

5. Natural Resources

5.1 Watersheds and Water Supply

Water Supply Watersheds

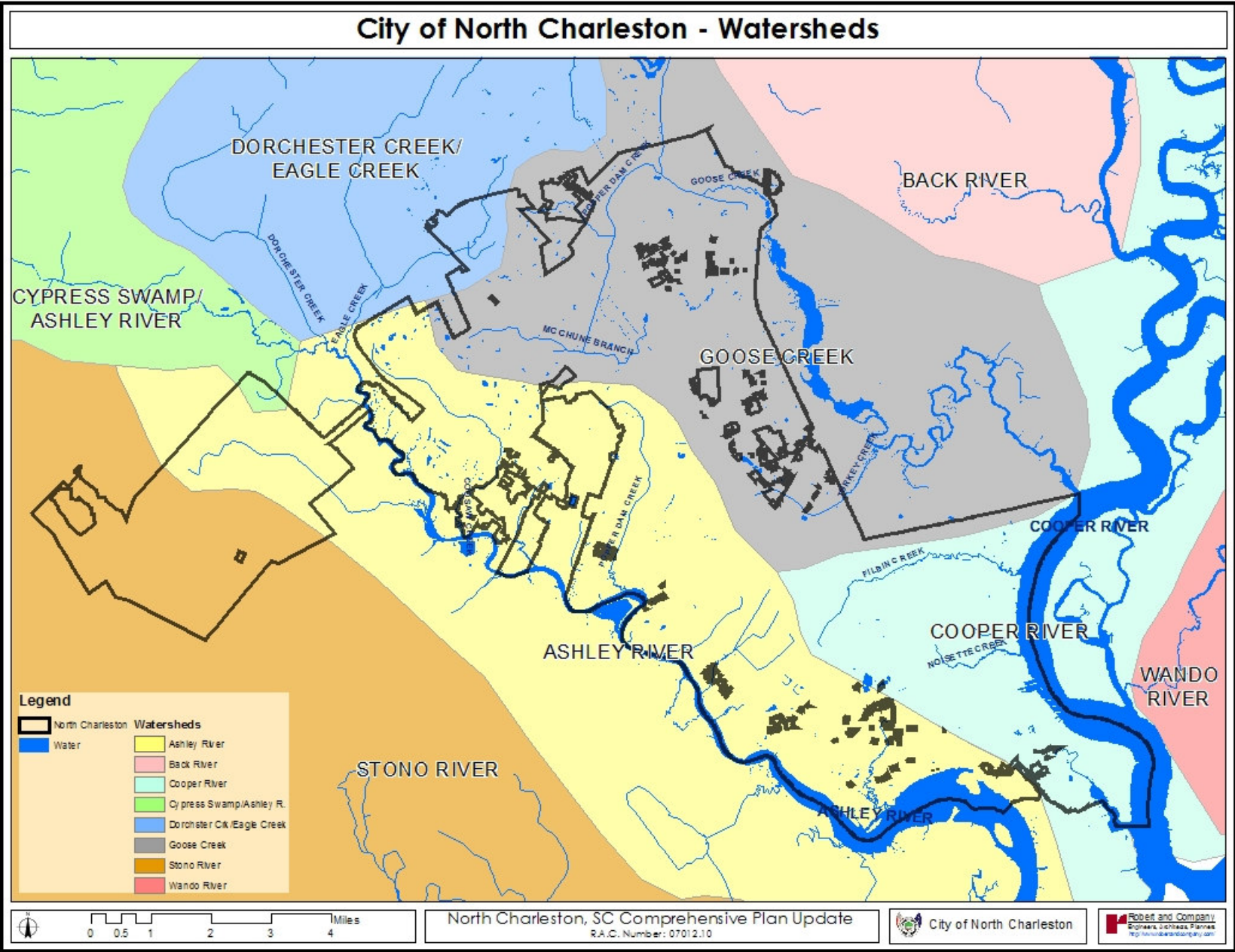
A water supply watershed is the area where rainfall runoff drains into a river, stream or reservoir used downstream as a source of public drinking water supply. By limiting the amount of pollution that gets into the water supply, local governments can reduce the costs of purification and help safeguard 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 North Charleston borders the Cooper River on its east side, the Ashley River, as well as several tributary creeks. The Ashley and Cooper Rivers form a water sub-basin, part of the greater Santee Basin. Within this sub-basin, North Charleston is primarily divided into the following four watersheds

- Goose Creek Watershed – most of North Charleston, north of I-526 and east of I-26 drains into Goose Creek. This includes Turkey Creek, and the McClure and Ladson Branches of Goose Creek.
- Cooper River Watershed – This includes southeastern portions of North Charleston that flow into Filbin Creek, Noisette Creek, Shipyard Creek, and the Cooper River.
- Ashley River Watershed- The majority of North Charleston, west of I-26 flows through this sub basin into the Ashley River. This includes Coosaw Creek, Popperdam Creek, Brickyard Creek, and the Ashley River.
- Dorchester Creek – Only a small portion of northwestern North Charleston drains to this sub basin, which is primarily via Eagle Creek.
- Additionally, the area known as Watson Hill that will potentially be annexed into North Charleston lies partly within the *Stono River Watershed* and *Cypress Swamp Watershed*. The following map shows the locations of these water supply watersheds.

The streams within these watersheds are not limited to North Charleston's city boundaries. They flow from and into other jurisdictions; therefore it is of great importance that North Charleston cooperate with other municipalities to ensure that one jurisdiction's environmental and land use policies do not negatively impact the quality of another jurisdiction's water supply.

Map 5.1 - Watersheds



Tidal Streams

North Charleston's two rivers (Ashley and Cooper), as well as several of its tributary creeks are tidally influenced, meaning they rise and fall with the tide and contain brackish water. Tidal streams in North Charleston contain valuable ecological resources.

Tidal streams are highly vulnerable to runoff and other impacts from adjacent land uses. The ecosystems of these streams are extremely diverse and fragile, and these streams often provide protection for juvenile fish from larger predators that cannot survive in smaller waters. The low amounts of dissolved oxygen prevents larger predators from being able to survive in tidal streams, but this low level of oxygen also makes these streams highly susceptible to pollution impacts from nearby land uses. For this reason, the South Carolina DHEC Office of Coastal Resource Management (OCRM) recommends 50-foot riparian buffers for tidal streams within the Charleston Harbor Project area to prevent sudden impacts to water quality, temperatures, and oxygen levels.

Noisette Creek Preserve Plan

The purchase agreement between the Noisette Company and the city of North Charleston officially establishes the Noisette Creek Preserve, consisting of a number of City, private, and company-owned, environmentally sensitive properties surrounding Noisette Creek. As part of this purchase agreement between, the Noisette Company was required to formulate the Noisette Creek Preserve Plan to evaluate the natural conditions, and formulate strategies for protecting, restoring, and managing the natural environment of the Noisette Creek watershed.

Noisette Creek is a tidal creek that flows into the Cooper River in the southeastern section of North Charleston (Planning Area 1). The Noisette Creek consists of a 1,400-acre watershed with a tidal marsh system, which contains a variety of unique and rare tidal creek habitats that have been degraded over time by development pressures and Naval Base operations. The intention of the Preserve Plan is to reverse the adverse effects imposed upon the creek and restore it to a more natural state in its water quality, water flow, and ecological integrity. The Preserve consists of 135 acres of water, marsh and upland.

The recommended approaches in the plan for restoring Noisette Creek Preserve include:

- ❑ Fifty-foot riparian buffers
- ❑ Restoration of wetlands
- ❑ Reduction of non-native, invasive plants,
- ❑ Habitat improvements,
- ❑ The use of natural stormwater treatment trains
- ❑ Reduction of stormwater runoff through the use of rain gardens, bioswales, and other natural filtration methods

The Noisette Creek Preserve Plan recommends a Noisette Creek Preserve Overlay district. This overlay would officially adopt the concepts of the plan as an ordinance, providing supplementary regulations to the zoning ordinance specifically for the parcels within the Preserve – regulations that will carry out the goals set forth in the plan. This proposed overlay could then serve as a prototype for other creek watersheds in North Charleston, such as Filbin, Coosaw, Brickyard, Eagle and Shipyard Creeks.

The figure at right shows the tidal marsh,



the recommended 50-foot buffers, the area to be protected, and city owned properties of the Noisette Creek Preserve.

The Michaux Conservancy is the official steward of Noisette Creek and its Preserve. It is a non-profit organization constituted specifically for the management and restoration of Noisette, and to provide environmental education and research for the benefit and environmental awareness of North Charleston.

5.2 Floodplains & Wetlands

Due to North Charleston's location near the coast and its low elevations there are several areas of the city that are either designated as wetlands or within a FEMA-designated flood zone.

Floodplains

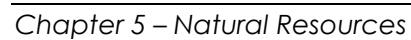
Small amounts of flooding occur frequently in North Charleston, because of the areas low elevation, abundance of rivers and streams, and tidal activity. The primary concern, however, is large floods or storm surges associated with hurricanes or tropical storms. A flooding event known as the 100-year floodplain, is the maximum flood level expected to occur an average of once every 100 years, or having a 1% chance of occurring each year. This is also known 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 VE – Areas that are within the 100-year floodplain, with additional storm surge or storm wave hazards.
- ❑ Zone A/AE – Areas within the 100-year floodplain.
- ❑ Zone X – Areas outside of the 100-year floodplain.

It is not only important to keep development out of major 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 extremely fragile to pollution, runoff, and other impacts from development within these areas.

There is only one area in North Charleston in Zone VE – the southeastern tip between Shipyard Creek and the Cooper River, where the Cooper River Marina is. There are, however, several areas that are within the 100-year floodplain. Most of these areas are along the Cooper River, Noisette Creek and Filbin Creek, but there are also Zone A/AE areas along the Ashley River, Goose Creek, and Popperdam Creek. North Charleston building codes require that bottom floors of structures be elevated a minimum of 1 foot above the base flood elevation.

The map on the following page illustrates floodplain zones and wetland areas. Currently, digital floodplain data is not available for Dorchester County. Generally, any floodplain areas in Dorchester County parts of North Charleston are also within the wetland areas shown in the map. 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.



Sea Level Rise

Climate change, whether due to human pollution or natural earth cycles, is creating a warmer Earth. As the earth warms, polar ice caps and glaciers melt at a faster pace, creating rises in sea level. Estimates vary, but the Charleston-North Charleston region could experience a sea level rise of one foot or more over the next 50 years. This is not necessarily cause for immediate panic, but it is something that should be monitored carefully to see if trends continue or accelerate. A rise in sea level would of course affect boundaries of the floodplain, with an increase in development that is within flood zones. If the current trend of warming and sea level rise continues over the next decade, North Charleston should be prepared to take measures to account for the changes and expected changes. This could include stricter floodplain regulations, larger riparian buffers, and possibly the need to take over land in areas that are likely to become subject to flooding. North Charleston should coordinate with regional, state, and federal agencies (FEMA) to continually monitor changes in sea level and floodplains.

Wetlands

Wetlands are areas that are flooded or saturated by surface or groundwater often and long enough to grow vegetation adapted for life in water-saturated soil. 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 federal Clean Water act and South Carolina Coastal Management Act provide regulations to protect wetlands in coastal South Carolina. The Ocean and Coastal Resource Management (OCRM) division of South Carolina's Department of Health and Environmental Control (DHEC) regulates activities that fill, remove, dredge, drain, or alter wetlands or other critical coastal areas.

Best Management Practices for Water Quality

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

Natural Treatment Train for Stormwater

This practice is encouraged both by the Noisette Company in their Preserve Plan, and by DHEC as a best practice for water quality management. This process involves using natural elements such as vegetated swales and marshland as stormwater filtration systems as an alternative to curb-and-gutter systems; floodplains also provide an important role in the natural water treatment process. This treatment train provides ecological, water quality, and sometimes even cost benefits over traditional curb-and-gutter. A local example of this type of system is being used in Oak Terrace Preserve, which uses and encourages bio-filtering methods, site reuse and tree preservation in order to reduce impervious surfaces and stormwater 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 stormwater filtration. Allowing stormwater to naturally flow into and out of wetlands and streams helps maintain water quality and prevents toxic pollution of ecological marine habitats. Currently, 25-foot riparian buffers are required in North Charleston's Dorchester Corridor I overlay zoning district, and even stricter regulations are in place for the Ashley River Scenic District, discussed below.

Ashley River Scenic District

The Ashley River Scenic District consists of three sub-districts – AR-1, AR-2, and AR-3, each with different levels of regulation. The purpose of the districts is to protect the natural beauty of the Ashley River, which is designated nationally as a Scenic River. The District also protects the heritage viewsheds of three National Historic Landmarks located directly across the river - Drayton Hall, Magnolia Plantation, and Middleton Place. The districts serve as overlay zoning districts, which supplement the underlying zoning with additional conditions and requirements.

AR-1 includes the following additional regulations

- ❑ Structural height limits of 35 feet
- ❑ No removal of trees within 100 feet of the river and adjacent lowlands
- ❑ No building within 100 feet of the river and lowlands
- ❑ No land alterations or impervious surfaces within 100 feet of the river and lowlands

AR-2 includes:

- ❑ Structural height limit of 35 feet
- ❑ No removal of trees of 6 inches in diameter or larger within 50 feet of the river and adjacent lowlands
- ❑ No buildings or structures constructed within 50 feet of the river and lowlands
- ❑ No land alterations or impervious surfaces within 50 feet of the river and lowlands

AR-3 includes:

- ❑ No buildings located within 50 feet of the river or adjacent lowlands
- ❑ Maximum impervious surface area of 40% within 50 feet of the river and lowlands
- ❑ Structural height limitation of 35 feet north of Wando Woods subdivision

For detailed regulations of these districts, refer to Section 5-8 through 5-10 of the *City of North Charleston Zoning Ordinance*. Map 9.7 in the Land Use Chapter of this document shows the location of the Ashley River Scenic District.

Both the Noiset Creek Preserve Plan, and the Charleston Harbor Special Area Management Plan recommend 50-foot natural vegetation buffers for all tidal creeks and wetlands. The buffers required under the previously mentioned overlay districts meet this, however there are other wetlands and tidal streams throughout the city that are not within these overlay districts. The City of North Charleston is currently trying to enact a citywide ordinance so that riparian buffers are required in all areas of the stream. If successfully passed, this ordinance will go a long way in protecting the city's vital water resources and ecological habitats. Priority should be given to tidal streams and impaired waters for buffer requirements, and should have 50 foot buffers in place for these areas. Other creeks and wetlands citywide should be given some level of protection, if not 50-foot buffers as well.

The Charleston Harbor Project Special Area Management Plan

The South Carolina Department of Health and Environmental Control's Office of Ocean and Coastal Resource Management (OCRM) funded and coordinated the Special Area Management Plan for the Charleston Harbor Estuary. The purpose of the plan was to develop policies to protect and sustain the cultural and natural resources of the estuary. The estuary includes the tidal streams and rivers that form the drainage of the Charleston Harbor. The plan makes several policy recommendations for growth management, water quality and protection of biological resources, to be carried out by DHEC, regional efforts, and local governments to improve natural systems within the Harbor Project Area.

A number of the plan's recommendations are already being carried out at some level by North Charleston, or will be carried out through implementation of this document's recommended policies.

- ❑ *Develop and promote measures to protect colonial water birds.* North Charleston has established itself as a bird sanctuary, and prohibits disturbance of bird species within its city limits. Improving water quality and protecting natural habitats through riparian buffers will go a long way towards allowing a wide variety of species to thrive locally.
- ❑ *Protect hydrology of key plant habitats by adopting policies that prohibit alterations of hydrology.* Establishment of protective natural buffers will also help protect habitats for native and/or vital plant species.

- ❑ *Encourage Reuse of existing developments.* A number of recent developments and proposed developments are reusing previous development sites. North Charleston should continue to encourage this type of reuse.
- ❑ *Reduce pulses of water into tidal creeks.* Limiting impervious surfaces and preventing development in wetlands and floodplains will produce less fluctuation in temperature and oxygen levels in tidal streams. Regulations in the Ashley River Scenic District are the best example of the city's efforts to accomplish this – the addition of similar regulations is advised along North Charleston's other tidally influenced waters.
- ❑ *Establish vegetative buffers.* Riparian buffers are required in several of the city's overlay districts, and this plan recommends additional buffers citywide, especially for impaired and/or tidal streams.
- ❑ *Improve stormwater best management practices design.* This document encourages North Charleston to promote and incentivize the use of these practices in new developments, such as is used in Oak Terrace Preserve.
- ❑ *Limit the impact of impervious surfaces.* Impervious surfaces are limited to an extent in North Charleston zoning regulations, particularly in some of the overlay districts. Further limitation in proximity to tidal streams and wetlands is recommended.
- ❑ *Design water body restoration efforts.* The proposed Noiset Creek Preserve Overlay will carry out natural system restoration efforts for the Noiset Creek watershed if implemented.
- ❑ *Encourage alternative development patterns.* Neo-traditional and conservation subdivisions help reduce sprawl and protect open space, both of which help to reduce runoff. Mixson is a good example of neo-traditional community design that uses sustainable practices – and the recognition of traditional residential development apart from suburban residential development in the upcoming zoning ordinance update will help encourage more neo-traditional design. The Planned Development District and some of the overlay districts in North Charleston encourage conservation subdivisions.

Other recommendations are not the sole responsibility of the city, but can be accomplished through participation and coordination with OCRM or other regional agencies and municipalities:

- ❑ *Establish local wetland mitigation banks.* This would allow developers who need to compensate for impacts to wetlands to restore or create new wetlands (on or off site locally), or to purchase wetland credits from the 'bank' to fund other wetland restoration efforts. This could be carried out at a city level, but would probably be more effective on a county or regional level.
- ❑ *Develop a water-related recreation plan.* The Harbor Management Plan recommends a water recreation plan that would encourage public-private partnerships in acquiring and development water-related recreation facilities, and assess pollution impact potential for proposed recreational activities. This will help maximize the potential for the regions waterways to provide cultural and recreational amenities without harming the watersheds.

- ❑ *Encourage mass transit.* North Charleston is taking steps towards promoting and encouraging mass transit (such as development of transit corridors), but successful mass transit requires regional efforts. If commuter rail is successfully implemented, the region could see a significant reduction on vehicle miles traveled.
- ❑ *Develop an area-wide runoff management strategy.* To help reduce runoff and non point source pollution, the Harbor Management Plan recommends a tri-county stormwater committee that would focus on minimizing runoff, and produce a Best Management Practices design manual for stormwater management strategies. This would also require an effort by local governments to revise local ordinances to accommodate the recommended strategies.
- ❑ *Establish an advanced coordination program for development sites.* This recommendation encourages communication with local economic development agencies to ensure that targeted industrial and business sites do not conflict with areas targeted for conservation.
- ❑ *Develop methods to mitigate problems caused by differences between jurisdictions.* This would involve cooperation between local jurisdictions to examine and eliminate differences in planning and zoning regulations that produce inefficiency or inconsistency in regional watershed management.

Coordination with OCRM is advised in setting measurable goals and applicable standards for these recommendations.

5.3 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 provides county-by-county listings of these species to help educate the public of their presence and potential threats to their populations. The table on the following three pages lists the threatened and endangered species for Charleston County, SC, along with their preferred habitats, and the types of threats they are vulnerable to. Dorchester County also has a variety of species, but none that are not also on the Charleston County list. Therefore an additional Dorchester County list is not necessary here, but those species that are in both counties are so designated in the table.

The lists are countywide, rather than citywide; therefore, some species will be relevant to some areas of a county, and not to others. Since Charleston County has both coastal and inland areas, several species on the county list (i.e., sea turtles and manatees) would not be found within North Charleston. However, activities within North Charleston can have indirect impacts on regional coastlines, so it is valuable for North Charleston residents to have an awareness of

threatened or endangered species within their county and region, even if they would not encounter them within their own community.

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

- ❑ *Threatened Species* – any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range;
- ❑ *Endangered Species* – any species in danger of extinction throughout all or a significant portion of its range.

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 5.3.1 – Threatened & Endangered Species, Charleston County

Species	Federal Status	State Status	Habitat	Threats
Mammals				
West Indian Manatee (Trichechus manatus)	E	E	Coastal waters, estuaries, and warm water outfalls	Initial decreases probably due to overharvesting for meat, oil, and leather; current mortality due to collisions with boats and barges; decline also related to coastal development and loss of suitable habitat, particularly destruction of seagrass beds
Birds				
Bald Eagle (D) (Haliaeetus leucocephalus)	T	E	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	Human activities that can cause them to abandon nest, or to not properly incubate eggs, or care for young
Bachman's Warbler (Vermivora bachmanii)	E		Nests in low, wet, swampy areas forested with mature sweet gum, oaks, hickories, black gum, and other hardwoods; also seems to prefer an opening in the forest covering and ground densely covered with cane, palmetto, blackberry, gallberry, and other shrubs and vines	Loss of habitat, believed to be extinct
Wood Stork (D) (Mycteria americana)	E	E	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
Red-cockaded woodpecker (D) (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	Reduction of older age pine stands and to encroachment of hardwood midstory in older age pine stands due to fire suppression
Piping plover (Charadrius melodus)	T	T	Winters on SC coast; prefers areas with expansive sand or mudflats (for foraging) in close proximity to a sand beach (for roosting)	Habitat alteration and destruction and human disturbance in nesting colonies; recreational and commercial development have contributed greatly to loss of breeding habitat

Species	Federal Status	State Status	Habitat	Threats
Reptiles				
Kemp's ridley sea turtle (<i>Lepidochelys kempii</i>)	E		Outside of nesting season, primarily found in the nearshore and inshore waters of the Gulf of Mexico, although immatures have been observed along the Atlantic as far north as Massachusetts	Overharvesting of eggs and adults for food and skins, drowning when caught in shrimp nets
Leatherback sea turtle (<i>Dermochelys coriacea</i>)	E		Rarely nests in SC, visits often coincide with periodic abundance of cannonball jellyfish; distributed worldwide in tropical and temperate waters of the Atlantic, Pacific, and Indian Oceans, most pelagic of the sea turtles	Loss or degradation of nesting habitat due to coastal development and beach armoring; disorientation of hatchlings by beachfront lighting; and incidental take from channel dredging and commercial trawling
Loggerhead sea turtle (<i>Caretta caretta</i>)	T		Nests on SC ocean beaches, forages primarily on mollusks and crustaceans in shallow ocean waters and stream channels, widely distributed throughout the world	Loss or degradation of nesting habitat due to coastal development and beach armoring; disorientation of hatchlings by beachfront lighting; and incidental take from channel dredging and commercial trawling
Green sea turtle (<i>Chelonia mydas</i>)	T		Rarely nests in SC, generally found in fairly shallow waters (except when migrating) inside reefs, bays, and inlets	Exploitation for food, high levels of predation, loss of nesting habitat due to human encroachment, hatchling disorientation due to artificial lights on beaches, and drowning when trapped in fishing and shrimping nets
Amphibians				
Flatwoods salamander (<i>Ambystoma cingulatum</i>)	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	Habitat destruction as a result of agricultural and silvicultural practices (e.g., clearcutting, mechanical site preparation), fire suppression, and residential and commercial development

Species	Federal Status	State Status	Habitat	Threats
Fish				
Shortnose sturgeon (D) (<i>Acipenser brevirostrum</i>)	E	E	Occur in most 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

Species	Federal Status	State Status	Habitat	Threats
Plants				
Sea-beach amaranth (<i>Amaranthus pumilus</i>)	T	T	Atlantic coast barrier island beaches, on overwash flats at accreting ends of islands and lower foredunes of non-eroding beaches	beach-armoring, construction of other beach stabilization structures, beach grooming, insect herbivory, off-road vehicles
Canby's dropwort (D) (<i>Oxypolis canbyi</i>)	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	Loss or alteration of wetland habitats
Pondberry (D) (<i>Lindera melissifolia</i>)	E	E	Found in swamp and pond margins, sandy sinks, swampy depressions or wet flats that are subject to drying but the roots are submerged at times	Drainage ditching and subsequent conversion of habitat to other uses, lack of seedling production
American chaffseed (<i>Schwalbea americana</i>)	E	E	Found in various sandy soil areas on the coastal plain; plants are usually found on margins of savannahs and cypress ponds that are seasonally wet; best managed by prescribed fire	Fire suppression, habitat conversion, and incompatible agriculture and forestry practices

Source: U.S. Fish and Wildlife Service; T = threatened, E = endangered; (D) indicates species that are also included in the Dorchester County list

Bird Sanctuary

North Charleston's Code of Ordinances establishes the city as a bird sanctuary, whereas 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 to prevent the destruction of bird habitats.

The city could go a step further to declare the city a sanctuary to protect other types of wildlife, such as deer, squirrel, rabbits, and other small mammals that make North Charleston their natural habitat. This provision should exclude fish, crabs, and other species that are killed for subsistence. This will help keep the city's natural habitats and ecosystems diverse and healthy.

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 sediment and erosion control 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.

Tree preservation standards in a city's subdivision regulations can often be too prescriptive and inflexible. Communities need to be willing to use performance-based tree standards and to allow variation from other rigid development standards. This will give the project design team the ability to work with the existing, unique conditions of a project site.

Tree preservation ordinances vary in form and complexity across the country, though many have common elements. Ordinance standards vary from an extreme of protecting 2- to 3-inch trees or larger (essentially nursery stock size) up to venerable 24- or 36-inch trees. Many use 6-, 8-, or 12-inch trees as the baseline size for tree preservation. Lake Forest, Illinois, for example, uses 12-inch trees as the threshold size for protection. Some ordinances focus only on preserving historic or specimen trees. Charlotte, North Carolina, requires that all trees greater than 24 inches in diameter or any specimen trees more than 12 inches in diameter be shown on construction plans so they can be considered during the planning process.

Other ordinances emphasize retention of native plant communities. The ordinance of Hilton Head Island, South Carolina, attempts to maintain the same diversity and composition of species that existed on the pre-developed site through strict preservation standards and appropriate replanting requirements. Instead of relying on tree sizes or types, another approach is to require that a minimum percentage of a site be left in trees or replanted or to establish a minimum tree diameter or square-inch total that must be met on each site. This approach is more typical when the goal of the

ordinance is focused on protecting woodlands. This is because it allows the flexibility to save or plant trees of various sizes and still meet the standard. Often, a city or county planning office has a licensed arborist on staff to make judgments on tree regulations and the appropriateness of site plans.

North Charleston's tree protection ordinance requires that all significant trees be flagged and shown on building site plans. Significant trees are any healthy trees over 10 inches 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 and by recommendation of the City Horticulturist. The ordinance requires that the site location of buildings and driveways avoid all Grand Trees (trees with 25 inches DBH or higher) to the extent possible, and no Grand Trees can be removed that are outside of the building footprint.

North Charleston's tree protection standards are average to above average in protection of its trees compared to other ordinances throughout the nation. The city's ordinance also does a good job in allowing some flexibility by accepting a tree replacement plan for sites that cannot reasonably meet the 25% requirement for preservation of significant trees – the plan would allow the developer to replace trees onsite at a net total DBH equal to the amount removed over the allowable percentage. In rare cases where even this cannot be met on-site, the developer can pay into a city tree replacement fund to mitigate the removal of trees.

The modification to the ordinance that the city should consider is to put more emphasis on protecting native plant species, to maintain a similar diversity and composition of species that existed in the area pre-development. This would perhaps involve stricter standards for native species than for other species, or could protect plants other than trees that hold importance to the native plant diversity.

5.4 Sustainability

North Charleston is beginning to emerge as a state leader in sustainability. Sustainability is an umbrella of principles that encourages decisions that improve quality of life without compromising future generations ability 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 attempt to construct buildings that are energy efficient and where possible use alternative energy sources such as solar power. The use of rain gardens and natural bioswales rather than curb and gutter systems for stormwater 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 North Charleston.

Programs & Organizations

The Sustainability Institute

The Sustainability Institute is a North Charleston-based 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 North Charleston 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.

The Urban Alliance

The Urban Alliance is a network of companies that support and advocate sustainable practices, and help support the Noisette Community Project. The majority of these companies are manufacturers that use sustainable methods to produce their goods. The alliance educates the public about available sustainable materials and products, and its members participate in research to further develop the technologies used in their practices. The Urban Alliance Studio is an informative and interactive display about the various products and practices of the companies that comprise the Alliance. The studio is located on Storehouse Row in the Noisette community, free and open to the public.

LEED Certification

LEED is the Leadership in Energy and Environmental Design Green Building Rating System™. It is a rating system for the U.S. Green Building Council and is used as a benchmark for the design, construction and operation of high-performance green buildings.

There are currently 16 LEED certified projects in South Carolina, three of which are located in North Charleston: North Charleston Elementary School, the Urban Alliance Studio, and Half Moon Outfitter's distribution center. Half Moon's distribution center achieved a Platinum rating, LEED's highest standard. Two other projects – the Navy Yard at Noisette and WPC Inc.'s Corporate Office Building are registered LEED projects, which is the first step in achieving LEED certification.

Earth-Craft Homes

LEED is used as a rating system for commercial and public buildings, but the benchmark for green residential construction is Earth-Craft. 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.

Clemson University Restoration Institute

Clemson is developing a research campus on the former Navy Base property in North Charleston for its Restoration Institute, the first formal academic organization focused on the restoration economy. The Restoration Institute covers a variety of disciplines – health, hydrology, materials engineering, historic preservation, and urban design – disciplines that help restore and revitalize existing areas through structural and cultural preservation.

Sustainable Developments

Noisette Redevelopment

The Noisette Community Master Plan encourages the use of LEED standards for all commercial and public structures within its planning area, and residential construction standards similar to EarthCraft. Development within the Navy Yard at Noisette will be required by the Noisette Company to meet these standards. Additionally, Noisette encourages the use of school facilities to serve community functions, including shared libraries, classrooms, and recreational facilities. This reduces the need for public resources to produce stand-alone facilities.

Oak Terrace Preserve

Oak Terrace Preserve, currently being developed at the former Century Oaks site is a community built entirely of EarthCraft certified homes. In addition to its green construction practices, the community design was developed to utilize a bio-filtering stormwater system, and it has preserved the area's tree canopy by saving hundreds of its live oaks and other trees.

Jessco Homes

Jessco Homes is a builder based in the Charleston region that primarily specializes in new lot suburban homes. However, they have recently partnered with North Charleston and other local governments to provide affordable housing on in-fill lots. Recently, they have constructed homes in the Liberty Hill neighborhood that are between 700 and 1,000 square feet, and sell for approximately \$85,000. These small, affordable units provide a great opportunity to convert renters into homeowners.

Jessco has expressed interest in acquiring substandard mobile home parks to convert into new, affordable housing. They are also interested in using green building standards for their homes. Partnerships between the City of North Charleston and Jessco or other similar builders can help meet the demand of affordable, owner-occupied housing throughout the city, as well as help promote green building standards and its affordability.

Brentwood Homes

Brentwood is another builder of EarthCraft standard homes that has produced residences in Indigo Palms and Oak Terrace Preserve.

Hunley Waters

Hunley Waters is a 36-unit residential community situated along Noisette Creek near the former Navy Base. While its home prices are less affordable than the previously mentioned projects the development is incorporating green development principles, including EarthCraft standards for all of its homes. The homes are built on a site adjacent to Noisette Creek, so eco-friendly development was encouraged and will be used in the community design and home construction to minimize its impact on the creek and its habitats. A community dock will be used rather than individual docks for each waterfront lot.

Mixson

Mixson is a new development under construction at the southwestern spoke of Park Circle along Mixson Avenue. Mixson was developed by the I'On Group, responsible for the highly acclaimed I'On subdivision in Mt. Pleasant. Mixson is pursuing LEED Silver certification for its residential structures, and each residence will also be equipped with Energy Star rated appliances and fixtures. Pervious paving in alleys and courtyards, low-flow plumbing fixtures, and natural irrigation design will contribute efforts towards reducing water consumption in the development.

In addition to these sustainable developments and initiatives that are occurring in the city, there is also a general 'buzz' - anecdotal evidence that North Charleston is on the forefront of sustainability and green building practices. Small businesses and residents that choose to live in parts of North Charleston are citing its sustainability as a factor in relocating to the city. Magazines and newspapers are also taking notice and writing articles about the city's 'green' practices.

This is something that North Charleston can be proud of, and should use as an opportunity to build on this reputation in order to set itself apart as a unique community in the region and state. As the nation's fuel prices continue to rise, the use of alternative sources of energy for automobiles, homes and businesses is growing on the nation's conscience. If North Charleston continues to advance its reputation as an incubator of renewable resources and sustainable practices, it will be strategically in a position to take advantage of this national trend and help to attract 'cutting edge' businesses. As

mentioned previously in Economic Development, North Charleston should declare itself a 'Sustainable City' to promote itself as a location for innovative business and quality of life.

5.5 Natural Resource Goals and Policies

Goal 5.1: Preserve natural systems associated with tidal streams, wetlands and floodplains

- ❑ Policy: Prevent the fill and development of wetlands and floodplain areas where possible.
- ❑ Policy: Take measures to restore tidal stream watersheds.
 - Action: Adopt the proposed Noisette Creek Preserve Overlay to increase protection around Noisette Creek's watershed.
 - Action: Create restoration management plans for other tidal streams within the city.
- ❑ Policy: Prevent development and impervious surfaces (except bridges) within 50 feet of streams and wetlands
 - Action: Adopt a city wide riparian buffer ordinance to increase stream and wetland protection outside of current overlay districts.

Goal 5.2: Maintain and enhance the natural beauty throughout North Charleston

- ❑ Policy: Protect native plant and animal species in North Charleston
 - Action: Revise the tree preservation ordinance to increase standards for native species.
 - Action: Revise the bird sanctuary section of the city's ordinance to include protection of small mammals.
- ❑ Policy: Continue protecting scenic corridors and natural viewsheds along the Ashley and Cooper Rivers.

Goal 5.3: Promote more ecological awareness

- ❑ Policy: Provide trails and parks with educational and interpretive ecological learning experiences.
- ❑ Policy: Continue to encourage eco-friendly and neo-traditional development design to promote green building practices and reduce sprawl.

Goal 5.4: Reduce stormwater runoff and non-point source pollution for improved water quality

- ❑ Policy: Discourage polluting industries and business operations
- ❑ Policy: Encourage developers to utilize bioswales and natural treatment train systems as a natural alternative to curb-and-gutter system
 - Action: Encourage residents to use rain gardens on their property to help reduce runoff
 - Action: Add a maximum impervious surface percentage standard to residential zoning districts.
- ❑ Policy: Improve drainage and reduce storm water runoff
- ❑ Policy: Coordinate with other regional jurisdictions to ensure consistent water quality throughout the region.
 - Action: Support regional water quality efforts that support the recommendations of the Charleston Harbor Management Plan.