

**NATURAL RESOURCES
ELEMENT**



**FLORENCE COUNTY
COMPREHENSIVE PLAN**

NATURAL RESOURCES ELEMENT

TABLE OF CONTENTS

INDEX OF TABLES AND FIGURES	2
INTRODUCTION	3
CLIMATE AND TOPOGRAPHY	4
PRIME AGRICULTURE & FOREST LAND.....	5
FOREST LAND	5
AGRICULTURAL RESOURCES	5
SOIL TYPES.....	8
EROSION.....	11
MINING.....	11
WATERSHEDS & WATER BODIES	13
WATER BODIES.....	14
RIVER BASINS & WATERSHEDS	14
SURFACE WATER QUALITY	18
FLOODPLAINS.....	26
FLOOD HAZARD AREAS.....	26
THREATS TO NATURAL RESOURCES	28
WATER QUANTITY	28
WATER QUALITY	29
PLANT/ANIMAL HABITATS & ENDANGERED SPECIES	33
AIR QUALITY.....	35
UNIQUE SCENIC VIEWS & RECREATION AREAS	37
SUMMARY	42
GOALS AND IMPLEMENTATION STRATEGIES	43
REFERENCES	49
INTERNET SOURCES	49
ELEMENT ADOPTION DATES	51

INDEX OF TABLES AND FIGURES

TABLES

Table 3-1	Florence County Temperature Summary (1948-2006).....	4
Table 3-2	Florence County Precipitation Summary (1892-2006)	4
Table 3-3	Farm Land for Florence and Surrounding Counties (2002).....	6
Table 3-4	Number & Size of Farms in SC, Florence, & Neighboring Counties (1997 & 2002) .	6
Table 3-5	Size and Number of Farms, Florence County (1997 & 2002)	7
Table 3-6	Florence County Changes in Number and Acreage of Farms (1987-2002).....	7
Table 3-7	Florence County Soil Types.....	10
Table 3-8	Florence County Active Mining Permits.....	12
Table 3-9	2006 List of Impaired Waters	20
Table 3-10	Common Water Quality Indicators	21
Table 3-11	Sites on the 2006 303(d) List for Mercury Contamination in Fish	22
Table 3-12	2007 Fish Consumption Advisories	22
Table 3-13	Endangered Plant & Animal Life: Florence County	34

FIGURES

Figure 3-1	Florence County Farmland	8
Figure 3-2	Florence County Soil Types.....	9
Figure 3-3	Watershed of Eastern South Carolina	13
Figure 3-4	Florence County Water Bodies	14
Figure 3-5	Carolina Bay	18
Figure 3-6	Florence County Wetland Inventory	25
Figure 3-7	Florence County Flood Zones	27
Figure 3-8	Natural Water Cycle.....	30
Figure 3-9	Development Impacts to the Water Cycle	30
Figure 3-10	Analysis Between Water Quality and Impervious Surface	32
Figure 3-11	Sources of VOCs	36
Figure 3-12	Sources of NOx	36
Figure 3-13	Lynches River County Park	38
Figure 3-14	Jeffries Creek	39
Figure 3-15	Florence Rail Trail	39

NATURAL RESOURCES ELEMENT

INTRODUCTION

An analysis and inventory of the natural resources of the County is necessary to effectively and productively plan for growth and development. While identifying and recognizing these resources, the Natural Resources Element of the Florence County/Municipal Comprehensive Plan will not only provide information about such resources, but also discuss goals for protection and sustainment. By attempting to preserve, maintain, and improve our natural resources, many facets of our community can be enhanced including social, economic, and cultural aspects.

Conserving natural resources and maintaining a healthy environment is not just about water quality or tree preservation. It is also about understanding the interconnectedness of our ecosystem and using natural resource based planning to ensure that future development respects the characteristics that make Florence County unique. Natural resource based planning starts with conducting a natural resources inventory so a community can see its assets. It then requires that resources be prioritized. Plans and regulations then direct development to the areas most suited for protection, ensuring minimal impact on priority natural resources through the location, design, and engineering of new development.

Florence County is located in the Coastal Plain region of the East Coast and has a variety of natural features and resources that contribute to the quality of life experienced by its residents. Fertile soils, a number of surface water streams, climatic conditions suitable for extended agrarian activities, and an abundance of forested areas enrich the County's recreation amenities, community facilities, and industrial opportunities.

Florence County has a total of 803.05 square miles of land area. Of these 803.05 square miles, 3.84 are covered by water (2005 SC Statistical Abstract). Forest areas and watercourses surround the County on nearly every side, including the Great Pee Dee River that borders Florence County along its eastern side and the Lynches River that runs directly through Florence County ending as it converges with the Great Pee Dee River in the City of Johnsonville. In addition to these rivers, a host of other features compose the natural resources within the total area of Florence County, including fertile soil, wetlands, swamps, bays, and many naturally scenic areas.

This Element is divided into twelve sections, including the Introduction, Summary, and Goals. The remaining sections are:

- Climate and Topography/Slope Characteristics
- Prime Agriculture & Forest Land
- Soil Types
- Mining
- Water & Wetlands
- Flood Hazard Areas
- Plant/Animal Habitats & Endangered Species
- Air Quality
- Unique Scenic Views & Recreation Areas

The conservation of natural resources coupled with the understanding of our ecosystems will ensure that future development has a reduced impact on our natural resources with attention given to location, engineering and design.

The information in the Natural Resource Element is a statement of current environmental conditions and an analysis of that information. It serves to show the resources and environment indicative to Florence County. Ideally, this document will be used as the basis for future planning in Florence County in order to recognize, protect, and enhance existing natural resources.

CLIMATE AND TOPOGRAPHY

The climate in Florence County is relatively temperate. The warm season begins in April and extends into September. The Appalachian Mountains, which are 175 miles northwest of Florence, act as a natural barrier from most cold fronts keeping winters relatively mild. However, winter temperatures often dip into the 20s. Snow flurries can occur, but it is unusual to have any measurable amount of snowfall. The average temperature in January is 44.7 degrees. The first frost of the season typically occurs in mid-November, with the last frost typically in mid-March. Florence averages an annual rainfall of 43.72 inches, with 36% falling in summer, the greatest of any other season. In addition, Florence experiences its warmest weather during the summer months, with the average temperature in July reaching 81°F. Annually, the average daytime temperature is 63.2°F. The tables below list climate statistics for the County (Internet 1).

Table 3-1 Florence County Temperature Summary (1948-2006)

	TEMPERATURE	DATE
Highest Maximum Temperature	108°F	6/27/1954
Highest Mean Temperature	92°F	7/13/1986
Lowest Minimum Temperature	0°F	1/21/1985
Lowest Mean Temperature	12.5°F	1/21/1985
Maximum Annual Average Temperature	74.8°F	N/A
Mean Annual Average Temperature	64°F	N/A
Minimum Annual Average Temperature	53.1°F	N/A

Source: South Carolina State Climatology Office

Table 3-2 Florence County Precipitation Summary (1892-2006)

	STATISTIC	DATE
Highest Daily Rainfall	8.2"	9/5/1979
Annual Average Rainfall	46.46"	n/a
Wettest Year	82.64" of precipitation	1929
Driest Year	27.5" of precipitation	1954
Mean Snowfall	1.9"	n/a
Largest Snowfall	13"	1973

Source: South Carolina State Climatology Office

Florence County can be found approximately 60 to 65 miles inland from the Atlantic Ocean between the Great Pee Dee and Lynches Rivers. It is composed of 803.05 square miles, or approximately 512,000 acres, and it is situated in the northeast part of South Carolina in the coastal plains region. Florence County has a gently rolling to level terrain, and resides between 25 and 150 feet above sea level. The City of Florence, the highest point in the County, is situated 150 feet above sea level, as opposed to the flood zones, which are located 25 feet above. The majority of the County is an average of 70 feet above sea level and is drained by the tributaries of the Great Pee Dee and Lynches Rivers (Internet 13).

PRIME AGRICULTURE & FOREST LAND

FOREST LAND

Florence County woodlands can be divided into two types of vegetative communities: upland vegetation and lowland forest areas. The upland forest has both coniferous (cone bearing) and deciduous (shedding leaves annually) forests. This area is known to have ample pines and broad leaf tree species that tower across the landscape. The types of trees in the upland area can include: oaks, sweet gums, and hickories. At the base of the larger trees is an assortment of thick understory, including smaller trees, shrubs and vines such as blackberry and muscadine grape. The lowland forest areas, which are located within the flood plain of the Great Pee Dee and Lynches Rivers, include trees such as bald cypress, gum, sycamore, water hickory, lowland oaks, soft maples, willows, and others. The understory is similar to the understory of the upland woodlands, but is also cleaner in flood prone areas.

Trees are vital natural resources and must be conserved and protected. Trees have many benefits to a community such as:

- reducing electricity bills by providing shade to homes and neighborhoods
- increasing property values, reducing storm water runoff and flooding possibilities
- enhancing wildlife and providing habitats for animals and other plants
- improving air quality by removing dust and other pollutants such as ozone, carbon monoxide and sulfur dioxide from the air and producing oxygen
- reducing the temperature by providing shade
- reducing glare and reflection
- contributing to a more aesthetically pleasing community

Trees contribute greatly to a community which is why it is vital to enhance, conserve, and protect the trees in Florence County. This concept will be discussed further in the Land Use Element.

AGRICULTURAL RESOURCES

Significant portions of Florence County have been adapted for crop production and overall farm usage. (See Table 3-3) Soil types and their characteristics, which will be discussed later, are important factors in the measure of success realized in growing the variety of crops in Florence County. The table below compares the farm acreage of Florence County with those of the neighboring counties.

THIS SPACE LEFT BLANK INTENTIONALLY

Table 3-3 Farm Land for Florence and Surrounding Counties (2002)

COUNTY	TOTAL LAND AREA OF COUNTY (ACRES)	FARM LAND (ACRES)	% FARM LAND
Florence	511,494	171,388	33.51%
Clarendon	388,640	147,890	38.05%
Darlington	359,718	161,443	44.88%
Dillon	259,123	112,262	43.32%
Lee	262,611	122,518	46.65%
Marion	313,024	93,262	29.79%
Marlboro	307,021	114,963	37.44%
Sumter	425,894	135,805	31.89%
Williamsburg	597,760	205,904	34.45%

Source: National Agricultural Statistic Service

As the table above indicates, Florence County had a relatively lower percentage of farm land, compared to other surrounding counties. At 33.5%, Florence ranks seventh in the Pee Dee in its percentage of farm land. Only Sumter and Marion have lesser amounts of farm land at 31.89% and 29.79% respectively. Lee County, which is primarily rural, has the largest portion of farm land at 46.65%. However, the table below provides further insight into how farming is changing in Florence and surrounding counties.

Table 3-4 Number & Size of Farms in SC, Florence, & Neighboring Counties (1997 & 2002)

COUNTY	# OF FARMS (1997)	AVERAGE SIZE (1997)	# OF FARMS (2002)	AVERAGE SIZE (2002)
South Carolina	25,807	193 acres	24,541	197 acres
Florence	762	235 acres	612	280 acres
Clarendon	365	407 acres	390	319 acres
Darlington	433	382 acres	361	447 acres
Dillon	229	415 acres	197	570 acres
Lee	267	465 acres	324	378 acres
Marion	240	347 acres	213	438 acres
Marlboro	212	564 acres	222	518 acres
Sumter	501	296 acres	537	253 acres
Williamsburg	740	272 acres	681	302 acres

Source: SC Statistical Abstract, 2006

As illustrated in the table above, in 2002 Florence County had 612 individual farms, at an average size of 280 acres. Of the Pee Dee Counties, only Williamsburg has more farms than Florence with 681. Dillon County represents the Pee Dee County with the largest average size farm at 570 acres. Based on the above table, between 1997 and 2002 the number of farms in Florence County decreased, but the size of the remaining farms increased. So, while Florence lost a number of farms over this time period, the County also gained acreage on remaining farms. Of the 612 farms, 464 were less than 219 acres. This may be an indication of an emergence of part-time or hobby farmers that operate farms under the notion that the farm will not be a primary source of income. Often times, hobby farmers operate farms as a side job. Farms in Florence County represent 2.5% of all farms in the state. Statewide, Anderson tops this list, with 6.7% of all farms in South Carolina located in their county. Moreover, McCormick County has the fewest farms in the state, representing only 0.4% of the total. Of the Pee Dee Counties, Florence ranks fifth in the market value of agricultural products sold, at thirty-five million dollars per year. The majority of the thirty-five million dollars of agricultural products sold in Florence County is produced by the farms in the county that are over 219 acres in size. From the table below, you can see that 148 farms are larger than 219 acres. The farms in Florence, large and small, produce a variety of crops, including cotton, soybeans, hay, tobacco, grain corn, and grain wheat.

Table 3-5 Size and Number of Farms, Florence County (1997 & 2002)

SIZE OF FARM (ACRES)	NUMBER OF FARMS (2002)
1 - 49 ACRES	228
50 - 99 ACRES	100
100 - 219 ACRES	136
220 - 499 ACRES	64
500 + ACRES	84

Source: National Agricultural Statistic Service

In regards to total farm acreage, Florence County's total has decreased approximately 24% between 1987 and 2002. Changes in farmland resources have also occurred over recent periods of time. Significant changes in the amount of farmland in the County may be indicative of changes in community priorities or due to development activities and increased competition in other economic markets. The table below indicates the changes in farms in Florence County between 1987 and 2002.

Table 3-6 Florence County Changes in Number and Acreage of Farms (1987-2002)

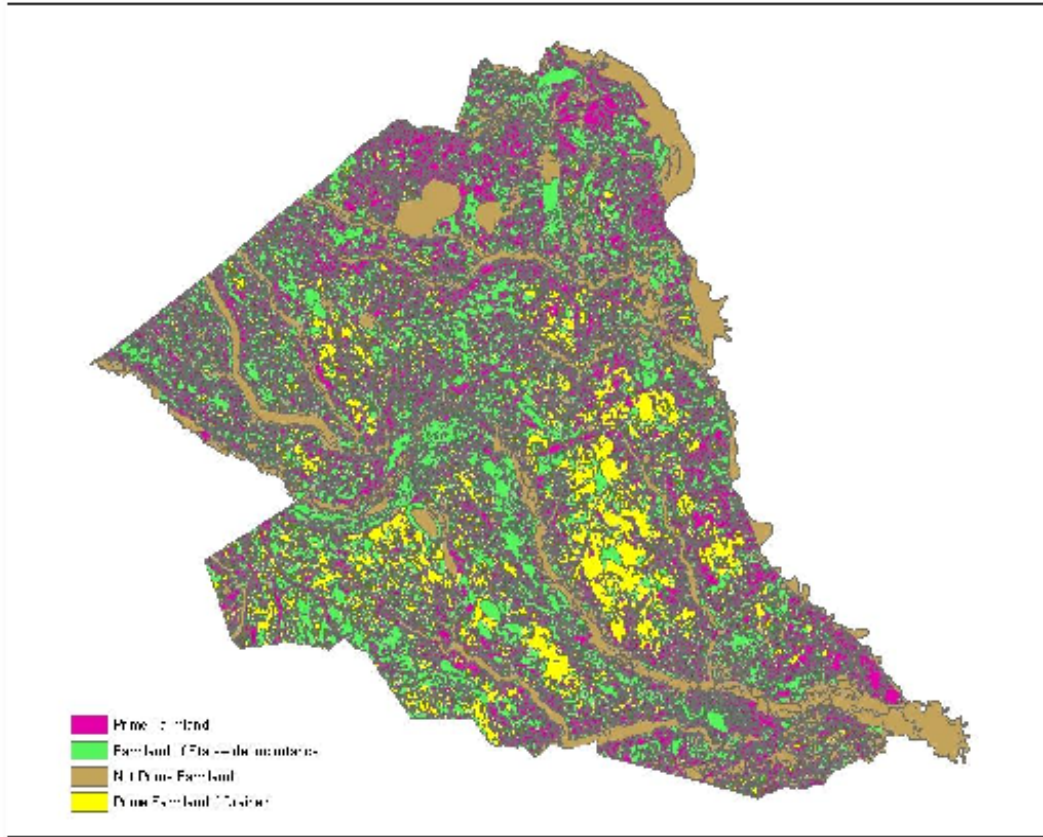
	# OF FARMS	LAND IN FARMS	TOTAL CROPLAND	TOTAL CROPLAND
1987	926	209,688 acres	891 farms	136,465 acres
1992	781	194,822 acres	755 farms	131,812 acres
1997	615	168,600 acres	579 farms	114,479 acres
2002	612	171,388 acres	532 farms	103,576 acres
15 year change	-314	-38,300 acres	-359 farms	-32,889 acres

Source: National Agricultural Statistic Service

While agriculture is visible across Florence County, certain areas, such as locations of prime farmland, are better suited for this use. Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. If treated and managed according to acceptable farming methods, prime farmland can produce large amounts of crops. Not only is prime farmland ideal for farming and crop production, but it can easily be converted and used for development. Often times, prime farmland is converted for development purposes when it is located in close proximity to urban areas. Between 1992 and 1997, 86,200 acres of prime farmland in South Carolina was converted to developed land. Furthermore, of the land developed during those years, 23.8% was prime farmland. If Florence County desires to protect prime farmland from development in the future, this can be accomplished through zoning and conservation easements.

Land that does not meet the criteria for prime may be considered farmland of statewide importance. The criteria for defining farmland of statewide importance are determined by the appropriate state and local agencies in cooperation with the US Department of Agriculture (USDA). Farmland of statewide importance includes land areas where the soils do not meet the requirements for prime farmland, but are still highly productive. Farmland of statewide importance may include tracts of land that have been designated for agriculture by State law. This type of farmland can produce a high yield of crops if treated and managed properly. In addition, it can be expensive to convert back into quality cropland once developed. The following map shows the location of prime farmland and farmland of statewide importance in Florence.

Figure 3-1 Florence County Farmland



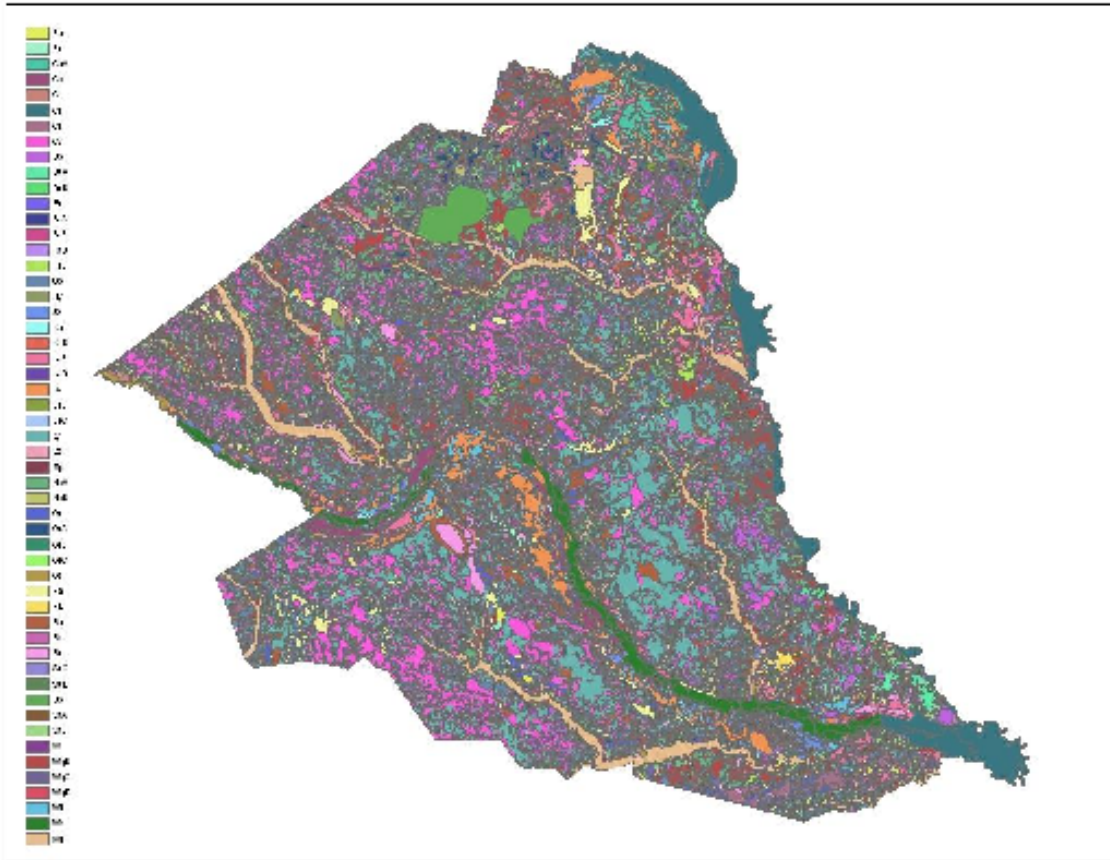
Map courtesy of the South Carolina Department of Natural Resources

SOIL TYPES

Soil types play a crucial role in determining agricultural, industrial, recreational, and wildlife composition. Throughout Florence County, there are a variety of uses for the wide range of soils. Soil types considered optimal for agricultural use are also considered good for residential, commercial, and industrial uses. The following is a brief summary of some of the soil types found in Florence County. The information in this section was taken from the Natural Resource Conservation Service (NRCS) website (Internet 2). The table and map below, which can and should facilitate land use planning, list the soil types in Florence County.

THIS SPACE LEFT BLANK INTENTIONALLY

Figure 3-2 Florence County Soil Types



Source: Natural Resource Conservation Service (Internet 2)

THIS SPACE LEFT BLANK INTENTIONALLY

Table 3-7 Florence County Soil Types

SOIL TYPE	ACRES	COMMON CROPS
Barth Loamy Sand (Ba)	2,813	n/a
Brogdon Sand (Br)	1,074	n/a
Cahaba Loamy Fine Sand (0-3% Slopes) (CaA)	5,833	n/a
Cahaba-Leaf Complex (Cb)	3,845	n/a
Cape Fear Loam (Ce)	967	n/a
Chastain-Chewacla-Congaree (Ch)	18,471	n/a
Chipley Loamy Sand (Cn)	4,090	Tobacco, cotton, corn, soybean, oats
Coxville Fine Sandy Loam (Cv)	69,674	Corn, soybeans, small grain, pasture grasses
Duplin Fine Sandy Loam (Dp)	20,402	Tobacco, cotton, corn, soybean, truck crops, small grain
Duplin and Exum Soils (0-2% Slopes) (DuA)	3,222	n/a
Duplin and Exum Soils (2-6% Slopes) (DuB)	961	n/a
Exum Sandy Loam (Ex)	1,154	n/a
Faceville Loamy Sand (0-2% Slopes) (FaA)	357	n/a
Faceville Loamy Sand (2-6% Slopes) (FaB)	256	n/a
Faceville Loamy Sand (6-15% Slopes) (FaD)	42	n/a
Fuquay Sand (0-4% Slopes) (FuB)	2,294	n/a
Goldsboro Loamy Sand (Go)	46,306	Tobacco, cotton, corn, soybeans, truck crops, small grain
Hyde Loam (Hy)	357	n/a
Johns Fine Sandy Loam (Jo)	6,917	n/a
Kalmia Loamy Sand (Ka)	1,799	n/a
Kenansville Sand (0-4% Slopes) (KeB)	1,642	n/a
Lakeland Sand (0-6% Slopes) (LaB)	22,096	Corn, peanuts, watermelons, soybeans
Lakeland Sand (6-15% Slopes) (LaD)	3,848	Coastal Bermuda grass, bahia grass, sericea lespedeza
Lucy Sand (0-6% Slopes) (LuB)	1,442	n/a
Lynchburg Sandy Loam (Ly)	78,523	Tobacco, corn, soybeans, small grain
Lynn Haven Sand (Lz)	446	n/a
Mine Pits and Dumps (Mp)	419	n/a
Norfolk Loamy Sand (0-2% Slope) (NoA)	34,993	Cotton, corn, soybeans
Norfolk Loamy Sand (0-2% Slope) (NoA)	7,114	Cotton, corn, tobacco, soybeans, small grain
Olanta Loamy Sand (On)	4,001	n/a
Orangeburg Loamy Sand (0-2% Slopes) (OrA)	3,224	Cotton, tobacco, corn, soybeans
Orangeburg Loamy Sand (2-6% Slopes) (OrB)	1,544	n/a
Orangeburg Loamy Sand (6-10% Slopes) (OrC)	100	n/a
Osier Loamy Sand (Os)	7,058	n/a
Pantego Loam (Pa)	12,546	n/a
Pocalla Sand (0-4% Slopes) (PIB)	1,422	n/a
Rains Sandy Loam (Ra)	20,487	Corn, soybeans, small grain, pasture grasses
Rimini Sand (Rs)	154	n/a
Rutlege Loamy Sand (Ru)	7,357	Gum trees, water-tolerant oak trees, cypress, some pines
Sunsweet Loamy Fine Sand (6-10% Slopes) (SuC)	1,418	n/a
Sunsweet Loamy Fine Sand (10-25% Slopes) (SuE)	1,494	n/a
Urban Land-Coxville Norfolk Association (Ub)	4,778	n/a
Varina Loamy Fine Sand (0-2% Slopes) (VaA)	1,470	n/a
Varina Loamy Fine Sand (2-6% Slopes) (VaA)	3,911	n/a
Water (W)	3,433	n/a
Wagram Sand (0-6% Slopes) (WgB)	30,263	Cotton, tobacco, corn, soybeans, Bermuda & bahia grass
Wagram Sand (6-10% Slopes) (WgC)	2,834	n/a
Wagram Sand (10-15% Slopes) (WgD)	1,291	n/a
Wahee Fine Sandy Loam (Wh)	5,598	n/a
Wehadkee-Chastain Association (Wk)	11,011	n/a
Wehadkee and Johnson Soil	31,622	n/a

Source: Natural Resource Conservation Service (Internet 2)

EROSION

In addition to the many uses that can occur on various soil types, there are also major concerns with erosion of soils in Florence County. Soil erosion management is a widespread issue in both Florence and throughout South Carolina, and leads to many problems including the following:

- Filling of streams and lakes
- Reduction of cropland
- Damaging of fish and wildlife habitats
- Clogging of storm drainage systems
- Increasing the costs associated with water treatment

Erosion is a process in which soil particles are loosened from an original resting area and transported to another location. Although often a natural process and the result of wind, water run-off, or other geologic means, erosion can be increased by poor land use practices, deforestation, overgrazing, unmanaged construction activity, and road building. However, improved land use practices can reduce erosion through techniques such as terrace-building and tree planting. In order to reduce the amount of erosion caused by development, sites that have soil types with minimal limitations regarding the intended use for the site are encouraged for selection. Erosion mitigation methods would also help to increase site stability and reduce the negative effects on other areas in the County.

Additionally, by volume, sediment, matter that has been deposited by some natural process such as wind and water, is considered a major source of water pollution. In order to attempt to alleviate this growing problem, there are several steps that can be taken according to the NRCS as follows:

1. Planners should pass ordinances in their communities to control erosion.
2. Plans should include standard practices to reduce runoff and retain soils sediment on site.
3. Developers should be required to prepare a soil and water conservation component to any development that disturbs or adds fill dirt to the natural surface of the land.
4. The watershed approach should be used in planning for soil and water conservation and stormwater management.
5. Local planners should encourage the adoption of Best Management Practices (BMPs) to guide forestry, agriculture, and construction activities.
6. Planners should use soil survey information for making land use plans and decisions. Furthermore, builders and developers should consult a soil survey before commencing any construction activities.

MINING

South Carolina currently has approximately 540 active mining permits. Sixteen of these permits are active in Florence County. Of these 16 mines, 7 mine strictly sand, while the other 9 mine both sand and clay. In 1974, the South Carolina Mining Act was passed to ensure all mined lands would be returned to some useful purpose and for the protection of people and the environment. This process is also known as the reclamation process. The reclamation process, as well as the mine permitting process, is overseen by the Mining and Reclamation Section of the SC Department of Health and Environmental Control (SCDHEC). The basic objectives of reclamation are to ensure public safety, establish vegetation for soil stability, and protection of adjacent areas. The regulations allow for reclamation such as lakes or ponds, grasslands,

woodlands, croplands, parks or recreational areas, landfills or residential or commercial development (Internet 15). The table below provides a list of active mining permits in Florence County, as well as the minerals mined and the reclamation practice.

Table 3-8 Florence County Active Mining Permits

MINE NAME	MINERALS MINED	RECLAMATION PRACTICE
Anderson Pit	Sand Top	n/a
Asphalt Plant # 8	Sand	Grasslands
Hayes Excavation	Sand/Clay	Lake or Pond
Hayes Excavation (2)	Sand/Clay	Lake or Pond
Huggins Pit	Sand Top	n/a
J. Hayes	Sand/Clay	Grasslands
J. Hayes (2)	Sand/Clay	Grasslands
Johnsonville Plant	Sand	Lake or Pond
McCutcheon #2	Sand/Clay	Grasslands, Lake or Pond
McCutcheon Mine	Sand/Clay	Grasslands
McLellan Pit	Sand Top	n/a
Poston Pit	Sand/Clay	Grasslands, Lake or Pond
Prestress Mine	Sand	Grasslands, Lake or Pond
R.E. Goodson Mine	Sand/Clay	Grassland
Wildbird Run Mine	Sand Top	n/a
Wildbird Run Mine (2)	Sand Top	n/a

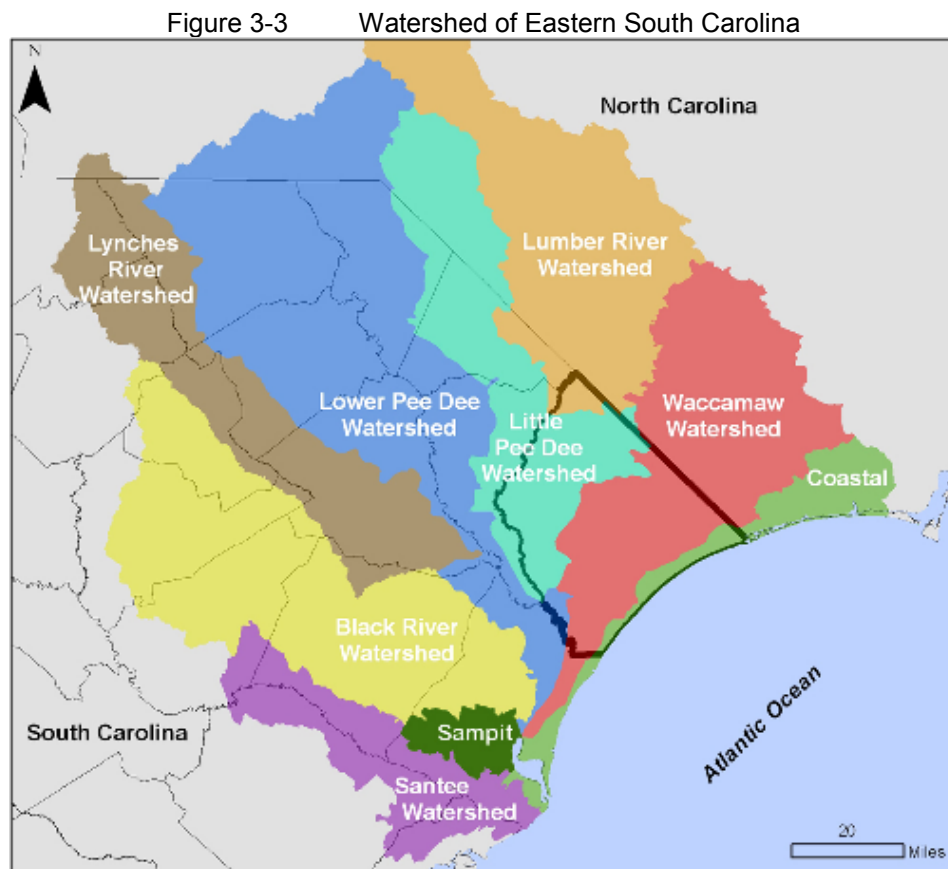
Source: SC Department of Health and Environmental Control (SCDHEC)

THIS SPACE LEFT BLANK INTENTIONALLY

WATERSHEDS & WATER BODIES

A watershed is the land that water flows across or through on its way to a common stream, river, or lake. Water that flows across land is usually the result of rainfall, which generates stormwater runoff. Areas with high water tables also support sustained dry weather flows into low-lying areas, such as ditches and creeks. Flows are also supported by groundwater emissions, including artesian springs.

Depending on the specific management need, a watershed can be defined broadly, such as the drainage for an entire river or lake, or very narrowly, such as the drainage feeding just a small creek or pond. The broadest spatial scale is termed a “basin” and the smallest, a “catchment”. In South Carolina, eight basins have been defined (**Map 1**). Florence County, located west of the highlighted County, Horry County, lies within two watersheds, the Lower Pee Dee and Lynches River Watersheds.

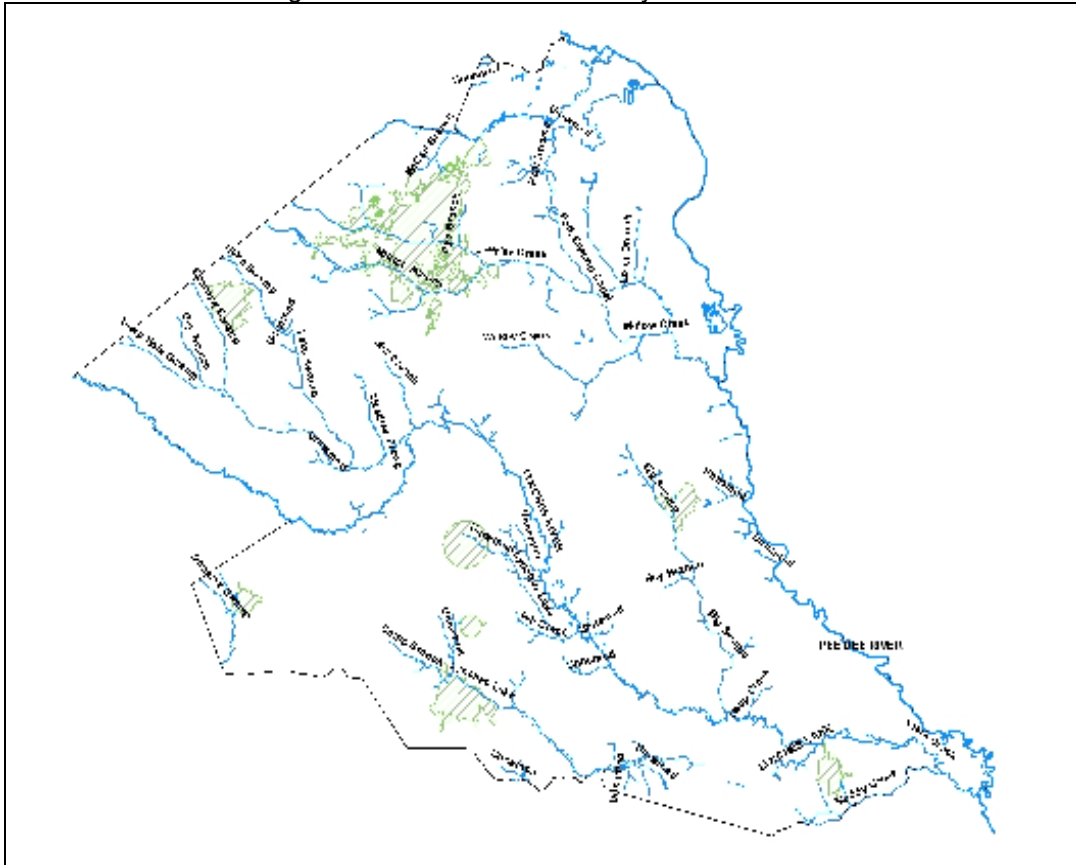


Source: Waccamaw Watershed Academy, Coastal Carolina University

WATER BODIES

Florence County has over 139,000 acres covered by water. These water sources include rivers, creeks, ponds, and streams. The map below shows the major water bodies in Florence County.

Figure 3-4 Florence County Water Bodies



Map courtesy of the Florence County Planning Department

RIVER BASINS & WATERSHEDS

Two major river basin assessments were completed in August 2007, by Natural Resource Conservation Service (NRCS). These reports provide a comprehensive study and assessment and can be accessed at: http://www.sc.nrcs.usda.gov/intranet/rapid_watershed_assessment.html

Watersheds and drainage basins are the parts of the land surface of Florence County that serve the purpose of channeling rainwater to the two major rivers in the County: the Lynches River and the Great Pee Dee River. The average annual rainfall for the County is 46.46 inches per year. Most of this rainfall is used by plants, absorbed into the soil, or drained into basins and rivers (Internet 1). A portion of the rainfall is intercepted by plants and absorbed into the soil. The remaining water that is not evaporated progresses through drainage basins to river channels.

The following information, taken from a report by the North Carolina Department of Environment and Natural Resources, details information about the Yadkin-Pee Dee River Basin: The Yadkin-Pee Dee Basin is the northern portion of a large river system that drains central North Carolina and northeastern South Carolina. The basin is divided into four sub-basins. The headwaters of the Yadkin River drain the eastern slope of the Blue Ridge Mountains, northeast of Blowing Rock. In the upper part of the basin the Yadkin flows generally northeasterly for about 100 miles before turning south. It continues flowing southeasterly and merges with the Uwharrie River east of Albemarle to form the Pee Dee River. The Rocky River flows into the mainstream below Lake Tillery. The Pee Dee continues flowing southeastward through South Carolina, where it is known as the Great Pee Dee River, and flows into the Atlantic Ocean near Georgetown, SC (Internet 5).

Land in Florence County is influenced by two major rivers of the Pee Dee River basin and an extensive network of tributaries feeding into those rivers. Interconnected within the County are also a number of branches, creeks, swamps and wetlands, as indicated in the map above. These areas serve vital functions related to the County's water supply, drainage, agricultural activities, and wildlife habitat. Some of the tributaries of the two rivers in the County are unnamed and minor in terms of the water volume contributed into larger streams, but they all contribute to the important surface water areas of the County. The list provided in this section includes the rivers, creeks, and most of the major branches feeding into the rivers (1997 Comprehensive Plan).

Florence County is covered in its entirety by the Pee Dee River basin. However, there are three sub-basins that operate within this larger basin to drain runoff from portions of the County. These three sub-basins are described as follows:

- **Great Pee Dee River Sub-basin:** This sub-basin drainage area covers the northeastern portion between Marion and Florence Counties, draining about 40% of the County's land area. The City of Florence and the Town of Quinby are both located within the Great Pee Dee River Sub-basin.
- **Lynches River Sub-basin:** This sub-basin drains the municipalities of Timmonsville, Coward, Lake City, Scranton, Pamplico and Johnsonville. Being located in the middle of the County, the Lynches River Sub-basin covers about 55% of Florence County.
- **Black River Sub-basin:** Although the Black River does not flow through any portion of Florence County, part of its sub-basin can be found in the County. Black River is in Williamsburg County just to the south of Florence County. About 5% of Florence County's southwestern edge is affected by the sub-basin of the Black River.

Issues involving river basins are primarily related to water run-off. Run-off can carry a variety of pollutants, including petroleum products from spills, automobiles, and highways. Pesticides and fertilizers, as well as chemical treatments for golf courses, can travel along the sub-basins in the County. As mentioned earlier, sedimentation from erosion and contaminants can cause problems for water-based recreational areas and natural sources used for public water supplies. As part of the mandate from the Environmental Protection Agency (EPA) and the South Carolina Department of Health and Environmental Control (SCDHEC), Florence County has adopted a storm water management plan that addresses various requirements. Implementation of this plan will not only allow Florence County to meet the Federal and State requirements, but also provide opportunities for improving the water quality in the area.

The following sections provide listings and information about water resources in Florence. A map of many of these water features can be found in the map on page 12 of this document.

Rivers

- **Great Pee Dee River:** This River forms the eastern border of Florence County and runs in a southeastern direction. This is the larger of the two rivers associated with the County and has a drainage area over most of the northeast portion of Florence County.
- **Lynches River:** Lynches River enters the County on the west near Cartersville and runs through the middle and southeast parts of the County. Its boundaries merge with the Great Pee Dee River in the southeastern corner of the County.

Lakes and Ponds

- **Forest Lake:** Located off of West Palmetto Street
- **Lazar Lake:** Situated between Second Loop Road and Jeffries Creek
- **Lynches Lake:** Located between Lake City and Johnsonville
- **Lake Oakdale:** Located northwest of Interstate 95 in the Oakdale community
- **Freedom Florence Pond:** Located off of SC 51 near Jefferies Creek
- **McLeod Park Pond:** Located off of US 76 at David McLeod Park
- **Muldrows Mill Pond:** Located south of the City of Florence near US 52
- **Quinby Pond:** Located on King Road¹

Wetlands and Swamps

Wetlands cover a large part of Florence County. These areas create a number of outdoor activities including fishing, hunting, boating, wildlife observation, natural studies, swimming, camping, and hiking. According to the Environmental Protection Agency (EPA), "Inland wetlands are most common on floodplains along rivers and streams, in isolated depressions surrounded by dry land, along the margins of lakes and ponds, and in other low-lying areas where the groundwater intercepts the soil surface or where precipitation sufficiently saturates the soil". Florence County wetlands may include marshes and wet meadows with herbaceous plants, swamps dominated by shrubs, and wooded swamps with trees as described by the EPA. These areas are abundant in undisturbed plant and animal life with some of the species found being rare and endangered, which will later be discussed (Internet 6).

Swamps

- **Back Swamp:** Traces a portion of the northern County line abutting Darlington County
- **Big Swamp:** Runs parallel with a portion of SC 51 near the Pamplico area
- **Deep Hole Swamp:** Located in Cartersville
- **Douglas Swamp:** Located in the Motts area, southwest of Olanta
- **Lake Swamp:** Situated between Timmonsville and Effingham
- **Little Swamp:** Located near the Pee Dee River in the southeastern part of the County
- **Long Branch Swamp:** Runs along the southern portion of the County line and borders Williamsburg County
- **Middle Swamp:** Located southwest of the City of Florence
- **Polk Swamp:** Located in the northeast part of Florence County
- **Sparrow Swamp:** Situated south of Timmonsville
- **Snow's Island:** Located in the southeastern most tip of the County near Johnsonville

Branches

- **Alligator Branch:** Located between US 52 and Savannah Grove Road
- **Barfields Old Mill Branch:** Located northeast of Pamplico
- **Bay Branch:** Located in the Cartersville Township, west of Timmonsville
- **Big Branch:** Located near Danwood
- **Bigham Branch:** Located north of Pamplico
- **Boggy Branch:** Located in the northeast part of County

¹ Added Per Town of Quinby

- **Bullock Branch:** Located southeast of Pamplico
- **Bushy Branch:** Runs through Olanta and into Douglas Swamp, just south of Olanta
- **Camp Branch:** Runs along Highway 403, towards Lake City
- **Cane Branch:** Located in the north central part of County
- **Claussen Branch:** Located in the northeast part of County
- **Gum Branch:** Located on Cane Branch Road
- **Long Branch:** Located in the northeast part of County
- **McCall Branch:** Located west of Evergreen
- **Meadow Prong Branch:** Located in Effingham, west of Savannah Grove Road
- **Middle Branch:** Situated in the northern part of County
- **Mill Branch:** Located on the eastern part of the County, north of Pamplico
- **Mill Pond Branch:** Located southwest of Pamplico
- **Pole Cat Branch:** Located near Lynch Cross Roads, west of Coward
- **Two Mile Branch:** Located west of Scranton (1997 Comprehensive Plan)

Creeks

- **Adams Creek:** Located in the northern part of County
- **Beaver Dam Creek:** Located northwest of the City of Florence
- **Black Creek:** Located north of Quinby
- **Clarks Creek:** Marks a portion of the southeastern County line
- **Cypress Creek:** Located near Evergreen
- **Deep Creek:** Located north of Johnsonville
- **High Hill Creek:** Located between Coward and Scranton
- **Jeffries Creek:** Runs through the northern portion of the County from the Darlington County line in the west to the Pee Dee River in the east
- **Muddy Creek:** Runs along the southern portion of the County line near Johnsonville
- **Willow Creek:** Located near Evergreen (1997 Comprehensive Plan)

Carolina Bays

While many of the natural resources in Florence County are clearly identifiable and understandable, there is one natural phenomenon that has varying explanations for how they came to exist. The following information is taken from a brochure from US Fisheries and Wildlife to assist in explaining this resource. Carolina Bays are small wetland depressions which are symmetrically oval in shape. When seen from the air, they are very distinct and the long axis of the oval is always oriented northwest to southeast. These wetlands occur only in the coastal plain regions of North Carolina, South Carolina, and Georgia and vary in size from one acre to thousands of acres. The origin of Carolina Bays is a mystery. Some theories include: meteor showers, ocean currents, and sinkholes, but each theory has at least one flaw to disprove it. There are several different vegetative structures found in Carolina Bays based on the depression depth, size, hydrology, and subsurface. The map below shows Woods Bay located in Florence County, near Olanta.

The map below shows Woods Bay located in Florence County, near Olanta. Woods Bay consists of 1,590 acres including marsh, sand hills, oak, hickory forest and a shrub bog. More than 75 species of mammals, reptiles and amphibians are found here, along with more than 150 species of birds. Woods Bay State Natural Area offers a close-up look at one of the last remaining large Carolina Bays on the Atlantic Coastal Plain.

Kingsburg Bay is a very unique Carolina Bay in Kingsburg, Lower Florence County that is being extensively studied for its unique plant and animal communities.

Figure 3-5 Carolina Bay



Map courtesy of the Florence County Planning Department

Some bays are predominately open water areas with large scattered pond cypress trees, while others are very thick, shrubby areas. A list of the bays in the County is given below. There are also numerous smaller and unnamed bays in the County that may not be named here.

Bays

- **Alligator Bay:** Located near the Evergreen Community
- **Big Bay:** Situated southeast of Scranton
- **Ben Gause Bay:** Located near Lynches River County Park
- **Carolina Bay:** Located in southwest portion of County
- **Cox Bay:** Located southeast of New Hope
- **Cypress Bay:** Located near Highway 46 close to the Evergreen Community
- **Dials Bay:** Located near Highway 51 close to the Evergreen Community
- **Green Bay:** Situated on the east side of Florence County, south of Highway 76
- **Green Spring Bay:** Located near the Evergreen Community
- **Gregg Bay:** Located southwest of Evergreen near Highway 149
- **Kingsburg Bay:** Located in Kingsburg, Lower Florence County, on Chinaberry Road
- **Maple Bay:** Located near the Evergreen Community
- **Mill Bay:** Located north of Lake City
- **Morris Bay:** Located near the Effingham Community
- **Sand Hill Bay:** Situated near Effingham
- **Tans Bay:** Located off Highway 35 (John Paul Jones Road) near Perkins Crossroads
- **Turner Bay:** Located near Highway 149 near the Evergreen Community
- **Whites Bay:** Located near Highway 301, southwest of Cusaac's Crossroads
- **Woods Bay:** Located south on Highway 58 toward Shiloh, Woods Bay Rd(Hwy 48)

SURFACE WATER QUALITY

In 1972 Congress enacted the Clean Water Act ("CWA" or "the Act") "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters" so as to support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water. SC DHEC has been delegated as the authority to implement the provisions of the CWA through S.C. Regulation 61-68, *Water Classifications and Standards* and S.C. Regulation 61-69, *Classified Waters*.

Regulation 61-68 establishes water classifications based on designated uses (DUs) tied to water quality standards and criteria.

By federal law, the waters classified for regulation under the Clean Water Act are those defined as all the "waters of the United States" (33 CFR Part 328). These generally include all natural surface waters including some wetlands. A complete list of water bodies and their specific classification can be found in S.C. Regulation 61-69, *Classified Waters*.

The types of classified waters in Florence County are listed below along with their designated uses (DU). Examples of the most important DUs are: (1) supports recreational activity, (2) supports aquatic life, (3) drinking water source. For each classification, a set of water quality standards and criteria exist. Failure to maintain these standards is taken as evidence of lack of attainment of designated use. SC DHEC is charged with monitoring compliance with the water quality standards. It is the intent and purpose of the regulations that waters that meet the standards shall be maintained and waters that do not meet the standards shall be improved (SCDHEC, State of South Carolina Integrated Report for 2004, Part II: Assessment and Reporting, 2004).

- **Class ORW**, or "outstanding resource waters," is freshwater or saltwater which constitute an outstanding recreational or ecological resource, or those freshwaters suitable as a source for drinking water supply purposes, with treatment levels specified by the Department.
- **Class FW**, or "freshwater," is water suitable for primary and secondary contact recreation and as a source for drinking water supply, after conventional treatment. These waters are also suitable for fishing, and the survival and propagation of a balanced indigenous aquatic community of fauna and flora. This class is also suitable for industrial and agricultural uses.

Every two years, SCDHEC is required to report which waterbodies fail to meet water quality standards and hence are not attaining their designated uses. This is referred to as the 303(d) list of impaired waterbodies. The 2004 and 2006 lists for waters and sediment in Florence County is provided in Table 3-9. It is based on samples collected between 2000 and 2004. Sites are listed by water or sediment quality criteria that have been violated, such as adequate dissolved oxygen, or excessively high turbidity, fecal coliform, heavy metals or pesticides.

It is important to note that the 2006 sampling periods, 2000 – 2004 included years during which Florence County was in a period of severe drought, i.e., 1999 – 2002. Higher rainfall would be expected to result in lower water quality due to pollution from stormwater runoff.

The following are abbreviations for uses which support a particular activity as determined by SCDHEC:
AL- Aquatic Life Use
REC-Recreational Use/Swimming
FISH-Fish Consumption

THIS SPACE LEFT BLANK INTENTIONALLY

Table 3-9 2006 List of Impaired Waters

Station Number	Waterbody	County	Use	Cause
PD-230	Middle Swamp @ SC 51 3.5 mi. SSE of Florence	Florence	AL	DO
PD-230	Middle Swamp @ SC 51 3.5 mi. SSE of Florence	Florence	REC	FC
PD-065	Gulley Branch @ S-21-13 Timrod Park	Florence	AL	BIO
PD-256	Jeffries Creek @ S-21-112 4.8 mi. W of Florence	Florence	AL	DO
PD-256	Jeffries Creek @ S-21-112 4.8 mi. W of Florence	Florence	REC	FC
PD-167	Willow Creek @ S-21-57	Florence	REC	FC
PD-630	Willow Creek @ SC 327	Florence	AL	BIO
PD-231	Jeffries Creek UN # RD 3.3 mi ESE of Claussen	Florence	AL	CU
PD-622	Great Pee Dee River @ Dewitt Bluff	Florence	Fish	HG
PD-076	Great Pee Dee River @ Poston Ellisons	Florence	Fish	HG
MD-662	Great Pee Dee River @ Bostick	Florence	Fish	HG
PD-623	Black Creek @ SC 327	Florence	Fish	HG

Source: SCDHEC, 303 (d) List of Impaired Waterbodies 2006
https://www.scdhec.gov/environment/water/docs/06_303d.pdf

THIS SPACE LEFT BLANK INTENTIONALLY

Water Quality Indicators used in Table 3-9 are provided below:

Table 3-10 Common Water Quality Indicators

Parameter	Abbreviation	Water Quality Effect
Dissolved Oxygen	DO	Essential for the survival of aquatic organisms. If the amount of oxygen dissolved in water falls below the minimum requirements for survival, aquatic organisms may die. Pollution also can cause declines in DO. Decreasing DO is a negative water quality indicator of aquatic life.
Turbidity	TURB	Turbidity is an expression of the scattering and absorption of light through water. The presence of clay, silt, fine organic and inorganic matter, soluble colored organic compounds, and plankton and other microscopic organisms increases turbidity. Increasing turbidity can be an indication of increased runoff from land and is a negative water quality indicator.
Heavy Metals	CU, ZN, NI	These metals are toxic to aquatic life. They are introduced into natural waters by runoff from roads as the metals are common components of automobiles and gasoline.
Macro-Invertebrates	BIO	The abundance and diversity of the native macro invertebrates is used as a biotic indicator of ecosystem health. High abundance and diversity indicate water quality and habitat are in excellent condition. The use of this indicator requires knowledge of "natural" abundance and diversity.
Fecal Coliform Bacteria	BACT	Coliform bacteria are present in the digestive tract and feces of all warm-blooded animals. Their presence indicates that surface waters may contain pathogenic microbes. Correlations have been shown between fecal-coliform numbers in recreational and drinking waters and the risk of adverse health effects. Increasing bacteria levels is a negative water quality indicator for recreational use.

Source: SCDHEC, Watershed Water Quality Report, Pee Dee Basin, 2000

Since 1976, SC DHEC has been monitoring fish for pollutants (<http://www.scdhec.gov/environment/water/fish/index.htm>). Most of the fish sampling sites in Florence County have been continuously 303(d)-listed for mercury contamination. This has led to the posting of fish consumption advisories (Table 3-12). For reasons not understood, the mercury concentrations in fish from the Pee Dee are the highest in the State.

Table 3-11 Sites on the 2006 303(d) List for Mercury Contamination in Fish

TMDL TARGET DATE	LOCATION	STATION
	BLACK CREEK @ SC 327	PD-623
	GREAT PEE DEE RIVER @ HWY 378	PD-076
	GREAT PEE DEE RIVER @ DEWITTS LANDING	PD-622
	GREAT PEE DEE RIVER @ BOSTICK	PD- 662

SCDHEC protects public health by issuing fish consumption advisories based on their 303(d) list: https://www.scdhec.gov/environment/water/docs/06_303d.pdf

The 2007 Fish Consumption Advisories are provided in the following table.

Table 3-12 2007 Fish Consumption Advisories

WATERBODY	LOCATION	SPECIES OF FISH	ADVISORY
Great Pee Dee River	From NC/SC State Line to the Great Pee Dee River	All Other Fish	1 meal a month
		Bowfin (Mudfish)	DO NOT EAT ANY
		Chain Pickerel	DO NOT EAT ANY
		Flathead Catfish	DO NOT EAT ANY
		Largemouth Bass	DO NOT EAT ANY
	From the NC/SC State Line to U.S. Hwy 17	Black Crappie	1 meal a week
		Blue Catfish	1 meal a week
		Bluegill	1 meal a week
		Channel Catfish	1 meal a week
		Redear Sunfish	1 meal a week
	From the NC/SC State Line to U.S. Hwy 17	Warmouth	1 meal a week
		Chain Pickerel	1 meal a month
		Bowfin (Mudfish)	DO NOT EAT ANY
		Largemouth Bass	DO NOT EAT ANY

Source: SCDHEC (<http://www.scdhec.net/environment/water/fish/advisories.htm>)
https://www.scdhec.gov/environment/water/docs/06_303d.pdf

Section 303 of the Clean Water Act also established the principle of the total maximum daily load (TMDL) as a means of reducing water pollution in impaired waters. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. It is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources and includes a margin of safety and consideration of seasonal variations (SCDHEC).

Sites on the 303(d) list are required by the CWA to develop a Total Maximum Daily Load (TMDL). This is a pollution source budget that identifies the loading reductions required to enable the receiving waters to attain water quality standards. A TMDL for dissolved oxygen was approved in 1999 for the Great Pee Dee River. This was required for approval of NPDES discharge permits for the sewage treatment plants. SC DHEC has set target dates for development of the remaining TMDLs. At this time, implementation of the TMDLs is strictly voluntary with financial incentives available through US EPA 319 grant funding. This voluntary status is subject to change as a new regulatory program is expected to increase local responsibilities for insuring improved water quality in stormwater runoff (National Pollution Discharge Elimination System (NPDES) Phase II Stormwater Program for Small Municipal Separate Storm Sewer Systems (SMS4s)).

Approved Total Maximum Daily Load:

TMDL Document	Number of Stations	Parameter of Concern	Status
Pee Dee Basin	3	Fecal Coliform	Completed and Approved
Thompson Creek	2	Fecal Coliform	Approved and Implementing

Regulatory monitoring associated with the CWA has been conducted by SCDHEC. This monitoring is done on a watershed basis. Due to financial limitations, sampling efforts are concentrated on a rotating basis amongst the eight basins in South Carolina such that each basin is studied at least once every five (5) years (SCDHEC, URL: <http://www.scdhec.net/environment/water/shed/prog.htm>).

The last intensive study of the Pee Dee and Coastal water basins was conducted in 2003 and the next is scheduled for 2008. During the off years, only two sites are sampled once a month. Detailed watershed water quality assessment reports summarizing the monitoring data are issued every five (5) years. (SCDHEC, URL: <http://www.scdhec.net/eqc/admin/html/eqcpubs.html#watershed>).

Other monitoring efforts include continuous water quality and quantity sensors maintained by the USGS. This data collection supported the development of the DO TMDL. As indicated in Table 3-9 at least two sites covered by this TMDL continue to experience declining DO (dissolved oxygen) and show no improvement. Since severe cuts were made to permitted discharges from the sewage treatment plants, the continuing decline in water quality is attributed to an increase in stormwater runoff. This source of oxygen demand was not explicitly included in the DO TMDL and hence is not currently being monitored or controlled.

To support the increased demands of the new NPDES Phase II Stormwater Program, Florence County is now directly linked to the U.S. Geological Survey (USGS) to maintain continuous water quality and quantity sensors in Lynches River. The data from these sensors is made available in realtime to the public through the USGS website (<http://waterdata.usgs.gov/sc/nwis/rt>).

Wetlands

Wetlands are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soils (EPA- ACOE, Wetland Definition). Wetlands are essential components of the landscape of Florence County. Their functions are multiple and diverse and include:

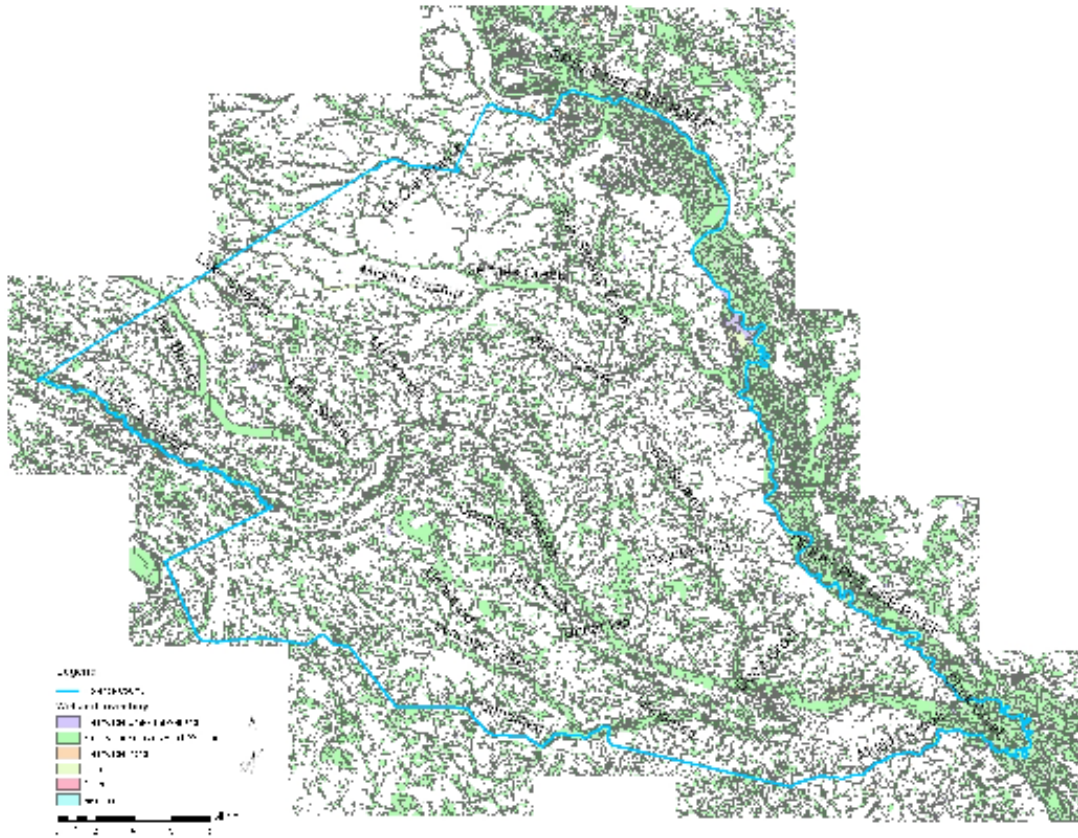
- Critical breeding, nesting, and feeding habitats for many species of waterfowl, mammals, and reptiles
- Water quality protection and enhancement by moderating surface runoff, recharging groundwater supplies, and trapping and removing sediments, nutrients, and chemical pollutants
- Spawning and nursery grounds for many commercial fish and shellfish species
- Flood hazard reduction by reducing the velocity of flowing water, absorbing and slowly releasing floodwaters, thereby lowering flood peaks
- Recreational opportunities for bird watchers, hunters, canoeists, anglers, and others.

There are about 4.5 million acres of wetlands in South Carolina, about 23.4 percent of the state's land surface. Only four states – Alaska, Florida, Louisiana and Maine have a higher percentage of wetlands than South Carolina (SCDHEC, The Facts on Wetlands). Florence County is approximately **44%** wetlands (Tiner et al, 2002). As shown in Figure 3-6, wetlands are a major feature of the landscape in our county. Historically, the value of wetlands has been misunderstood, resulting in the destruction of more than 50 percent of the United States' naturally occurring wetlands. In the past two decades, 84 percent of wetlands losses have occurred in the southeastern United States.

The last Wetlands inventory for Florence County was done in 1993. One goal is to have a current wetlands inventory done for the entire County in the next five years showing remaining isolated wetlands, wetlands placed in mitigation.

THIS SPACE LEFT BLANK INTENTIONALLY

Figure 3-6 Florence County Wetland Inventory



Source: U.S. Fish and Wildlife Service

Since the enactment of the Federal Clean Water Act, the U.S. Army Corps of Engineers has issued permits to discharge material into waters of the United States, which includes wetlands (404 Certification). As the lead agency permitting activities in wetlands, the Corps determines what areas are wetlands and subject to federal regulations. Many states have a wetland permission program to augment the Federal program. South Carolina does not. This leaves several types of activities in wetlands unregulated including: discharge of untreated stormwater into wetlands, ditching to drain wetlands, and exempted activities such as silviculture (fisheries). In South Carolina, several state programs that regulate activities in wetlands areas are tied to the Federal permitting program. The SCDHEC's Bureau of Water must issue a water quality certification for every federal permit that allows a discharge to state waters, including wetlands (401 Certification). SCDHEC's Office of Ocean and Coastal Resource Management (OCRM) must certify that any federal action in the coastal zone is consistent with state's coastal zone management plan. Activities in tidal wetlands require a permit from OCRM (Wetlands and Their Importance, DHEC). As of 2007, Florence County has no wetland mitigation banks.

Carolina Bays are isolated wetlands in natural shallow, elliptical, depressions that are largely fed by rain and shallow groundwater. Researchers believe Carolina Bays are 30,000 to 100,000 years old, yet scientists are not certain of their origins. They are found primarily in North and South Carolina and Georgia but range from Florida to Delaware. They fill with rainwater during winter and spring and dry during summer months. When left in an unaltered condition, these bays are generally considered to be an isolated, freshwater wetland. The bays provide many of the values associated with wetlands including stormwater storage, water quality enhancement, and habitat for many wildlife species. Each bay may range in size of less than one acre to more

than 1,000 acres. Only 10% of the original bays remain. More than 97% of the Carolina bays once found in South Carolina have been destroyed or severely altered (University of Georgia, Carolina Bays Fact Sheet).

The Natural Resource Conservation Services (NRCS) Wetland Reserve Program (WRP) provides cost-share to landowners to protect these wetland areas. The impact of this successful project has helped other counties restore and mitigate for the loss of wetlands. One possible goal for Florence County is to identify these special areas and to work closely with NRCS and landowners to place these areas in Wetland Reserve Programs for protection.

The City of Florence has implemented a special conservation/reserve program for setting aside sensitive areas of wetlands and open space for protection. In addition, they have implemented a Jeffries Creek Overlay Ordinance that that protects 30 feet of the riparian buffer adjacent to Jeffries Creek in the city.

FLOODPLAINS

Florence County has 22% of total land area composed of 100 year flood plain. Floodplains perform important natural functions including:

- Temporary storage of floodwaters,
- Moderation of peak flows,
- Maintenance of water quality,
- Groundwater recharge,
- Erosion prevention,
- Wildlife habitat,
- Recreational opportunities.

FLOOD HAZARD AREAS

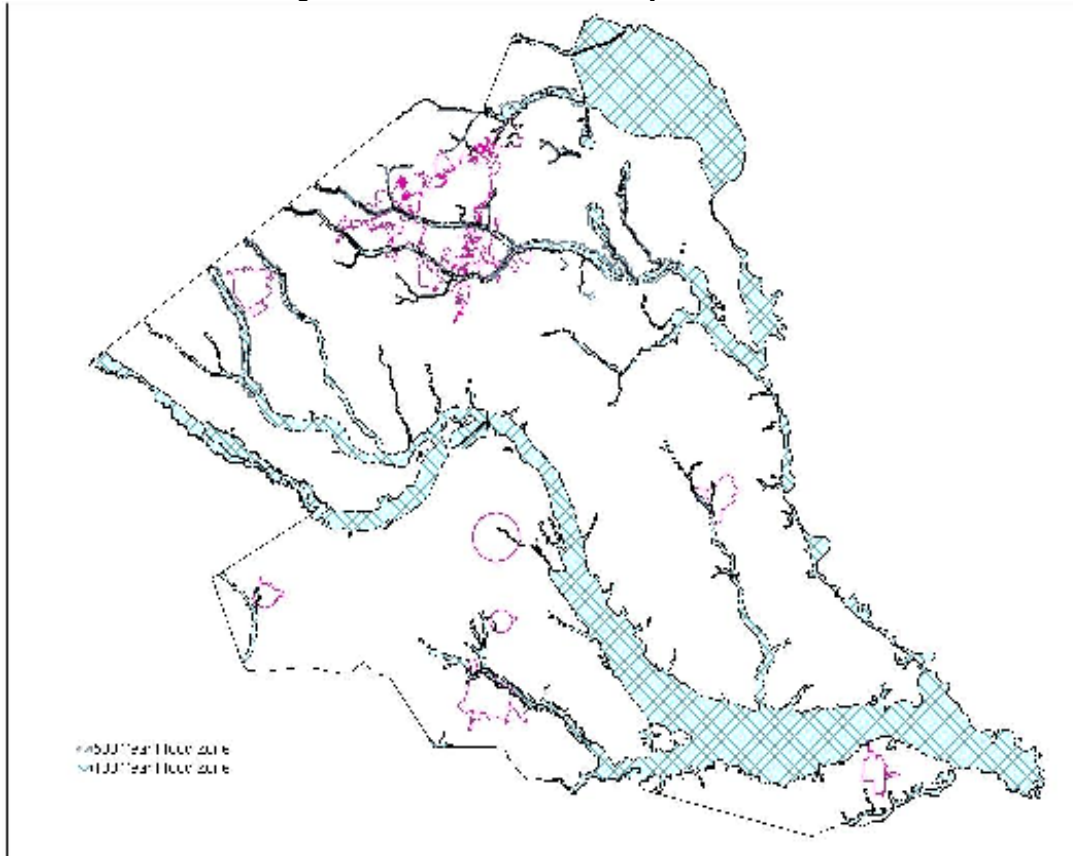
Flood hazard areas are locations that are generally in and around water streams and bodies that are prone to rising waters. The flood hazard areas of Florence County are classified either by the 100 year Flood Zone area or the 500 year Flood Zone area. The 100 year Flood Zone is defined as an area having a 1% chance of being inundated with floodwaters in any given year. Other terms used for this area are “base-flood” or “1% chance flood.” The 500 year Flood Zone is defined as an area of moderate flood hazard. (SCDNR, Regulations for Floodplain Management). To put this into perspective, a home, for example, that lies in a flood hazard area may have a 0.6% chance of experiencing some form of flood damage during the term of a typical 30-year mortgage (Internet 16).

The floodway of a body of water is the area that carries the most significant amount of floodwater during a flood. Therefore, these areas are likely to have the deepest and fastest water. Floodways must be kept open and free of obstructions to allow floodwaters to move downstream and not be diverted onto other properties. Placing fill or buildings in a floodway may block the flow of water and increase flood heights. Although the FEMA National Flood Insurance Program (NFIP) does allow development in these areas as long as it does not obstruct water flow, Florence County should still be cognizant of limiting development in the floodways.

With the many waterways and tributaries in and around Florence County, there are flood hazard areas in nearly every part of the County. In the northern part of the County, where the borders of Darlington, Dillon, and Marlboro counties are located, there is an extensive flood hazard area connected with the waters of the Pee Dee River and Black Creek. On the northwest side of the County, Jeffries Creek and several other swamps enter the County. These tributaries all have

flood hazard areas associated with the land adjacent to their banks. Most of the southeastern portion of the County and the entire eastern borders abutting Marion County are within the flood hazard area associated with the Pee Dee River. Lynches River also has an extensive flood hazard area on the western side of the County, which forms part of the border with Lee and Sumter counties. The flood hazard area of the Lynches River continues through the County following the floodway of the river down through the Johnsonville area, where the Lynches and Pee Dee Rivers meet. The map below is a visual display of this information.

Figure 3-7 Florence County Flood Zones



Map courtesy of the Florence County Planning Department

In Florence County, flooding may naturally occur. However, development can also affect the levels of floods. According to an article in the July 2006 edition of Planning, land development can dramatically alter hydrology. On an undeveloped site, precipitation can either soak into the ground by infiltration to be used by existing vegetation or return to the atmosphere through evaporation. When new houses are built, natural landscapes are converted to lawns, surfaces are paved for parking lots, and other forms of impervious cover are introduced. As a result infiltration and evaporation rates decrease and the amount of surface runoff increases. The same amount of rainfall may cause more surface runoff and more flooding after development than before (Meenar, Duffy, & Bari). To help with this, Florence County currently has a flood damage control ordinance and also participates in the National Flood Insurance Program. All regulations for these items are currently administered by the Florence County Planning Department.

The National Flood Insurance Program (NFIP) requires participating counties and towns to issue permits for construction in the 100-year floodplain. If state and federal permits are required, development may not begin until all necessary permits are issued. Proposed development must

not increase flooding or create a dangerous situation during flooding, especially for adjacent or nearby property owners. Structures must be built to minimize damage during flooding (SCDNR, Regulations for Floodplain Management).

In 1998, the Federal Emergency Management Agency (FEMA) designated the City of Florence as the first Project Impact Community in South Carolina. A Hazard Evaluation Plan was the first step in determining the risks in the Florence area. Several committees involving both the private and public sectors have addressed these risks and developed the following mitigation actions:

- Hurricane Awareness displays at Lowe's Home Improvement stores and other local events,
- Employee Hazard Awareness events at local industries and businesses,
- Hurricane Hunter exhibit at Florence airport in cooperation with Florence County Emergency Preparedness, National Weather Service and Pee Dee Electric Cooperative,
- Florence Area Household Hazardous Waste Collection Days, (Ongoing annual event)
- City of Florence Hazard Awareness Calendar 2001 distributed to over 13,000 households,
- Public notices regarding flood risks, flood insurance and suggested mitigation actions.

* For further Stormwater related information and NFIP minimums for building in flood zones, or to obtain copies of the Stormwater Ordinance and Design Manuals, go to the Florence County Government website at <http://www.florenceco.org>.

THREATS TO NATURAL RESOURCES

WATER QUANTITY

In 1900 total water use was 430 billion m³ (cubic meters) in South Carolina. By 2000 it was 6,050 billion m³ which reflects 14 fold increase over the 20th century. Some regions are facing severe problems due to scarcity of water resources and pollution of natural waters. In 1900 the relative water use was 81.4% for agriculture, 7.0% for industry, and 4.7 % for urban purposes. By 2000 the relative water use was 56.7% for agriculture, 31.7% for industry, and 3.7% for urban purposes. (Kandratyev et al., 2003)

The per capita renewable fresh water supply is rapidly declining, especially in dry and hot climates. There may be 1-3 billion people experiencing water stress by 2025 (Gardener-Outlaw and Engleman, 1997).

There is a wealth of published scientific data on methods of land development, erosion control, water quality management, and soil fertility management. It is important to strengthen channels of communication between scientists and policy makers so that valuable and credible scientific data and practical technology can be translated into simple language that policy makers can understand and use to implement constructive strategies for the future.

Intra-basin water withdrawals are currently not regulated by the state. With potential long term water supply crisis facing South Carolina and our neighboring state and the present state of MODERATE to SEVERE DROUGHT PHASE continuing across the state, a water conservation and management plan should be addressed.

In recognition of declining groundwater levels and depletion of local aquifers S.C. Department of Health and Environmental Control has designated the Pee Dee region as a Capacity Use Area. Capacity Use Area designation, according to Title 49 Chapter 5 of the South Carolina Code of Laws, requires that *"groundwater resources of the state be put to beneficial use to the fullest extent to which they are capable, subject to reasonable regulation, in order to conserve and protect these resources, prevent waste and to provide and maintain conditions which are conducive to the development and use of water resources."*

Where large amounts of groundwater pumping has caused or will cause a problem, such as saltwater contamination of lower water levels in nearby wells, a Capacity Use Area may be designated by DHEC. There are currently four Capacity Use Areas in South Carolina: the Low Country, Trident, Waccamaw, and the Pee Dee (Darlington, Dillon, Florence, Marion). The purpose is not to prevent the use of or limit access to the groundwater resource, but to ensure that this important resource is available for everyone to use. Large users, such as industries or water suppliers, who plan to pump more than 3 million gallons a month must receive a permit and report the amount withdrawn each year. The Pee Dee Capacity Use Area was designated in 2006. At this point, a large-scale switch was made to use treated surface water as the primary drinking water source for Florence County. A capacity use program for groundwater withdrawals covers only large volume users.

In order to more responsibly manage Florence County's groundwater resources, the county should consider adopting mechanisms, such as watershed management plans, which would provide additional protection to designated *critical water resource areas*, including selected watersheds. Additional considerations could include land use, development and building regulation revisions to encourage water conservation.

In 1996, various amendments to the federal Safe Drinking Water Act (SDWA) provide for a greater focus on pollution prevention as an approach to protecting surface water and groundwater supplies from pollution. The amendments require SCDHEC to provide Source Water Assessments to federally defined public water supply systems. SCDHEC has now generated assessment reports for all federally defined public water supply systems (SCDHEC, URL: <http://www.scdhec.net/environment/water/srcewtr.htm>).

Improving water use efficiency, decreasing nonpoint source pollution, conserving soil and water resources and restoring degraded soils and ecosystems are important strategies for enhancing and improving supplies of fresh water resources. A County wide plan for water quantity/water conservation should be a near term County goal.

WATER QUALITY

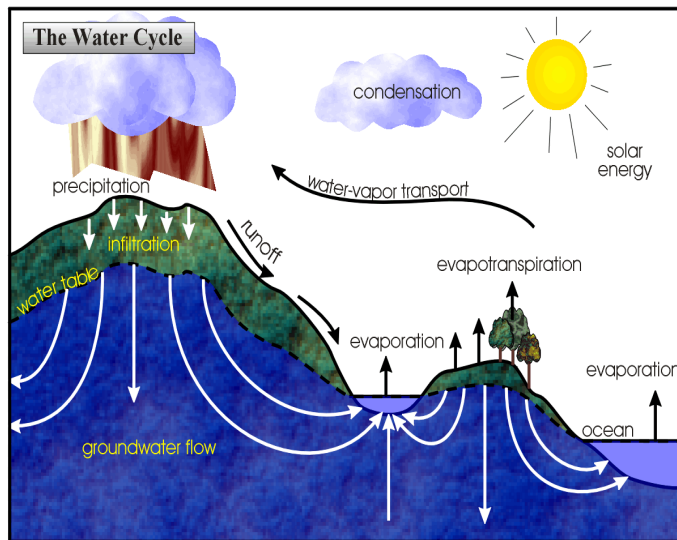
The primary threat to water quality in Florence County is from stormwater runoff and loss of natural filtration as a result of reduction of vegetated riparian buffers and wetlands. Over the past several years, Florence County has experienced unprecedented growth. This increased development alters the surface of the land by replacing natural cover with rooftops, roads, parking lots, driveways and sidewalks. These hard surfaces are impermeable to rainfall and are collectively known as impervious cover (Center for Watershed Protection).

Over 200 watershed studies have shown that impervious cover and the polluted run off from that impervious cover can have a negative impact on the quality of our nation's aquatic resources. Non-point source pollution (NPS) is the technical term for polluted runoff. It occurs when water flowing over the land picks up an array of contaminants, which find their way into our waterways, either directly or through storm drain collection systems. The term non-point is used to distinguish this type of pollution from point source pollution, which comes from specific sources such as industrial facilities or sewage treatment plants. The Environmental Protection Agency has estimated that NPS is the single largest cause of the deterioration of our nation's water

quality. Polluted runoff is largely the result of the way we develop, use and maintain our land. (SCNEMO–Non-Point Education for Municipal Officials: www.scseagrant.org/scnemo/factsheets.htm).

When development occurs, the resultant alterations to the land can lead to dramatic changes to the hydrology, or the way water is transported and stored. Impervious man-made surfaces (roads, driveways, rooftops) and compacted earth associated with development create a barrier to the seepage of rainfall into the soil, thus increasing surface runoff and decreasing groundwater infiltration. This disruption of the natural water cycle leads to a number of changes, including: 1) increased volume and velocity of runoff, 2) increased frequency and severity of flooding, 3) peak (storm) flows many times greater than in undisturbed eco-systems, 4) loss of natural runoff storage capacity in vegetation, wetlands, and soil, 5) reduced groundwater recharge and 6) decreased base flow, the groundwater contribution to stream flow. (Impacts of Development on Waterways, Nonpoint Education for Municipal Officials, NEMO).

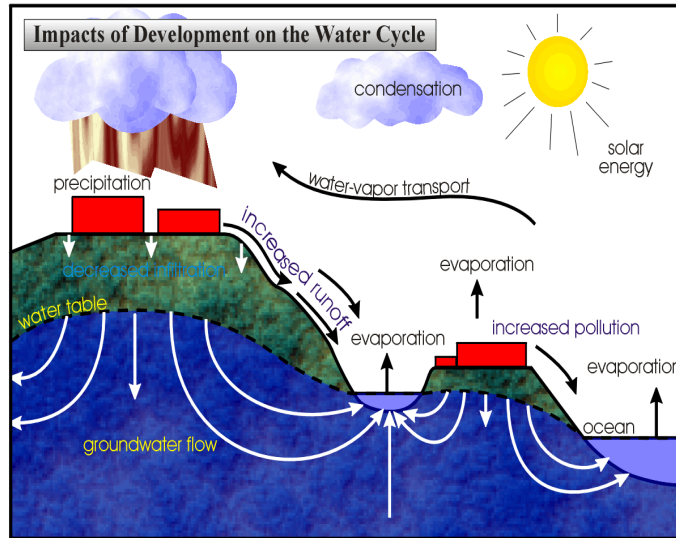
Figure 3-8 Natural Water Cycle



Source: NEMO, Linking Land Use to Water Quality

THIS SPACE LEFT BLANK INTENTIONALLY

Figure 3-9 Development Impacts to the Water Cycle



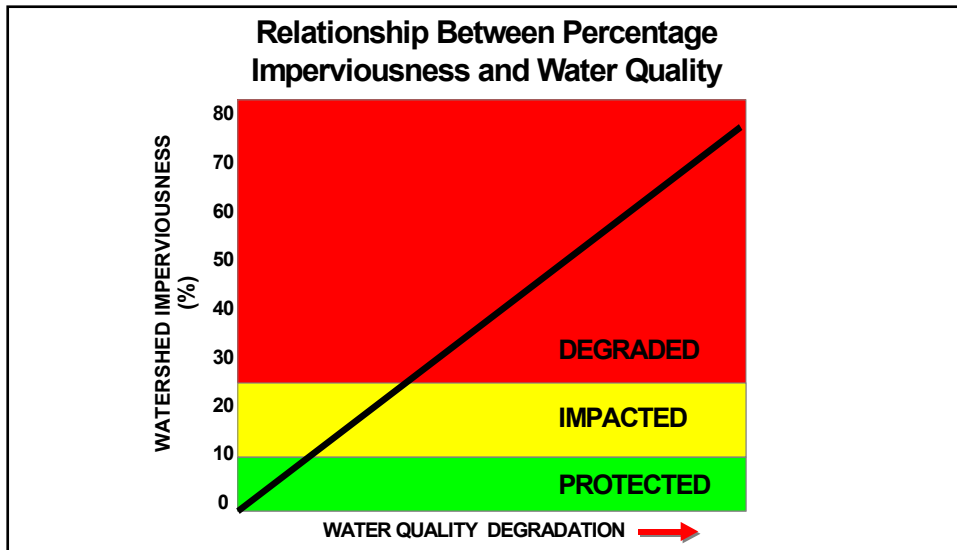
Source: NEMO, Linking Land Use to Water Quality

Development results in more intensive land use and a related increase in the generation of pollutants. Increased runoff serves to transport these pollutants directly into waterways, creating nonpoint source pollution, or polluted runoff. Stormwater runoff is widely recognized by environmental scientists and regulators as the single largest threat to water quality in the United States. (NEMO)

The hydrologic, physical and ecological changes caused by development can have a dramatic impact on the natural function of our waterways. When increased pollution is added, the combination can be devastating. In fact, many studies are finding a direct relationship between the intensity of development in an area - as indicated by the amount of impervious surfaces - and the degree of degradation of its waterways. These studies suggest that water quality begins to degrade at impervious levels of 12% to 15%, or at even lower levels for particularly sensitive waters. (NEMO)

THIS SPACE LEFT BLANK INTENTIONALLY

Figure 3-10 Analysis Between Water Quality and Impervious Surface



Source: Adapted from Schueler, et al, 1992

The figure above shows the relationship between impervious land coverage and water quality. Pervious surfaces including wetland systems provide drainage, aquatic habitat, and a degree of pollutant removal through natural processing. (NEMO)

There are several widely accepted methods to accommodate development in a way that addresses stormwater runoff and its environmental effect including low impact development techniques.

Low Impact Development (LID) techniques provide ways to simultaneously incorporate economic and environmental considerations into the land development process in order to keep the perviousness of the land as close to pre-construction levels as possible. This approach uses various planning and design practices and technologies to simultaneously conserve and protect natural resource systems while reducing infrastructure costs. LID still allows land to be developed, but in a cost-effective manner that helps mitigate potential environmental impacts. LID is best suited for new, suburban development. Developers who have used LID practices and technologies have indicated that one of the keys to a successful project is to invest additional time and money in the initial planning stages of development. While this idea may be unpopular because of increased up-front costs, the expenditures are often recouped in the form of rapid home sales, enhanced community marketability, and higher lot yields (National Association of Home Builders, The Practice of Low Impact Development, 2003).

LID deals mainly in three major development topics: stormwater management, wastewater management and circulation design. LID storm water management systems can reduce development costs through the reduction or elimination of conventional storm water conveyance and collection systems. LID systems can reduce the need for paving, curb and gutter, piping, inlet structures, and storm water ponds by treating water at its source instead of at the end of the pipe. However, developers are not the only parties to benefit from the use of LID storm water management techniques. Municipalities also benefit in the long term through reduced maintenance costs. When dealing with wastewater, the LID approach gives developers a variety of on-site wastewater treatment system options either as alternatives or enhancements to conventional septic systems. LID designs for streets, sidewalks, and driveways can maintain the functions of circulation while helping to reduce expanses of impervious surfaces that can alter local hydrology and degrade water quality. In turn, new street designs can influence the layout of

lots and help to increase the volume of open space in new residential developments. When coupled with narrower, open-section streets, a well-designed street layout can eliminate hundreds of square feet of impervious surface. Depending on the density, location, and type of subdivision, different types of street layouts may easily lend themselves to a cluster arrangement, conserving natural features, maintaining open space, and protecting water quality (National Association of Home Builders, *The Practice of Low Impact Development*, 2003).

PLANT/ANIMAL HABITATS & ENDANGERED SPECIES

Within the many forested areas of Florence County are the habitats of a host of animal species that make the County and the surrounding areas their home. More specifically, Florence County's animal life includes woodcock, snipe, ducks, mergansers, coots, Canada goose, deer, fox, raccoon, minks, otters, coyote, and bobcats.

The importance of the various animal species among the County's wildlife population is essential in the proper functioning of the entire biotic system in the region. Current knowledge of all the interrelated relationships between individual species is limited. The presence of some wildlife species helps to identify certain natural communities and plant life. The red cockaded woodpecker and the longleaf pine/grassland plant community are an example of community identification by association with the known habitat of the specific animal. This association may also be helpful in identifying disruptions in the natural habitat as the presence of such animal populations decline or change over time.

Table 3-13 shown on the page 34 lists plants and animals in the Florence County region that have been placed on the list of rare, endangered or threatened species. This information was gathered from the South Carolina Department of Natural Resources.

As indicated in this table, there are a variety of different plant and animal species in Florence County, many of which are threatened or endangered species. Therefore, special attention should be given to protecting the habitats of these species.

THIS SPACE LEFT BLANK INTENTIONALLY

Table 3-13 Endangered Plant & Animal Life: Florence County

COMMON NAME	SPECIES GROUP	GLOBAL DEGREE OF ENDANGERMENT	STATE DEGREE OF ENDANGERMENT	LEGAL STATUS
Georgia Leadplant	Plant	Very Rare or Restricted	Unknown	Of State Concern
Blue Maiden-Cane	Plant	Apparently Secure	Unknown	Of State Concern
Black-Stem Spleenwort	Plant	Demonstrably Secure	Critical or Imperiled	Of State Concern
Narrowleaf Sedge	Plant	Demonstrably Secure	Unknown	Of State Concern
Willdenow's Sedge	Plant	Demonstrably Secure	Reported, but lacking good documentation	Of State Concern
Meadow Sedge	Plant	Demonstrably Secure	Unknown	Of State Concern
Cayaponia	Plant	Apparently secure	Unknown	Of State Concern
Seabirds and/or Wading Birds	Birds	Unknown	Unknown	Of State Concern
Southeastern Tickseed	Plant	Very Rare or Restricted to Demonstrably Secure	Unknown	Of State Concern
Gravel Elimia	Snails	Apparently Secure	Unknown	Of State Concern
Bald Eagle	Birds	Apparently Secure	Imperiled	State Endangered as of June 28, 2007
Loggerhead Shrike	Birds	Apparently Secure	Rare or Uncommon	Of State Concern
Boykin's Lobelia	Plant	Imperiled to Very Rare or Restricted	Unknown	Of State Concern
Climbing Fern	Plant	Apparently Secure	Critical to Imperiled	Of State Concern
Carolina Bird-In-A-Nest	Plant	Imperiled to Very Rare or Restricted	Unknown	Of State Concern
Canby's Dropwort	Plant	Imperiled	Critical	Federal and State Endangered
Red-Cockaded Woodpecker	Birds	Very Rare or Restricted	Imperiled	Federal and State Endangered
Pickerel Frog	Amphibian	Demonstrably Secure	Unknown	Of State Concern
Awned Meadowbeauty	Plant	Very Rare or Restricted	Imperiled	Of State Concern
May White	Plant	Imperiled	Imperiled	Of State Concern
Horned Beakrush	Plant	Apparently Secure	Reported, but lacking good documentation	Of State Concern
Tracy Beakrush	Plant	Apparently Secure	Unknown	Of State Concern
Stalkless Yellowcress	Plant	Demonstrably Secure	Unknown	Of State Concern
Chaffseed	Plant	Imperiled	Imperiled	Federal and State Endangered
Ovate Catchfly	Plant	Imperiled to Very Rare or Restricted	Unknown	Of State Concern
Broad-Toothed Hedge-Nettle	Plant	Demonstrably Secure	Critical	Of State Concern
Ovate Marsh Fern	Plant	Very rare or Restricted	Reported, but lacking good documentation	Of State Concern
Weak Nettle	Plant	Apparently to Demonstrably Secure	Unknown	Of State Concern

Source: South Carolina Department of Natural Resources (Internet 8)

AIR QUALITY

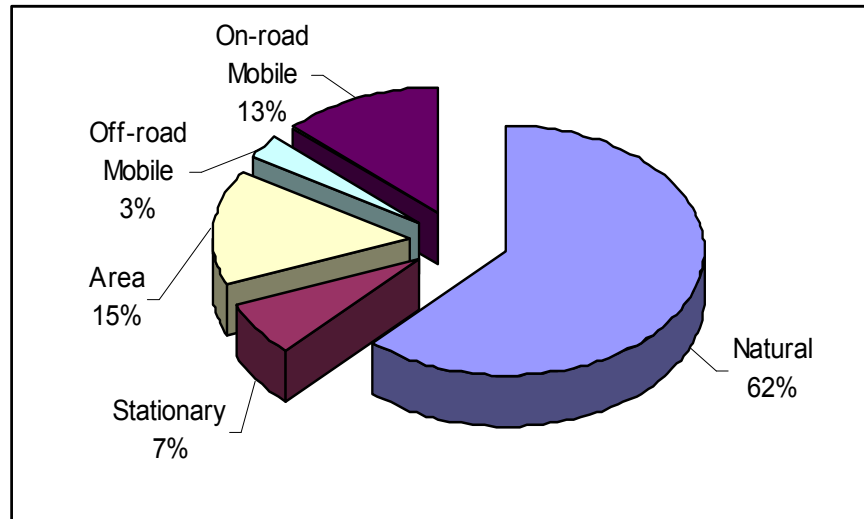
The quality of air in Florence County and throughout our region is important for a variety of reasons. The South Carolina Department of Health and Environmental Control (SCDHEC) identifies a range of air pollutants, six of which are currently the focus of air quality monitors throughout South Carolina due to their health concerns. While additional information on these pollutants is available from SCDHEC, it is important to describe one of them in great detail due to an agreement Florence County entered into with the SCDHEC and the Environmental Protection Agency (EPA). This agreement, known as the Early Action Compact, was developed at the end of 2002 and has an end date of December 31, 2007. The primary role of the Early Action Compact is to reach a standard of attainment for ozone, which is set by the EPA. According to the Ozone Fact Sheet provided by SCDHEC, the following facts explain several key points about ozone:

- Ten to fifteen miles above the earth, stratospheric ozone occurs naturally and protects us from exposure to the sun's ultraviolet radiation. At ground-level, ozone is a result of air pollution and can harm our health.
- Ground-level ozone is formed when two chemicals, nitrogen oxides (NOx) and volatile organic compounds (VOCs), react in the presence of heat and sunlight.
- NOx and VOCs are emitted when fossil fuels are burned. Some sources of these pollutants are cars, trucks, and industry. Other sources of VOCs include natural sources like pine trees, as well as vapors from paints, glues, and solvents.
- Ground-level ozone is a concern during the hot, summer months.
- Areas that usually have the most severe ground-level ozone problems include densely populated areas and areas with high levels of traffic.
- The Environmental Protection Agency sets standards for ozone and other air pollutants. For each pollutant, there are two standards. The primary standard is set to protect health, regardless of the cost. The secondary standard protects public welfare. Public welfare includes effects on soil, water, property, animals, and visibility.
- When the ground-level ozone level is high, it can cause eye irritation, headaches, dryness of the mouth and throat, shortness of breath, wheezing, and coughing.
- Children, the elderly, and people with pre-existing lung disease such as emphysema, asthma, and chronic bronchitis are especially sensitive to ground-level ozone. However, everyone is sensitive to high levels of ground-level ozone (Internet 17).

To further examine our sources of NOx and VOCs, the following charts may be useful:

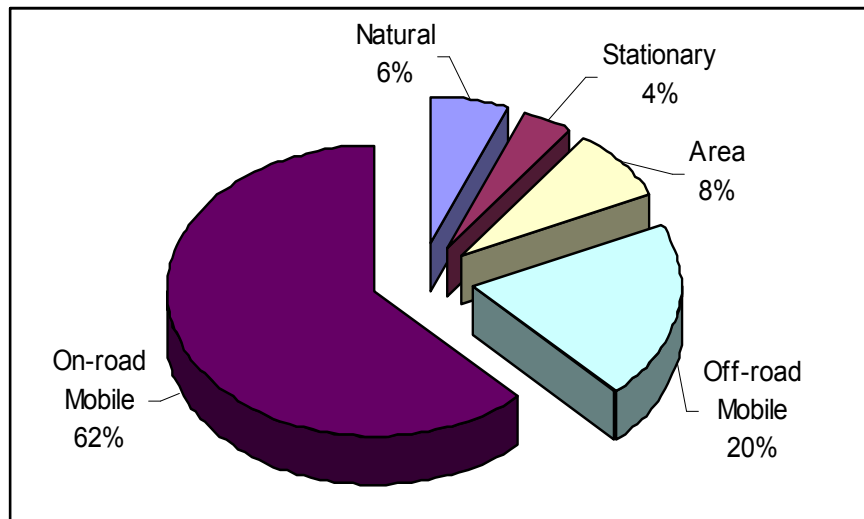
THIS SPACE LEFT BLANK INTENTIONALLY

Figure 3-11 Sources of VOCs



Source: Environmental Protection Agency (Internet 9)

Figure 3-12 Sources of NOx



Source: Environmental Protection Agency (Internet 9)

According to the Florence County Early Action Plan, emissions of NOx and VOCs are precursors to the formation of ozone. South Carolina is sometimes referred to as “NOx limited.” This means that small amounts of NOx enable ozone to form rapidly when VOC levels are relatively high, but ozone production is quickly limited by the removal of NOx. Under these conditions, NOx reductions are highly effective at reducing ozone while VOC reductions have little effect. With such a high percentage of NOx coming from on-road sources, it would appear that reductions from mobile sources would be most beneficial.

The Clean Air Act, which was last amended in 1990, requires the EPA to set National Ambient Air Quality Standards for pollutants considered harmful to public health and the environment. When the National Ambient Air Quality Standards are not met in a specified area, the area is designated by the EPA as “non-attainment.” If the area meets the standard they are designated “attainment.”

In a case that there is not enough data to make the designation, the EPA will designate the area as "unclassifiable."

Florence County is currently in attainment for ozone, however as the EPA continues to review the National Ambient Air Quality Standards, ozone and other pollutants, such as particulate matter, may become areas of concern. As part of the Early Action Compact and as a way to promote good air quality, Florence County is on the verge of launching a campaign known as Take a Break from the Exhaust (TABFTE). TABFTE is a project that was developed in 2001 by the Bureau of Air Quality (BAQ) to help reduce the amount of Vehicle Miles Traveled (VMT) in an effort to reduce Ground-Level Ozone. This program has become a successful tool that has been recognized by the Governor's office as the 2003 Pollution Prevention Award winner for state agencies (Internet 12). The program was proposed to Florence County. This program will be revisited as Florence County addresses new EPA Standards on air quality. The hope is that other countywide organizations will see the positive effects of this program and begin to use it. The collective efforts of a wide variety of organizations/businesses in the County should prove very beneficial in reducing the amount of ground level ozone in Florence County.

UNIQUE SCENIC VIEWS & RECREATION AREAS

This section includes scenic views, scenic sites and unique parks and recreation areas that enhance the natural features of the County. There are a number of areas and sites in the County that generally inspire appreciation for the natural environment and resources of Florence and contribute to the quality of life to area residents. Natural scenic areas exist in nearly every part of Florence County. Even some developed areas have rural characteristics such as roadways with canopy trees and moss coverings, which may add to the scenic experience. These rural attributes may contribute to the level of enjoyment and quality of life for many of the residents. A number of natural scenic sites, including streams, developed recreational areas, and boating facilities are located in the County. The following facilities allow greater access to natural resources in the Pee Dee area.

Scenic Rivers Program

The South Carolina Rivers Act of 1989 established the South Carolina Scenic Rivers Program to protect "unique or outstanding scenic, recreational, geologic, botanical, fish, wildlife, historic or cultural values" of selected rivers or river segments in the state. The goal of the program is the conservation of South Carolina's river heritage through the proper management of the natural and cultural character of the state's river corridor.

The basic method of river corridor protection is a cooperative, voluntary management program created by landowners, community interests, and the South Carolina Department of Natural Resources. The intent of the program is to bring landowners together to study the river and key river issues and to address these issues and management practices on lands bordering the river. Together, landowners and other interested parties in the community develop a scenic river management plan that recommends long term management strategies oriented toward preserving traditional uses of the river and the preservation of the scenic beauty of the river corridor.

The ***Great Pee Dee River*** in lower Florence County from the Highway 378 bridge down to Georgetown was given the scenic designation by the State Legislature in 2006. Presently, there is an effort by the Coastal Conservation League to have the portion above Highway 378 designated as well. This portion of the river boasts some of the most unusual limestone cliffs and scenic vistas in the Pee Dee as well as being significant historical and archeological sites.

Lynches River

Lynches River features towering cypress trees and sandhills offering a wide variety of vegetation. Attractions along the river include fishing, canoeing, kayaking, and hiking along nature trails. Lynches River enters the County on the west near Cartersville and runs through the middle and southeast parts of the County. Its boundaries merge with the Great Pee Dee River in the southeastern corner of the County. In 1992, the Upper Lynches River, which runs from Lee County to Lynches River County Park in Florence County, was designated as a scenic river by the SC Department of Natural Resources (SCDNR). The study conducted on the Upper Lynches River found that the overall wild character of the river is intact, it is free flowing, and it provides exceptional recreational values. Four wildlife species of concern were found to be inhabitants of the area surrounding the Upper Lynches including: the fox squirrel, the pickerel frog, the spotted turtle, and the red-cockaded woodpecker. In addition, landowners were in favor of the scenic river designation, as was the Florence, Sumter, Lee, & Darlington County Councils and the State Legislature. The Lynches River is significant because it provides miles of natural wildlife corridor, which serves as a refuge for area-sensitive species. The recreational opportunities are also unique and exceptional. The SCDNR is currently in the process of studying the Lower Lynches River for possible designation as a scenic river as well.

Figure 3-13 Lynches River County Park



Picture courtesy of the Florence County/Municipal Planning Department

THIS SPACE LEFT BLANK INTENTIONALLY

Jeffries Creek

While Jeffries Creek spans across the northern portion of Florence County, a park is located at 1501 Hillside Drive between Edisto Drive and DeBerry Boulevard. This 55-acre park features nature trails, playgrounds and a picnic area and shelter. (Florence Web.com Parks)

Figure 3-14 Jeffries Creek



Picture courtesy of the Florence County/Municipal Planning Department

Rail Trail

The Florence Rail Trail is 14 acres of natural and paved trails along an abandoned rail corridor in West Florence. It can be accessed from several points along the trail. The two parking areas provide easy trail access and are located at Old Ebenezer Road and at McLeod Fitness Center. There are currently plans to expand the Rail Trail to further enhance the connectivity in the Florence area. The Rail Trail is the perfect opportunity to view some beautiful natural scenery inside the city limits of Florence.

Figure 3-15 Florence Rail Trail



Picture courtesy of <http://www.sciway3.net/outdoors/park-florencerailtrail.html>

In addition to the Rail Trail, numerous boat ramps in Florence County provide access to the scenic waterways listed previously. These ramps allow access to view the beautiful natural scenery of the waterways in Florence County by providing entry to these scenic bodies of water.

Boat Ramps

- SC Highway 327 Boat Ramp on Black Creek
- US Highway 52 Boat Ramp on Lynches River
- Odell Venters on Lynches River
- Bazens Landing on the Great Pee Dee River
- Cain Landing on the Great Pee Dee River
- Dewitts Bluff on the Great Pee Dee River
- Ellison Landing on the Great Pee Dee River
- Red Bluff on the Great Pee Dee River
- Persimmon Bluff on Lynches River
- Timber or Ginn's Bluff on Lynches River
- Bottle Landing on Lynches River
- Pitts Landing on Lynches River
- Mack Lake on Lynches River
- Smith Landing on Lynches River
- River Rest (aka Timber Landing) is located on Lynches River
- Lee Landing on Lynches River
- Bass Bridge on Lynches River
- Courtney Point on Lynches River
- Cockfield Landing on Lynches River
- Anderson Bridge on Lynches River
- High Bank located on Lynches River
- Rush Landing located on Lynches River
- Bostick's Landing on Great Pee Dee River

South Carolina Heritage Trust Program

The South Carolina Department of Natural Resources' Heritage Trust Program was created in 1976, the first such program in the nation. It was established to preserve those natural features and cultural landmarks that are quickly disappearing as the state's population increases in size. The program's purpose is to identify, evaluate, and protect the elements considered the most outstanding representatives of the state's heritage. There are currently no heritage preserves in Florence County (SCDNR, Protecting South Carolina's Natural and Cultural Heritage).

Open Space Planning

Planning for Open Space can help to prioritize lands for acquisition and donation so that the County will have an interconnected network of usable open spaces and viable natural resource conservation lands. Open Space planning can also enhance access to parks and recreation areas, tie into the current Rail Trails program, enhance quality of living for residents, and benefit tourism in the County. The goal of open space planning is:

- To promote the preservation of open space, scenic areas and vistas greenways, squares and village greens;
- To promote the protection and conservation of environmental or natural resources;
- To promote the expansion of quality open space for a wide range of recreational opportunities including playgrounds, playfields, plazas, parks, mini-parks, picnic areas, bicycle or hiking trails, or golf courses for all county residents;

- To promote tourism emphasizing open space, recreational sites, and natural resources of Florence County;
- To promote education, awareness, and research relating to environmental and natural resources;
- To assist in coordinating activities of volunteers, organizations, businesses and governmental agencies interested in the preservation of open space, recreational sites, and natural resources;
- To prepare and submit to the Florence County Council for consideration a proposed list of areas of open space, significant environmental and natural resources, and recreational sites to be acquired, leased, preserved, protected, maintained, or developed.

Growth Potential and Management

Land use and management can define the impact to natural resources, particularly to water resources in relation to water quality. Assessing the potential for an area to expand and grow allows for water quality planning to occur and permits monitoring for potential impairment of water quality. Indicators used to predict growth potential include water and sewer service, road and highway accessibility, and population trends. These indicators and others are used to determine areas within the Pee Dee River Basin having the greatest potential for impacts to water quality as a result of development.

Road systems, water systems and utility systems are not built piece by piece without any advanced planning or coordination between different system components. Built infrastructure systems are planned, designed and invested far in advance of their actual use. The same principles and approaches that are used for built infrastructure should be followed when looking at our natural resources, our green infrastructure. Green Infrastructure is the interconnected network of protected land and water that supports native species, maintains natural ecological processes, sustains air and water resources, and contributes to the health and quality of life for Florence County residents. This green infrastructure is important to the economic future of Florence County and planning needs to be proactive with an eye towards preserving and protecting as much of this green infrastructure as possible.

Natural Resource Conservation

There are several non-profit groups advocating for the conservation and preservation of Natural Resources in Florence County. They are:

- The Pee Dee Land Trust is a 501c3, nonprofit organization dedicated to protecting our region's significant agricultural, historical, and natural areas through the use of conservation easements. Additionally, the Land Trust provides educational programs and outreach activities. Its focus area includes eight counties that border the Great Pee Dee River in South Carolina including Florence County.
- The Pee Dee Chapter of the Sierra Club whose statement of purpose is to explore, enjoy, and protect wild places of the earth; to practice and promote responsible use of the earth's ecosystems and resources; to educate and enlist humanity to protect and restore the quality of the natural and human environment; and to use lawful means to carry out these objectives.
- The Pee Dee River Watchers program is responsible for advocating compliance with environmental laws, identifying problems which affect the Great Pee Dee River, responding to citizen complaints, educating the public, and advocating for the public's right to protect and defend the environment.

- Responsible Economic Development is a land watch group that is involved in protecting and enhancing the community through participation in land use decisions, zoning, and development that minimizes impact to natural resources as well educating the public on the effects of urban sprawl.

SUMMARY

Florence County has a variety of natural features and resources that contribute to the quality of life experienced by its residents. These features include fertile soils, which are suitable for crop production, a number of surface water streams, including the Lynches and Great Pee Dee Rivers, climatic conditions suitable for extended agrarian activities, an abundance of wooded areas, community facilities, and industrial opportunities. Furthermore, Florence County enjoys a number of wetlands, swamps, and bays that are the habitat for a number of unique plant and animal species. In addition, many parts of the rural and urban settings of Florence County have scenic roadways and attractive landscapes. Too often, this abundance of natural resources is taken for granted. The future use of land, especially development in a rapidly growing Florence County, can have a profound effect on the natural resources in the County. One large mistake that can be made is to sacrifice the natural resources in the County for the sake of economic development. Instead, developers and County/City officials should work together to prosper in both economic development and protection of natural resources. Natural resources are an integral part of the Florence community and contribute greatly to the quality of life experience by the residents. The recognition, enhancement, and protection of these resources will ultimately lead to sustainable community growth and a more beautiful Florence County that all can enjoy.

THIS SPACE LEFT BLANK INTENTIONALLY

GOALS AND IMPLEMENTATION STRATEGIES

The goals of the Natural Resources Element seek to promote an atmosphere of recognition, enhancement, and protection of the natural resources in Florence County in order to heighten the appeal and character of the community and promote a better quality of life for all residents.

GOAL 1

Establish an atmosphere of awareness and importance of the natural resources in Florence County to include scenic areas, unique plant and animal habitats, wetlands, and prime agricultural and forest lands.

Implementation Strategy: Inventory all key natural and scenic resources in the County. This information should be shared with developers in the Florence area. Furthermore, Florence County may periodically sponsor natural resources awareness campaigns.

Adopt an agriculture overlay ordinance in the County to preserve current agricultural areas and ensure that farming/agriculture operations are not adversely affected by new residential and commercial developments. **(short term)**

Time Frame: 1 year. This element can be used as a starting point.

GOAL 2

Protect natural resources while shaping the future development of Florence County with special emphasis on protecting rare and endangered species habitats.

Implementation Strategy: Review new development proposals for impacts to natural resources, and establish a staff person to consider the impact of new developments upon natural resources and natural conditions, which may include scenic areas, unique plant and animal habitats, wetlands, and prime agricultural and forest lands more specifically and as part of the National Pollutant Discharge Elimination System (NPDES) Phase II Storm Water regulations, county staff should review and inspect development for compliance. This can be accomplished in conjunction with Goal 1 and the Land Use Element of the Florence County/Municipal Comprehensive Plan.

Time Frame: Review criteria and staff member hired within 1 year. Continue implementation thereafter.

THIS SPACE LEFT BLANK INTENTIONALLY

GOAL 3

Strive to protect air quality of Florence County and the Pee Dee region before it becomes an observed problem.

Implementation Strategy:

- Implement the TABFTE campaign in order to promote activities which improve air quality. Hopefully this program will be a countywide success and other businesses will follow in the footsteps of Florence County by implementing the program in their own organizations.
- Cooperate with state and federal agencies in the efforts to monitor air quality. **(continuously)**
- Work with known sources of air pollution to maintain and reduce emissions and to mitigate the effects to the extent possible. **(short term)**
- Minimize domestic burning of field and yard debris, trash, etc. **(short term)**
- Minimize vehicle trips by partnering with PDRTA to establish park and ride lots to employment centers, shopping area and recreation areas. **(short term)**
- Provide incentives for the creation of off street bike and walking trails as means of transportation. **(short term)**
- Encourage and provide incentives for mixed use developments built for pedestrian-friendly use which minimize the daily number of car trips necessary. **(short term)**

Time Frame: Continuous implementation of the program in order to constantly reduce the amount of air pollution in Florence County.

GOAL 4

To preserve and enhance the scenic areas of Florence County.

Implementation Strategy: Work in conjunction with the Pee Dee Land Trust and local land owners to expand the use of conservation easements in rural agricultural, scenic, historical areas to encourage easements where appropriate to instate voluntary land protection.

Time Frame: 15-20 years to complete implementation, with a comprehensive list to be developed within 2 years.

GOAL 5

To promote alternative forms of energy use.

Implementation Strategy: Explore the use of energy in public, commercial, and residential uses. Investigate available technologies and then educate county staff on advantages and disadvantages.

Time Frame: Research and education to begin within 1 year and continue throughout the life of this document.

THIS SPACE LEFT BLANK INTENTIONALLY

GOAL 6

To protect and promote solar natural resources.

Implementation Strategy: Explore the use of solar energy in public, commercial, and residential uses. Investigate available technologies and then educate building inspection staff on advantages and disadvantages.

Time Frame: Research and education to begin within 1 year and continue throughout the life of this document.

GOAL 7

Reduce erosion through techniques such as terrace building and tree planting.

Implementation Strategy: Pass an ordinance which requires the planting of trees and the building of terraces when development occurs.

Time Frame: Ordinance to be drafted and passed within one year. This goal will work in conjunction with the Land Use Element of the Florence County/Municipal Comprehensive Plan.

GOAL 8

- a. Consider watershed boundaries as well as political boundaries when making major land use decisions.
- b. Protect jurisdictional and other wetlands, floodplains, and other ecologically sensitive areas such as riparian corridors and watersheds.

Implementation Strategy:

- With Florence County being the downstream recipient of water from the Catawba, and Yadkin River watersheds, which cross county and state boundaries, it is essential to encourage the creation of interstate and intergovernmental compacts, which address watershed issues. **(intermediate to long term)**
- Cooperate with the Natural Resource Conservation Service to promote the Wetlands Reserve Program as a viable conservation option for qualified landowners. **(continuous)**
- Adopt more stringent building requirements for land disturbance in the 100-year flood zone. **(short term)**
- Provide incentives for developers to preserve natural vegetation at residential development sites. **(short term)**
- Establish an annual awards program highlighting projects that have successfully implemented creative development techniques that conserve natural resources. **(short term to intermediate)**
- Cooperate with public education providers by sponsoring workshops, publications and other outreach efforts that could assist private landowners, developers and engineers in implementing natural resources conservation practices on large and small scale. **(continuous)**

Time Frame: as noted above

GOAL 9

- a. Maintain and improve the surface water quality for all waterbodies located in Florence County.
- b. Restore and maintain the chemical, physical, and biological integrity of the County's waters so that they can support the protection and propagation of fish, and wildlife and recreation in and on the water.
- c. The County should take an active role in encouraging development techniques which maintain or improve water quality.

Implementation Strategy:

- Develop and implement an outreach program to educate residents, tourists and community leaders on the unique and fragile ecosystems of Florence County on behavior that can help or harm this resource. **(short term)**
- New County buildings should incorporate low impact design techniques and LEED certification into the overall site plan as a model for private developers by 2015. **(short term to intermediate)**
- Study land use and zoning around water supply sources, both surface waters and wells and implement policies that would further a protection program. **(long term)**
- Work with SCDHEC to implement programs, which will improve the surface water quality of those segments of river and which have been listed as impaired Waterbodies. **(continuous)**
- Work with Clemson University Pee Dee Research and Education, the Natural Resource Conservation Service, the Farm Bureau and local agricultural and mine landowners to address issues that affect water quality including confined animal feeding operations, buffering, irrigation, and dewatering. **(short term)**

Time Frame: as noted above

GOAL 10

Assess and create a plan addressing water quantity including water conservation and management policies.

Implementation Strategy:

- Designate impaired waterways pursuant to State and Federal water quality standards. **(short term)**
- Maximize buffers and inputs to impaired waterways from development and other uses that will further impact water quality and quantity. **(intermediate)**
- Cooperate with State and Federal agencies and develop best management practices for land uses adjacent to water bodies. **(long term)**

Time Frame: as noted above

GOAL 11

Conserve the essential flood reduction, groundwater recharge, pollution filtering, and recreation functions of wetlands.

Implementation Strategy:

- Seek to alleviate point source pollution. **(continuous)**
- Upgrade stormwater facilities to meet future demand. **(continuous)**
- Utilize the development review process to ensure proper stormwater management techniques. **(continuous)**

Time Frame: as noted above

GOAL 12

Ensure that flood prone areas and floodways are maintained for their essential natural functions.

Implementation Strategy:

- Minimize wetland impacts during new and expanded development. **(continuous)**
- Support wetland creation and restoration projects. **(continuous)**
- Seek conservation easements on privately-owned wetlands that will preserve its natural function into perpetuity. **(continuous)**

Time Frame: as noted above

GOAL 13

Improve stormwater and drainage management.

Implementation Strategy:

- Provide incentives for developers to incorporate creative stormwater management techniques into their developments including LID, green building technology, pervious surfaces, rain gardens, and bio-retention areas. **(short term)**
- Prepare a comprehensive drainage master plan for the County as a way to take a more holistic approach to stormwater management. Areas with significant drainage problems should have more stringent stormwater requirements placed on new development. **(long term)**
- Improve stormwater management and computer modeling capabilities. **(intermediate)**
- Develop a capital improvements plan to resolve major drainage basin problems. **(short term)**
- New County buildings should incorporate low impact design techniques into the overall site plan as a model for private developers. **(short term to intermediate)**

Time Frame: as noted above

GOAL 14

Florence County needs to protect and conserve its forests, agriculture, plant and animal habitat, and urban trees while increasing its preserved open areas, scenic areas and recreational opportunities.

Implementation Strategy:

- Through the development review process, minimize the destruction of existing trees to ensure ecological and aesthetic benefits. **(continuous)**
- Promote the use of native species whenever possible. **(continuous)**
- Produce a Countywide Open Space Plan to guide the creation of permanently protected, interconnected, usable open areas within residential developments and around other significant features in the County. **(long term)**
- Determine the feasibility of creating a 'no net loss' of tree canopy for new and expanding developments. **(short term)**
- Seek conservation easements on priority natural resources for perpetual protection. **(intermediate)**

Time Frame: as noted above

GOAL 15

Protect and conserve the ecologically important areas and promotion of sustainable land use.

Implementation Strategy:

- Amend the Land Development Regulations to address defensible space as a wildfire mitigation technique when new development is proposed in close proximity to large tracts of forested land. **(short term)**
- Provide incentives to developers to maintain existing vegetation within new commercial and residential development. **(short term)**
- Create a tree preservation ordinance to include standards for conservation that would both enhance the aesthetic and the environmental function of urban trees. **(short term)**
- Support adding property to the Heritage Preserves and Pee Dee Land Trust. **(continuous)**
- Encourage property owners to participate in the Wildlife Habitat Incentives Program of the Natural Resources Conservation Service. **(short term to intermediate)**
- Develop an Open Space Plan. **(long term)**
- Explore creative planning techniques, such as transfer of development rights, as a means to conserve important natural and scenic features of the County. **(short term to intermediate)**
- Encourage the reuse and upgrade of existing infrastructure rather than the expansion of infrastructure into undeveloped areas. **(short term)**
- Work with the Master Gardeners and other local organizations to educate landowners and developers on the benefits of native species and the hazards of invasive species within their developments. **(short term)**

Time Frame: as noted above

REFERENCES

1. Meenar, Mb Mahburur, Duffy, James, and Bari, A.S.M. Life on the Floodplain. Page 30. July 2006.
2. Tiner, R. W., H. C. Bergquist, G. P. DeAlessio, and M. J . Starr. 2002. Geographically Isolated Wetlands: A Preliminary Assessment of their Characterisitcs and Status in Selected Areas of the United States. U.S. Department of the Interior, Fish and Wildlife Service, Northeast Region, Hadley, MA.

INTERNET SOURCES

1. South Carolina State Climatology Office. Accessed at <http://www.dnr.sc.gov/climate/sco/>. November 13, 2006.
2. Natural Resource Conservation Service (NRCS). Assessed at <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>. December 12, 2006.
3. United States Department of Agriculture, National Agriculture Statistic Service. Accessed at <http://www.nass.usda.gov/index.asp>. May 3, 2007.
4. South Carolina Department of Health and Environmental Control (SCDHEC). Accessed at <http://www.scdhec.gov/egc/water/pubs/pdfact.pdf>. December 12, 2006.
5. Yadkin-Pee Dee Basin. Accessed at http://www.ncwater.org/Reports_and_Publications/swsp/swsp_jan2001/final_pdfs/B18_YadkinPeeDee.pdf. May 3, 2007.
6. U.S. Environmental Protection Agency, Wetlands. Accessed at <http://www.epa.gov/owow/wetlands/vital/what.html>. December 15, 2006.
7. FEMA, "Are You Ready?" Accessed at <http://www.fema.gov/areyouready/flood.shtm>. December 15, 2006.
8. S.C. Department of Natural Resources. Accessed at https://www.dnr.sc.gov:4443/pls/heritage/county_species.list?pcounty=florence. November 8, 2006.
9. Environmental Protection Agency. Accessed at www.epa.gov. December 19, 2006.
10. S.C. Department of Environmental Control, The Take a Break from the Exhaust Program. Accessed at <http://www.scdhec.gov/egc/outreach/html/messages.html#tab>. May 8, 2007.
11. U.S. Department of Energy, Solar Energies Technology Program. Accessed at <http://www1.eere.energy.gov/solar/>. December 19, 2006.
12. Florence Rail Trail and Connections. Accessed at <http://www.sciway3.net/outdoors/park-florencerailtrail.html>. May 29, 2007.
13. Florence County Climate. Accessed at <http://www.florenceco.org/GeneralInformation/Climate/>. June 14, 2007.

14. US Geological Survey. Accessed at <http://www.mrdata.usgs.gov>. June 18, 2007.
15. SCDHEC, Division of Mining and Solid Waste Management. Accessed at <http://www.scdhec.gov/lwm/html/mining.html#go>. June 20, 2007.
16. FEMA, Frequently Asked Questions. Accessed at http://www.fema.gov/plan/prevent/fhm/fq_term.shtm. June 21, 2007.
17. SCDHEC, Ozone Fact Sheet. Accessed at <http://www.scdhec.gov/environment/baq/docs/factsheets/ozone.pdf>. July 6, 2007.
18. S. C. Department of Parks, Recreation and Tourism
<http://www.southcarolinaparks.com/park-finder/state/216.aspx>
19. Horry County Comprehensive Land Use Plan
20. Gardener-Outlaw, T., and R. Engelman. 1997. Sustaining water, easing scarcity: a second update. Population International, Washington, DC.
21. Kondratyev, K.Y. , V.F. Krapivin, and C.A. Varotosos. 2003. Global carbon cycle and climate change. Springer-Verlag, Berlin, Germany.
22. SCNEMO-Non-Point Education for Municipal Officials:
www.scseagrant.org/scnemo/factsheets.htm

ELEMENT ADOPTION DATES

Florence County.....	April 17, 2008	Ordinance No. 23-2007/08
City of Johnsonville.....	May 6, 2008	Ordinance No. 2008-09
Town of Olanta.....	May 6, 2008	Ordinance No. 16 I, 16-7
Town of Quinby.....	May 6, 2008	Ordinance No. 08-2007/08
Town of Scranton.....	June 9, 2008	Ordinance No. (No Number)
Town of Timmons ville.....	June 3, 2008	Ordinance No. 460