

## CHAPTER 5 – NATURAL RESOURCES

### INTRODUCTION

Sky, water, stone and tree... All were in place when Native Americans first arrived on the scene at locations now within the city of North Charleston. Initially a wilderness to the Europeans when they came up the Ashley and Cooper Rivers, the natural resources emerged as critical to the development of the region as the American community developed into trading posts, farms, phosphate mines, suburban and now urban communities. The City's natural resources helped create and define the city in the mid-twentieth century and remain important to the City's future as a center for commercial development including world trade, education, manufacturing, and regional transportation. The city is

### 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, and the Ashley River forms the border on the west with the exception of the Watson Hill area west of the river. The Ashley and Cooper Rivers and several tributary creeks form water sub-basins (or watersheds). All are part of the greater Santee River Basin, and

committed to conserving these natural resources because they are essential to quality of life and economic well-being.

The waters that form the city's eastern and western boundaries may be considered by many to be the foremost natural resource of the city providing a heritage of Lowcountry elegance on the Ashley and maritime access on the Cooper. Protected water resources contribute to local quality of life by providing fresh water, green space, natural corridors for wildlife, and opportunities for recreation as well as economic prosperity.

most of 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** – The southeastern portions of North Charleston drain into Filbin Creek, Noisette Creek, Shipyard Creek, and other, smaller streams that drain into the Cooper River southeast of Goose Creek.
- ❑ **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* – A very small portion of northwestern North Charleston drains to this sub basin via Eagle Creek which empties into the Ashley River.
- ❑ *Cypress Swamp/Ashley River Watershed* – A small portion of the Watson Hill Area is located along the Ashley River Tributary 36 which flows northeastward into the Ashley River within the Cypress Swamp Watershed and flows.
- ❑ **Stono River Watershed** – Approximately 60% of the Watson Hill area annexed into North Charleston in 2011 lies partly within the Stono River basin portions of the and the following map shows the locations of these water supply watersheds.

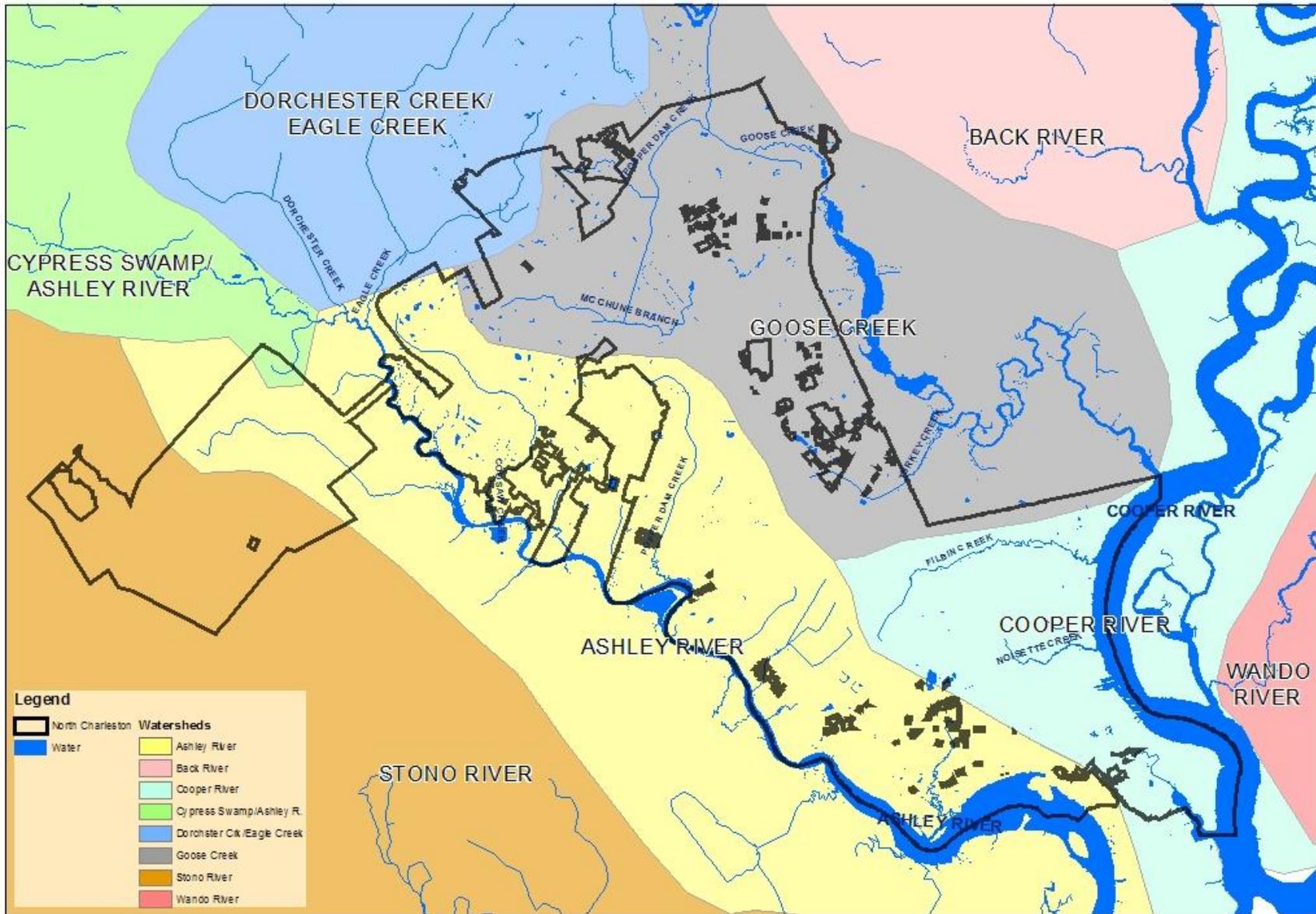
The streams within these watersheds flow across North Charleston’s city boundaries, from and into other jurisdictions.

#### TIDAL STREAMS

North Charleston’s two major rivers (the Ashley and the Cooper), and several of their tributary creeks are tidally influenced, meaning they rise and fall with the tide and contain brackish water.

The tidal streams in North Charleston are valuable ecological resources, but 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. Low amounts of dissolved oxygen prevent larger predators from being able to survive in tidal streams, but low levels of oxygen also makes these streams highly susceptible to pollution impacts from nearby land uses. For this reason, the South Carolina DHEC Office of Ocean and Coastal Resource Management (OCRM) recommends 50-foot riparian buffers for tidal streams within the Charleston Harbor Project area to reduce the potential impacts of sudden rainwater events negatively affecting water quality, temperatures, and oxygen levels.

MAP 5.1: WATERSHEDS



NOISETTE CREEK PRESERVE PLAN

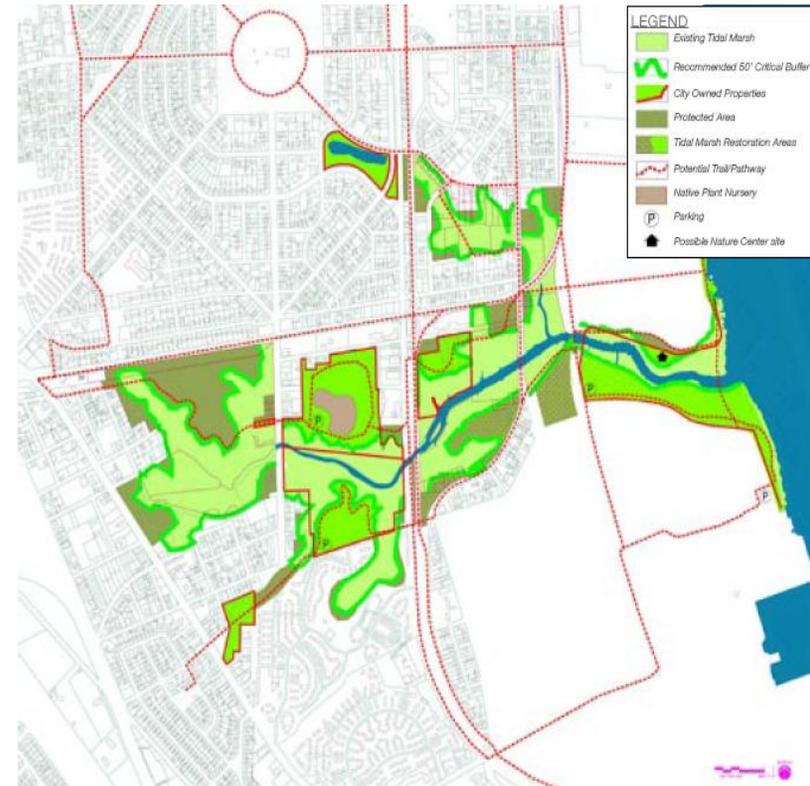
Noisette Creek is a tidal creek and watershed in southeastern Planning Area 1 of the city of North Charleston. The 1,400-acre watershed flows into the Cooper River and contains a tidal marsh system with a variety of unique and rare tidal creek habitats that had been degraded over time by military and industrial operations and development pressures.

In 2003, the Noisette Community Master Plan was completed and adopted by the City. In 2005, the Noisette Company released the Noisette Creek Preserve Plan to evaluate the natural conditions, and recommend strategies to protect, restore, and manage the watershed’s natural environment. The intent of the Preserve Plan was to reverse the adverse effects on the creek and restore its water quality, water flow, and ecological integrity to a more natural state.

The Noisette Creek Preserve includes 135 acres of environmentally sensitive water, marsh and upland surrounding Noisette Creek owned by the City, and private enterprises. The recommended approach in the Noisette Creek Preserve Plan included:

- ❑ 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 figure below shows the tidal marsh, the recommended 50-foot buffers, the protected area. The Preserve Plan set the pattern for additional attention to watershed protection within the City.



These regulations helped carry out the goals in the plan and served as a prototype for the protection of other watersheds, such as Filbin, Coosaw, Brickyard, Eagle and Shipyard Creeks in North Charleston. Based on the recommendations of the Noisette Preserve Plan, the City adopted Section 6-17, requiring 50-foot riparian buffers throughout the City (with the exception of the

Dorchester Road Corridor I Overlay District and the Ashley River Scenic Districts, all of which had preexisting buffer standards) in 2009 and amended in 2010.

## 5.2 FLOODPLAINS AND WETLANDS

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

### FLOODPLAINS

Small amounts of flooding occur frequently in North Charleston, because of the area's low elevation, abundance of rivers and streams, and tidal activity. The primary concern, however, is a large flood or storm surge 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:

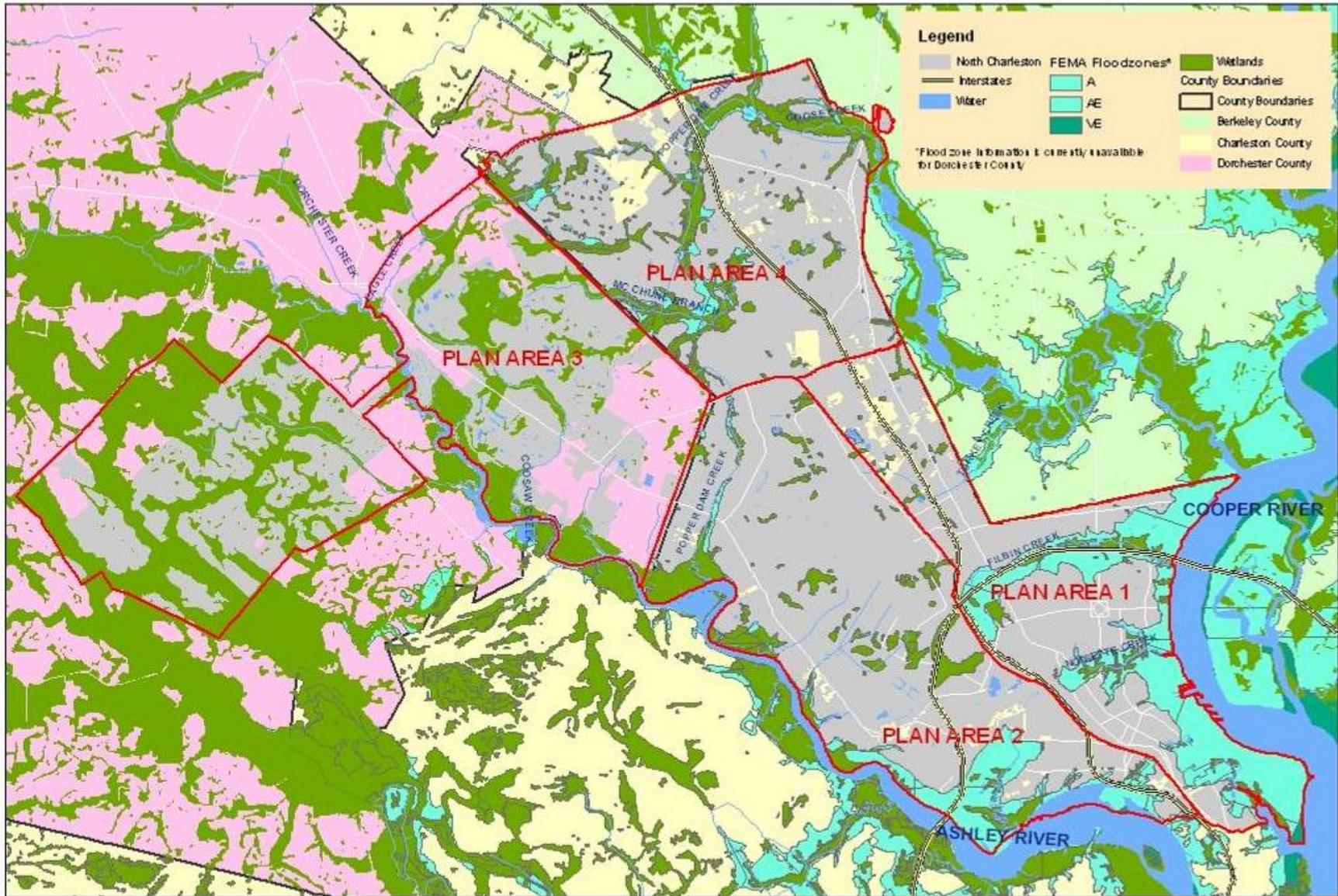
- ❑ *Zone VE* – Areas that are within the 100-year floodplain, with additional storm surge or storm wave hazards.
- ❑ *Zone A/AE* – Areas within the 100-year floodplain.
- ❑ *Zone B (or X-Shaded)* - Areas between the limits of the base flood and the 500-year flood.
- ❑ *Zone X* – Areas outside of the 100- and 500- year floodplain.

Development in areas zoned VE or A/AE will require flood insurance. 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 vulnerable to pollution, runoff, and other impacts from development within these areas.

There are limited areas in North Charleston in Zone VE, however several areas 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 one foot above the base flood elevation.

Map 5.2 on the following page illustrates generalized floodplain zones and wetland areas. Digital floodplain data for Dorchester County was based on 1999 data, but new maps are awaiting approval (projected effective date: March 2016). Charleston County flood maps are being redrawn with a projected effective date of December 2016. New flood maps will be integrated into planning decisions upon approval. 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.

MAP 5.2: FLOOD ZONES AND WETLANDS



## SEA LEVEL RISE

Climate change, whether due to human-generated pollution or natural earth cycles, appears to be creating a warmer Earth. As the Earth warms, polar ice caps and glaciers may 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. Although this is not necessarily cause for immediate panic, it is something that should be monitored to see if trends continue or accelerate. A rise in sea level would of course affect floodplain boundaries with an increase in existing development that is within flood zones.

If sea levels rise over the next decade, North Charleston should be prepared to take measures to account for the floodplain boundary 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 continue monitoring changes in sea level and floodplains.

## WETLANDS

Wetlands area 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) and the Army Corps of Engineers regulate 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-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 stormwater filtration systems as an alternative to curb-and-gutter systems. The use of natural elements also provides ecological, water quality, and sometimes even cost benefits over traditional curb-and-gutter conveyance systems that expedite stormwater flow (and any contaminants the water picks up) more directly into the network of surface streams and rivers. The Natural Treatment Train for Stormwater practice is

encouraged by DHEC as a best practice for water quality management and is favored in the Noisette Creek Preserve Plan. Another local example of this type of system was 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. Outside these districts, 50-foot riparian buffers are required.

The Noisette Creek Preserve Plan and the Charleston Harbor Special Area Management Plan recommended 50-foot natural vegetation buffers for all tidal creeks and wetlands. In 2009, North Charleston adopted Ordinance No. 2009-67 to apply natural vegetative buffers of fifty (50) feet in depth on the upland side of critical lines along tidal tributaries of the Ashley River or Cooper River (as designated by OCRM), adjacent to preserved wetlands, and along the upland side of the bank of any non-tidal tributary of the Ashley River or Cooper River. No new buildings or impervious surfaces are allowed within the buffer. These provisions are codified as Section 6-17 of the Zoning Ordinance.

#### ASHLEY RIVER SCENIC DISTRICT

The Ashley River Scenic District consists of three sub-districts – AR-I, AR-II, and AR-III, each with different levels of regulation. The purpose of the AR districts is to protect the natural beauty of the

Ashley River, which is designated as a State of South Carolina Scenic River, and the Ashley River Road National Scenic Byway and protect the heritage viewsheds of three National Historic Landmarks located directly on the western side of the river: Drayton Hall, Magnolia Plantation, and Middleton Place. The AR districts are overlay zoning districts which supplement the underlying zoning with additional conditions and requirements with regard to vegetation removal, building height, and impervious surface coverage.

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

#### **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 plan developed policies to protect and sustain the cultural and natural resources of the estuary, including the tidal streams and rivers that create and drain into Charleston Harbor. The plan made policy recommendations for growth management, water quality and protection of biological resources to be carried out by DHEC's regional efforts and local governments to improve natural systems within the Harbor Project Area.

A number of the plan's recommendations have been carried out by North Charleston through implementation of the Management Plan'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.

Improved water quality and continued protection of natural habitats allow a variety of species to thrive locally.

- ❑ *Protect hydrology of key plant habitats by adopting policies that prohibit alterations of hydrology.* The establishment of protective natural buffers has helped protect habitats for native and/or vital plant species.
- ❑ *Encourage reuse of existing developments.* Several recent projects and proposed developments used or will reuse previously developed properties. As North Charleston continues to mature, the City is expected to continue encouraging this type of reuse.
- ❑ *Reduce pulses of water into tidal creeks.* Limiting impervious surfaces and preventing development in wetlands and floodplains produces less fluctuation in temperature and oxygen levels in tidal streams. Regulations in the Ashley River Scenic District and the protection of 50' natural buffers illustrate the city's efforts to reduce pulses during storm events.
- ❑ *Establish vegetative buffers.* Riparian buffers were added as a requirement for the development of any new development or expansions to existing development sufficient to trigger application of normal buffer requirements through the Zoning Ordinance.
- ❑ *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 are 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 and adjacent to both tidal and other streams and wetlands.

- ❑ *Design water body restoration efforts.* The Noisetette Creek Preserve Plan proposed natural system restoration efforts for the Noisetette Creek watershed.
- ❑ *Encourage alternative development patterns.* Neo-traditional and conservation subdivisions help reduce sprawl and protect open space, both of which help to reduce runoff. The Mixson project is a good example of a neo-traditional community design. Recognition of neo-traditional residential development apart from traditional suburban residential in the City's zoning ordinance and building codes helps encourage neo-traditional design as a viable alternative providing greater choice for the consumer.

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 regional waterways to provide cultural and recreational amenities without harming the watersheds.

- ❑ *Encourage mass transit.* North Charleston promotes and encourages mass transit as an alternative for residents and businesses. However, successful mass transit requires regional efforts to implement successfully. The I-26 ALT Plan is assessing the current state of mass transit and is expected to recommend actions that promote the growth of transit use and ultimately the growth of the transit system into a viable alternate mode of travel to automobile travel for the region and the city.
- ❑ *Develop an area-wide runoff management strategy.* To help reduce runoff and non point source pollution, the Harbor Management Plan recommended a tri-county stormwater committee that would focus on minimizing runoff, and produce a Best Management Practices design manual for stormwater management strategies. This requires an effort by North Charleston in concert with other 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 all are also on the Charleston County list.

The lists are countywide, rather than specific to the city; some are unlikely to be found within city limits. For instance, sea turtles and manatees would not likely to be found within North Charleston. However, activities within North Charleston can have impacts on regional coastlines, so it is valuable for North Charleston residents and decision-makers to have an awareness of threatened or endangered species within the 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 and 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](http://www.fws.gov/charleston/docs/county_lists.htm).

#### **BIRD SANCTUARY**

North Charleston’s Code of Ordinances Sections 4-21 and 4-2 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 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.

**Table 5.3.1: Threatened & Endangered Species, Charleston County**

Species	Federal Status	State Status	Habitat	Threats
<b>Mammals</b>				
<b>West Indian Manatee</b> (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
<b>Birds</b>				
<b>Bald Eagle (D)</b> (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
<b>Bachman's Warbler</b> (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
<b>Wood Stork (D)</b> (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
<b>Red-cockaded woodpecker (D)</b> (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 mid-story in older age pine stands due to fire suppression
<b>Piping plover</b> (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
<b>Reptiles</b>				
<b>Kemp's ridley sea turtle</b> (Lepidochelys kempii)	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
<b>Leatherback sea turtle</b> (Dermochelys coriacea)	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
<b>Loggerhead sea turtle</b> (Caretta caretta)	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
<b>Green sea turtle</b> (Chelonia mydas)	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
<b>Amphibians</b>				
<b>Flatwoods salamander</b> (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	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
<b>Fish</b>				
<b>Shortnose sturgeon (D)</b> (Acipenser brevirostrum)	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
<b>Plants</b>				
<b>Sea-beach amaranth</b> (Amaranthus pumilus)	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
<b>Canby's dropwort (D)</b> (Oxypolis 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	Loss or alteration of wetland habitats
<b>Pondberry (D)</b> (Lindera melissifolia)	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
<b>American chaffseed</b> (Schwalbea americana)	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

## 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.

North Charleston's tree protection ordinance requires that all significant trees be shown on building site plans. 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 and recommendation of the City Horticulturist. The ordinance requires that the site location of buildings and driveways avoid all Grand Trees (trees with 24 inches DBH or higher) to the extent possible, and no Grand Trees are to be removed that are outside of the building footprint. Inch-for-inch mitigation is required for the removal of any grand tree, regardless of location. Special rules apply to pine trees per Section 6-16 of the Zoning Regulations.

North Charleston'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.

## 5.4 SUSTAINABILITY

North Charleston has emerged as a state 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 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.

## **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 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.

### 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.

In 2007, there were 16 LEED certified projects in South Carolina including three in North Charleston: North Charleston Elementary School, the Urban Alliance Studio (at 7 Storehouse Row), and Half Moon Outfitter's distribution center. Half Moon's distribution center achieved LEED's highest standard: a Platinum rating. Two other projects, the Navy Yard at Noisette and WPC Inc.'s Corporate Office Building, had registered for the first step in achieving LEED certification. In 2014, there were 17 LEED certified projects and 18 projects pending certification in North Charleston alone! Many of these included major buildings at Boeing and Trident Tech.

### 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.

### CLEMSON UNIVERSITY RESTORATION INSTITUTE

Clemson developed 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 COMMUNITY

The Noisette Community Master Plan encouraged 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 has been required to meet these standards. Noisette also encouraged the use of school facilities to serve community functions, including shared libraries, classrooms, and recreational facilities to reduce the need for multiple single use stand-alone facilities.

### OAK TERRACE PRESERVE

Oak Terrace Preserve was developed at the former Century Oaks site as a community built entirely of EarthCraft certified homes. In addition to green construction practices, the community design was developed to utilize a bio-filtering stormwater system, and preserve the area's tree canopy by saving hundreds of 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 partnered with North Charleston and other local governments to provide affordable housing on in-fill lots. They constructed homes in the Liberty Hill neighborhood that are between 700 and 1,000 square feet, and sold for approximately \$85,000. These and similar small, affordable units provide a great opportunity to convert renters into homeowners.

### HUNLEY WATERS

Hunley Waters is a 36-unit residential community situated along Noisette Creek near the former Navy Base. While its home prices were less affordable than other previously mentioned projects, the development incorporated green development principles, including EarthCraft standards. The homes were built on a site adjacent to Noisette Creek, so eco-friendly development was encouraged and used in the design and construction to minimize impacts on the creek and its habitats. A community dock was recommended as an alternative to individual docks for each lot.

### MIXSON

Mixson is located at the southwestern spoke of Park Circle along Mixson Avenue, and received LEED Silver certification for its initial phase of residential structures. Each residence was equipped with Energy Star rated appliances and fixtures. Previous paving in alleys and courtyards, low-flow plumbing fixtures, and natural irrigation design will contribute efforts towards reducing water consumption in the development. In 2015, development of Mixson is continuing as new multi-family housing is being built and single-family units are in the planning stage.

In addition, additional sustainable developments and initiatives have created 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 have cited sustainability as a factor in relocating to the city. Magazines and newspapers also have noticed and written articles about the city's 'green' practices.

North Charleston is proud of its reputation and tries to build on this initial success to set itself apart as a unique community and as an incubator of renewable resources and sustainable practices. This places the city in a positive strategic position to attract 'cutting edge' business and development. As stated previously in the discussion of Economic Development, North Charleston should promote its image as a 'Sustainable City' and location for innovative business and quality of life.

**5.5 NATURAL RESOURCE GOALS AND POLICIES**

<b>GOAL</b>	<b>POLICY</b>	<b>ACTION</b>	<b>STATUS</b>
5.1: Preserve natural systems associated with tidal streams, wetlands and floodplains	Policy 5.1.1: Prevent the fill and development of wetlands and floodplain areas where possible.	Filling and/or development within wetlands is regulated by the Army Corps of Engineers	Ongoing
	Policy 5.1.2: Take measures to restore tidal stream watersheds.	Adopt the proposed Noisette Creek Preserve Overlay to increase protection around Noisette Creek’s watershed.	The City adopted Section 6-17 to provide riparian buffers city-wide. Planning for the Noisette Preserve is ongoing, and the City is purchasing properties in area using Greenbelt funds.
		Create restoration management plans for other tidal streams within the city	
	Policy 5.1.3: Prevent development and impervious surfaces (except bridges) within 50 feet of streams and wetlands	Adopt a city wide riparian buffer ordinance to increase stream and wetland protection outside of current overlay districts.	Done. Riparian buffer requirements adopted in 2009 & codified in Section 6-17. Dorchester Road Corridor I buffer reqts. are 25’ (see Section 5-12) and Ashley River Scenic Districts vary (see Sections 5-8 through 5-10).
5.2: Maintain and enhance the natural beauty throughout North Charleston	Policy 5.2.1: Protect native plant and animal species in North Charleston	Revise Tree Preservation Ordinance to increase standards for native species	City tree ordinance requires replacement of removed trees in kind (except non-native species and pines, which must be replaced with native species).
		Revise Bird Sanctuary section of City ordinance to include protection of small mammals	

GOAL	POLICY	ACTION	STATUS
	Policy 5.2.2: Continue protecting scenic corridors and natural viewsheds along the Ashley and Cooper Rivers	Enforce the riparian buffer and scenic district requirements	Ongoing.
Goal 5.3: Promote more ecological awareness	Policy 5.3.1: Provide trails and parks with educational and interpretive ecological learning experiences	Use Greenbelt funds to piece together parcels around city creeks to support creating trails system.	Ongoing
	Policy 5.3.2: Continue to encourage eco-friendly and neo-traditional development design to promote green building practices and reduce sprawl	Support LEED, EarthCraft, and other sustainability programs in new developments	
Goal 5.4: Reduce stormwater runoff and non-point source pollution for improved water quality	Policy 5.4.1: Discourage polluting industries and business operations		
	Policy 5.4.2: Encourage developers to utilize bioswales and natural treatment train systems as a natural alternative to curb-and-gutter system	Encourage residents to use rain gardens on their property to help reduce runoff	The Ashley Cooper Stormwater Education Consortium, of which the City is a member, provides education & training to reduce pollutants in residential and commercial developments
		Add a maximum impervious surface percentage standard to residential zoning districts	Maximum lot occupancy standards are codified in the Zoning Regulations.
	Policy 5.4.3: Improve drainage and reduce storm water runoff		
	Policy 5.4.4: Coordinate with other regional jurisdictions to ensure consistent water quality throughout the region	Support regional water quality efforts that support the recommendations of the Charleston Harbor Management Plan	City is partner in Ashley Cooper Stormwater Education Consortium working to implement a regional watershed runoff education strategy in Charleston urbanized area.