SECTION 4

Description of Existing Environment in Planning Area

This section describes the existing environment to facilitate the identification of potential SCI to the natural environment as projects are undertaken and growth occurs in the Planning Area. The data for this section were gathered through literature reviews, geographic information system (GIS) analysis, phone conversations, letters, and meetings with various agency personnel.

4.1 Topography and Floodplains

The Town is located in the central piedmont physiographic region and has a consistently rolling terrain with moderately steep slopes. Floodplains function as storage areas for surface water during large rainfall events. Within floodplains, microtopographical variations often create pockets of riparian wetlands. These riparian areas provide multiple functions including: flood storage, wildlife habitat, corridors for wildlife movement, and water quality functions such as infiltration zones and surface water filtering.

A majority of regulated floodplain area is within the Town's stream buffer zone. Floodplains within watersheds greater than one square mile are regulated by the Federal Emergency Management Agency (FEMA). Flood Insurance Rate Maps (FIRM) for the area were dated May 2, 2006 (FEMA, 2006). The regulatory floodplains represent 17.3 percent of the total Planning Area, as shown on Figure 4-1. This does not include Town-regulated floodplains which provide additional flood protection, discussed in Section 6.2. FIRMs for the Neuse River basin and Cape Fear River basin in Wake County are in the process of being updated and are expected to be available for public review in 2014. This will include new detailed floodplain studies in both the Neuse and the Cape Fear River Basins, which will increase the floodplain information available to the Town. The floodplains shown in Figure 4-1 may change in the future based on the revisions reflected in the updated FIRMs.

4.2 Soils

The major soil types are Cecil, Creedmoor, and White Store. Other soils present include Appling, Helena, Cecil, and Wedowee. These soils are mostly sandy loams. Soil types within floodplains and adjacent to streams include Chewacla, Congaree, Mayodan, and Wehadkee (USDA, 1970).

4.3 Land Use

Figure 4-2 illustrates the general land use categories within the Planning Area. The map shows land that is available for development, land that is already developed, Duke Energy lands, and land that is protected as open space. The developed land is divided into residential and non-residential uses. In some cases, a land use category is mixed use, and these areas were typically

classified as non-residential development. The open space category includes protected open space, parks, and privately held open space.

Table 4-1 provides detail on the acres within each general land use category. Approximately 29 percent of the land is developed, another 24 percent is currently undeveloped, with the remaining approximately 46 percent including open space, gamelands, Duke Energy land, and Harris Lake. The undeveloped category includes parcels that are 10 acres or greater that have a residence on them, as these lands could be subdivided in the future. Not including Harris Lake, approximately 32 percent of the Planning Area is owned by Duke Energy and is largely forested.

TABLE 4-1
Planning Area Existing Land Use

General Land Use Type	Square Miles	Percent of Planning Area
Residential Developed	11	18%
Non-residential Developed[1]	6.7	11%
Undeveloped[2]	14.4	24%
Open Space	4.3	7%
Harris Lake	4.5	7%
Duke Energy land		
- Undeveloped	11.8	19%
- Gamelands	8.1	13%
Total	**60.8**	**100%**

Source: Town of Holly Springs, 2013; Wake County, 2013, NCWRC, 2013a

[1] Transportation and mixed use are included within the Non-Residential category

[2] Undeveloped land is any undeveloped land that has potential for development. Undeveloped land may be forested, agricultural, cleared, or residential with 10-acre lot

Figure 4-2 illustrates the Town's riparian buffers within the Town's Planning Area, which accounts for 0.9 square miles of protected open space and 1.5 percent of the Planning Area. Streams outside the Town's ETJ fall within the County's jurisdiction and have protection strategies in place. These streams will fall under the Town's jurisdiction once the ETJ is expanded. When this occurs, the Town will need to verify whether the streams are perennial, intermittent, or ephemeral, which will determine the size of the buffer as described in Section 6. The floodplain area inside the Planning Area is 10.5 square miles (17.3 percent of the Planning Area).

The actual percentage of open space within the Planning Area is likely greater than the amount indicated by Table 4-1 and Figure 4-2 due to the following factors: 1) large portions of the areas classified as residential are open space due to the large amount of low-density development; 2) the Town requires open space in new residential and commercial developments and 3) the Town requires the protection of riparian buffers and limits development in floodplains. In addition, other areas within developed categories, such as perimeter buffers and other required recreation areas, are actually open space. Therefore, although the open space area is 7 percent of the Planning Area in Table 4-1, there are many areas that are undeveloped open space within the developed land use designations that would increase this percentage.

Table 4-2 breaks the general land use categories out further based on Wake County's parcel database and the Town's zoning classifications described in Appendix C. Undeveloped and Vacant land (no building included in Wake County's parcel database) account for 24 percent of the land. This land may be forested, in agriculture, or cleared. The largest development category is medium density residential (9 percent of the Planning Area).

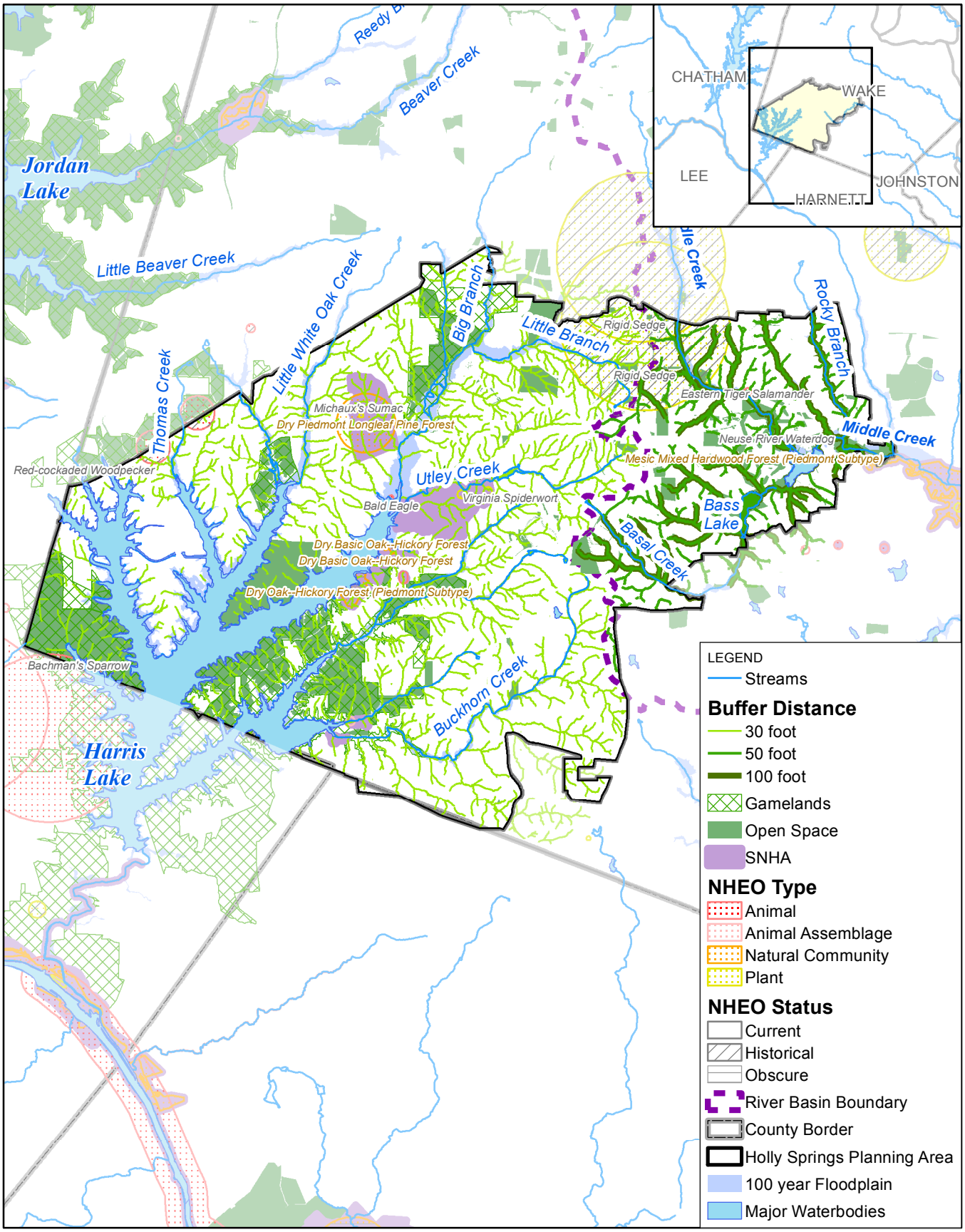

FIGURE 4-1
Environmental Features
2015 Secondary and Cumulative Impacts
Master Management Plan - Town of Holly Springs

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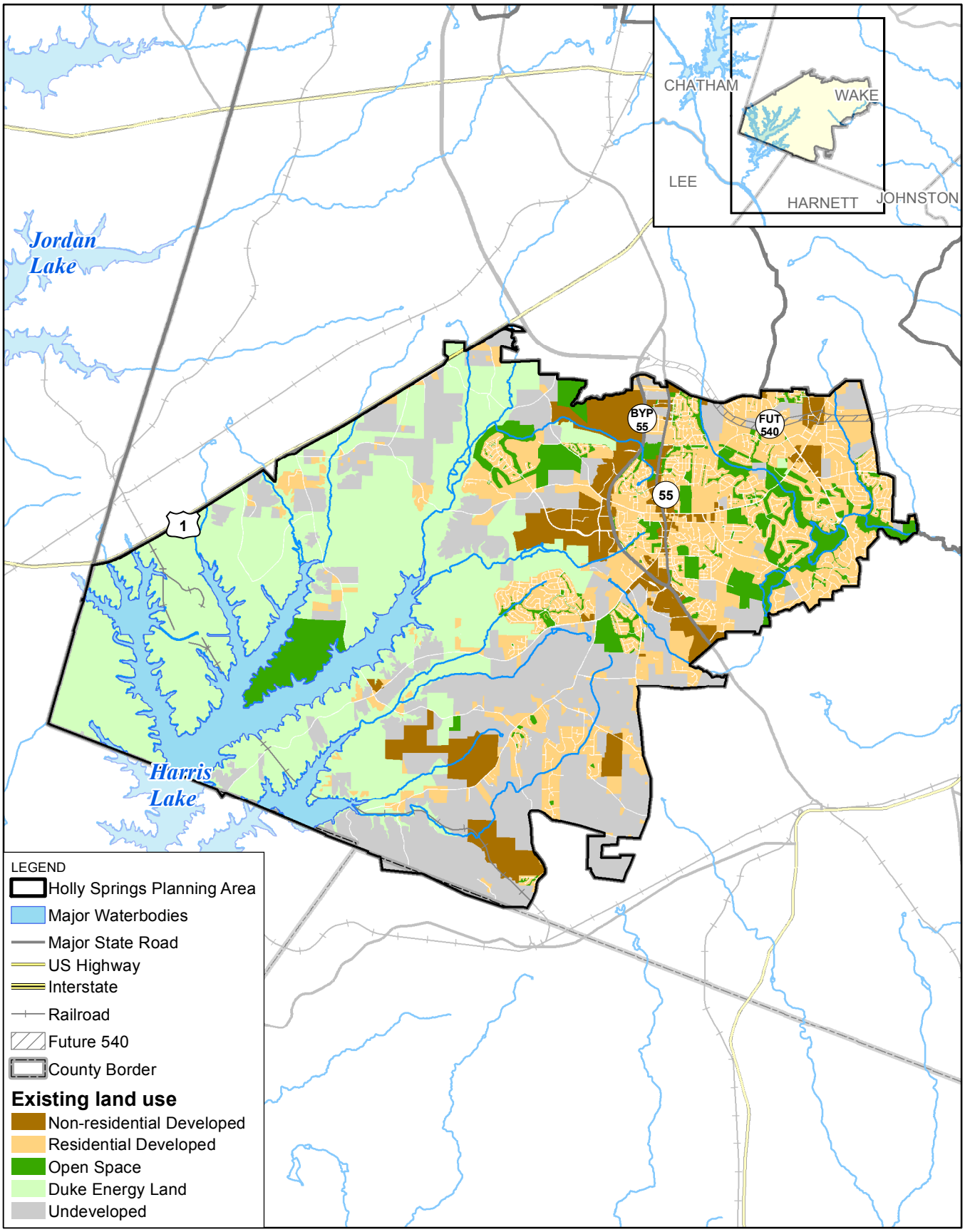

FIGURE 4-2
Existing Land Use
2015 Secondary and Cumulative Impacts
Master Management Plan - Town of Holly Springs

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Table 4-2 also includes estimates of percent imperviousness; the estimated values shown in the table were used in modeling analyses performed for the Town of Cary (CH2M HILL, 2002a). These values are based on literature values. The percentage impervious per land class was used to estimate the impervious area for the 2013 land use data. The total estimated percent impervious is approximately 15 percent.

TABLE 4-2
Planning Area Detailed Existing Land Use

Land Use Type	Square Miles	Percent of Planning Area	Estimated Percent Imperviousness[2]	Estimated Impervious Square Miles
Commercial	1.4	2%	82%	1.1
Industrial	1.3	2%	82%	1.1
Office/Industrial	1.6	3%	77%	1.2
High-Density Residential	2.7	4%	44%	1.1
Medium-Density Residential	5.4	9%	21%	1.1
Low-Density Residential	2.9	5%	21%	0.6
Open Space	4.3	7%	4%	0.2
Harris Lake/Open Water	4.5	7%	N/A	
Duke Energy land				
Undeveloped	11.8	19%	3%	0.4
Gameland	8.1	13%	2%	0.2
Undeveloped/Vacant	14.4	24%	3%	0.2
Transportation[1]	2.4	4%	87%	2.1
Total	**60.8**	**100%**		**9.5**

Source: Town of Holly Springs, 2013; Wake County, 2013
Note: The Town's land use categories are described in Appendix D.

[1] Transportation is not included in the land use coverages. The area used for transportation was estimated by subtracting the land use area from the transportation area.

[2] Percent impervious value estimates are based on modeling analyses done for the Town of Cary (CH2M HILL, 2002a). Percent impervious values were assigned for the Town of Holly Springs based on density definitions. The percent impervious for the office/industrial category was assumed to be the average of the values for office and industrial categories.

4.4 Wetlands

For regulatory purposes under the Clean Water Act (CWA), the term wetlands means "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." In general, wetlands share three key characteristics: wetland hydrology, hydric soils, and hydrophytic vegetation. Wetlands and vegetated riparian areas are valuable because they are among the most biologically productive natural ecosystems in the world. They also protect wildlife, provide natural open spaces, protect water quality, control erosion, and limit flood damage.

Wetlands, as classified in the United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI), within the Planning Area are primarily riparian or bottomland forest associated with streams and their floodplains (Figure 4-3 and Table 4-3) (NCCGIA, 2013, based on the 1982 USFWS NWI). The majority of the NWI wetlands are forested and are part of bottomland communities adjacent to larger streams within the Planning Area. The Wake County Soil Survey (USDA, 1970) also shows that hydric soils are present, primarily within riparian and floodplain areas. Wide areas of forested riparian wetlands are present along White Oak Creek, Little White Oak Creek, and Big Branch, according to NWI. Middle Creek also has associated forested and scrub-shrub wetlands. Open water ponds occur along many of the streams within the Planning Area. Included in the open water calculation is Harris Lake, creating a large open water area when compared to other wetland types. While the NWI does not map all jurisdictional wetlands, it is useful in terms of classifying types of wetlands within the Planning Area and approximate locations. It is important to note that many changes have taken place within the Planning Area since these data were compiled.

TABLE 4-3
National Wetlands Inventory, within the Planning Area

NWI Type	Acres
Emergent	6
Forested/Shrub	1,187
Lakes/Ponds	3,207
Total	**4,400**

Source: NCCGIA, 2013

4.5 Prime or Unique Agriculture

North Carolina Executive Order 96 charges all State agencies to minimize the loss of prime agricultural and forested lands as defined in the Federal Farmland Protection Policy Act. The United States Department of Agriculture (USDA) Natural Resources Conservation Service has classified lands into three categories based on suitability for agricultural uses. These classifications incorporate soil type, slope, and water capacity. *Prime farmlands* are those soils with slopes between 0 and 8 percent in capability classes I and II, and some in capability class III. *Unique farmlands* are recognized for having a certain set of parameters necessary to produce certain high-value crops. The third category, *farmland of statewide importance*, includes those soils that do not quite qualify as prime farmlands. Factors include steepness of slope, susceptibility to erosion, and permeability (USDA, 1998).

Soils defined as prime farmlands are present within the Planning Area. The major soil types are Cecil, Creedmoor and White Store. Other soils present include Appling, Helena, Cecil, and Wedowee. These soils are mostly sandy loams. Soils types within floodplains and adjacent to streams include Chewacla, Congaree, Mayodan, and Wehadkee. Of the major soil types within the Planning Area, Appling, Cecil, Congaree, Creedmoor, and Chewacla are listed as prime farmlands (USDA, 1998). Chewacla soils must be drained to be of use for agricultural purposes.

Other soil types considered of statewide importance include these same soils but with steeper slopes, Mayodan thin silt loams, and White Store. Many of these soils, especially in the eastern portion of the Planning Area, have been impacted by development and other soil disturbances.

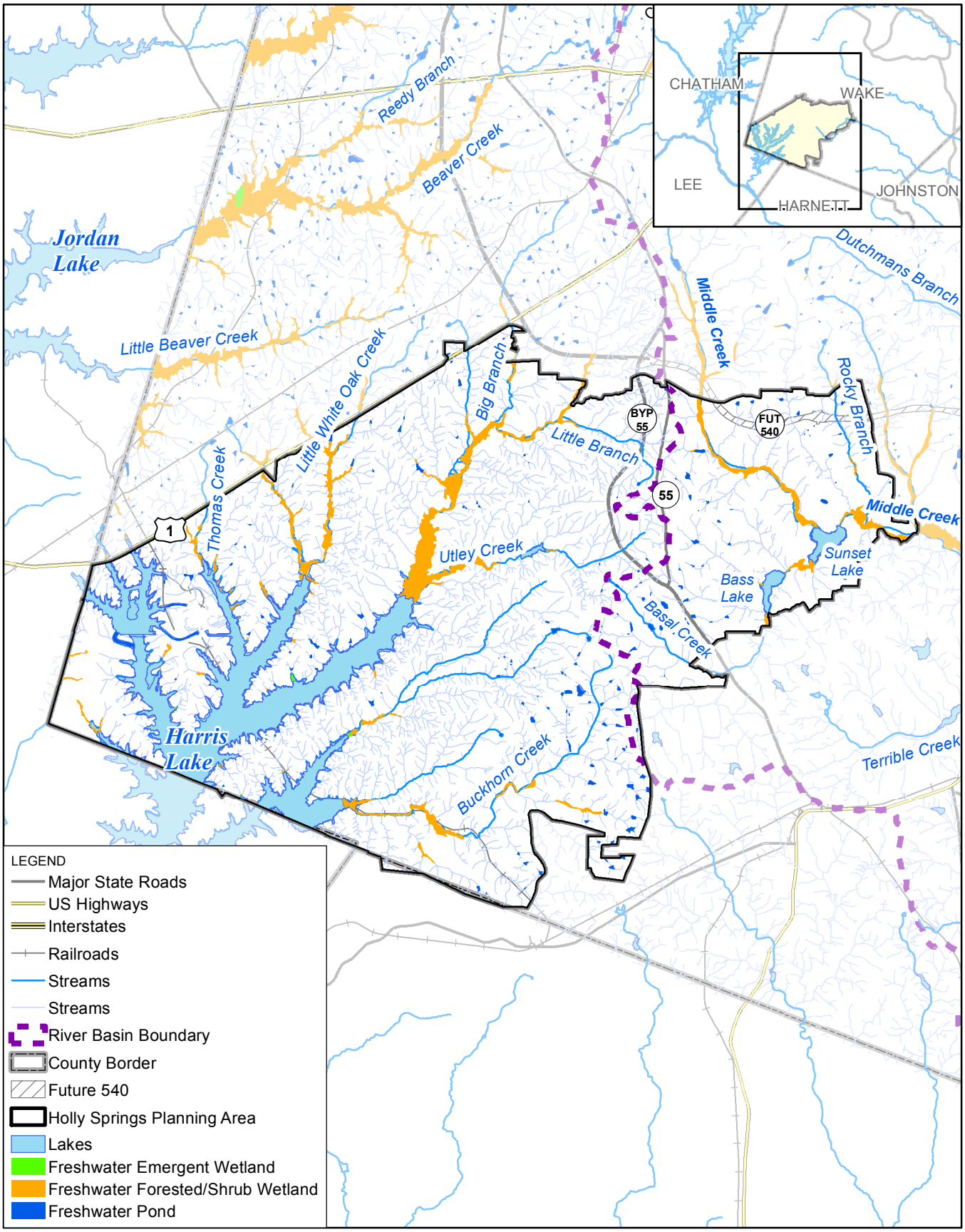

FIGURE 4-3
National Wetlands Inventory (NWI)
2015 Secondary and Cumulative Impacts
Master Management Plan - Town of Holly Springs

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Currently, 24 percent of the Planning Area remains undeveloped, which can include agricultural or forested land. The North Carolina Gap Analysis Program (NCGAP) provides land cover data based on an analysis performed by the United States Geological Survey (USGS) using 1992 satellite imagery. While the NCGAP data does not reflect recent growth, it does show that much of the land within the Planning Area has been converted from agricultural lands to developed land uses. Currently, agricultural lands are concentrated in the southern portion of the Planning Area and include pockets of both cultivated row crops and pasture areas.

4.6 Public Lands and Scenic, Recreational, and State Natural Areas

This category includes Federal, State, and local parks and other scenic and recreational areas within the Planning Area.

The Town's major parks and recreation areas and conservation lands are listed in Table 4-4 and shown on Figures 4-1 and 4-2 as open space. The Town has over 6,000 acres within its Planning Area that are parks. Parks that are considered undeveloped have no active or passive use while developed parks have a designated active use for a portion of the park area but often contain an undeveloped potion as well. Sugg Farm, primarily pasture and woodland, was purchased by the Town in 2012 as a location for outdoor festivals. The 116-acre property is located adjacent to Bass Lake Park; a master plan for the area is currently being developed by the Town. Bass Lake Park is the second largest Town-owned park at 98 acres, providing fishing, hiking, canoeing, and environmental programs. Jones Park is located adjacent to Holly Springs Elementary School, providing environmental education facilities to students as well as athletic and playground facilities for the neighborhood. A master plan was recently developed for the Mims property, which will be an area of passive recreation (Alta Greenways, 2012). Parrish Womble Park includes synthetic turf soccer fields that provide stormwater infiltration.

There are several areas of undeveloped park land and preserved open space within the Town, particularly along Middle Creek. The Town continues to monitor an approximate 40-acre area of habitat for the state-listed Easter tiger salamander (*Ambystoma tigrinum*) along Middle Creek, which includes floodplain protection area. The Town intends on protecting this area in a voluntary dedicated tiger salamander preserve through coordination directly with the property owners. The Town owns a 74-acre and 50-acre undeveloped park property known as Sunset Oaks and Woodcreek Park site, respectively. In 2011 the town was granted a 46-acre tract of land, known as the Jordan property, which is adjacent to a 48-acre tract owned by the Town of Cary.

Other significant recreational areas within the Planning Area are owned by Wake County and Duke Energy. Shearon Harris County Park, owned by Wake County, is located adjacent to Harris Lake and provides opportunities for hiking, mountain biking, picnicking, and a public launch site for canoes and kayaks. The Shearon Harris Game Lands, owned by Duke Energy, also provide public recreation opportunities.

To date, the Town has established eight miles of greenways. More are planned, as documented in the Vision Holly Springs Comprehensive Plan (Design Based Planning, 2009). The plan was

developed with other Wake County and neighboring towns' plans in mind, in an effort to provide connectivity.

Scenic areas also provide passive recreational opportunities such as hiking and bird watching when located on public land and include Significant Natural Heritage Areas (SNHAs). These areas are discussed in Section 4.13.

TABLE 4-4
Parks within the Planning Area

Park	Total Acres	Acres within Planning Area	Owner
Developed			
Veteran's Park	10	10	Town of Holly Springs
Hunt Community Center	11	11	Town of Holly Springs
Springs of Holly Springs Nature Trail	12	12	Privately Owned
Mims Property	17	17	Town of Holly Springs
Jones Park	24	24	Town of Holly Springs
North Main Athletic Complex	42	42	Town of Holly Springs
Parrish Womble Park	44	44	Town of Holly Springs
Bass Lake Park	98	98	Town of Holly Springs
Sugg Farm Park	116	116	Town of Holly Springs
Shearon Harris County Park	593	593	Wake County
Subtotal Developed	***967***	***967***	
Undeveloped			
Holly Glen Park	2	2	Town of Holly Springs
Trail linkage parks	6	6	Town of Holly Springs
Woodcreek	50	50	Town of Holly Springs
Jordan Property	46	46	Town of Holly Springs
Sunset Oaks	74	74	Town of Holly Springs
Subtotal Undeveloped	***178***	***178***	
Game Lands			
Shearon Harris Game Lands	6,994	5,184	Duke Energy
Total	***8,139***	***6,329***	

4.7 Areas of Archaeological or Historical Value

SEPA requires the conservation and protection of the State's natural resources and preservation of "the important historic and cultural elements of our common inheritance." The National Register of Historic Places (NRHP) is the formal repository of information pertaining to historic structures and districts and is managed by the National Park Service (NPS). Places considered for listing include historic structures and districts, cemeteries, and archeological sites. To assess

the general character of cultural resources associated with the Planning Area, background research was conducted using the NRHP website (NPS, 2014).

There are three properties within the Town listed on the NRHP. These properties include the Mims House, the Holly Springs Masonic Lodge, and the Holleman House in New Hill. The Town has developed a master plan for passive recreation at the Mims House property (Alta Greenways, 2012).

As of 2014, there have been almost 1,900 archaeological sites identified, ranging from Paleo-Indian (10,000 BC) to 19th century industrial sites (NCDCR, 2014a)

In an effort to support Federal efforts to protect historic places, the Town has been a Certified Local Government (CLG) since 1994 (NCDCR, 2014b). The responsibilities of a CLG include to:

- Enforce appropriate State or local legislation for the designation and protection of historic properties.
- Establish a historic preservation review commission.
- Maintain a system for the survey and inventory of historic properties compatible with the statewide survey.
- Provide opportunities for public participation in the local program.

As a CLG, the Town is eligible for grant money and can provide local expertise during the nomination process for the NRHP. The Wake County Historic Preservation Commission has jurisdiction over the Town.

4.8 Air Quality

The U.S. Environmental Protection Agency (USEPA) uses the Air Quality Index (AQI) to report ambient air quality conditions, and the AQI ranges from good, moderate, unhealthy for sensitive groups, unhealthy, to hazardous. In 2012, the median AQI in Wake County was 42, or good. No days were considered unhealthful and 4 days were considered unhealthful for sensitive populations (USEPA, 2012).

A new, more stringent National Ambient Air Quality Standard (NAAQS) for ozone was established by USEPA in 1997. As of June 2005, Wake County, which was identified as a maintenance area, was no longer subject to the 1 hour standard. In March 2008, USEPA further strengthened the national standards for 8-hour ozone levels. Since 2006, the County has been listed as a maintenance area for the 8-hour ozone standard. Ozone is not directly emitted, but is formed when sunlight reacts with volatile organic compounds and nitrogen oxides and is a component of smog. The largest source of the precursors to the formation of ozone in the Planning Area is exhaust from motor vehicles. The Raleigh/Durham area is listed as a maintenance area for carbon monoxide, which is primarily emitted from transportation and industrial sources (USEPA, 2013).

North Carolina had its lowest ozone levels on record in 2013 since air monitoring began in the early 1970s. The declining ozone levels went hand-in-hand with lower emissions from the state's power plants. A recent report by the North Carolina Division of Air Quality (NCDAQ) shows that the state's coal-fired power plants have cut their nitrogen oxide emissions, a primary

industrial contributor to ozone pollution, by more than 80 percent since the General Assembly enacted the Clean Smokestacks Act in 2002 (NCDENR, 2013a).

4.9 Noise Levels

Within the Planning Area, noise is primarily created by residential traffic. Noise levels are highest along traffic corridors, with lower noise levels in residential areas. Construction activities, which occur with development, are also present within the Planning Area and are temporary. Typical residential noises include lawn mowers, leaf blowers, and barking dogs. This noise is generally concentrated during daylight hours. Noise is also associated with industrial activities; however, industrial land uses only comprise 2 percent of land use, so this is not a major contributor of noise in the Planning Area.

4.10 Water Resources

4.10.1 Surface Water

The Town's Planning Area is approximately 61 square miles. The Planning Area lies on the ridge line between the Neuse and Cape Fear River basins. Approximately 20 percent of the Planning Area lies in the Neuse River basin (HU 03020201) and 80 percent lies in the Cape Fear River basin (HU 03030002) (Figure 4-4).

The major tributary to the Neuse River basin within the Planning Area is Middle Creek (Table 4-5; Figure 4-4). Tributaries to Middle Creek include Basal Creek and Rocky Branch. Bass Lake was reconstructed by the Town after destruction by Hurricane Fran. The Environmental Management Commission (EMC) classifies all waterbodies within the state based on the best usage and each classification represents certain designated use. Middle Creek within the Planning Area is listed as Class C NSW (NCDENR, 2012a) as shown in Table 4-5. (Note: The EMC has not classified many of the unnamed tributaries shown on Figure 4-4. Stream classifications of unnamed tributaries are the same as the stream to which they drain).

TABLE 4-5
Planning Area Watersheds

River Basin	Watershed	EMC Subbasin	EMC Water Quality Classification	Watershed Description
Neuse River	Middle Creek	03-04-02	C NSW	Includes Basal Creek, Rocky Branch, and Unnamed tributaries
Cape Fear River	Harris Lake	03-06-07	WS-V	Harris Lake
			B; C	Includes Buckhorn Creek, Jim Branch, Cary Branch, Norris Branch, Utley Creek, Little Branch, Big Branch, White Oak Creek, Little White Oak Creek , Thomas Creek and Unnamed tributaries

Source: NCDENR, 2012a; B = Primary Recreation; C = Secondary Recreation

Class C waters are suitable for aquatic life support, swimming, and fishing, while Class B waters are suitable for all Class C uses, but are also used for primary recreation on an organized basis. In addition to the assigned classifications mentioned above, all waters within the Neuse

River basin are classified as Nutrient Sensitive Waters (NSW) in response to excessive growths of macroscopic and/or microscopic vegetation in the estuary.

Streams within the Cape Fear River basin drain mainly to Harris Lake (Table 4-5; Figure 4-4). Streams include Buckhorn Creek, Jim Branch, Cary Branch, Utley Creek, White Oak Creek, Little White Oak Creek, Little Branch, Big Branch, and Thomas Creek. All streams except a segment of Buckhorn Creek are classified as Class C. The lower segment of Buckhorn Creek is classified as Class B. In addition, the Harris Lake watershed is classified as WS-V. WS-V watersheds have no development restrictions. A small portion of the Planning Area along the southwestern border of Wake County, with Chatham County, is within a WS-IV watershed that drains to the Cape Fear River. This WS-IV area is located outside the Town's current ETJ. This area comprises less than one percent of the Planning Area.

Harris Lake is located partially in the southwestern corner of Wake County and has a surface area of 4,190 acres at full pool conditions. This reservoir provides cooling water for the Shearon Harris Nuclear Power Plant owned by Duke Energy and is considered eutrophic (NCDENR, 2004). Aquatic macrophytes, including *Hydrilla* sp., have been observed throughout the reservoir.

Macroinvertebrate and fish communities are sampled by NCDENR to assess water quality and habitat conditions. Within the Neuse River basin portion of the Planning Area, there are three sites on Middle Creek that have been sampled for marcroinvertebrate communities. Two sites on State Road 1301, one below and one above Sunset Lake, were sampled in 1986 and 2005 respectively, both receiving a bioclassification of Fair. The 2012 Basinwide Assessment Report for the Neuse River basin report indicated that during the 2005 sampling event the stream had high conductivity values and stated that this could be an indication of influences from nonpoint urban runoff and the upstream WRF discharge (NCDENR, 2012b). Another site on Middle Creek, at State Road 1152, was sampled in 2009, with a rating of Fair. A site on Basal Creek, just outside the Planning Area was sampled in 1986 for macroinvertebrate communities and had a rating of Good-Fair. Sampling sites downstream in Middle Creek, outside of the Planning Area, have shown improvements from ratings for Fair to Good-Fair (NCDENR, 2012b).

Two sites in the Cape Fear River basin portion of the Planning Area were sampled for macroinvertebrates in 2003 as part of a special study for the Ecosystem Enhancement Program (EEP). One, located on Buckhorn creek by State Road 1117, was rated Good, and the second site, located on Little Branch by State Road 1153, was not rated (NCDENR, 2004). There are no fish community sampling sites within the Planning Area (NCDENR, 2005).

4.10.1.1 303(d)-Listed Streams

Section 303(d) of the CWA requires that states develop a list of waters not meeting water quality standards or with impaired uses. The state must prioritize these water bodies and prepare a management strategy or total maximum daily load (TMDL). Middle Creek is the only waterbody in the Planning Area that is listed as impaired (NCDENR, 2012a). The impairment is based on ecological and biological integrity as well as turbidity. Elevated conductivity levels are also consistently measured in Middle Creek.

4.10.1.2 Wake County Watershed Assessment Summary

Wake County, in an effort to characterize the health of its streams and watersheds, completed a watershed assessment in 2001 (CH2M HILL, 2002b). The goal of these efforts was to assess the

overall effects of land use changes on physical stream structure and aquatic communities. An update to this watershed assessment has not been undertaken since 2001.

In summary, three types of monitoring were conducted in streams and watersheds county-wide:

- **Biological assessment**—Benthic organisms were collected and identified, providing an estimate of long-term effects of water quality on the aquatic community.
- **Habitat assessment**—The effects of land use changes on streams were assessed to help differentiate the impacts of water quality pollutants versus habitat degradation on the stream environment.
- **Stream geomorphology**—Characteristics such as channel shape, channel slope, sediment load, and sediment size were assessed to help determine stream bank erodibility and other potential areas of stream degradation.

This assessment concluded that many of the streams within the County were degraded. Influencing factors included agricultural practices and urbanization, with the effects of urbanization on the biotic community structure more pronounced than agricultural effects. Within the Planning Area, three sites were evaluated (Table 4-6). Basal Creek exhibited the most entrenchment of the sites sampled. Watershed conditions and bioclassifications based on benthic macroinvertebrate sampling are in line with the majority of streams in the County.

TABLE 4-6
Wake County Watershed Assessment Summary

Stream Name	Nearest Road Crossing	Habitat Condition	Bioclassi-fication	Watershed Classification	Entrenchment
White Oak Creek (Big Branch)	Holly Springs New Hill Rd	Suboptimal	Fair	Good	Slight
Basal Creek	NC 55	Marginal—Suboptimal	Good–Fair	Good–Fair	Entrenched
Middle Creek	Tallicud Rd	Marginal	N/A	Fair	Slight

Source: CH2M HILL, 2002b

4.10.2 Groundwater

The western portion of the Planning Area is within the Triassic Basin of the Piedmont region of North Carolina and is characterized by a thin regolith layer, which limits groundwater storage capacity. Because of the properties of Triassic soils in the area, infiltration is low and septic systems may not percolate well, and could provide a public health hazard if not properly designed, installed, and maintained. The Southeastern portion of the Planning Area is within the Coastal Plain Basement and Metaigneous, Felsic Hydrogeologic unit. The Coastal Plain Basement is comprised of undifferentiated crystalline basement rocks of igneous and metamorphic origin overlain by sedimentary sands, gravels, clays, and marine deposits. Hydraulic conductivity is higher in the eastern portion of the Planning Area due to the greater prevalence of gneiss rock compared to the sedimentary rock found in the Triassic Basin. The Metaigneous, Felsic Hydrogeologic Unit is light colored, massive to foliated metamorphosed bodies of varying assemblages of felsic intrusive rock types. Local shearing and jointing are common. Well yields in

areas with felsic geology are average for the Piedmont whereas those in the Triassic are low. In general, well yields in the western part of the Planning Area tend to be low (around 5 to 25 gallons per minute) with yields in the southeast being moderately higher.

Within the Harris Lake watershed, approximately 6 to 8 percent of precipitation reaches the groundwater for recharge, contributing approximately 35 to 55 percent of stream baseflow during normal precipitation years. Upper portions of the watershed include some areas of the Coastal Plain Basement while the remainder of the watershed is Triassic basin. Groundwater within the Planning Area is generally free of contaminants and, to the extent it is available in sufficient quantity, is used as a source of drinking water by individuals and community well systems (CDM, 2003). In most cases, groundwater is safe to use as a drinking water source; it is void of contaminants.

Some residents within the Planning Area currently obtain their water from wells and discharge waste to septic systems. These residents could request municipal water and sewer service when it is available to them. New development will be served by the Town's Utley Creek WRF and by the Town's water supply.

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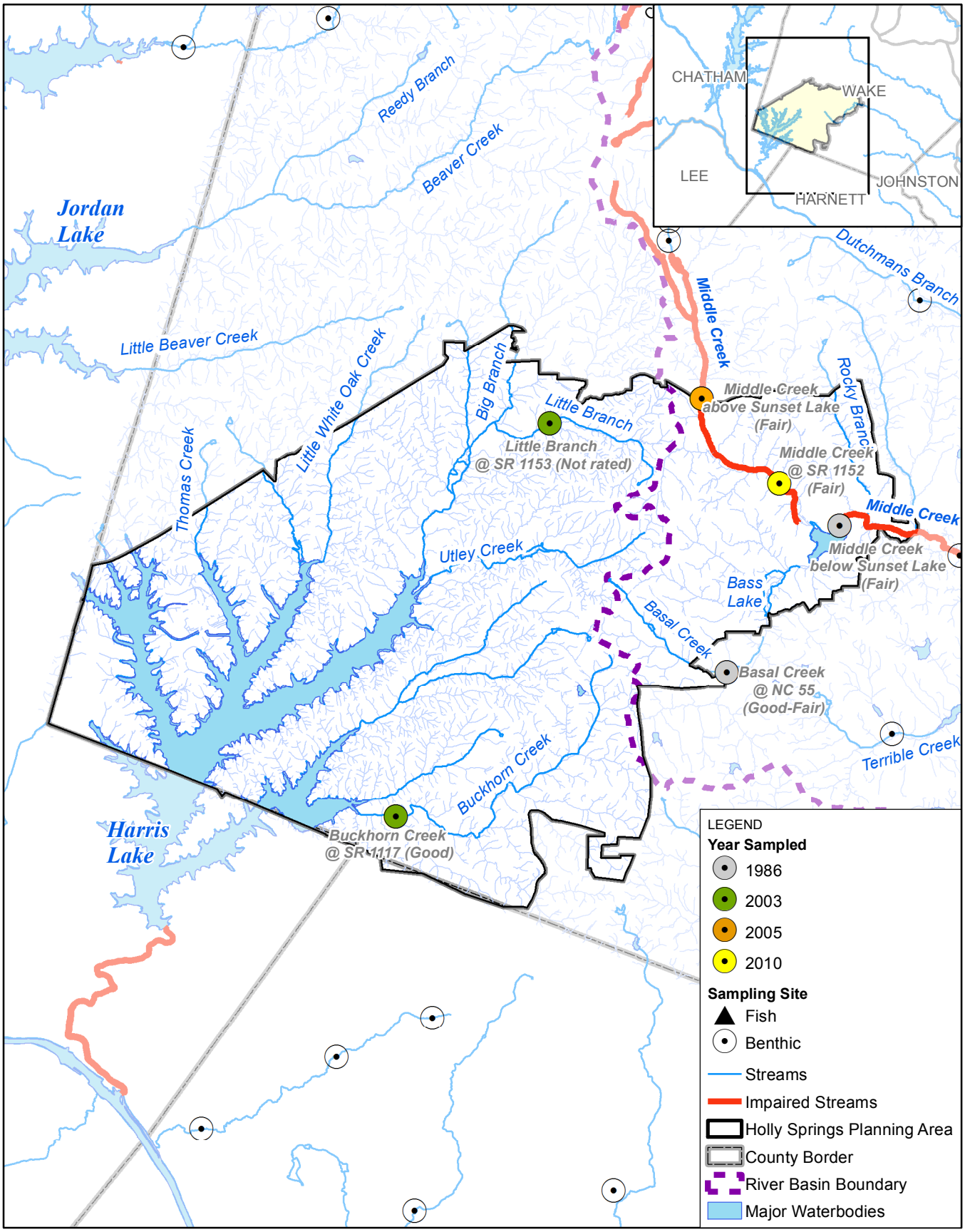

FIGURE 4-4
Water Resources
2015 Secondary and Cumulative Impacts
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4.11 Forest Resources

The majority of the Planning Area is forested, as discussed in Section 4.3. In addition to land use data provided by the Town, land cover data developed by the NCGAP were also analyzed (NCGAP, 2006). The NCGAP provides land cover data based on an analysis performed by the USGS using 1992 satellite imagery. These data provide a better understanding of the types of forest resources present within the Planning Area.

Large areas of forested land are present in the western portion of the Planning Area, while the eastern portion is more fragmented. The most dominant forest type within the Planning Area is Dry-Mesic Oak and Pine Forests, which includes loblolly pine (*Pinus taeda*) and several oak species including white (*Quercus alba*), southern red (*Q. falcata*), and post (*Q. stella*).

Another common forest type includes Piedmont Dry Mesic Oak-Pine Forests, which are dominated by loblolly pine, especially those that previously were cleared. Communities with drier xeric habitats tend to be dominated by Virginia pine (*P. virginiana*) or shortleaf pine (*P. echinata*).

Also present are Piedmont/Mountains Dry-Mesic Oak and Hardwood Forests which are primarily oak dominated forests with white oak often dominant. Habitats with drier conditions are dominated by southern red, post, and chestnut oaks (*Q. prinus*). Sweetgum (*Liquidambar styraciflua*) and yellow poplar (*Liriodendron tulipifera*) are the other main canopy species. Sites with basic soils may also provide habitat for eastern red cedar (*Juniperus virginiana*).

The areas surrounding Harris Lake were previously managed by the former CP&L energy company for timber production, and are identified by NCGAP as Coniferous Cultivated Plantation (natural and planted). Most planted pines are loblolly, but slash (*P. elliottii*) and longleaf (*P. palustris*) pines are also present.

Forests within the Basal Creek headwaters are mostly Coastal Plain Dry to Dry-Mesic Oak Forests. While this community is also dominated by white oak, it differs because other main canopy species include water oak (*Q. nigra*), northern red oak (*Q. rubra var. borealis*), and hickory (*Carya sp.*).

Along stream corridors, Floodplain Wet Shrubland and Piedmont Mixed Bottomland Hardwood Forest communities are present. Tag alders (*Alnus serrulata*) and button bush (*Cephalanthus occidentalis*) often dominate the shrub communities. Typical bottomland forest canopy species include sweetgum, red maple, sycamore (*Plantanus occidentalis*), and black gum (*Nyssa sylvatica*), which are all tolerant of wetter soils. Wide areas of bottomland forest are present along Big Creek and Middle Creek. Narrower areas of bottomland forest are present along the other tributaries to Harris Lake. Large areas of successional forest are present along Little Branch (NCGAP, 2006).

4.12 Shellfish or Fish and their Habitats

Water resources within the Planning Area provide aquatic habitat for various species of fishes and other aquatic organisms. These streams provide free-flowing, warm-water habitats with moderate gradient; generally alternating pools and riffle-runs; and substrates consisting mainly of rocks, gravel, sand, and mud. Many ponds also provide warm-water habitat within the Planning

Area. Recreational fishing opportunities are available including at Harris Lake. Typical fishes caught within the streams and lakes include catfish, suckers, bass, crappie, and sunfish.

The Town's Bass Lake Park provides fishing opportunities for the Town. The Town has worked with NCWRC to stock Bass Lake with 1,000 catfish a month from April to September pending the weather and hatchery production (Pers. comm. Crouch, 2014). Bass Lake is a key fish habitat in Wake County. Harris Lake is being stocked with grass carp in an effort to control the aquatic macrophyte Hydrilla sp (NCDENR, 2004).

NCDENR does not maintain any fish community sampling sites within or near the Planning Area (NCDENR 2004, 2012b).

4.13 Wildlife and Natural Vegetation

Upland wildlife communities are home to Virginia opossum (*Didelphis virginiana)*, raccoon (*Procyon lotor)*, eastern cottontail (*Sylvilagus floridanus)*, gray squirrel (*Sciurus carolinensis)*, red (*Vulpes vulpes)* and gray foxes (*Urocyon cinereoargenteus)*, and white-tailed deer (*Odocoileus virginianus)*, as well as the eastern mole (*Scalopus aquaticus)* and several species of shrews and mice. Amphibians and reptiles are abundant and diverse. Frogs, turtles, and water snakes inhabit wetlands and the perimeters of ponds and streams.

Bird life in the Planning Area is typical of the Carolina Piedmont. The Northern cardinal (*Cardinalis cardinalis*), American robin (*Turdus migratorius*), Carolina chickadee (*Poecile carolinensis*), Eastern bluebird (*Sialia sialis*), Eastern towhee (*Pipilo erythrophthalmus*), various sparrow and warbler species, and other songbirds make their homes in the backyard habitats and forests of the area. Hawks, such as the red-tailed hawk (*Buteo jamaicensis*), owls, and vultures, are predator and scavenger species known to inhabit the area. The open waters of Harris Lake and the many ponds in the Planning Area attract the Bald eagle (*Haliaeetus leucocephalus*) and a variety of waterfowl, including migratory species. Mallards, wood ducks, teal, and other ducks, as well as geese, may be seen during certain seasons. Wading birds, including great blue heron (*Ardea herodias*) and green heron (*Butorides virescens*), may be encountered along lake shallows. A wading bird rookery is located along the Jim Burt Branch section of Harris Lake (Figure 4-1). However, birds from this rookery most likely feed throughout the area.

Following is a discussion of the more rare wildlife and wildlife habitats found within the Planning Area. Forested areas and habitats were discussed in Section 4.11.

4.13.1 Rare, Threatened, or Endangered Species

Specific regulations exist at the State and Federal levels to protect endangered and threatened species and their habitats from impacts due to public or private projects and land-disturbing activities. The primary law that protects sensitive wildlife species is the Federal Endangered Species Act (ESA) of 1973.

Information obtained from the North Carolina Natural Heritage Program's (NCNHP) Natural Heritage Element Occurrence (NHEO) and SNHA databases, updated January 2014, were analyzed to identify locations of rare and endangered species populations and occurrences of exemplary or unique natural ecosystems (terrestrial and aquatic) and special wildlife habitats in the Planning Area. Figure 4-1 illustrates the distribution of these areas and occurrences within and adjacent to the Planning Area.

The USFWS identifies species that are federally listed as endangered, threatened, or species of concern and may have suitable habitat present or known occurrences in Wake County, as listed in Table 4-9 (USFWS, 2014a). Using the 2014 NHEO data provided by NCNHP, a complete list of state-listed species within Wake County was prepared and is provided in Appendix E, as well as state listed species within the Planning Area.

Twenty species are federally listed in Wake County (Table 4-7). Of these, sixteen are listed as federal species of concern (FSC). Three species are listed as endangered, including the Red-cockaded woodpecker, Michaux's sumac, and the dwarf wedgemussel. One species, the Northern long-eared bat, has been proposed for listing as federally endangered or threatened (USFWS, 2014a). Of these, Michaux's sumac is present within the Planning Area (NCNHP, 2014).

A brief discussion of each federally protected species with the potential to occur in the Planning Area, according to the USFWS, is included.

The Bald eagle (*Haliaeetus leucocephalus*) was removed from the Federal List of Threatened and Endangered Species in 2007. The species is now protected by the Bald and Golden Eagle Protection Act (BGPA), which prohibits disturbing the eagle or its nests, which are often constructed near water and reused by the same pair year after year. The recovery of this species is largely due to the banning of harmful pesticides including dichlorodiphenyltrichloroethane **(**DDT). According to the most recent version of the NHEO database provided by NCNHP, there is a nest at the northeast end of Shearon Harris Lake, near Utley Creek, within the Planning Area (NCNHP, 2014).

The northern long-eared bat (*Myotis septentrionalis*) is proposed for listing as an endangered species. It is 3 to 4 inches in length, with a wingspan of 9 to 10 inches and is distinguished by its long ears. They roost individually or in colonies under tree bark or in crevices of both live and dead trees. They typically hibernate in caves and mines, usually large with large entrances, stable temperatures, and high humidity with limited air flow. White-nose syndrome, a fungal disease known to affect bats, is currently the predominant threat to this bat. White-nose syndrome is currently found in at least 22 of 39 states, including North Carolina , and continues to spread across much of the northern and eastern US (USFWS, 2014b). In 2013, NCWRC adopted a surveillance and response plan to outline steps to protect the species (NCWRC, 2013b). The northern long-eared bat has not been observed within the planning area (NCNHP, 2014).

Historic red-cockaded woodpecker (*Picoides borealis*) records were present within the Planning Area along US 1. According to NCNHP (2004), these populations have been extirpated. No current populations of red-cockaded woodpecker are present and it has not been observed in the Planning Area since before 1990. Its preferred habitat is open pine stands greater than 30 years old, with mature live trees (60+ years old) being used for nesting cavities. Typically they do not forage more than 0.5 miles. Currently little habitat is available in the county and is not likely to increase due to the time required for trees to become suitable for roosting and nesting.

The dwarf wedgemussel (*Alasmidonta heterodon*), a freshwater mussel species, is federally listed as endangered. This small mussel is less than 1.5 inches in length and can be identified by its dentition pattern; the right valve possesses two lateral teeth, while the left valve has one tooth. Habitat preferences include a slow to moderate current and a sand, gravel, or muddy stream or

river bottom. As with other freshwater mussel species, glochidia are released into the water by females after reproduction. These glochidia then attach to host fishes for further development. The success of the species depends on the success of specific host fishes. The tessellated darter (*Etheostoma olmstedi*), johnny darter (*Etheostoma nigrum*), and mottled sulpin (*Cottus bairdi*) have been identified as hosts for the dwarf wedgemussel (USFWS, 2014a). The original range of this species stretched from New Brunswick, Canada, to North Carolina. This species has been found elsewhere in Swift Creek, Little River, and Buffalo Creek, but according to the most recent version of the NHEO database provided by NCNHP, no individuals of dwarf wedgemussel have been recorded within the Planning Area. The NHEO database indicated the dwarf wedgemussel was last observed in 2012 in Swift Creek downstream of Lake Benson, outside of the Planning Area (NCNHP, 2014).

A mussel survey was conducted by CZR, in June and July 2004 to determine if any federally listed mussel species are present within the area. As described by CZR (2004), the majority of the survey sites exhibited wide forested riparian buffers in subdivision developments and undeveloped woodlands. Eleven survey sites in the Middle Creek watershed are within the Planning Area. Other sites are upstream and downstream of the Planning Area. Downstream sites may be affected by upstream watershed activities due to drainage patterns allowing a portion of the water to reach those areas.

Overall, the two dominant species of mussels found during the survey were eastern elliptio (*Elliptio complanata*) and variable spike (*Elliptio icterina*). These species are common and often abundant in the area; however, only small populations of these species were found within the Planning Area. Three sites were sampled along Basal Creek and its smaller tributaries. No mussels were found. Along Rocky Branch, three sites were also sampled. Three *Elliptio* sp. were found at one of those sites. Along the mainstem of Middle Creek, many *Elliptio* sp. were collected. At Site 7, located downstream of Sunset Lake, eastern lampmussel (*Lampsilis radiata radiata*) and paper pondshell (*Utterbackia imbecillis*) were collected, in addition to a large population of *Elliptio* sp. Downstream conditions were similar; at Site 10, over 600 *Elliptio* sp. and a few eastern lampmussel were found. Upstream of the Planning Area on Middle Creek, fewer *Elliptio* sp. were found. No other species were observed. Most notable is that no individuals, live or relic, of the federally listed endangered dwarf wedgemussel were found during the survey. Also, a study by CZR in 2001 found no dwarf wedgemussels on Middle Creek from approximately 1,500 feet upstream of SR 1006 to SR 1330 in Johnston County (CZR, 2001).

According to NCWRC, the Middle Creek watershed provides suitable habitat for the Atlantic pigtoe (*Fusconaia masoni*) as well as many State-listed mussel species including Roanoke slabshell (*Elliptio roanokensis*), eastern lampmussel, creeper (*Strophitus undulates)*, triangle floater (*Aslasmidonta undulata*), and notched rainbow (*Villosa constricta)* (NCWRC, 2014). Of these, within the Planning Area, the CZR mussel survey located eastern lampmussel. The federal species of concern Atlantic pigtoe has been found downstream of the Planning Area on Middle Creek by the NCNHP (NCNHP, 2014).

Table 4-7

Federally Listed Species within Wake County

Scientific Name	Common Name	Federal Status	County Status
Animals			
Aimophila aestivalis	Bachman's Sparrow	FSC	Historic
Ambloplites cavifrons	Roanoke bass	FSC	Current
Anguilla rostrata	American eel	FSC	Current
Etheostoma collis lepidinion	Carolina darter	FSC	Probable/potential
Haliaeetus leucocephalus	Bald eagle	BGPA	Current
Heterodon simus	Southern hognose snake	FSC	Obscure
Lythrurus matutinus	Pinewoods shiner	FSC	Current
Myotis austroriparius	Southeastern myotis	FSC	Historic
Myotis septentrionalis	Northern long-eared bat	P	Current
Noturus furiosus	Carolina madtom	FSC	Current
Picoides borealis	Red-cockaded woodpecker	E	Historic
Invertebrates			
Alasmidonta heterodon	Dwarf wedgemussel	E	Current
Elliptio lanceolata	Yellow lance	FSC	Current
Fusconaia masoni	Atlantic pigtoe	FSC	Current
Lasmigona subviridis	Green floater	FSC	Current
Insects			
Speyeria diana	Diana fritillary	FSC	Current
Plants			
Lindera subcoriacea	Bog spicebush	FSC	Current
Monotropsis odorata	Sweet pinesap	FSC	Historic
Rhus michauxii	Michaux's Sumac	E	Current
Sagittaria weatherbiana	Grassleaf arrowhead	FSC	Historic
Trillium pusillum var. virginianumpusillum	VirginiaCarolina least trillium	FSC	Current

Source: USFWS, 2014a

Note: A complete list of state-listed species within Wake County is provided in Appendix E.

Federal Status

T = Threatened
E = Endangered
FSC = Federal Species of Concern
P = Proposed listing
BGPA = Bald and Golden Eagle Protection Act

Michaux's sumac (*Rhus michaux*) is an upland terrestrial vascular plant that is considered endangered. This shrub grows to between 1 and 3 feet and flowers between June and July. Most plants are unisexual, which may partly explain the plant's rarity due to its low reproductive capacity. Typical habitat includes sandy or rocky open woods with basic soils. Repeated disturbance is necessary to provide open areas for this plant to be successful. Remaining populations are found along maintained roadway rights-of-way and areas managed with frequent fires. Threats to remaining populations include habitat loss due to development and fire suppression. Michaux's sumac, according to the most recent version of the NHEO database provided by NCNHP, is present near the Shearon Harris Longleaf Pine Forest SNHA (NCNHP, 2014).

4.13.2 Significant Natural Heritage Areas

Many of the listed species within Wake County and the Planning Area are found within SNHAs as shown on Figure 4-1. Other state-listed species are located within the unique habitats of SNHAs. These State-designated areas are sites with special biodiversity significance and may include habitat for rare species, exemplary or unique natural communities, important animal assemblages, or other important ecological features. SNHAs within the Planning Area are listed in Table 4-8. None of the SNHAs in the Planning Area are identified as aquatic habitat in the SNHA database (NCNHP, 2014). A description of each SNHA based on information from NCNHP is provided below (NCNHP, 2003).

Blue Pond Salamander Site (Sunset Lake) consists of two small wooded ponds that are seasonally inundated and are one of the most important amphibian breeding sites in the County, despite their location in the middle of a residential development. In addition to the blue pond salamander, the State threatened eastern tiger salamander (*Ambystoma tigrinum*) is likely to occur in and near the Blue Pond Salamander Site SNHA and also along Middle Creek.

Hollemans Crossroads Salamander Pools consists of two small vernal pools that serve as breeding habitat for several species of amphibians, including the four-toed salamander. This site is privately owned.

Hollemans Crossroads Slopes consists of many rather narrow ridges and ravines, including some steep slopes overlooking Harris Lake. Most of the slopes contain mature hardwood forests, over slightly acidic to nearly neutral soils in the Triassic Basin. The site contains a rare Wake County example of Basic Oak-Hickory Forest, as well as areas leaning more toward Dry Oak-Hickory Forest. This site is privately owned.

Jim Branch/Buckhorn Creek Forests consists of two nearly separate areas -- slopes along Buckhorn Creek (south of the road) and slopes and creek, with a heron rookery, along Jim Branch (north of the road). Along Jim Branch is a moderate-sized nesting colony of great blue herons. This site is privately owned.

Middle Creek Bluffs and Floodplain is a segment of wide floodplain and slopes that support extensive mature Mesic Mixed Hardwood Forest natural community and areas of good quality Piedmont/Low Mountain Alluvial Forest communities. The site is privately owned. The state species of concern Neuse River waterdog (*Necturus lewisi*) has the potential to occur in this SNHA. The state rare Lewis's heartleaf (*Hexastylis lewisii*) is likely to be found within or near the Middle Creek Bluffs and Floodplain SNHA.

TABLE 4-8
Significant Natural Heritage Areas

SNHA	Total Acres	Acres within Planning Area
Blue Pond Salamander Site	<1	<1
Hollemans Crossroads Salamander Pools	3	3
Hollemans Crossroads Slopes	132	132
Jim Branch/Buckhorn Creek Forests	26	26
Middle Creek Bluffs and Floodplain	358	7
Shearon Harris Longleaf Pine Forest	357	357
Utley Creek Slopes	459	459
Total	**1,336**	**985**

Source: NCNHP, 2014

Shearon Harris Longleaf Pine Forest has a remnant Piedmont Longleaf Pine Forest natural community. This is the only example of this community in the region. The privately owned site is leased for research by the North Carolina State University Forestry School.

Utley Creek Slopes contains an extensive Dry Oak-Hickory Forest natural community. Other notable features include rock outcrops, with "caves" along Utley Creek, exposing sedimentary rock. The rare Virginia spiderwort (*Tradescantia virginiana*) is found here. The four-toed salamander (*Hemidactylium scutatum*) is found near Utley Creek Slopes SNHA. This site is privately owned.

4.13.3 Natural Vegetation

Within the Planning Area, natural vegetation is typical of Piedmont upland and bottomland communities. However, smaller unique ecosystems are also present. Following are descriptions of natural communities, as described by Schafale (2012), which are present within the Planning Area according to the NHEO database (NCNHP, 2014). These areas are identified as natural communities within the NHEO data base and are shown in Figure 4-1.

4.13.3.1 Dry Oak-Hickory Forest (Piedmont Subtype); Dry Basic Oak-Hickory Forest; Dry Mesic Oak-Hickory Forest (Piedmont Subtype)

This forest type is similar to the Piedmont Monadnock Forest, which is comprised of upland hardwoods that tolerate dry, acidic soils. However, Dry Oak—Hickory Forests are not dominated by the chestnut oak (*Q. montana*), but by white (*Q. alba*), Spanish (*Q. falcata*), or post (*Q. stellata*) oaks. Areas that were once cultivated also have pines present. The Dry Oak—Hickory Forest was once one of the Piedmont's predominant forest types. An example of this forest type can be found at Middle Creek Bluffs SNHA.

4.13.3.2 Mesic Mixed Hardwood Forest (Piedmont Subtype)

This upland forest community is usually found on lower, steep, and/or north-facing slopes with well drained, acidic soils, such as the Middle Creek Bluffs. It is categorized by its mesophytic tree canopy, which includes beech (*Fagus grandifolia*), red oak (*Q. rubra*), and yellow

poplar (*Liriodendron tulipifera*). The absence of bottomland trees and base-loving plants separates this forest from other common community types.

4.13.3.3 Piedmont/Mountain Semipermanent Impoundment (Shrub subtype)

This community type is best described as either an old, undisturbed, constructed or natural beaver pond in a floodplain such as that found on Middle Creek and within the Triassic Basin of the Piedmont. Being in a floodplain, these impoundments are subject to sudden flooding and draining, sedimentation, and other damaging events. Pond depth determines the vegetation type; if shallow, flood-tolerant trees such as red maple (*A. rubrum*) and willow oak (*Q. phellos*) will populate the ponds. Deeper ponds will support small duckweed (*Lemna perpusilla*) and green arrow-arum (*Peltandra virginica*). Wetland shrubs and herbs fill out the pond fringe.

4.13.3.4 Dry Piedmont Longleaf Pine Forest

This forest type is distinct for having longleaf pine (*Pinus palustris)* naturally dominant or codominant. In degraded examples where logging has occurred, the canopy may resemble Dry Oak–Hickory Forest or may be dominated by loblolly pine (*Pinus taeda)* and shortleaf pine (*Pinus echinata)*, with only scattered longleaf pine species. This area occurs within the Planning Area in the Shearon Harris Longleaf Pine Forest SNHA.

4.14 Introduction of Toxic Substances

Toxic substances and their cleanup are regulated by the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The goals of these programs are to eliminate or reduce toxic waste, clean up waste which has been leaked, spilled, or improperly disposed, and protect people from harmful waste.

While there are no Superfund sites within the Planning Area, Shearon Harris Nuclear Plant is located adjacent to Harris Lake. This nuclear plant uses Harris Lake for its cooling water (USEPA, 2014).

Other potential sources of toxic substances present in the source basin study area are agricultural-related and residential landscape-related substances including fertilizers, herbicides, and pesticides. Other common toxic substances are employed in the construction of homes and commercial buildings such as glues, solvents, and paints. Typical household hazardous wastes include oils, cleaners, solvents, paints, herbicides, and fertilizers.