

Table 3.3: Threatened & Endangered Species, Orangeburg County

Species	Federal Status	State Status	Habitat	Threats (Best period for survey)
Amphibians				
Frosted flatwoods salamander (Ambystoma cingulatum)	T	E	Adults and sub adults are fossorial; found in open mesic pine/ wiregrass flatwoods dominated by longleaf or slash pine and maintained by frequent fire. During breeding period, which coincides with heavy rains from Oct. to Dec., move to isolated shallow, small depressions (forested with emergent vegetation) that dry completely on a cyclic basis (Larvae present in breeding ponds	Habitat destruction as a result of agricultural and tree planting practices (e.g., clear-cutting, mechanical site preparation), fire suppression, and residential and commercial development. (January-April)

Gopher frog (Lithobates capito)	ARS	E	Natural savanna, flatwoods, sandhill communities, and scrublands, usually near ponds.	Critically imperiled - Loss of habitat and fire suppression. (Call survey: February-April Breeding: October-March)
Species	**Federal Status**	**State Status**	**Habitat**	**Threats (Best period for survey)**
Dwarf Siren (Pseudobranchus striatus)	-	T	Aquatic salamanders gilled throughout life. They feed on tiny invertebrates and live in shallow ditches, cypress swamps, and weed-choked ponds.	Imperiled - Habitat encroachment
Birds				
American wood stork (Mycteria Americana)	T	-	Primarily feed in fresh and brackish wetlands and nest in cypress or other wooded swamps	Decline due primarily to loss of suitable feeding habitat; other factors include loss of nesting habitat, prolonged drought/ flooding, raccoon predation on nests, and human disturbance of rookeries. (Nesting season: February 15-September 1
Bald Eagle (Haliaeetus leucocephalus)	BGEPA	T	Coastlines, rivers, large lakes or streams which provide adequate feeding grounds; typically nest in SC between late Oct. and late ay; tend to return year after year to the same nest tree	Imperiled - Human activities that can cause them to abandon nest, or to not properly incubate eggs, or care for young. (Nesting season: October 1-May 15)
Red-cockaded woodpecker (Picoides borealis)	E	E	Nest in mature pine with low understory vegetation (<1.5 m); Forage in pine and pine hardwood stands >30 years of age, preferably >10" dbh.	Imperiled - Reduction of older age pine stands and to encroachment of hardwood mid-story in older age pine stands due to fire suppression. (Nesting season: April 1-July 31)
Mammals				
Rafinesque's big-eared bat (Corynorthinus rafinesquii)	ARS	E	Found in mines, caves, large hollow trees, buildings, and bat towers	Imperiled - Habitat loss (Year round)
Tri-colored bat (Perimyotis subflavus)	ARS	-	Prefer edge habitats near areas of mixed agricultural use, where found to feed on large hatches of grain moths emerging from corn cribs. Cannot withstand freezing temperatures and are among the first bats to enter hibernation each fall and the last to emerge in spring. Found in mines and caves in the winter	Disturbance of habitat, noise disturbance, susceptibility to disease. (Year round)
Southeastern Bat (Myotis austroriparius)	-	R	Found in mines, caves, large hollow trees, buildings, and bat towers. They often hunt and feed over water. The feeding flights usually alternate with periods of rest, during which the bats hang to digest their catch.	Critically imperiled - Habitat loss

Species	Federal Status	State Status	Habitat	Threats (Best period for survey)
Eastern Fox Squirrel (Sciurus niger)	-	R	Abundant in open forest stands with little understory vegetation; ideally in small stands of large trees interspersed with agricultural land.	Habitat loss, over-hunting.
Reptiles				
Eastern diamondback rattlesnake (Crotalus adamanteus)	ARS	-	Upland dry pine forest, pine and palmetto flatwoods, sandhills, and coastal maritime hammocks, longleaf pine/turkey oak habitats, grass-sedge marshes and swamp forest, cypress swamps, mesic hammocks, sandy mixed woodlands, xeric hammocks, and salt marshes. May use burrows made by gophers and gopher tortoises during the summer and winter.	Habitat loss (Most of the year/Peak: April-November)
Pine or Gopher Snake (Pituophis melanoleucus)	-	R	Flat and dry habitats with open canopies and are most common in sand hill and sandy pine barren habitats, and also found in stands of longleaf pine or turkey oak forest.	Vulnerable - Habitat alterations, including fire exclusion.
Fish				
American eel (Anguilla rostrata)	ARS	-	Bottom dwellers in fresh water and estuaries and only leave these habitats to enter the Atlantic Ocean to spawn. Temperature dependent: normally (17-20° C), but can be found between 13-25° C	Commercial fishing exploitation and construction of hydroelectric dams that interfere with migration. (March 1-May 30; October 1- December 15)
Atlantic sturgeon (Acipenser oxyrinchus)*	E	-	Occur in major river systems along the eastern seaboard	Habitat alterations from discharges, dredging, or disposal of material into rivers, or related development activities involving estuarine/riverine mudflats and marshes; commercial exploitation up until the 1950's
Blueback herring (Alosa aestivalis)	ARS	-	Lives in marine systems and spawns in deep, swift freshwater rivers with hard substrates, migrating to spawning grounds in spring. During spawning, eggs are deposited over the stream bottom, where they stick to gravel, stones, logs, or other objects. Juveniles spend three to seven months in fresh water, and then migrate to the ocean.	Drastic declines from loss of habitat due to construction of dams and other impediments to migration; habitat degradation; fishing; and increased predation by recovering striped bass populations.
Shortnose sturgeon* (Acipenser brevirostrum)	E	E	Occur in major river systems along the eastern seaboard	Vulnerable - Habitat alterations from discharges, dredging, or disposal of material into rivers, or related development activities involving estuarine/riverine mudflats and marshes; commercial exploitation up until the 1950's

Species	Federal Status	State Status	Habitat	Threats (Best period for survey)
Invertebrates				
Savannah lilliput (Toxolasma pullus)	ARS	-	Small mussel with limited range of locations found in shallow water at the edges of streams, rivers, lakes, and backwaters.	Critically imperiled - Shallow water distributions are susceptible to off-road motor vehicle traffic, droughts and water draw-downs. (March 1-September 30)
Carolina Slabshell (Elliptio congaraea)	-	R	Mussel found in rivers and small streams, usually preferring sandy substrates	Vulnerable - Sensitive to channel modification, pollution, sedimentation, and low oxygen conditions,
Eastern Floater (Pyganodon cataracta)	-	NR	Mussel found in small streams, rivers, ponds, lakes, and marshes, usually in slow moving backwaters or standing water on fine sand, silt or muddy substrates.	Sensitive to channel modification, pollution, sedimentation, and low oxygen conditions,
Paper Pondshell Utterbackia imbecillis	-	-	Mussel found in rivers and streams, and may be found in temporary bodies of water that occasionally receive water from rivers during flood events.	Sensitive to channel modification, pollution, sedimentation, and low oxygen conditions,
Eastern Creekshell (Villosa delumbis)	-	NR	Mussel found resting on deep muddy flock, or in sand and boulder fields. It tends to stay close to the bank of streams and rivers, often among tree roots	Sensitive to channel modification, pollution, sedimentation, and low oxygen conditions. May be susceptible to bank erosion and the loss of a forested riparian zone.
Plants				
Boykin's lobelia (Lobelia boykinii)	ARS	R	Perennial herb found in cypress-black gum depression ponds, limesink depression ponds, Carolina Bays, wet pine savannas and flatwoods wet ditches	Vulnerable - Reduction of insect pollinators by pesticides, clearing, draining, and filling wetlands, lowering of water table by excess withdrawals for irrigation, fire suppression, and destruction of wetland transition zones by construction. (July/August)
Canby's dropwort (Oxpolis canbyi	E	E	Found in pond-cypress savannahs in Carolina Bay formations dominated by grasses and sedges or ditches next to bays; prefer borders and shallows of cypress-pond pine ponds and sloughs	Imperiled - Loss or alteration of wetland habitats (Mid-July-September)
Carolina-birds-in-a-nest (Macbridea caroliniana)	ARS	R	Flowering plant in the mint family in swamp forests	Loss or alteration of wetland habitats July-November
Sandhills lily (Lilium pyrophilum)	ARS	R	Flowering plant almost exclusive to longleaf pine communities in sandhills and herb- and shrub-dominated slopes along streams and small depressions.	Human intervention and habitat loss. (Late July-August)
Incised Groovebur (Agrimonia incise)	-	R	Perennial herb member of rose family found in damp lowland pine savannah sandy soil.	Imperiled - Human intervention and habitat loss.

Species	Federal Status	State Status	Habitat	Threats (Best period for survey)
Blue Maiden-cane (Amphicarpum muehlenbergianum)	-	R	Perennial grass grows in pine woods and savannas, as well as wetlands. It can grow in shallow pools and on shorelines.	Vulnerable and Imperiled - Human intervention and habitat loss.
Piedmont Three-awned Grass (Aristida condensate)	-	R	Perennial grass grows in sandhill and Carolina bay pine woods, savannas, and wetlands.	Imperiled - Due to human intervention and habitat loss.
Wagner's Spleenwort (Asplenium heteroresiliens)	-	R	Small perennial fern found on outcrops of marl (mix of clay, sand, and calcareous substrate that is soft and crumbly, usually containing shell fragments), on damp limestone ledges, and on tabby masonry (a mixture of sand, lime, and oyster shells).	Critically imperiled - Human intervention and habitat loss. Quarrying of the calcareous rocks on which it grows poses a "low-level" threat.
Black-stem Spleenwort (Asplenium resiliens)	-	R	Small perennial fern found at the base of cliffs or sinkholes on limestone or other alkaline rocks.	Critically imperiled - Human intervention and habitat loss.
Coastal-plain Water-hyssop (Bacopa cyclophylla)	-	R	Sandy margins of streams and ponds.	Critically imperiled - Human intervention, water pollution, and habitat loss.
Narrowleaf Sedge (Carex amphibola)	-	NR	Perennial densely tufted sedge commonly forming tussocks (hummocks) in moist woodlands, openings, and flood plains. Species handles wet to mesic moisture, grows in full sun if in wet conditions, and in partial sun to shade in wet-mesic to mesic areas.	Human intervention and habitat loss.
Widow Sedge (Carex basiantha)	-	R	Mesic to dry upland forests; most numerous in dry-mesic mixed-oak and oak-hickory forests.	Imperiled - Human intervention and habitat loss.
Cypress-knee Sedge (Carex decomposita)	-	R	Floodplain ponds and sinkholes, forested wetland swamps (on Bald cypress tree trunks and cypress knees at the waterline, and similar bases of Tupelo and Buttonbush), peaty mounds and tree hummocks.	Imperiled - Human intervention and habitat loss.
Meadow Sedge (Carex granularis)	-	R	Found in very wet soils in swamps and wet meadows and damp open woods and thickets.	Imperiled - Human intervention and habitat loss.
Southeastern Sneezeweed (Helenium pinnatifidum)	-	R	Perennial herb found in pine or cypress-dominated wet savannas, seepage slopes, bogs, boggy stream banks, white cedar swamps, and power line clearings through these habitats.	Imperiled - Human intervention and habitat loss.

Species	Federal Status	State Status	Habitat	Threats (Best period for survey)
Sarvis Holly (Ilex amelanchier)	-	R	Rare holly found along blackwater rivers and adjacent floodplains and in clay-based Carolina bays.	Vulnerable - Human intervention and habitat loss.
River Bank Quillwort (Isoetes riparia)	-	R	Aquatic plant found along margins of fresh water and brackish pond margins, cobble shorelines of rivers, and shallow gravelly areas of lakes	Imperiled – Pollution, habitat loss, and human intervention.
Pondspice(Litsea aestivalis)	-	R	Shrub from the laurel family found at the edges of ponds, cypress swamps, and Carolina bays.	Vulnerable – Draining wetlands, fire suppression, and human intervention.(Early March-April)
Piedmont Water-milfoil (Myriophyllum laxum)	-	R	Perennial aquatic herb found in sandhill ponds, spring runs, limesink or spring-fed ponds, and clear, sand-bottomed creeks through white cedar forests.	Imperiled - Human intervention, pollution, draining ponds , invasive water plants, and habitat loss.(All Year)
Georgia Beargrass (Nolina Georgiana)	-	R	Xerophytic flowering plant found in dry turkey oak scrub and longleaf pine woods.	Vulnerable - Human intervention and habitat loss.
Pineland Plantain (Plantago sparsiflora)	-	R	Perennial found on low roadsides and savannas, including seasonally wet, mowed roadsides.	Imperiled - Human intervention and habitat loss.
Leafy Pondweed (Potamogeton foliosus)	-	NR	Aquatic plant growing in water bodies such as ponds, lakes, ditches, and slow-moving streams	Human intervention and habitat loss.
Bottom-land Post Oak (Quercus similis)	-	R	Dominant tree in savannas and forests adjacent to grasslands, including pure or mixed stands.	Critically imperiled - Human intervention and habitat loss.
Awned Meadowbeauty (Rhexia aristosa)	-	R	Found on edges of limesink ponds; wet, peaty sands around depression ponds with pond cypress and swamp tupelo.	Vulnerable - Human intervention and habitat loss. (July – September)
Piedmont Azalea (Rhododendron flammeum)	--	R	Deciduous shrub found in dry woods and stream bluffs at elevations less than 1500 feet.	Vulnerable - Human intervention and habitat loss.
Harper Beakrush (Rhynchospora harperi)	-	R	Perennial grass-like herb found on lower slopes of grassy, sunny hillside seeps, streamheads, and bogs	Critically imperiled - Human intervention and habitat loss.
Tracy Beakrush (Rhynchospora tracyi)	-	R	Perennial sedge found along rivers and streams and in wetlands and grassy areas.	Vulnerable - Human intervention and habitat loss.

Species	Federal Status	State Status	Habitat	Threats (Best period for survey)
Sharp-scale Bulrush (Schoenoplectus erectus ssp. Raynalii)	-	NR	Bulrush plant found on wet shores of lakes, ponds, and streams	Human intervention and habitat loss.
Baldwin Nutrush (Scleria baldwinii)	-	R	Found along large stream margins with permanent wet, unconsolidated muck areas.	Imperiled - Human intervention and habitat loss.
Virginia Spiderwort (Tradescantia virginiana)	-	R	Perennial forb/herb that likes moist soils, including prairies, woodlands, meadows, hillsides, stream banks, and along road sides.	Critically imperiled - Human intervention and habitat loss.
Carolina Fluff Grass (Tridens carolinianus)	-	R	Perennial grass found on upland pine woods, sandhills, and fire-suppressed sandhills,	Critically imperiled - Human intervention and habitat loss.
Piedmont Bladderwort (Utricularia olivacea)	-	R	Very small, annual suspended aquatic carnivorous plant found in ponds, lakes and ditches.	Imperiled - Human intervention and habitat loss.

Source: US Fish and Wildlife Service: T = threatened, E = endangered, ARS = Species FWS petitioned to list and a positive 90-day finding was issued (no current Federal protections were identified), BGEPA = Federally protected under the Bald and Golden Eagle Protection Act; and South Carolina State Department of Natural Resources List of Rare, Threatened, and Endangered Species and Communities Known to Exist in Orangeburg County (June 2014): T = threatened, E = endangered, R = Rare (see ranking under threat), NR = Not Rated.

The South Carolina Department of Natural Resources also identified unique ecological communities that are significant to the State and known to occur in Orangeburg County. These include water bird colonies, Carolina bays, and limestone sinkholes, and the ecological *communities* listed below:

- Fagus grandifolia - quercus alba - (acer barbatum)/mixed herbs forest Atlantic Coastal Plain Mesic Mixed Hardwood Forest
- Fagus grandifolia - quercus nigra forest Coastal Plain Mesic Beech - Water Oak Forest
- Limestone sink community
- Pond cypress pond community
- Pond cypress savanna community
- Pond pine woodland community
- Quercus hemisphaerica - carya glabra - (fagus grandifolia) forest
- Small stream forest G5 S5 Swamp tupelo pond community
- Xeric sandhill scrub community

BIRD SANCTUARY

A section of the Orangeburg City Code establishes the city as a bird sanctuary where it is prohibited to trap, hunt, shoot, attempt to shoot, molest, or rob the nests of any species of bird or wild fowl. Additionally, tree preservation and riparian buffer regulations help prevent the destruction of bird habitat.

Trees

One of the most important natural resources in any community is its trees. Developers, particularly residential, generally avoid areas void of canopy. Trees in the urban environment serve to protect and enhance property values, control erosion, moderate climate extremes, provide screens and buffers, promote traffic safety and contribute to community ambiance and beautification. Orangeburg's trees serve no less a purpose.

The value of this resource is such that regulating and monitoring the care and cutting of trees is recommended as a means of protection and enhancement.

TREE PRESERVATION

Tree protection helps prevent a number of ill effects that clear-cutting of trees can create for a community. Removal of trees can lead to increased erosion from lack of root structures, which severely impacts water quality. A lack of trees also harms the air quality and reduces the amount of shade, which can lead to heat islands. Animals rely on trees, both for food and shelter. Additionally, trees add aesthetic value to a community, increasing the desirability and land values.

Significant trees are defined as any healthy trees eight (8) inches and greater in DBH (trunk diameter, measured at breast height). Removal of significant trees within the building and driveway footprint is permitted, but no more than 25 % of significant trees outside of the building footprint can be removed, except by order of the Zoning Administrator.

Orangeburg's tree protection standards are average to above average in protection compared to other local ordinances throughout the nation. The city's ordinance also allows some flexibility by accepting a tree replacement plan for sites that cannot reasonably meet the preservation requirement for significant trees. In these cases, the developer can pay into a city tree replacement bank to mitigate the removal of trees that cannot be replaced on site.

Additional emphasis on protecting native plant species and maintaining a similar diversity and composition of species that existed in the area pre-development could be considered to create stricter standards for native species than for other species or protect plants other than trees that hold importance to native plant diversity.

3.4 SUSTAINABILITY

Orangeburg is a leader in sustainability. Sustainability is an umbrella of principles that encourages decisions that improve quality of life without compromising the ability of future generations to enjoy the same quality of life. For natural resources, sustainability involves encourages wise consumption of the Earth's limited resources, and promotes development that reduces negative impacts on the environment. This can be as simple as household recycling to as large and complex as designing and implementing an entire sustainable neighborhood. Sustainable practices utilize recycled building materials in new or rehab construction and emphasize construction of buildings that are energy efficient and where possible use alternative energy sources such as solar power. The use of rain gardens and natural bio-swales rather than curb and gutter systems for storm water management is another common sustainable practice that provides water quality management through existing natural features, while limiting engineering and infrastructure.

This section examines some of the sustainable programs and practices that are occurring in Change to Orangeburg:

Sustainability Programs and Organizations

THE SUSTAINABILITY INSTITUTE

The Sustainability Institute is a local non-profit organization that promotes and advances sustainable building practices throughout South Carolina. The Institute educates citizens and builders about green building practices through workshops, programs and other events. They also own the GreenHouse, a renovated home in Change to Orangeburg that was retrofitted with sustainable products, and currently serves as a demonstration model and teaching tool for green building practices. The Institute also serves as a community resource for sustainable practices.

LEED CERTIFICATION

LEED is the Leadership in Energy and Environmental Design Green Building Rating System™ and has been used as a benchmark for the design, construction and operation of high-performance green buildings.

EARTHCRAFT HOMES

The benchmark for green residential construction, the EarthCraft House™ is a U.S. Southeastern Regional program for evaluating green building practices in residential construction. EarthCraft homes are energy efficient and toxin-free, and they utilize renewable resources in their construction.

3.5 NATURAL RESOURCE GOALS AND POLICIES

A summary review of the City's natural resources reveals that:

1. Climatic conditions contributed to the early development of the area as a farm community, and remain an asset to development in contrast to climatic conditions in northern states.
2. Wetlands paralleling the Edisto River and several smaller creeks provide a natural amenity in the way of linear greenways and natural habitat areas.
3. Trees constitute one of the City's most important resources.
4. Except for wetlands, soils within the City generally are suited to development and few building constraints.

Goals

GOAL	POLICY	ACTION	STATUS
3.1: Improve Navigability of the North Fork of the Edisto River	*River is classified by the state as a Class One flat-water and back country Boating River but is hazardous and difficult to navigate in places due to fallen trees. Within the Horne Wetlands Park and most of the City, the river is maintained for boating, but beyond the City the river is more perilous to boat traffic.*	*City should bring pressure on the state to maintain the navigability of the river in the interest of more fully benefiting from its resource value.*	
3.2: Create an Atmosphere of Awareness and Importance of the Community's Natural Resources	*3.2.1: The City and agencies involved in the promotion and development should periodically sponsor natural resource awareness campaigns.*		
	3.2.2: Promote cooperation and responsibility to ensure the sustainability of such resources		
3.3: Maintain Proper Functioning of Wetlands and Flood Plains.	*3.3.1: Prudently enforce the City's Flood Hazard Ordinance, and carefully review and mitigate projects impacting wetlands.*		
3.4: Encourage better landscaping and tree preservation during development process.	*3.4.1: Strengthen zoning regulations.*		
	3.4.2: Amend tree protection provision in zoning ordinance to protect trees.		
	3.4.3: Provide examples by developing city property with this goal in mind.		

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