System Integration Plan

Wooten Meadow Park

Raleigh, North Carolina

August 11, 2014

RALEIGH Parks, Recreation and Cultural Resources
parks.raleighnc.gov

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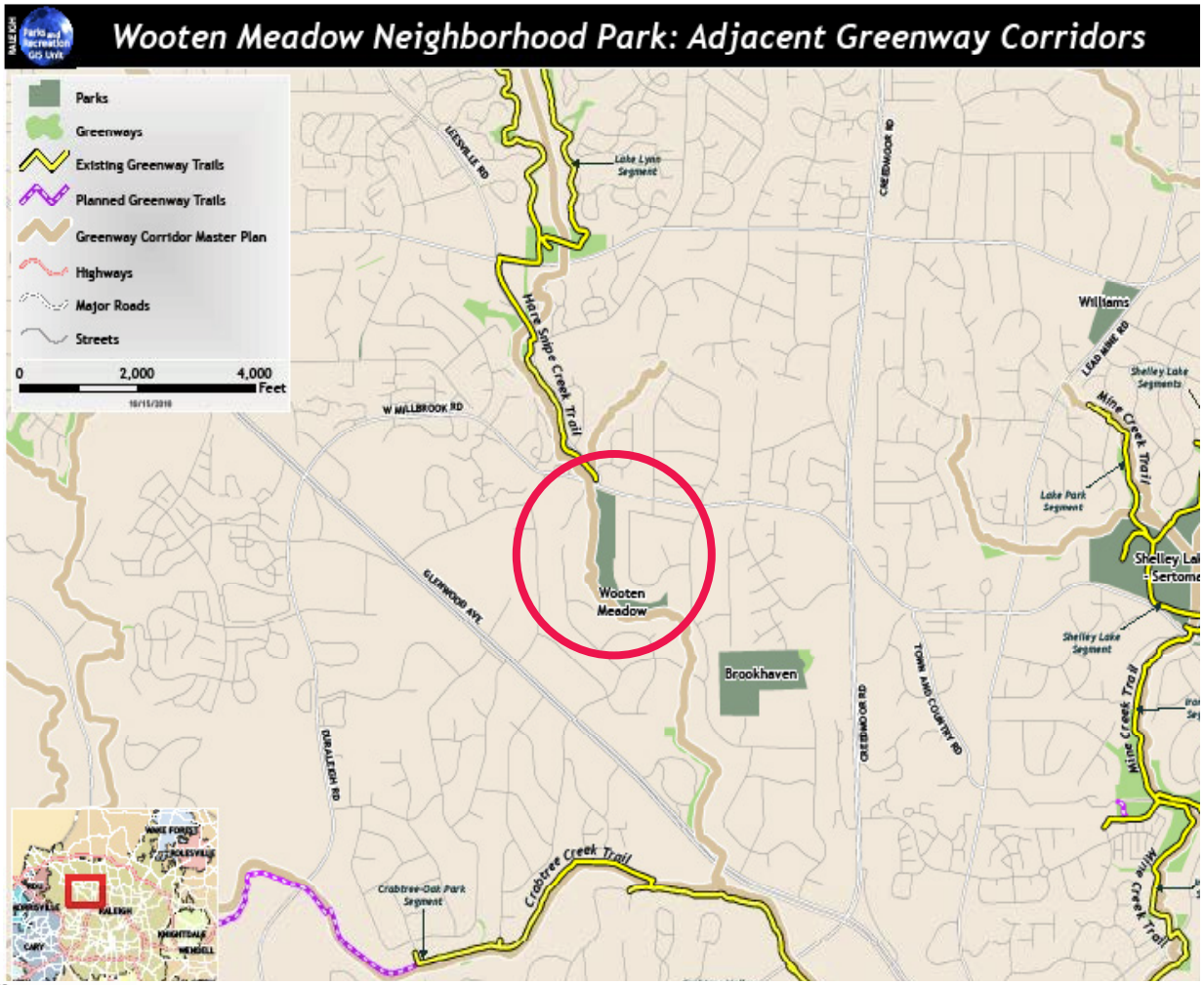
System Integration Plan
Wooten Meadow Park
Executive Summary

The City of Raleigh Parks, Recreation and Cultural Resources Department has developed a System Integration Plan for Wooten Meadow Park in northwest Raleigh. The System Integration Plan is part of the Park Master Plan process and involves a public input component. The intent of the System Integration Plan (SIP) is to document existing site conditions and develop a set of recommendations for interim management of the park property. The site specific SIP incorporates input from both internal and external Subject Matter Experts, and is developed with input and oversight from the Parks, Recreation and Greenway Advisory Board.

Wooten Meadow Park is located at 2801 W. Millbrook Road at the intersection of Leesville Road and W. Millbrook Road in Northwest Raleigh. Sidewalk and pedestrian crossing signals are in place at the road intersection. The 20.5 acre site was donated to the City of Raleigh in 1996 to be developed and used for the enjoyment of the citizens of Raleigh as a park and/or greenway.

Brookhaven Neighborhood park is located one mile east of Wooten Meadow, providing walking trails and an opportunity to experience nature. Lake Lynn Park and Community Center is a 52 acre community park located less than three miles north. Lake Lynn includes lighted tennis courts, a lighted ball field, playground, bocce courts, walking trails, and a community center with gymnasium, dance studio, meeting room, and weight room.

There is a three mile greenway trail around Lake Lynn that continues south toward Wooten Meadow, called Hare Snipe Creek Trail. Crabtree Creek Trail is located south of Wooten Meadow. The Raleigh Greenway Corridor Master Plan suggests an eventual connection between these two trails.



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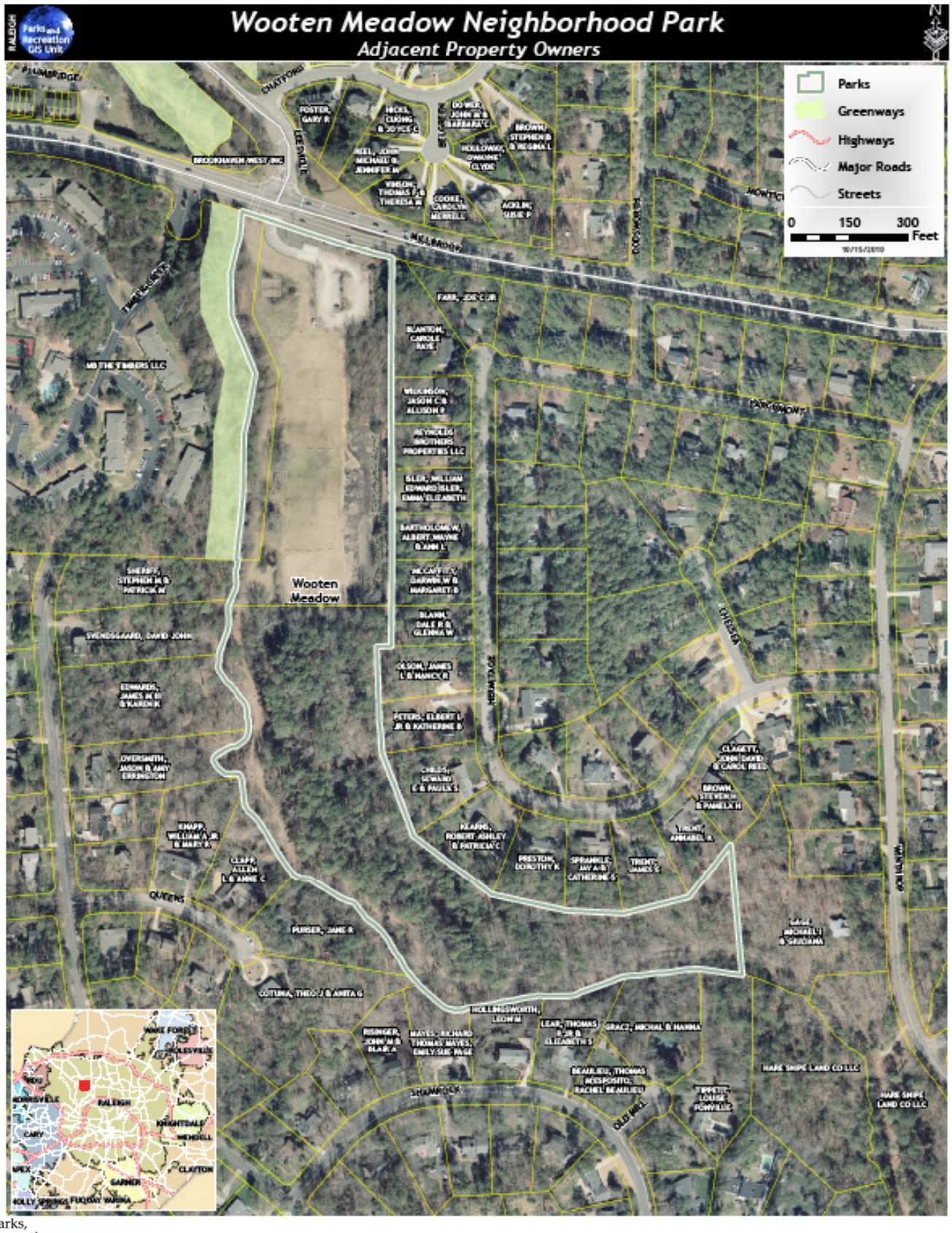
Executive Summary continued

Wooten Meadow is a partially undeveloped park site consisting of floodplain forest and an open field "managed" area. Land use in the vicinity includes mostly large lot residential. *The Timbers* apartment complex borders the northwest portion of the park across Hare Snipe Creek. There is a residential neighborhood on the north side of Millbrook Road.



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Wooten Meadow is located in the highly urbanized Hare Snipe Creek watershed of the Neuse River Basin. Hare Snipe Creek flows through Lake Lynn dam, which was constructed in 1976 for flood control. The Creek then continues flowing south along Wooten Meadow, eventually flowing into Crabtree Creek. Approximately 14.24 acres (70% of the total acreage) of the Wooten Meadow property are located in the floodplain of Hare Snipe Creek. The Creek is a dominant landscape feature of the park, impacting the site hydrology, topography, geology, soils, flora, and wildlife. Approximately 75% of Wooten Meadow is underlain by hydric soil, which is permanently or seasonally saturated by water. Standing water, saturated soils, scouring, debris accumulation, ephemeral channels, hummocks, and plants adapted to wet conditions are found throughout much of the property.

Sewer easements are located along both the west and east sides of Wooten Meadow. The western sewer easement along Hare Snipe Creek was installed in 1970 (see photo below). There are few trees established as a buffer between the sewer easement and the Creek. The Neuse River Riparian Buffer Rules require at least the first 30 feet adjacent to the Creek to be forested. Although the sewer easement is exempt from the rules, interim mangement recommendations for the site include partnering with City of Raleigh Public Utilities to manage easements.

Western sewer easement along Hare Snipe Creek. Creek bank is marked with a red line.

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Site amenities at Wooten Meadow currently include a park sign, a small parking area, and a multi-use open field on the north side of the park. The majority of the property has been maintained in a natural condition until a Master Plan can be developed for the park. Interim management of the mid field area of the park involves mowing sections of the field on a rotational basis, so that winter wildlife cover is available every year, and to provide interim pollinator habitat.

Signs of historic site use have been observed in the vicinity of the Wooten Meadow property and on privately owned properties in the vicinity. Structural historic remains observed thus far include a dry-stacked stone mill dam from approximately 1773 (see photo above). The City of Raleigh is working with the NC Department of Cultural Resources to follow regulations of the National Historic Preservation Act. Wooten Meadow has undergone an initial evaluation for potential park classification as a Nature Preserve or Protected Natural Area, using City of Raleigh Nature Preserves Criteria. Wooten Meadow does provide important stormwater benefits and contributes both riparian and and aquatic habitat to a wildlife habitat corridor between Lake Lynn and Crabtree Creek. There are no known occurrences of protected plant or animal species on the property. At the time of this report, the extent of invasive species occuring throughout the park negatively impacts the quality of the natural area, and the site does not achieve the quality associated with a Nature Preserve or Protected Natural Area. The Wooten Meadow property is **recommended for classification as a Neighborhood Park**.

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System Integration Plan
Wooten Meadow Park
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- Interim Management Recommendations
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Interim Management of Wooten Meadow Park

Interim management recommendations and documentation of existing site conditions are developed during the SIP phase of the Park Master Plan process. Interim management recommendations may be integrated into site design and subsequent park development and operation, which typically happens in phases and can take many years to implement. Site management is an ongoing stewardship challenge. Management goals and implementation strategies are important to establish, review and then adapt over time. They are "interim" only in the acknowledgment that site conditions change over time, requiring adaptation of management efforts to maintain priority site functions and manage human impacts. Land use goals and activities also change over time. Interim management has the potential for lasting cumulative impact to the site.

Wooten Meadow is monitored on a regular basis by Parks staff. Site issues are addressed as needed. Parks staff patrols the park boundaries and continues to conduct site investigations for the purposes of natural resources inventory. Illegal dumping is monitored and cleaned up on a regular basis. Tree maintenance and other grounds maintenance is done as needed.

The Parks, Recreation, and Cultural Resources Department should organize an annual park site evaluation to review existing site conditions, review the status of recommended interim management activities, and determine whether interim management recommendations should be modified.

Interim Management Recommendations

The following interim management recommendations are proposed for Wooten Meadow Park. Management tasks should be completed on the site as resources and staff are available. The Department should prioritize the interim management recommendations and identify specific staff to complete the tasks. Work progression and updates will be recorded in the final section of this report.

Interim management recommendations are organized into three categories: *Safety, Environment, Property Issues*.

Safety

- Wooten Meadow Park has not yet been fully evaluated for safety, and could contain unknown conditions such as unstable trees, barbed wire, ditches, unstable footing, or other hazards

- Determine species of fire ant present on the site. If fire ants are determined to be invasive imported fire ant species, the City should develop a plan and initiate fire ant management on the site before the park is developed, in order to reduce the spread of fire ants during site disturbance.

- Review location of hazardous trees particularly along established trails or other areas where the public may congregate. Remove hazard trees as needed. Downed wood could be left on site for wildlife habitat. Standing dead trees that do not constitute a hazard should remain on site for wildlife habitat.

- Remove barbed wire from bank of Hare Snipe Creek and along eastern property boundary, after documenting barbed wire locations for historical records

- Remediate open ditch hazard in northern field near Hare Snipe Creek

- Evaluate Hare Snipe Creek bank stability and potential frequent flash flooding conditions during rain events. Consider increasing buffer on east side of creek (in the western sewer easement) to discourage public use of the creek bank in unstable areas and improve treatment of stormwater runoff. Install warning signs for flash flooding if appropriate.

Environment

- Remove guys and staking from trees planted in northern area of the developed portion of park

- Monitor beaver activity in the area and initiate appropriate management to protect park resources

- Work with City of Raleigh Public Works Stormwater Division and other partner agencies to stabilize the stream bank of Hare Snipe Creek

- Develop sewer easement management recommendations in cooperation with City of Raleigh Public Utilities. Recommendations may apply to Wooten Meadow as well as other easement locations. Management recommendations may include decreasing the width of easements after sewer line installation, increasing tree canopy coverage over the easements, increasing trees in the riparian buffer, managing fire ants and invasive plants, and seeding recommendations for newly constructed easements.

- Further investigate hydrology within the park and determine potential improvements to the hydrologic function of the site. Investigations could include flood modeling and gathering of data over time as part of site management.

- There may be small jurisdictional wetlands within the park. Consult with Subject Matter Experts to determine this potential occurance.

- Consider allowing the area adjacent to Hare Snipe Creek to return to natural riparian/wetland conditions. A designated riparian zone within the southwest area of front field (adjacent to creek) could be delineated, boundary markers installed, and wetland vegetation will continue to re-occupy the area.

- Facilitate community education about floodplains and wetlands.

- Inventory and assess invasive vegetation and evaluate management options and priorities. Invasive non-native species could be managed when staff and support resources are available. English ivy could be removed from trees during volunteer stewardship work days, however the extent of English ivy at this site is challenging. Poison ivy and other potential hazards should be evaluated prior to volunteer events for safety of volunteers.

- Continue inventory and mapping of natural resources including flora and fauna. Consult with NC Natural Heritage Program and NC Wildlife Resources Commission on potential occurance of rare plants and wildlife.

- Forest Management could include selective removal of lower quality trees to encourage an increase in desirable species such as Umbrella Magnolia (*Magnolia tripetala*), Sweet Bay (*Magnolia virginiana*), Spicebush (*Lindera benzoin*), Red Chokeberry (*Aronia arbutifolia*), Winterberry (*Ilex verticillata*), and American Beech (*Fagus grandiflora*).

- Additional Forest Management may be needed on the site to address storm damage, serious disease or insect infestations, or other forest health issues that arise. For example, there are some large ash trees on the site, and the exotic pest *emerald ash borer* is expected to move into Wake County in the next several years. Forest Management options should be determined by Parks Staff and partner agencies. Healthy downed dead wood should be maintained on the site for wildlife habitat.

Property Issues

- Signage at the site should include a Parks, Recreation, and Cultural Resources phone number, and possibly website information, to report non-emergency site issues

- Wooten Meadow was donated to the City of Raleigh in 1996 to be developed and used for the enjoyment of the citizens of Raleigh as a park and/or greenway. The property donator, Mr. Louis E. Wooten Jr., requested that the park and/or greenway be named for his father L.E.Wooten. When the park signage is updated, the park name should be re-evaluated. The current park sign is *Wooten Meadows Park*, whereas the City's GIS database refers to the property as *Wooten Meadow*.

- Maintain established residential vegetation buffer

- Establish communication with neighborhoods in the vicinity of the park. Acquire contacts for Homeowners Associations in the park area. Work cooperatively with adjacent property owners to control and manage invasives and other park impacts.

- Remediate encroachment from neighboring properties. Encroachment involves private use of public property, and includes placing personal property on park land, destroying park land to expand a yard area, clearing vegetation to alter a view, creating private trails into or through a park, and yard waste dumping.

- Geocaching is not allowed on park property unless approved by PRCR staff

- Protect and maintain cultural and historical remains on the site, in cooperation with adjacent property owners. Metal detecting and exploration for old relics or removal or damaging of historic artifacts is not allowed on park property and is detrimental to historic integrity.

- Initiate a comprehensive archaeological survey of the area, both historic period and Native American, and share results with the NC Department of Cultural Resources to meet regulations of the National Historic Preservation Act.

- Remove English ivy from historic dam remains, after an archeological survey and only if approved by the NC Department of Cultural Resources

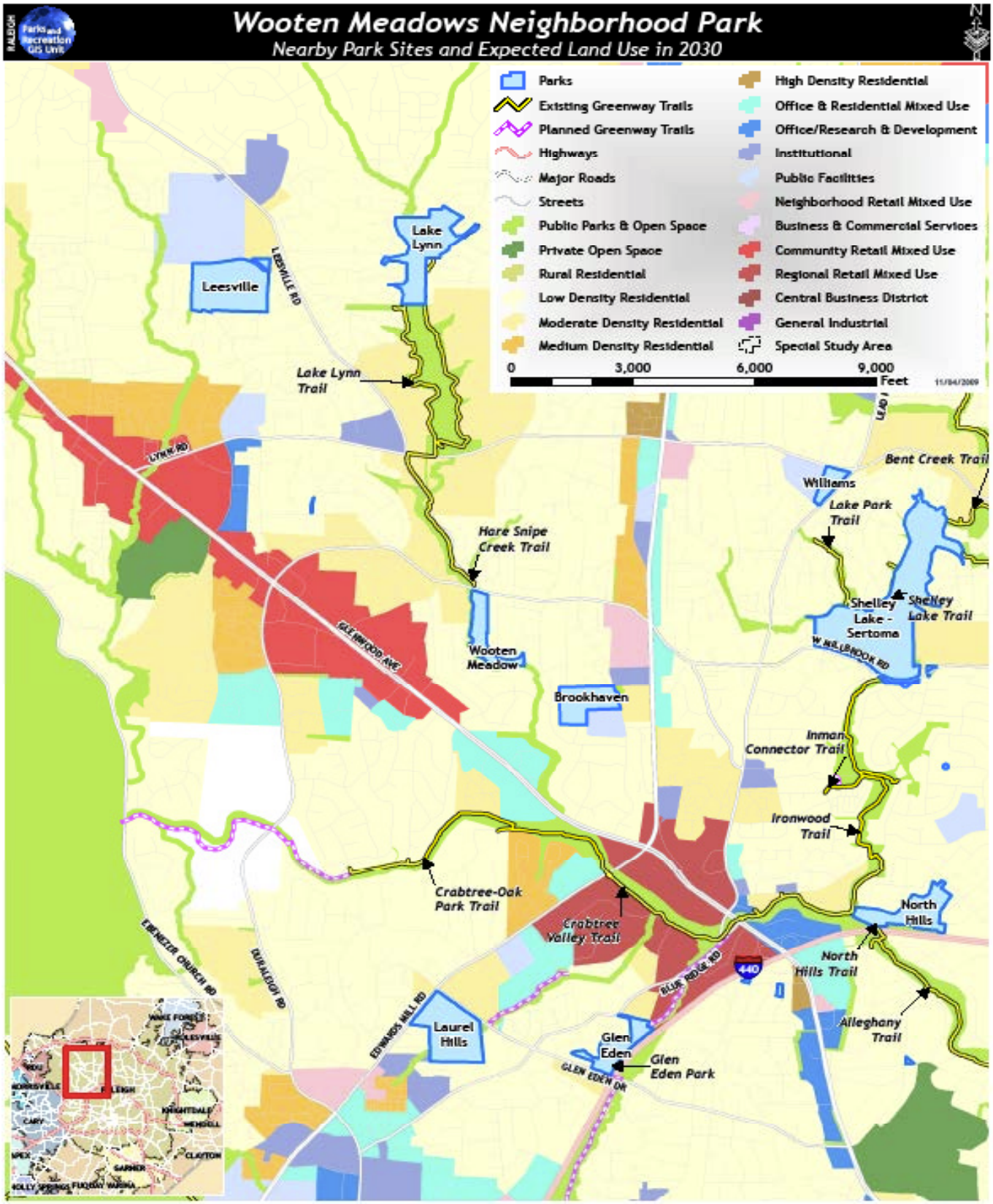
- Maintaining an un-mowed condition in the northern field area provides wildlife habitat during interim park planning

Completed and Ongoing Interim Management responsibilities

- Inventory of natural and cultural resources have been initiated
- Property boundaries markers have been installed around the perimeter of the site

Property Location

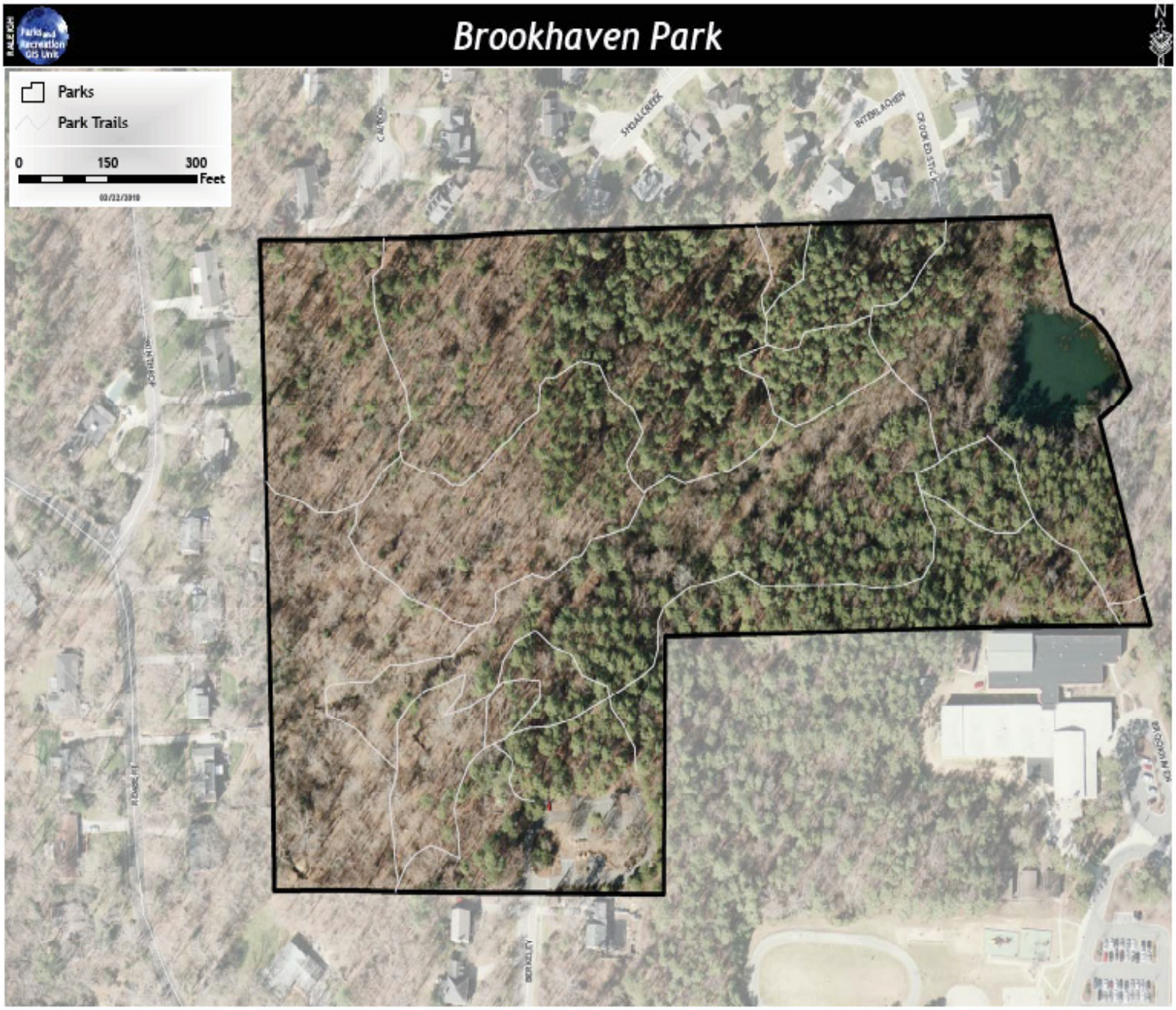
Wooten Meadow Park is located at 2801 West Millbrook Rd, at the intersection of Leesville Road and W. Millbrook Road in Northwest Raleigh. The map below shows additional City of Raleigh parks in the vicinity, and Future Land Use projected for the year 2030.



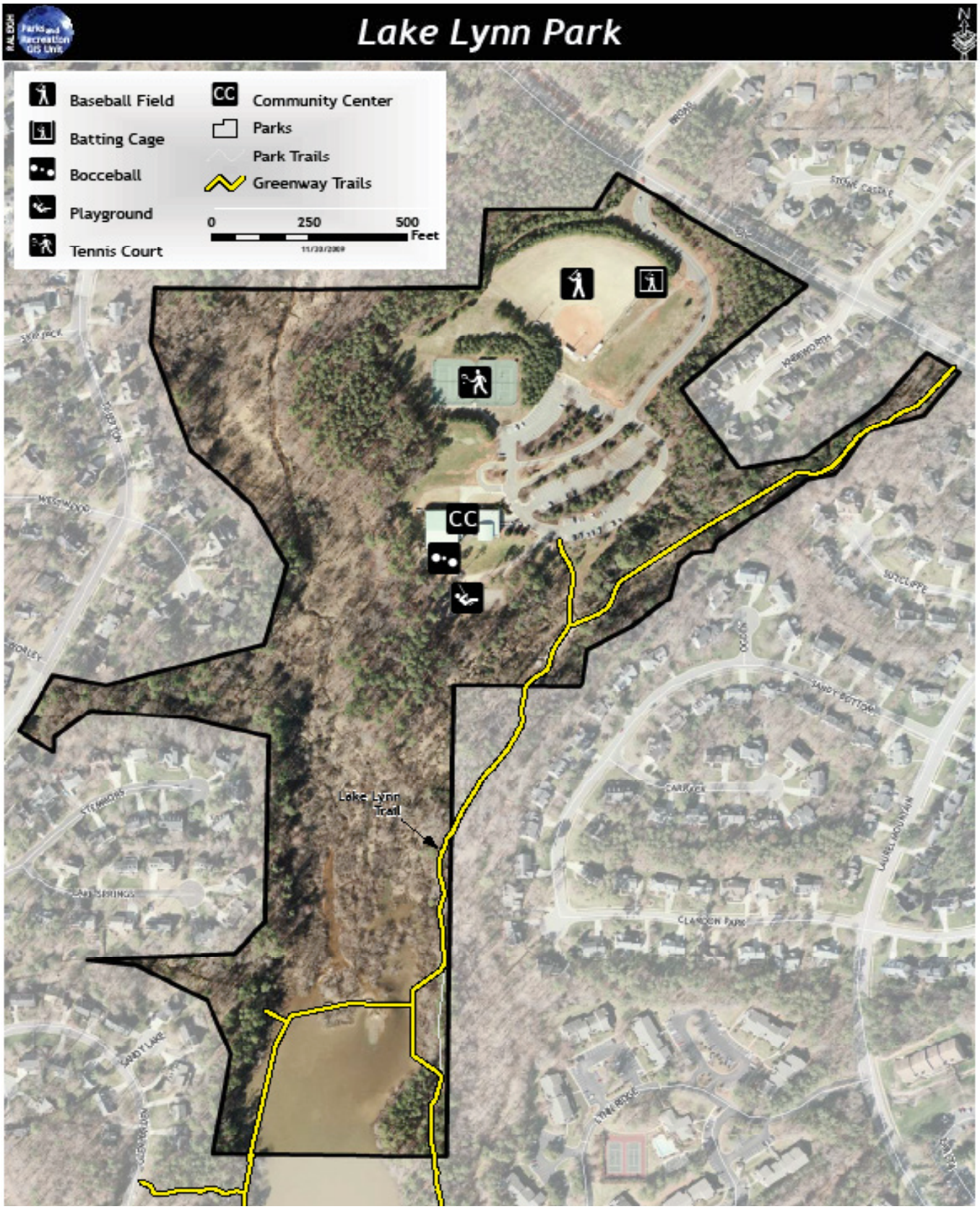
Park Sites in Vicinity

- **Brookhaven Neighborhood Park**
- **Lake Lynn Park and Community Center**
- **Leesville Community Park**
- **Shelley Lake-Sertoma Metro Park**
- **Optimist Community Park**

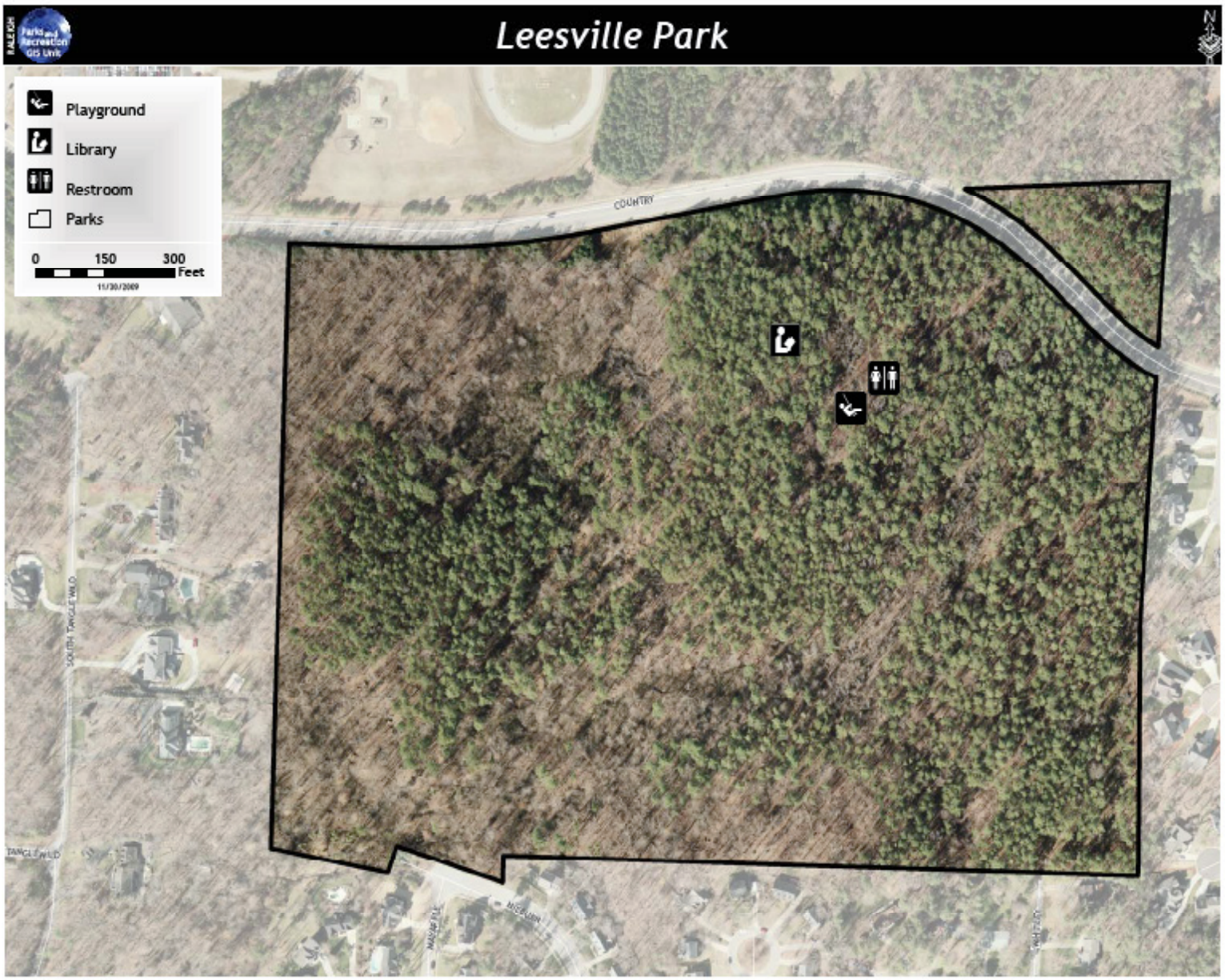
Brookhaven Park is a 26 acre neighborhood park located southeast of Wooten Meadow, with less than .25 miles between the two park sites. Brookhaven provides walking trails and an opportunity to experience nature. A perennial stream running through Brookhaven is a tributary of Hare Snipe Creek that is piped under Winthrop Drive.



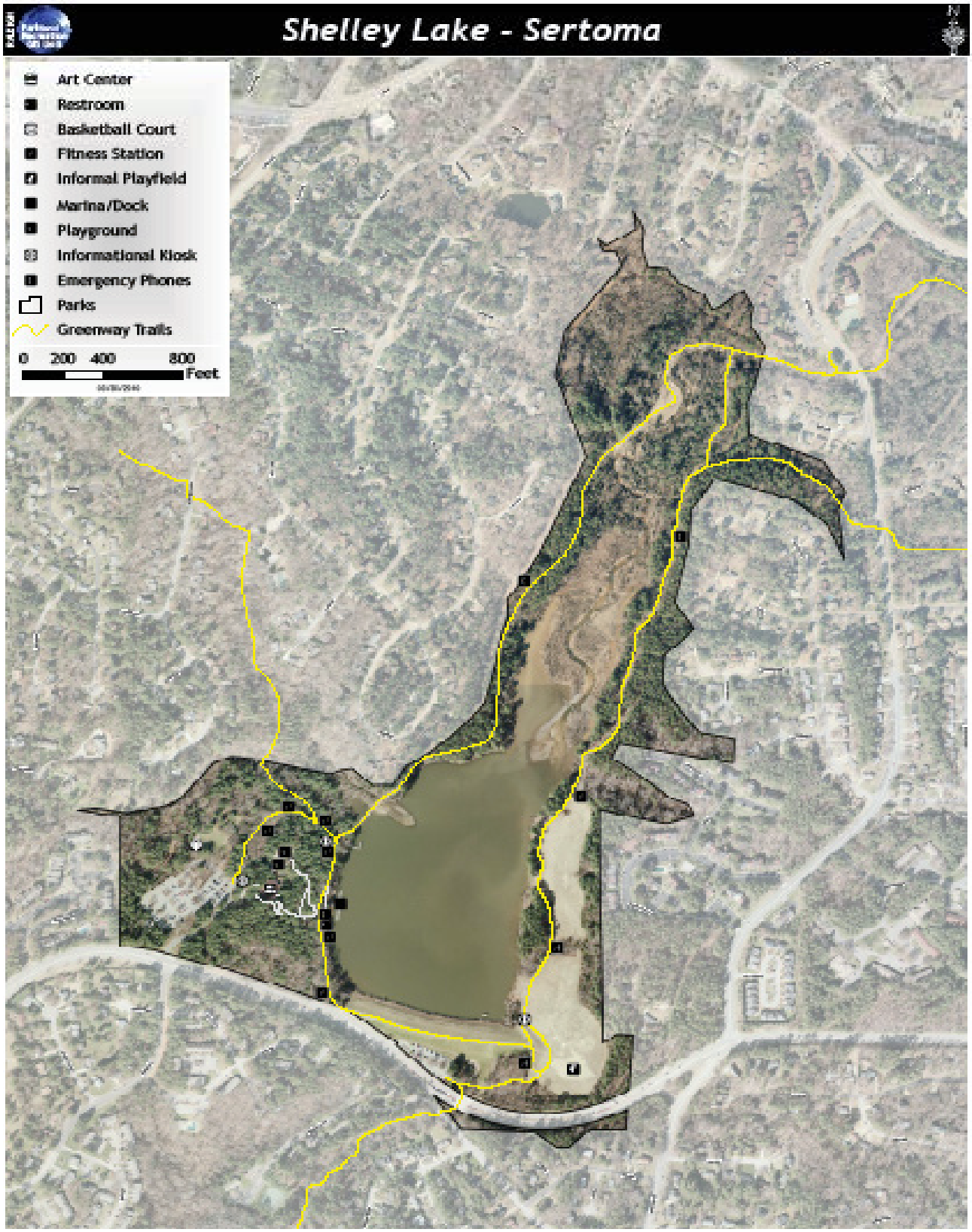
Lake Lynn Park and Community Center is a 52 acre community park located less than three miles north. Lake Lynn includes lighted tennis courts, a lighted ball field, playground, bocce courts, walking trails, and a community center. The Lake Lynn Community Center provides a gymnasium, dance studio, meeting room, weight room, and offers a wide range of programs for the public. There is a three mile greenway trail around the lake that currently terminates on the north side of Wooten Meadow.



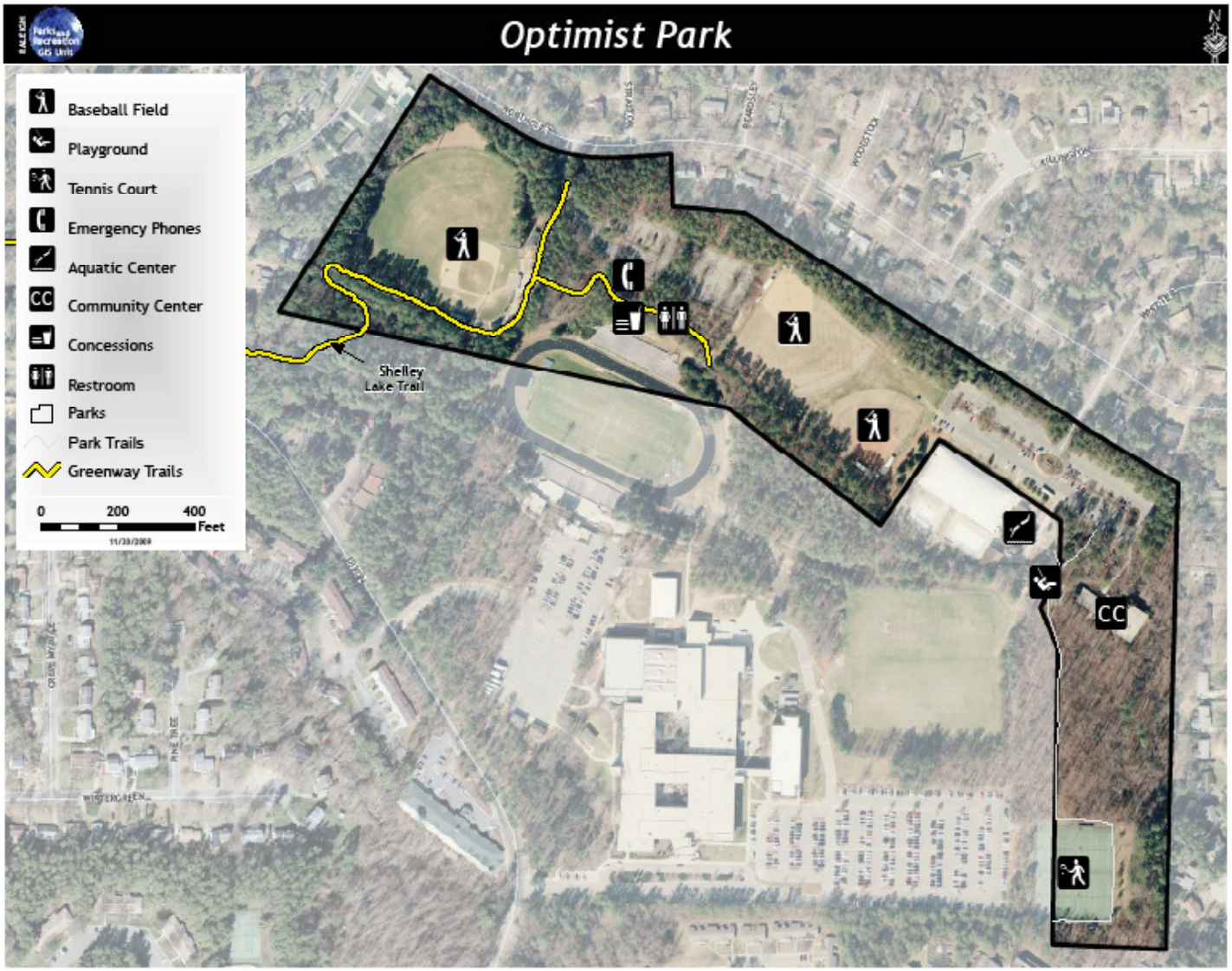
Leesville Community Park is a 55 acre park located approximately 3 miles northwest of Wooten Meadow. Leesville Community Park includes playground equipment for ages 2-5 years and 5-12 years with adjacent restroom facilities, a heritage garden containing historical and cultural remnants discovered on the property, and the Leesville Community Library operated by Wake County. The Master Plan for the park identifies future phases to include a community center, picnic/volleyball area, paved trails, interpretive areas, and an outdoor classroom.



Shelley Lake-Sertoma is a 145 acre Metro Park located less than 2 miles east of Wooten Meadow Park. This park includes a 53 acre lake, 2 miles of paved greenway trails with workout stations around the lake, a playground, multi-use fields, rental space, and Sertoma Arts Center. Sertoma Arts Center provides a variety of art programs including painting, drawing, pottery, crafts, photography, and dance.

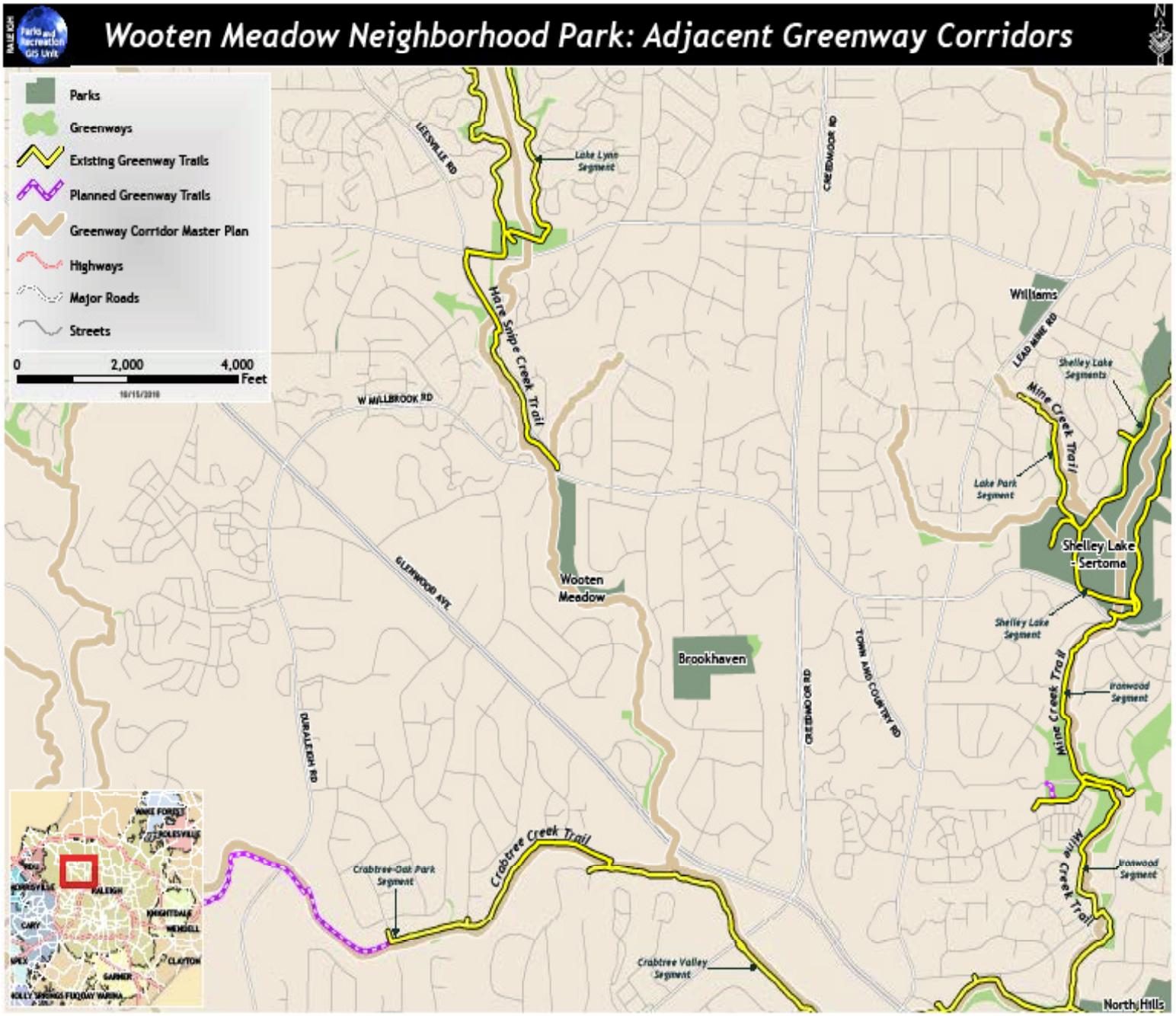


Optimist Community Park, at almost 31 acres, is located just to the east of Shelley Lake-Sertoma Metro Park and provides a community center, lighted ball fields and tennis courts, and a year-round swimming facility with an Olympic size swimming pool and a diving well with low and high diving boards. The park is located behind Sanderson High School and shares facilities with the Wake County Public School System. A greenway trail connects Optimist with Shelley Lake.



Greenways in Vicinity

The City of Raleigh Greenway system is a network of recreational trails and public open spaces that provide opportunities for a range of activities including biking, running, hiking, fishing, picnicking, bird watching, and nature study. Hare Snipe Creek Trail is just north of Wooten Meadow, and is connected to Lake Lynn. Crabtree Creek Trail is located south of the park. The Greenway Corridor Master Plan suggests an eventual connection between the two trails.



What is a System Integration Plan?

The System Integration Plan (SIP) is a sub-section of the overall City Park Master Planning process described in *City of Raleigh Council Resolution (2003) – 735*. The City of Raleigh Parks, Recreation, and Cultural Resources Department undertakes a public master plan process to help determine the specific elements that are desired in a particular park. The purpose of the site specific System Integration Plan is to develop a set of guidelines for the interim management of parkland prior to the initiation of a Master Plan. The SIP will document existing site conditions and constraints, establish the park's classification consistent with the Comprehensive Plan, and if applicable, any proposed special intent for the park. **Further details on System Integration Plans and the park master plan process for Wooten Meadow are included in Appendix A.**

Property Acquisition

Wooten Meadow Neighborhood Park was donated to the City of Raleigh in 1996 to be developed and used for the enjoyment of the citizens of Raleigh as a park and/or greenway. The property donator, Mr. Louis E. Wooten Jr., requested that the park and/or greenway be named for his father L.E.Wooten.

Deed Restrictions

The Warranty Deed for the property contains the following "Exhibit A"
Title to the property is subject to the following exceptions:

- *Right of way of Pleasant Grove Church Road and Leesville Road, and to easement for additional right of way to the City of Raleigh as described in Book 1613, Page 95, Wake County Registry.*

- *Forty-foot sanitary sewer easement shown on aforesaid map by J. Fred Davis, Jr., Inc. dated December 21, 1984 and to other sewer easements of record to the City of Raleigh.*

Phase 1 Environmental Assessment Report

A *Phase 1 Environmental Site Assessment* was completed in 1995 for Wooten Meadow Park during the site acquisition process; the Executive Summary of the report is included in Appendix B. The *Phase 1* report concludes no significant evidence of environmental contamination, environmental impairment, or Recognized Environmental Conditions (REC) in association with the property.

Neighborhood Park Classification

The City of Raleigh park classification system aims to provide a diverse, well-balanced, well-maintained range of recreational opportunities. The five park classifications are Neighborhood Parks, Community Parks, Metro Parks, Special Parks, and Nature Preserves. Neighborhood Parks are expected to serve the basic daily recreational needs of the surrounding neighborhoods. They most often include playgrounds, court surfaces such as basketball, tennis or volleyball, and open space or multi-use turf areas. Depending on the size, topography and other site characteristics, neighborhood parks may serve other needs as determined by the master planning process, proximity to other parks and greenway lands, and overall Parks and Recreation Department program needs. Smaller sites may be limited to very few elements; larger sites may present opportunities for elements such as walking tracks, athletic fields or neighborhood center buildings. In some cases deed restrictions or environmental requirements may dictate the options available. Other considerations, such as the size and character of existing parks in the area, barriers to access (such as major thoroughfares), availability of opportunities for future acquisition, and other elements of the City of Raleigh Comprehensive Plan are also taken into account when acquiring parkland.

Based on the 2004 Park Plan, the number of acres of existing neighborhood parkland compared to the expected population of an area is used to try to meet a Level of Service of 2.6 acres of parkland per 1,000 population. A new Park System Plan process is underway at the time of this SIP. The new park System Plan includes park classification review and a detailed evaluation of system needs and service expectations for park properties.

City of Raleigh Nature Preserves Criteria

A Nature Preserves Task Force was established in May 2010 at the request of Raleigh City Council. The Task Force consisted of representatives from the City of Raleigh, Wake Nature Preserves Partnership, and the Parks, Recreation and Greenway Advisory Board (PRGAB). The Task Force developed "Nature Preserves Criteria" for the purpose of evaluating existing park properties to determine whether the properties should be classified as Nature Preserves or Protected Natural Areas.

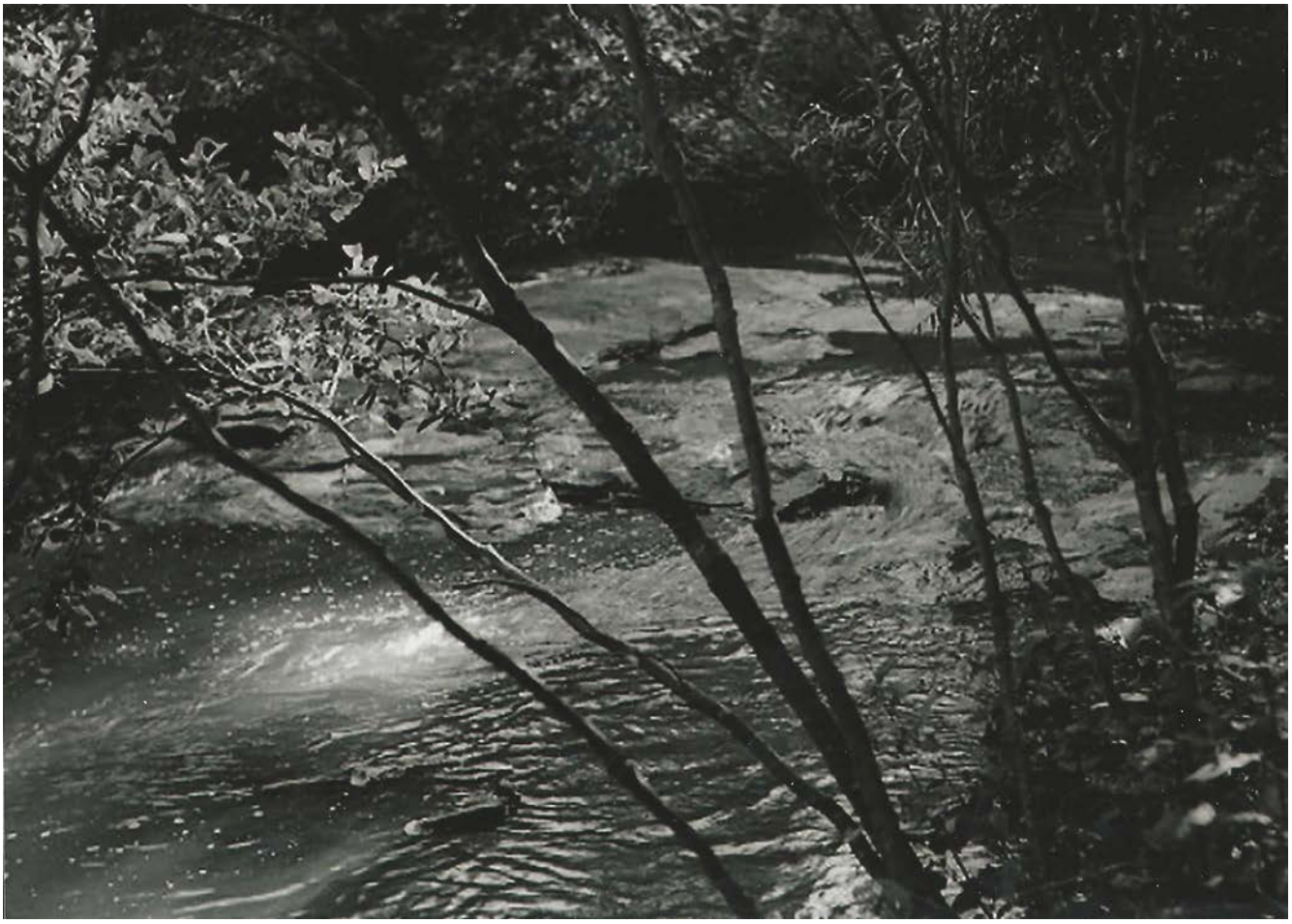
A "Nature Preserve" park classification is defined as an entire park unit that contains examples of high-quality plant or animal populations, natural communities, landscapes or ecosystems, documented by subject matter experts through local or state programs, that contribute to biodiversity and environmental health. The size of a Nature Preserve should be sufficient to buffer, conserve, and protect the target element or area. Efforts should be made to protect and manage significant natural resources in these areas through stewardship and best-practice management that do not degrade the resources present. Opportunities for the public enjoyment of natural resource based recreation and environmental education may be provided that are compatible with the protection and enhancement of the Nature Preserve and the nature experience.

A "Protected Natural Area" overlay classification is defined as a portion of a park unit that contains examples of high-quality plant or animal populations, natural communities, landscapes or ecosystems, documented by subject matter experts through local or state programs, that contribute to biodiversity and environmental health. In the case of existing parks, Natural Areas should be identified as part of an inventory process based on the natural resources, buffers, educational opportunities, and consistency with adopted master plans. Efforts should be made to protect and manage significant natural resources in these areas through stewardship and best-practice management that do not degrade the resources present. The designation of a Protected Natural Area should be differentiated from areas reserved for future development.

The criteria developed by the Task Force includes both objective and subjective criteria to facilitate evaluation of existing parks for classification or re-classification as "Nature Preserves", or recommendation for a "Protected Natural Area" overlay within a park unit. A copy of the **Nature Preserve Task Force Report** is available at www.raleighnc.gov (search for Nature Preserve Park Classification or NPTF).

Wooten Meadow has undergone an initial evaluation for potential park classification as a Nature Preserve or Protected Natural Area, using the City of Raleigh Nature Preserves Criteria. Wooten Meadow does provide important stormwater benefits and contributes both riparian and and aquatic habitat to a wildlife habitat corridor between Lake Lynn and Crabtree Creek. There are no known occurrences of protected plant or animal species on the property. At the time of this report, the extent of invasive species occuring throughout the park negatively impacts the quality of the natural area, and the site does not achieve the quality associated with a Nature Preserve or Protected Natural Area. The Wooten Meadow property is **recommended for classification as a Neighborhood Park**. Final determination for the best use of the park could occur during a future phase of park planning and development. A detailed application of the Nature Preserve Criteria to Wooten Meadow Neighborhood Park is included in Appendix C.

Wooten Meadow Cultural Resources and Historical Site Use



Hare Snipe Creek, circa 1930. Photo by Jim Denmark

Cultural Resources and Historical Site Use

Structural remains and other signs of land use history have been observed in the vicinity of the Wooten Meadow property near Hare Snipe Creek. Structural remains observed on the park property include an old dry stacked stone dam. The dam is reported from various sources as the remains of a mill dam associated with the 1773 Moses Parks Mill and/or the JD Hayes Mill labeled on the 1871 Fendol Bever's Map of Wake County. Mill foundations and remains of a mill head race are located in the vicinity on adjacent (currently privately owned) property. More details of the mill history are included on page 13 of this report. Additional land use history in the vicinity of the property is evaluated with maps, aerial photos, and other supporting information.

The cultural resources and land use background study of the Wooten Meadow property and surrounding area was initiated using the following data sources:

1. Historic maps of the North Carolina Department of Archives and History. The scale and accuracy of historic maps vary. Key features used to determine the approximate location of the Wooten Meadow property on historic maps are Hare Snipe Creek, Leesville Road, Glenwood Road, and Crabtree Creek.

- 1871 Fendol Bever's Map of Wake County
- 1887 Shaffer's Map of Wake County
- 1904 School Map of Wake County, W.G. Clements
- 1914 Wake County Soil Survey Map
- 1938 NC State Highway and Public Works Commission Map of Wake County

2. U.S. Department of Agriculture (USDA) Natural Resources Conservation Service in Raleigh North Carolina aerial photographs:

a. Photo BOP-4F-86, Grid M-7, flown March 29, 1949
b. Photo BOP-4N-188, Grid M-7, flown January 2, 1955
c. Photo BOP-5FF-112, Grid M-7, flown March 15, 1965
d. Photo BOP-2MM-27, Grid M-7, flown February 23, 1971
e. Photo USDA 40 37183, Grid 178-42, flown April 26, 1988
f. Photo NAPP 6134-29, Grid G-8, flown February 19, 1993

3. Phase 1 Environmental Site Assessment Wooten Property, Raleigh, NC, July 13, 1995 by Aquaterra, Inc.

4. Deed records from the property and U.S. Census records available on-line through Ancestry.com.

5. NC State Archives and "House Creek Township" folder from Olivia Raney Local History Library, Raleigh NC. The folder contains exerpts from a variety of sources, including Kelly A. Lally's *The Historic Architecture of Wake County, NC*

6. Historians/Subject Matter Experts on old mill sites in Wake County: Karl W. Wegmann, NCSU Assistant Professor, Doug Swords, Director of the Grist Mill Location Project, and James P Jones, Colonial History; descendent of former adjacent property owner and historic photographer Jay Denmark

7. Historic mill ponds and piedmont stream water quality: Making the connection near Raleigh, North Carolina, by Karl W. Wegmann et al, NCSU 2012 for The Geological Society of America Field Guide 29

8. Thesis- Millponds: An Archive for Post-Colonial Storm Histories, by Michael Cody Hunt, NCSU Marine, Earth, and Atmospheric Sciences 2011

9. Thesis- "I Am History, Don't Destroy Please": Three Gristmills and Their Communities in Wake County, North Carolina by Leslie Hawkins, NCSU History Department 2008

Dry-stacked stone dam remains covered by English ivy

A dry-stacked stone dam occurs on the Wooten Meadow property in the general location of the JD Hayes mill on the 1871 Fendol Bever's Map of Wake County. It is believed that the Wooten Meadow park property lies within a relic mill pond site that was located on Hare Snipe Creek.

Historians believe the dam pictured above was built for the Moses Parks mill, around 1773. Three men (likely investors) petitioned for a mill in this location along Hare Snipe Creek in 1773 (Richard Heartsville, Nathanial Kimbrouch, and John Hartsvield) (NC State Archives). The mill was situated on the property of Moses Parks, as evidenced in two land grants surveyed January 31, 1780. The location of the mill was at the intersection of two land grants for James House and Moses Parks. The original survey text for the starting point of the James House survey is "*Beginning at a water oak on Hairy Snipe Cr in Moses Park's line near his Mill*", indicating that in 1780 at the time of the land survey, the Moses Parks mill already existed.

North Carolina was declared a state in 1776, the General Assembly was created in 1777 and an act in 1777 allowed men who took an oath of allegience to the state to purchase land based on 50 shillings an acre and dependent on how many people were in the household. The process of receiving land patents during this time included making a claim on vacant land and if not contested within 3 months the claim would go to the county surveyor for permission to survey the land and thus create a warrant and plat for the land. The surveyor sent the plat and warrant to the secretary of state who created the patent. During the Revolutionary Period (1763-1783), the method of land ownership included land grants to early settlers in what was to become Wake County.

Early settlers built water-powered mills along small creeks and streams to grind grain. Each mill had a pond to supply a constant source of water to the mill. **A Colonial North Carolina Law of 1758 stated that all mills had to be accessible to the public and required a license from the County court in order to dam a waterway to build a mill. A 1777 law said "Every grist or grain mill, however powered or operated, which grinds for toll is a public mill".**

Dry-stacked stone dam remains are still visible on the west side of Hare Snipe Creek. Jumbled dam remains within the stream bed are also visible slightly downstream, as large dam rocks have been carried downstream over time by swift current.

A "JD Hayes Mill" is shown in approximately the same location as the Moses Parks Mill on the 1871 Fendol Bever's Map of Wake County (see page 17). It is unknown whether the JD Hayes Mill replaced the original Parks Mill or was built near the original mill. There are several structural remains in the vicinity; additional cultural explorations are needed to clarify and expand existing knowledge.

The name *JD Hayes* occurs numerous times in regional historic records: The 1870 Industrial Census lists a "J Hays Mill with a 4x20 foot overshot wheel".The North Carolina Business Directory for Wake County in 1880-1881 listed JD Hayes as a Justice in House Creek Township. The North Carolina Business Directory for Wake County in 1884 listed JD Hayes as a farmer, owner of "Hayes Store", and Magistrate for House Creek Township. In 1886 JD Hayes was listed as a Justice of the Peace for House Creek Township. *"Notice to Soldier Families: I will attend at the Court House in Raleigh on Wednesday and Saturday of each week, for the purpose of paying off the orders issued by agenda for the relief of indigent families of soldiers - JD Hayes, County Commissioner"* . (Blood and War at My Doorstep, B. Mckean,1863) According to an 1840 Manufacturing Census, more than 65,000 water-powered mills were located along streams in the eastern United States. In 1891, Wake County had 75 water-powerd grist mills.

"The local gristmill, in addition to providing the service of grinding grains, often had other services, such as cotton ginning machinery on site, or a blacksmith shop, community store, or distillery available nearby so farmers could most effectively use and enjoy their time spent away from working the land". (L Hawkins, 2008)

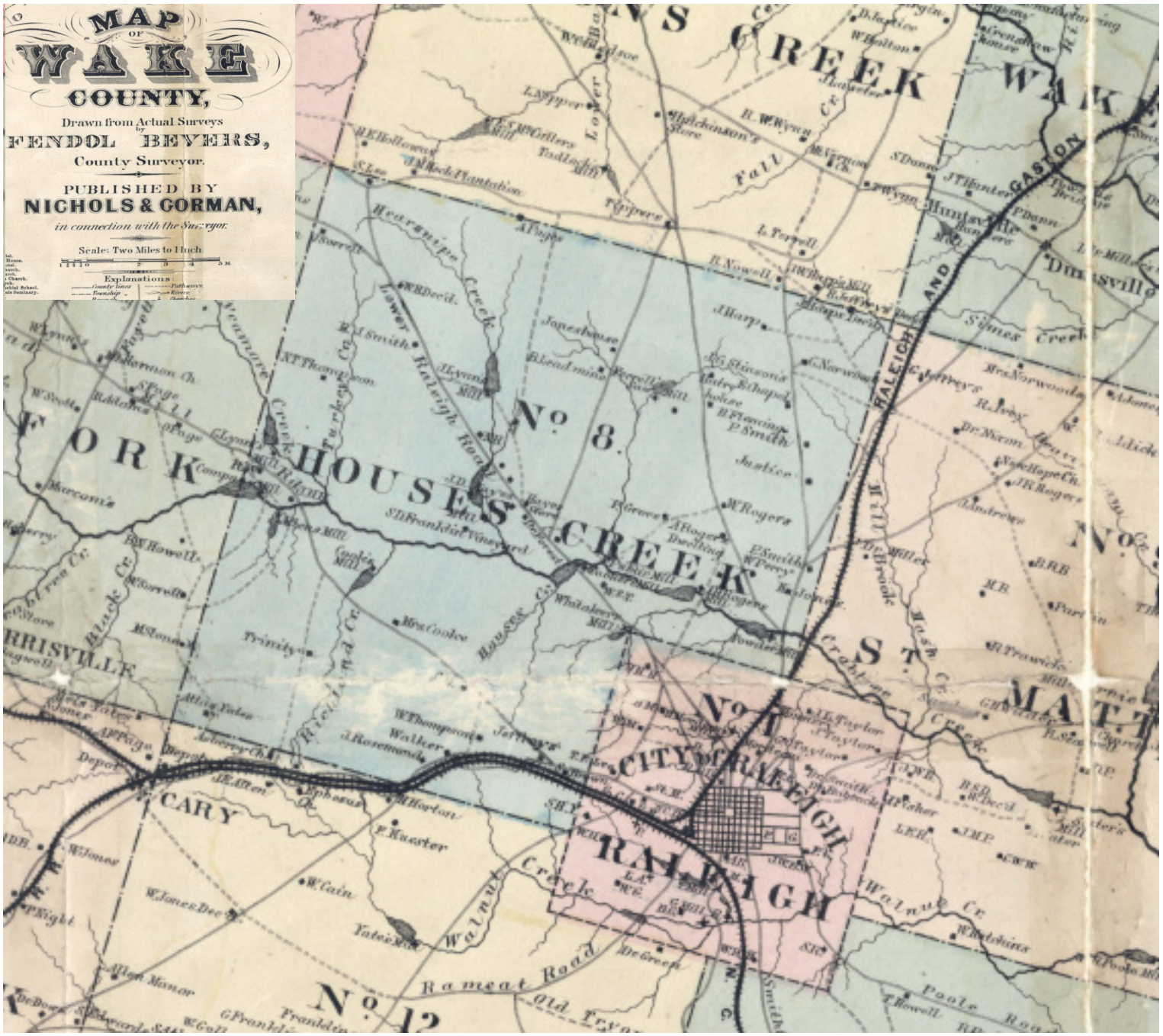
The 1871 Fendol Bever's map shows JD Hayes mill and mill pond on Hare Snipe Creek approximately .93 miles north of Crabtree Creek. Hayes Store was located near the mill, and was a voting place and post office, and was in operation from the 1860s to 1880s. A winery "SD Franklin Vineyard" is shown to the south of JD Hayes Mill near Hare Snipe Creek.

On the current Wooten Meadow property, on the east side of the dry-stacked stone dam remains, a worn path lies along the mid-ridge of the slope. Over thirty metal fence posts run along the length of this ridge. Aerial photos of the site, from as early as 1949, indicate several potential old roads or paths on the site that could be historically important. Archeological studies of the site should include investigation of historic periods and Native American history, and should include the park site and accessible neighboring properties in the vicinity.

Linear mid-ridge line occuring at east side of dam remains, visible on lidar map on page 18.

A portion of the eastern sewer easement is located on what may have been an old road bed. Water collects in the adjacent low area during the winter.

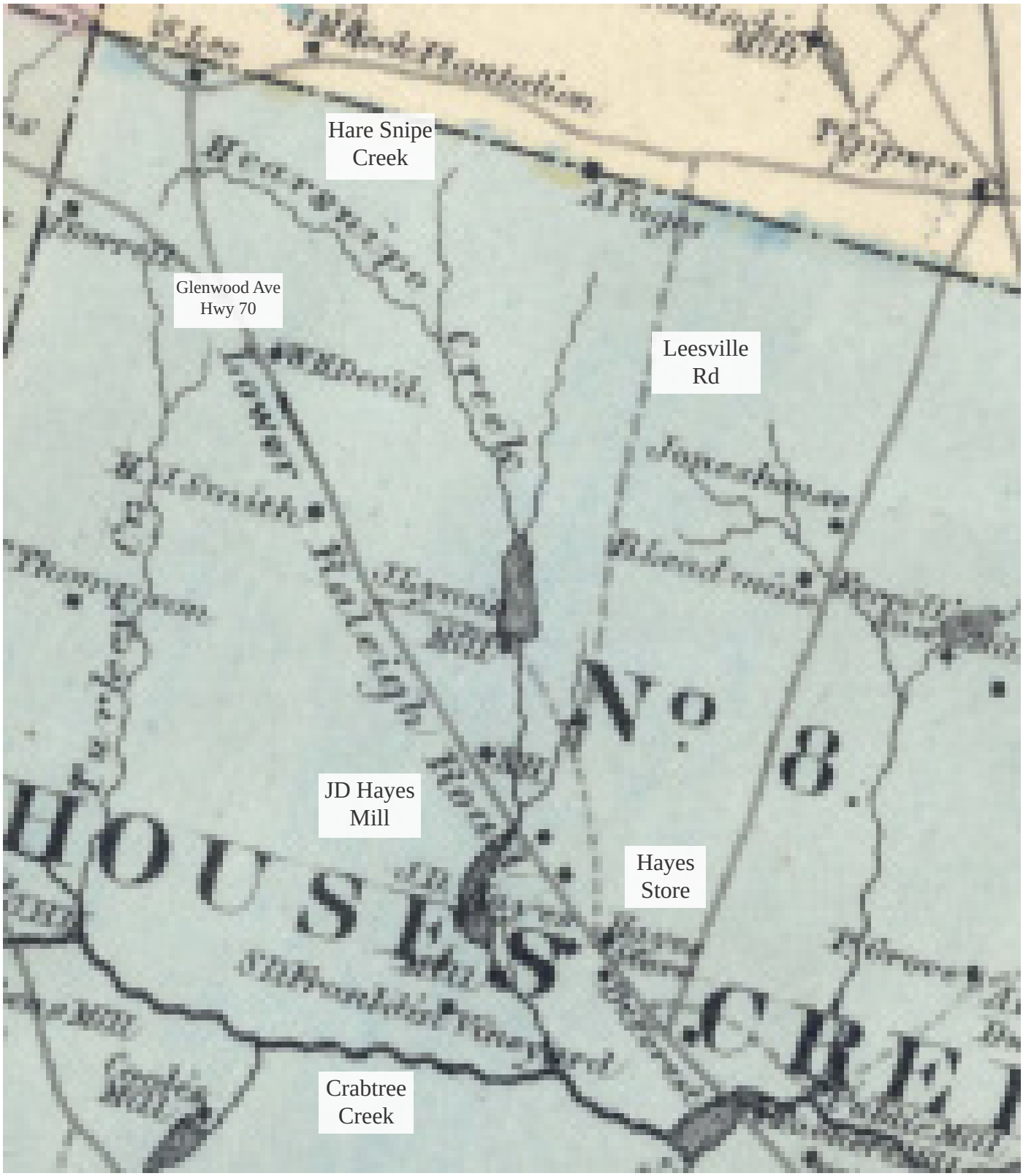
"Imagine when a lonely house was feature enough to identify whole stretch of wooded hill and valley, where Brookhaven and Oak Park and the Royal Villa and noisy US 70 now are - House Creek Township" - Raleigh Times, 28 May 1977 "The Trace of Times Past".



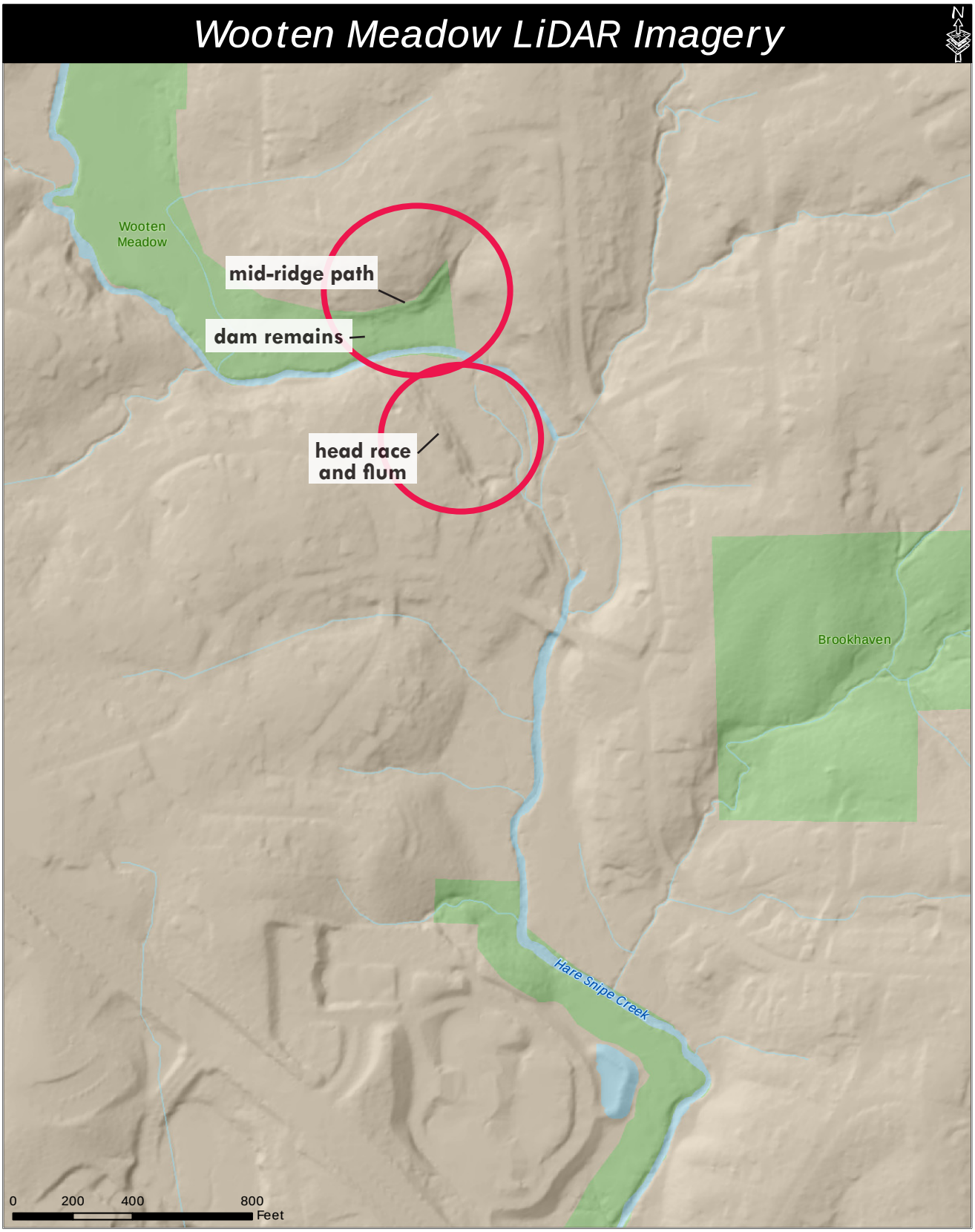
House Creek Township on the 1871 Fendol Bever's Map of Wake County
Description of House Creek Township on the map: *Rocky and broken, drak grey soils, red subsoil. Good water. Products: Corn, Wheat, Oats, Potatoes, Peas, Cotton Wood: Oak, Hickory, Pine, Black Jack*

Early maps depicted streams, main roads, property owners, and mills. JD Hayes' Mill is mapped along Hare Snipe Creek in House Creek Township. the only other mill shown along Hare Snipe Creek is J Lynn's Mill. The mill ponds associated with the mills are shaded in.

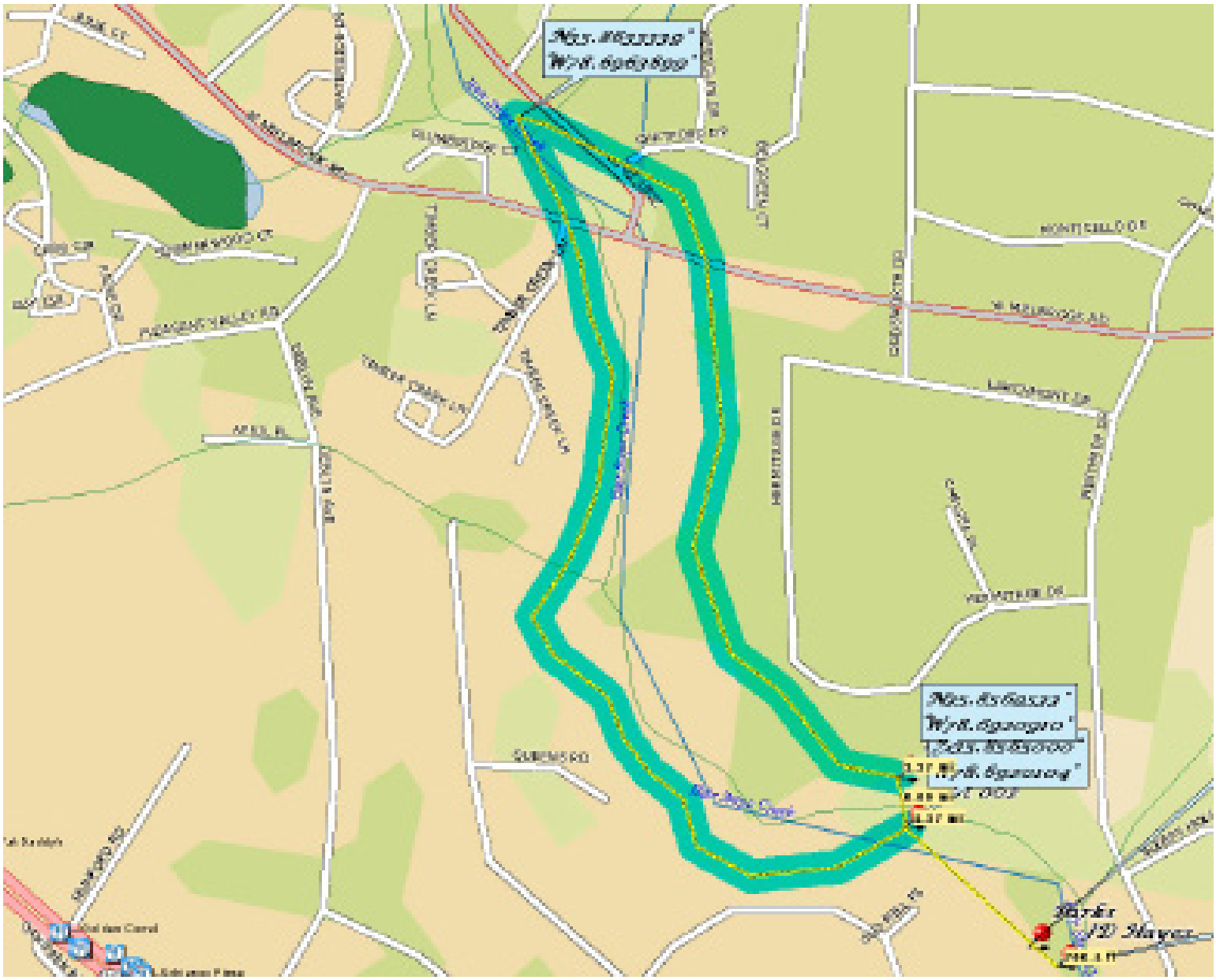
Vicinity of Wooten Meadow property, 1871



The 1871 Fendol Bever's map shows JD Hayes mill and mill pond on Hare Snipe Creek approximately .93 miles north of Crabtree Creek. Hayes Store, also shown on the map, was a voting place and included a post office, and was in operation from the 1860s to 1880s. Glenwood Ave (US Hwy 70) was called Lower Raleigh Rd on the 1871 Fendol Bever's Map of Wake County. A winery "SD Franklin Vineyard" is shown to the south of JD Hayes Mill.



Lidar map above shows the extent of the existing dam remains, the head race and flum. The mid-ridge line above the dam may be an old path or road (pictured on page 15).



Historic JD Hayes mill pond extent estimated by Dr Karl Wegmann and Doug Swords. Coordinate point at the top of the map is where the stream bed elevation matches the approximate elevation at the top of the dam. Coordinate points lower on the map represent the dry-stacked stone dam remains, the mill foundations and head race.

Water powered mills with their associated dams and mill ponds created historic modifications of the watershed. The JD Hayes mill site on Hare Snipe Creek is estimated to have created a long narrow mill pond, with ponded water stretching upstream to a point approximately 2,744 feet north of the dam's center point, based on an estimated 10 foot water height of other mill ponds from that generation, contour lines, and length of the dam. **In comparison, Lake Lynn currently ponds water along 3900 feet of Hare Snipe Creek.**

Over time, the mill pond would have filled in with sediment, called "backwater" or "slackwater sediments". "Mill ponds are dynamic environments, with fluctuations in shoreline". (M. Hunt, 2011) The JD Hayes dam was likely breached sometime between 1871 and 1887, because the mill appears on the 1871 Fendol Bever's Map of Wake County, but is absent from the 1887 Shaffer's Map of Wake County. Also by 1887, voting had changed from Hayes Store to "Edward's Store", mapped in approximately the same location.

The Table below is an exerpt from the 1871 Fendol Bever's Map of Wake County, describing the population of the Townships. House Creek Township is described as: 57.14 square miles, with 133 farms, and a population of 2,172. There were 383 dwellings within the township. The population included 575 white males, 639 white females, 474 colored males, and 484 colored females. In the 1870 Census, there were 386 families, in 386 dwellings reported. Pleasant Grove was a predominantly white community.

A TABLE

Showing the population of the different Townships in Wake County, N. C., Male and Female, White and Colored, with the number of dwellings and families in each, before any change was made in the lines, and from which the Census of 1870 was taken; also, the area in square miles, number of Farms and number of Acres in each Township, together with other valuable information. The survey was made expressly for this Map by the County Surveyor.

Number.	Name of Township.	No. of sq. miles first laid off, & from which the Census was taken.	Change in square miles to or from.	Present area in square miles, and according to the Map.	Number of acres in each Township.	Number of Farms in each Township.	Number of White Males.	Number of White Females.	Number of Colored Males.	Number of Colored Females.	Number of Dwellings.	Number of Families.	Total Number of inhabitants in each Township.
1	Raleigh	16.00		16.00	10.240	45	2,286	2,385	2,544	3,0[illegible]5	1,765	1,949	10,260
2	New Light,	30.00	16.28	46.28	29.619	80	250	273	136	139	[illegible]	144	798
3	Oak Grove,	68 56		68.56	43.878	240	798	754	398	350	[illegible]	35	2,300
4	Barton's Creek,	64.00	16 28	47.72	30.540	80	482	552	283	261	315	315	1,578
5	Walnut Forest,	74.00		74.00	47.360	200	794	734	823	784	561	566	3,135
6	Little River,	64.00		64.00	40.960	172	364	424	253	274	250	250	1,315
7	Cedar Fork,	64.00		64.00	40.960	96	400	506	257	292	272	272	1,455
8	House's Creek,	57.14		57.14	36.569	133	575	639	474	484	383	385	2,172
9	St. Matthew's,	59.22		59.22	37.900	110	580	624	520	470	417	420	2,194
10	Mark's Creek,	56.24		56.24	35.993	143	349	364	320	321	261	261	1,354
11	White Oak,	64.00		64.00	40.960	162	536	617	257	272	316	326	1,682
12	Swift Creek,	61.62		61.62	39.436	66	474	482	260	239	275	275	1,455
13	St. Mary's	71.76	4.50	67.26	43.046	213	555	596	447	447	377	379	2,045
14	Buckhorn	66.16		66.16	42.342	150	481	346	344	346	325	320	1,517
15	Middle Creek	71.36		71.36	45.670	86	466	506	247	252	270	270	1,471
16	Panther Branch	28 94	4.50	33.14	21.209	66	246	231	220	224	179	183	921
	Total,			916.70	586.682	2,036	9,636	10,033	7,783	8,200	6,495	6,700	35,652

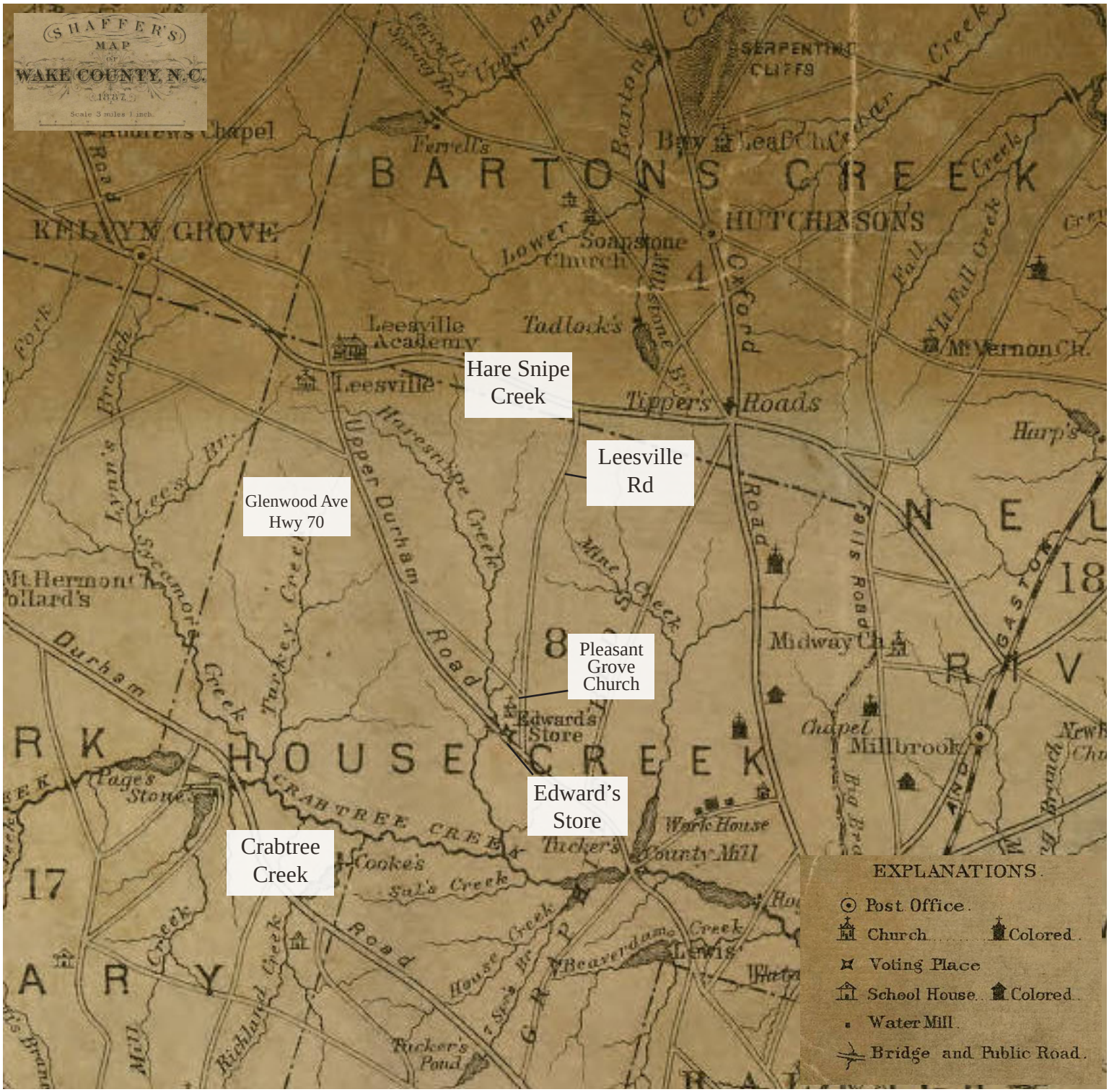
House Creek Township

The current location of the Wooten Meadow Property consists of a 20.5-acre area located at 2801 W. Millbrook Rd, south of the intersection with Leesville Rd. The property is located in House Creek Township, which was established in 1868. The current size of House Creek Township is much smaller than it was originally, due to annexations. House Creek Township historically included Five Points, Oberlin, and Method communities, all of which are now located in Raleigh (Lally, Kelly A., The Historic Architecture of Wake County, NC). The population data below shows the decrease in population after annexation in 1920 and 1940.

House Creek Township population from 1870-1940:

1870	1880	1890	1900	1910	1920	1930	1940
2,098	2,304	2,226	2,226	2,510	1,840	2,368	1,032

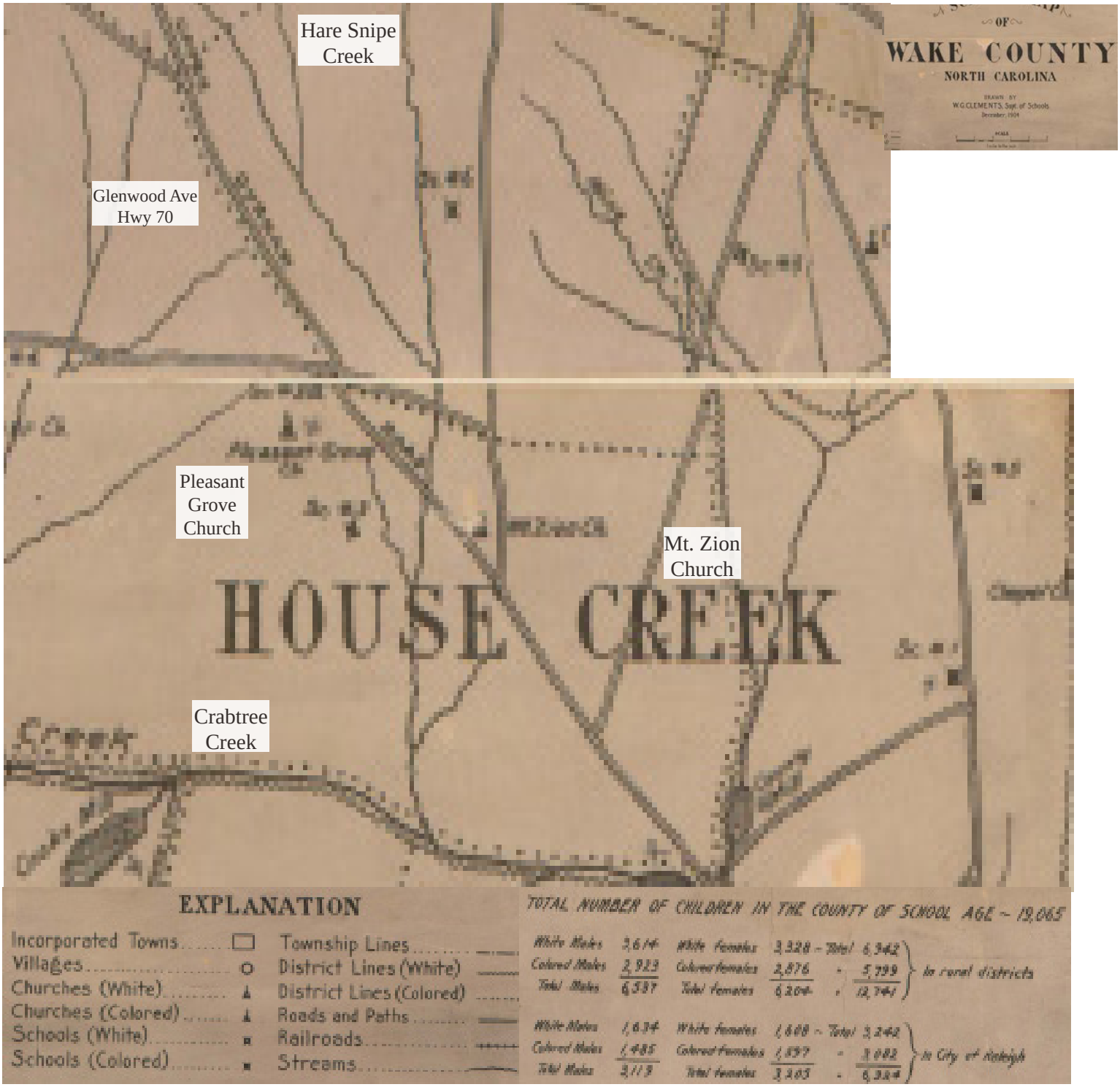
Vicinity of Wooten Meadow property, 1887



House Creek Township on the 1887 Shaffer's Map of Wake County

By 1887, there is no longer a mill shown at Hare Snipe near Crabtree Creek, leading historians to believe the JD Hayes mill dam was breached between 1871 and 1887. Glenwood Ave (Hwy 70) was called Upper Durham Rd on the 1887 Shaffer's Map of Wake County. In 1882, the name of Hayes Store is changed to Edward's Store, and is labeled as a Voting Place. "...*The polling place, heretofore located at Hayes Store in Houses Creek Township be changed to the Store of JT Edwards, just beyond the old place of voting, and all voters in said Township North of Crabtree Creek vote at Edward's Store*" (WCBCC Minutes, 6 Sept 1882). A Church and School House are labeled in the vicinity of Edward's Store. The church is likely Pleasant Grove Church, named on subsequent maps and reported at the site since the 1850s.

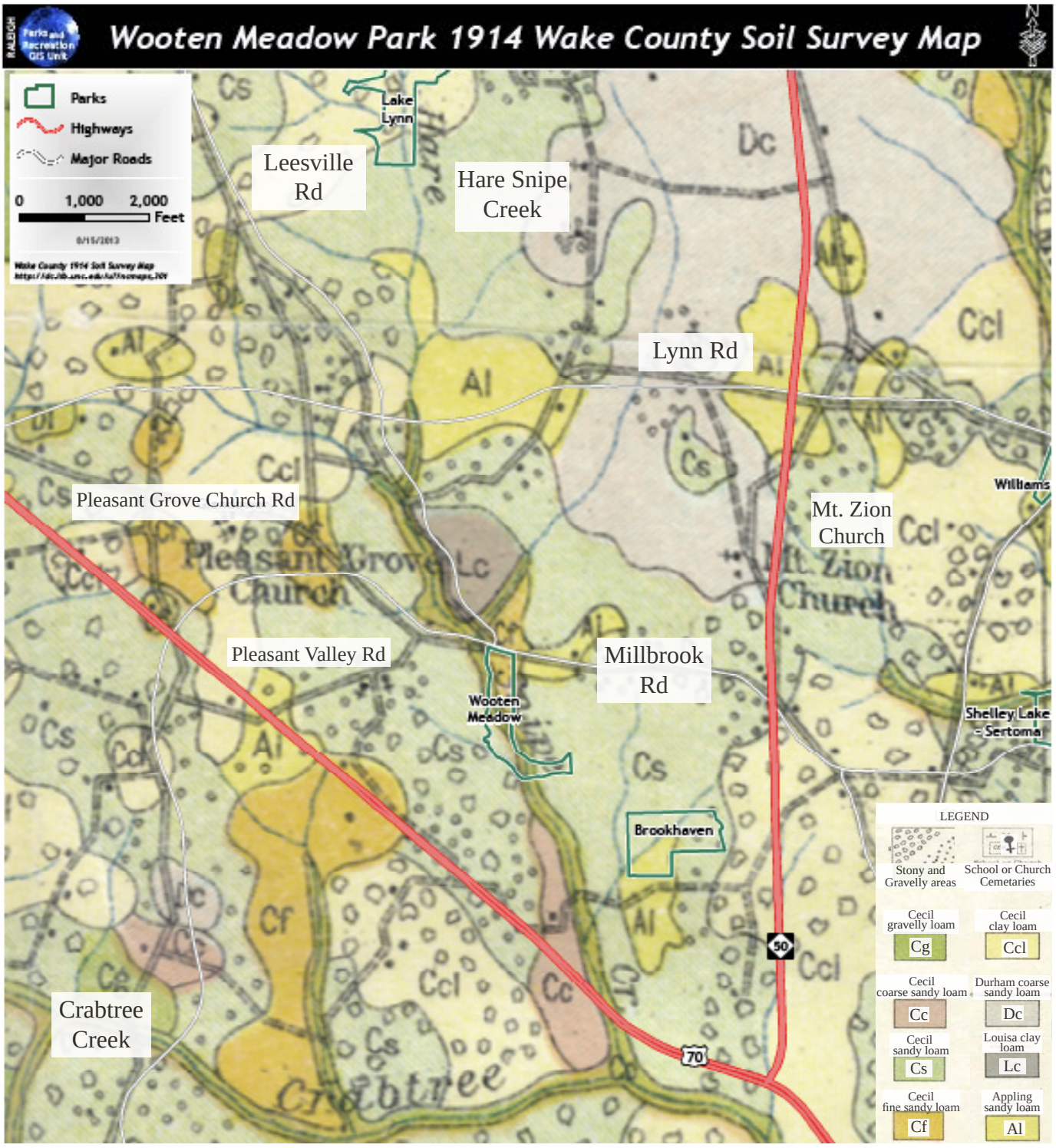
Vicinity of Wooten Meadow property, 1904



House Creek Township on the 1904 School Map of Wake County

In the September 9, 1872 *Wake Board of Education Minutes*, House Creek Township had 579 school children in 4 schools. Children attended school for 2 months. School attendance in House Creek included 48 white males, 33 white females, 88 colored males, 98 colored females. In 1904, according to the School Map of Wake County (above) the area around Hare Snipe Creek appears to be a colored district, however the Pleasant Grove Community was noted in historic records as a white community (Olivia Raney Local History Library). Schools #3 and #6 along Hare Snipe Creek are labeled as colored schools. Two schools labeled as #3 are in proximity of Pleasant Grove Church (inaccurately labeled on the west side of Upper Durham Rd), one school for whites and one school for coloreds. Today, the Pleasant Grove Church Cemetery has a section for whites and a section for "Slave and Free Blacks". The black markers do not have names. (*Cemetary Census, 2013*)

Vicinity of property in 1914, with current location of park overlaid on 1914 Wake County Soil Survey Map after geo-reference for accuracy (USDA)

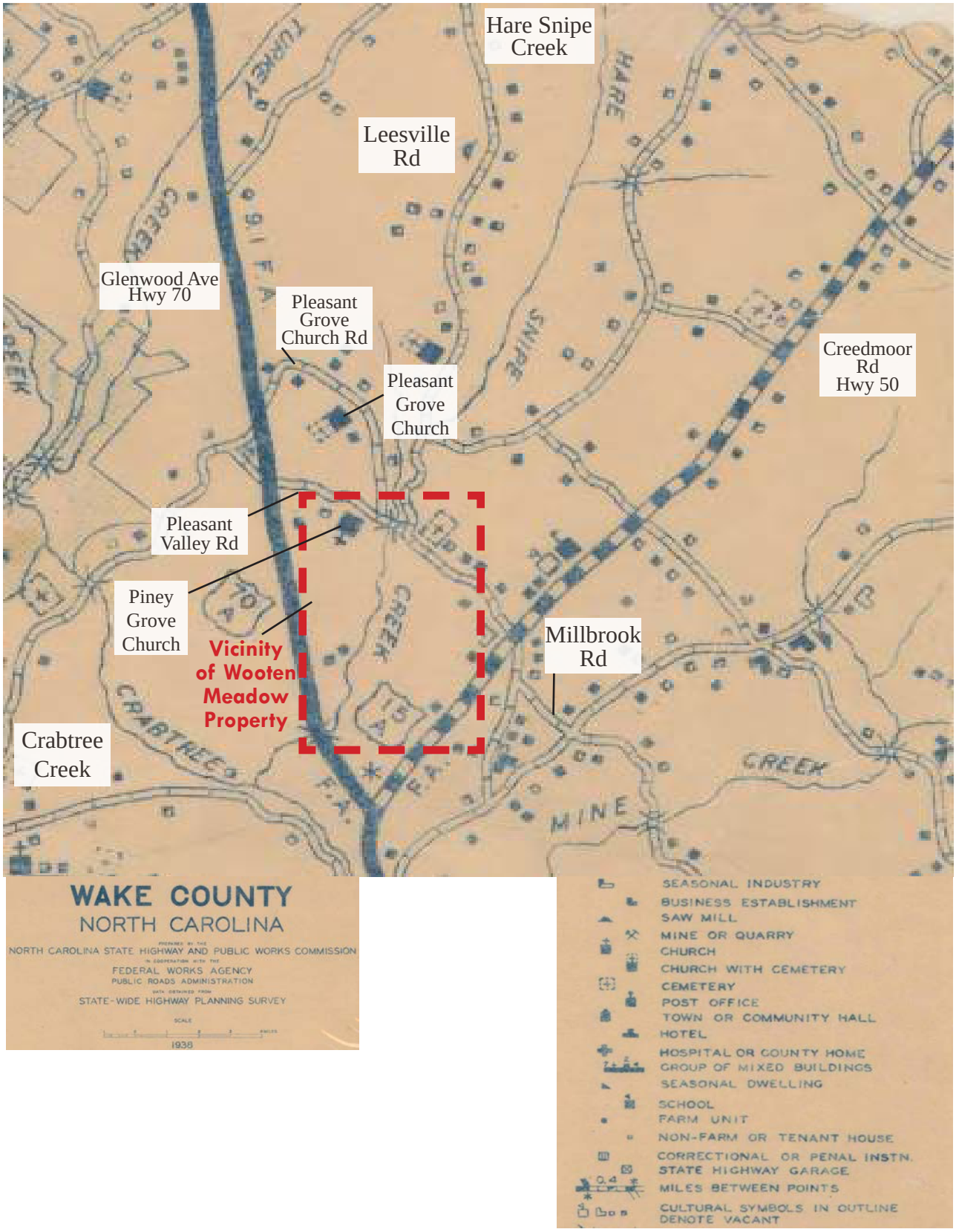


The Historic 1914 Wake County Soil Survey Map (*US Department of Agriculture, Bureau of Soils*) is overlaid on a 2013 map. The historic map has been geo-referenced for accuracy. The overlay shows both the historic and current locations of Leesville Rd and Millbrook Rd. The historic map shows the locations of Pleasant Grove Church and Mt Zion Church. The church located south of Pleasant Valley road is likely Piney Grove Church, established in 1908 (see photo on next page).

Piney Grove Church is now called Piney Grove AME Church
(African Methodist Episcopal Church)

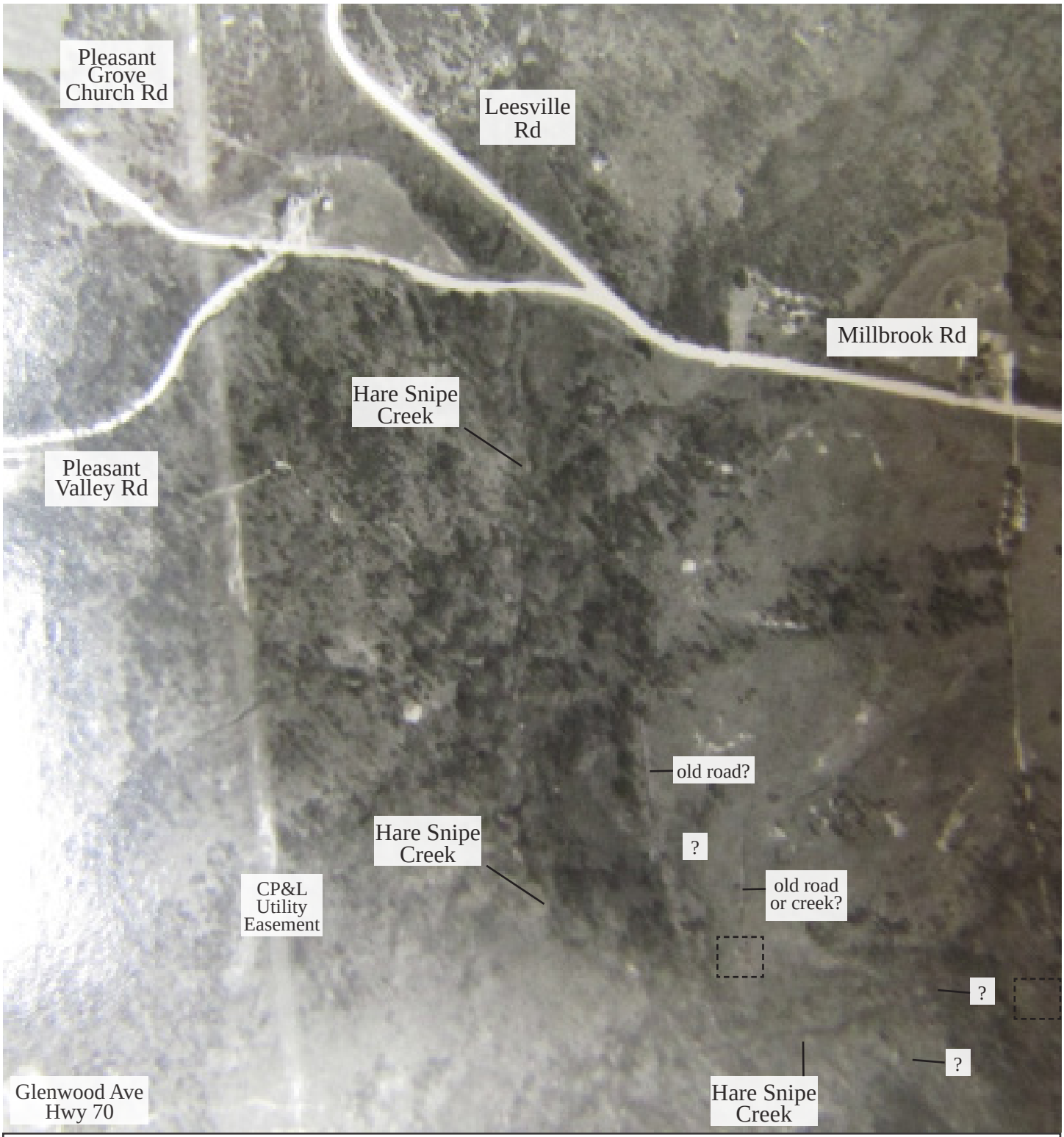
Piney Grove Church was established in 1908.

Vicinity of Wooten Meadow property, 1938



A 1938 North Carolina State Highway and Public Works Commission map depicts major roads and structures in the vicinity of the Wooten Meadow property. Creedmoor Rd (Hwy50) was called Hwy 15A at the time.

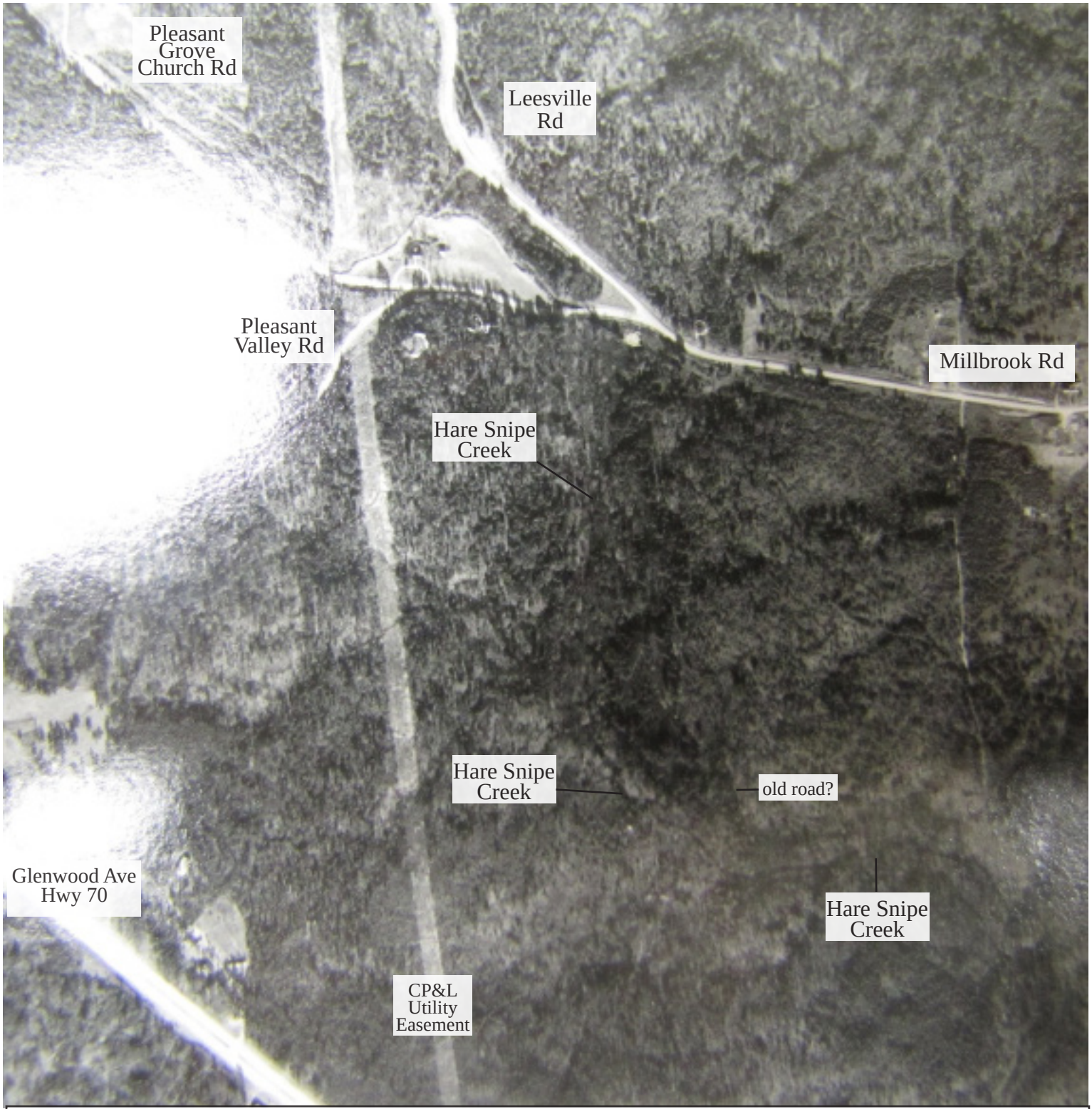
Vicinity of Wooten Meadow property, 1949



US Department of Agriculture, BOP-4F-86, Grid M-7, flown March 29, 1949

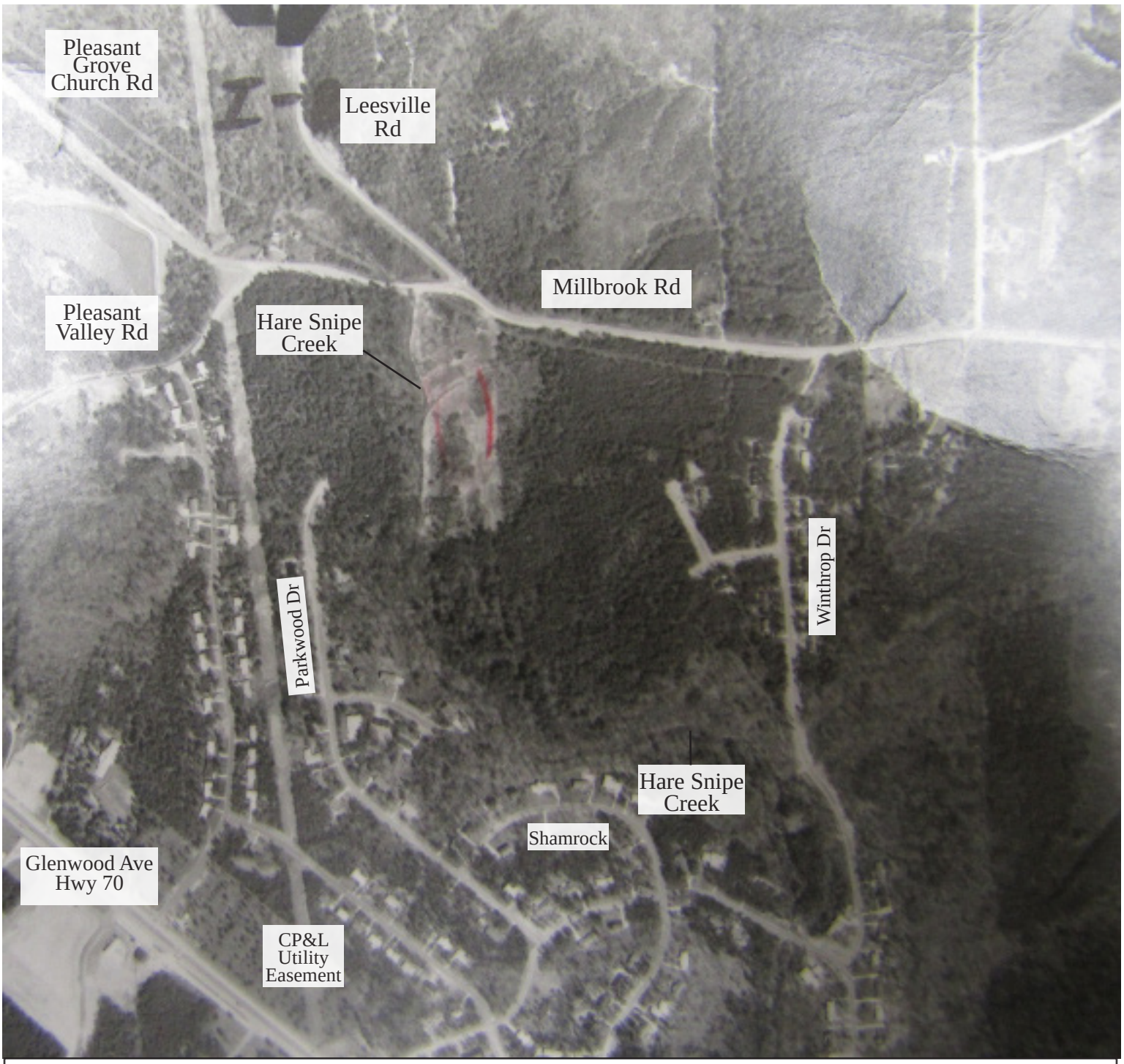
Hare Snipe Creek makes up the western property boundary of Wooten Meadow. There is a branch of the creek that flows west across the property near Millbrook Rd, and a branch in the south central portion of the property (see Wooten Hydrology map on page 50). Structural remains from a historic homestead have been found near the southeastern property boundary, just north of Hare Snipe Creek.

Vicinity of Wooten Meadow property, 1955



US Department of Agriculture, BOP-4N-188, Grid M-7, flown January 2, 1955

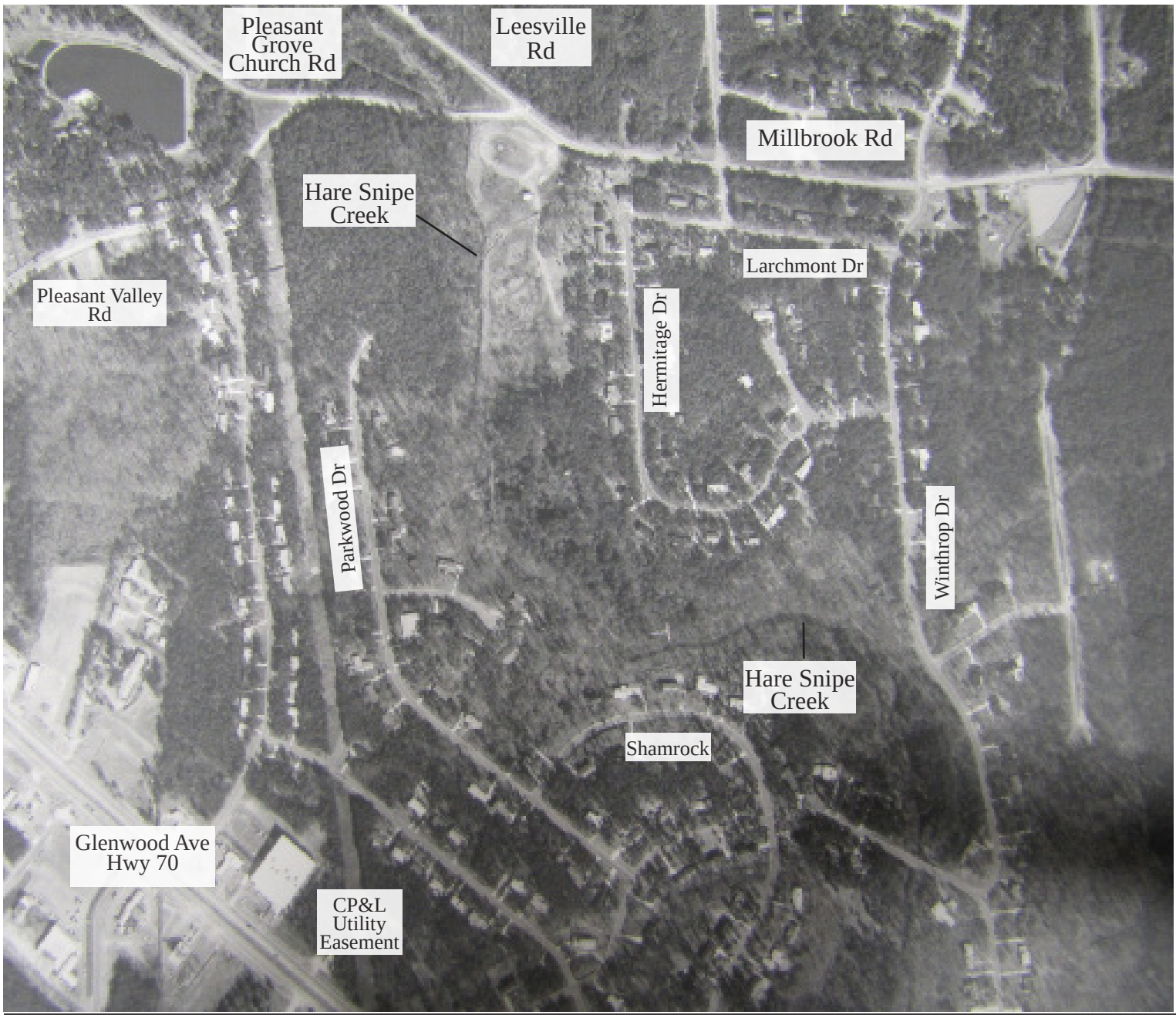
Vicinity of Wooten Meadow property, 1965



US Department of Agriculture, BOP-5FF-112, Grid M-7, flown March 15, 1965

The northern portion of the property appears cleared in 1965, with a structure near the small branch of Hare Snipe Creek that flows west across the property. The southern portion appears wooded and undeveloped. The surrounding properties have become partially developed, with the addition of Winthrop Drive and Parkwood Drive.

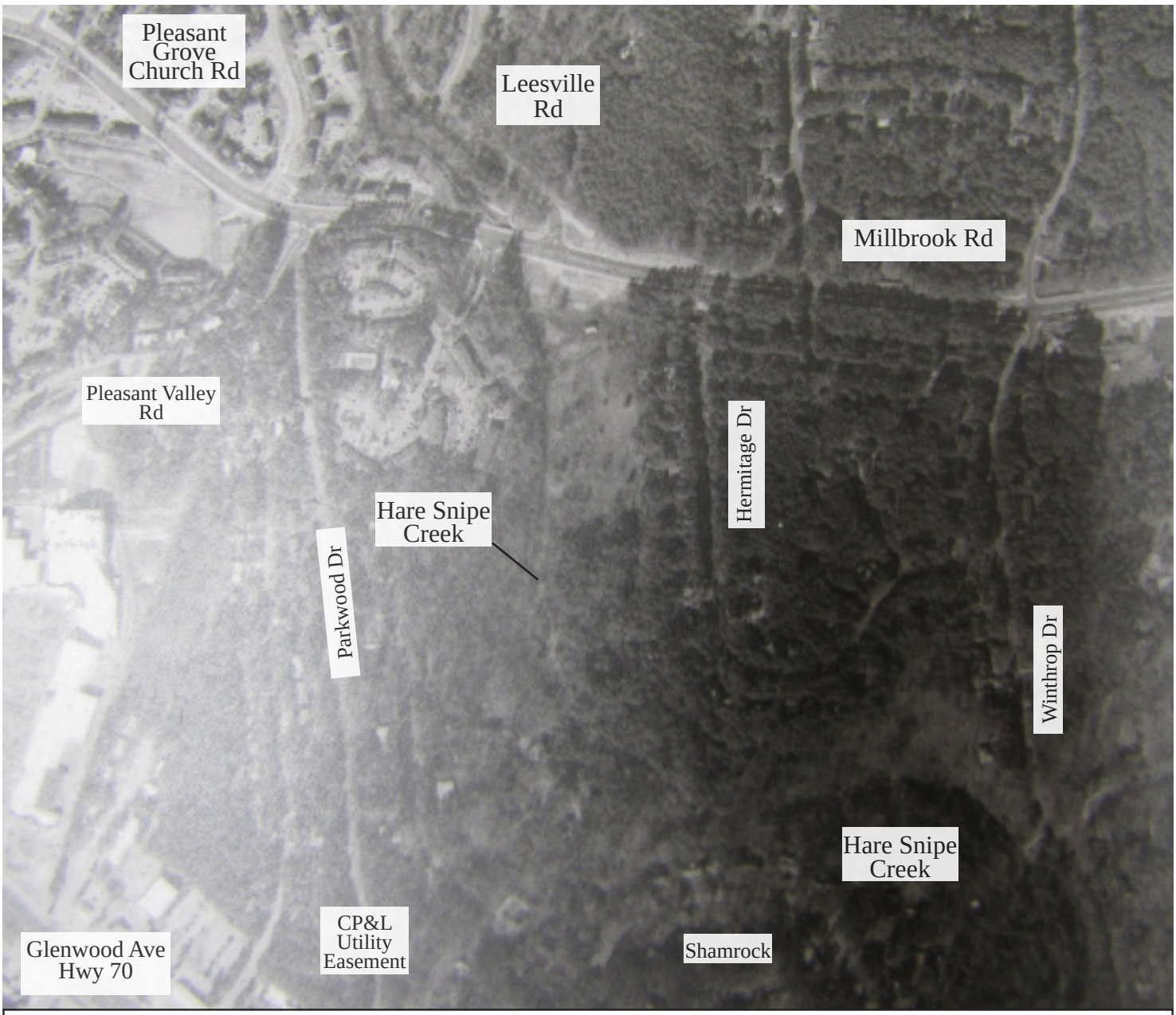
Vicinity of Wooten Meadow property, 1971



US Department of Agriculture, BOP-2MM-27, Grid M-7, flown February 23, 1971

The 1971 aerial photo of the Wooten Meadow vicinity shows the increase in residential development in this area of Raleigh. The Brookhaven neighborhood is expanded with the addition of Hermitage Dr and Larchmont Dr on the east side of the Wooten Meadow property, and Parkwood Dr on the west side.

Vicinity of Wooten Meadow property, 1988



US Department of Agriculture, USDA 40 37183, Grid 178-42, flown April 26, 1988

The Wooten Meadow park property was donated to the City of Raleigh in 1996 to be used as a park and/or greenway. The park property consists of three adjoining parcels. At time of acquisition the property appeared much as in the aerial photo above. There was one structure on the property, a small horse barn located near the north end of the property near W. Millbrook Rd. The building was 800-1000 sq ft with wood construction and a masonite type siding. The northern 10 acres of the property was cleared, fenced and used as a horse pasture. The remainder of the property was reported as wooded. According to information provided by the previous property owner Mr. Wooten, prior to his purchase of the property in the 1960s the northern portion was owned by Edwards Farms and the southern portion was owned by Glen Forest Company, a residential development firm. Mr. Wooten stated that the only use of the property to his knowledge was as farmland and pasture. Further residential development in the area includes The Timbers apartment complex on the west side of Hare Snipe Creek, development north of Pleasant Valley Rd and Pleasant Grove Church Rd.

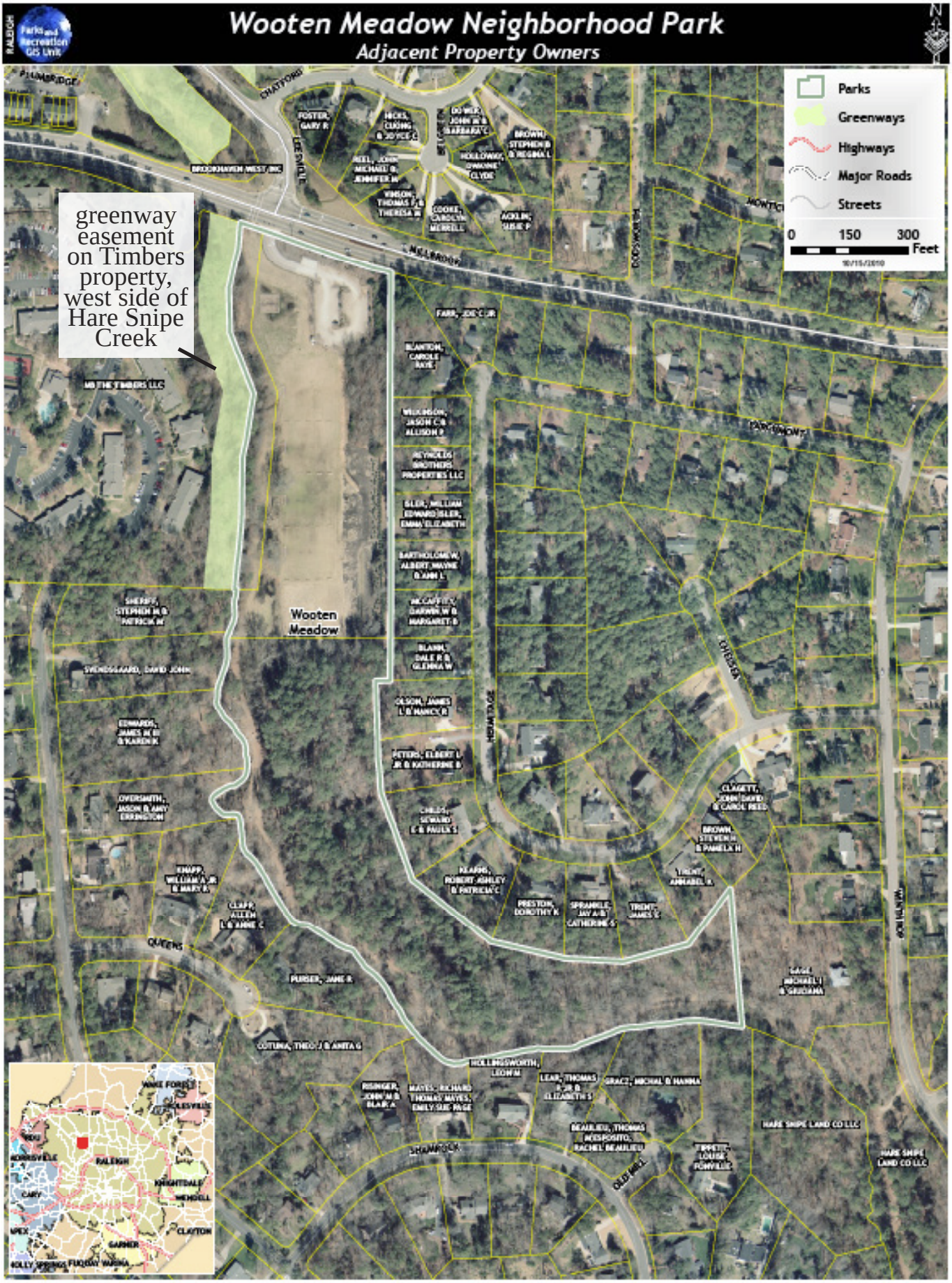
Wooten Meadow Site Description

The 20.5 acre site known as Wooten Meadow Park is located at **2801 W. Millbrook Road** at the intersection of Leesville Road and W. Millbrook Road in the Brookhaven Neighborhood in Northwest Raleigh. This park site is within the City's planning jurisdiction, in the Northwest Planning District, and within the Northwest Citizen Advisory Council (CAC) District. The site is zoned as Residential-4 (R-4) with a Neighborhood Conservation Overlay District. A Neighborhood Conservation Overlay District regulates built environmental characteristics such as minimum lot size, maximum building height, and front yard setback.

Land use in the vicinity includes mostly large lot residential. *The Timbers* apartment complex borders the northwest portion of the park across Hare Snipe Creek (see map on next page). Millbrook Road runs along the northern border of the park. There is a residential neighborhood on the north side of Millbrook Road. Sidewalk and pedestrian crossing signals are in place at the road intersection, and the Hare Snipe Creek Greenway Trail is completed north of Wooten Meadow Park.

Wooten Meadow Park is a mostly undeveloped park site consisting of three contiguous parcels, all located on the east side of Hare Snipe Creek. A greenway easement is located on the west side of the Creek within property owned by the Timbers LLC. Interim land use in the park includes floodplain forest and an open field "managed" area. Dominant landscape features include Hare Snipe Creek and Public Utility easements along the west and east sides of the property.

Wooten Meadow Park sign at Millbrook Rd



Parks, Recreation and Cultural Resources
parks.raleighnc.gov

Site amenities currently include a park sign, a small parking area, and a multi-use open field on the north side of the park.

North side of park, facing Millbrook Rd

Parking area with island

Entrance to fields

The park was previously leased by the Capital Area Soccer League (CASL). The Wooten Meadow Hydrology map on page 50 includes an aerial photo of the park from approximately 2003, showing the full extent of the park used for organized soccer. In 2007, the CASL lease ended. Bollards were placed in the former soccer fields until a Master Plan could be developed for the park.

Wooten Meadow fields, 2005

Wooten Meadow fields, 2009

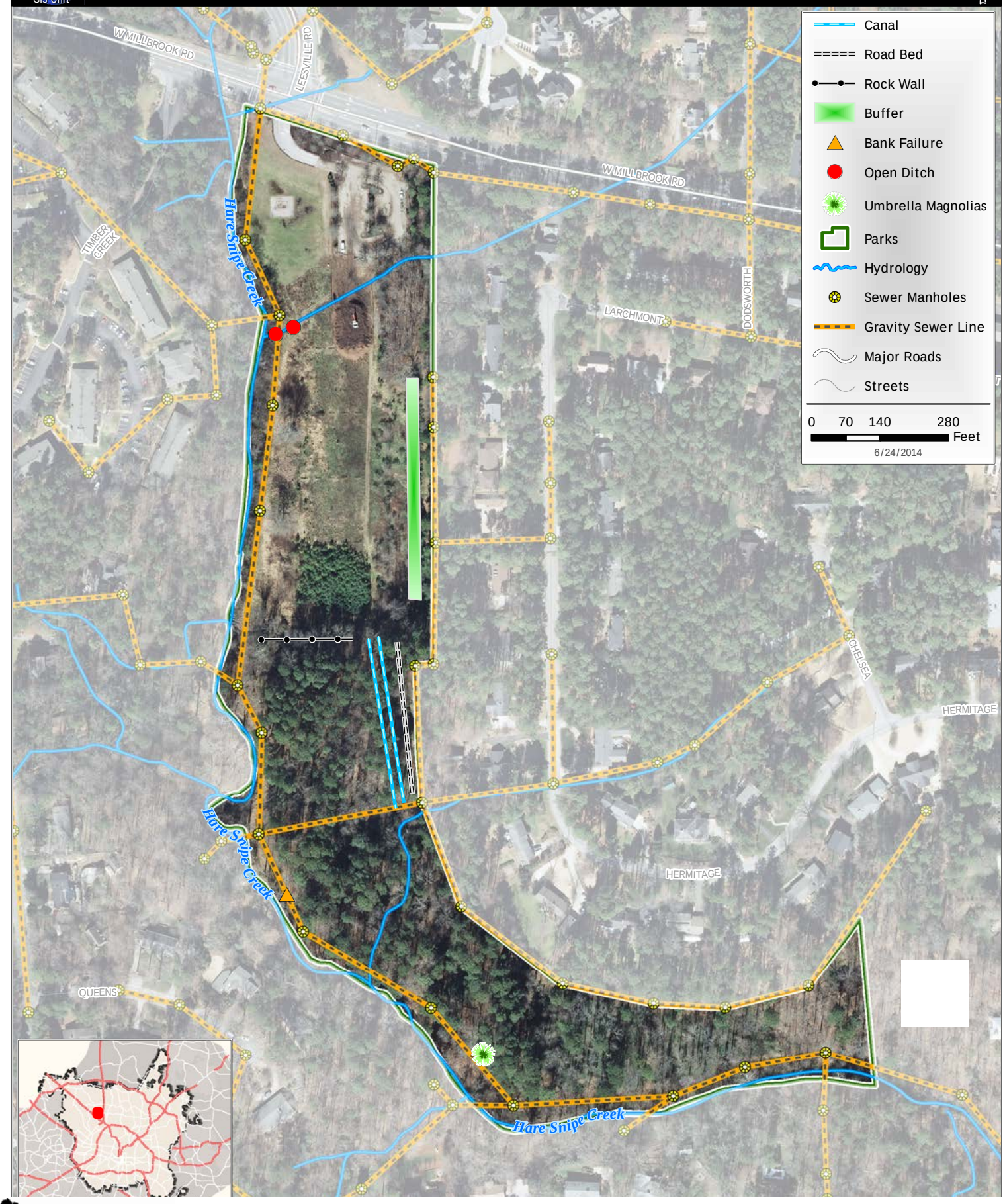
A vegetation buffer was created between neighboring houses on the east side of Wooten Meadow and the middle field area of the park, beginning in 2005. The extent of the vegetation buffer is shown on the Site Features map on page 37 of this report.

Residential vegetation buffer with a mix of evergreen trees and shrubs in 2005

Vegetation buffer along east side of property, 2010

Tree stakes still remain on some of the larger trees in the planting area. Stakes should be removed after one growing season. It is best not to use stakes except when required, for example when conditions are windy. (*International Society of Arboriculture Planting Specifications*)

Wooten Meadow Site Features



Interim management of the park's mid-field area involves mowing alternate sections of the field on a rotational basis, so that winter wildlife cover is available every year, and to provide interim pollinator habitat. Leaf and/or mulch storage is periodically an additional interim use of the site.

A path is generally mowed in front of the southern forested portion of the park. The photo above is taken from the eastern sewer easement, looking west toward Hare Snipe Creek.

Public Utility Easements

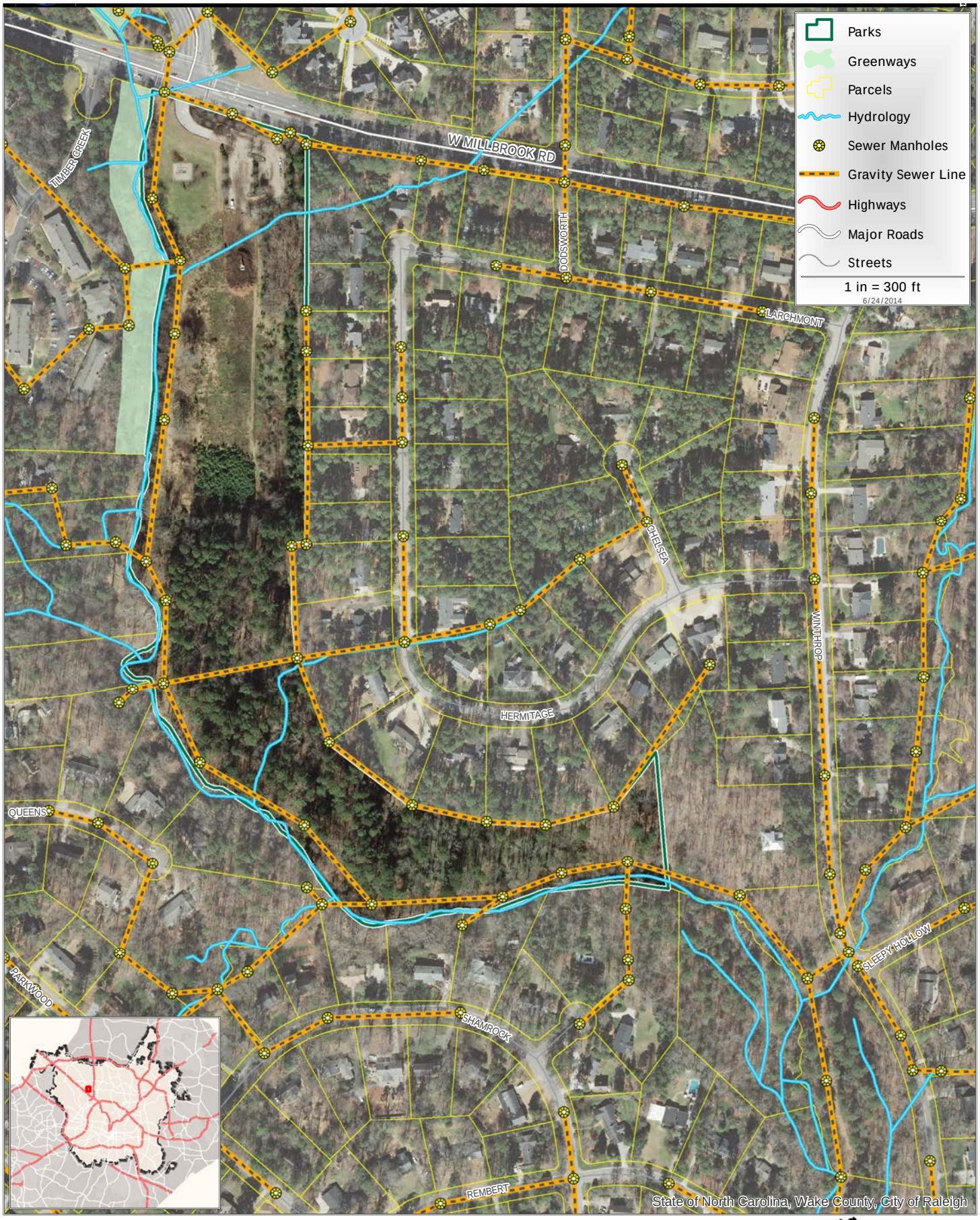
Wooten Meadow is located in a flood zone. Flood Zones depicted on the map on the following page are defined by the Federal Emergency Management Agency (FEMA). The map also shows the intended extent of the 50 foot Neuse River riparian buffer.

Sewer Easements

The Flood Zone and Sewer Easement map on the next page shows the extent of the City of Raleigh Public Utility easements on the Wooten Meadow property. Sewer easements exist on both the west and east side of the park. The sewer easements are maintained by the Public Utilities Department through mowing with a rotary cutter or brush hog to maintain low growing vegetation. Fire ants and invasive plants are dispersed throughout the sewer easements, as invasives are common in areas that have been disturbed.

The sewer easement along Hare Snipe Creek on the park's west property boundary was installed in 1970. There are very few trees established as a buffer between the sewer easement and the Creek. The Neuse River Riparian Buffer Rules would normally require at least the first 30 feet adjacent to the Creek (Zone 1) to be forested, however if the land use existed prior to the Buffer Rules adoption in 1997, the land use is "grandfathered" or exempt from the Rules, as long as the use continues unaltered. Grading and revegetating Zone 2 (the next 20 feet) is allowed provided that the health of the vegetation in Zone 1 is not compromised, the ground is stabilized and existing diffuse flow is maintained. Additional information on the stability and condition of the riparian buffer along Hare Snipe Creek is provided in the Water Resources section of this report, beginning on page 48.

Sewer Easements on Wooten Meadow and in vicinity



Parks, Recreation and Cultural Resources
parks.raleighnc.gov

The 40-foot wide western sanitary sewer easement supports a 24 inch gravity sewer. Riprap has been added at various easement locations to increase stream bank stability.

A lateral sewer easement connects the 24-inch western sanitary sewer with an 8-inch main sewer line running along the eastern park boundary, crossing the park near the middle of the property.

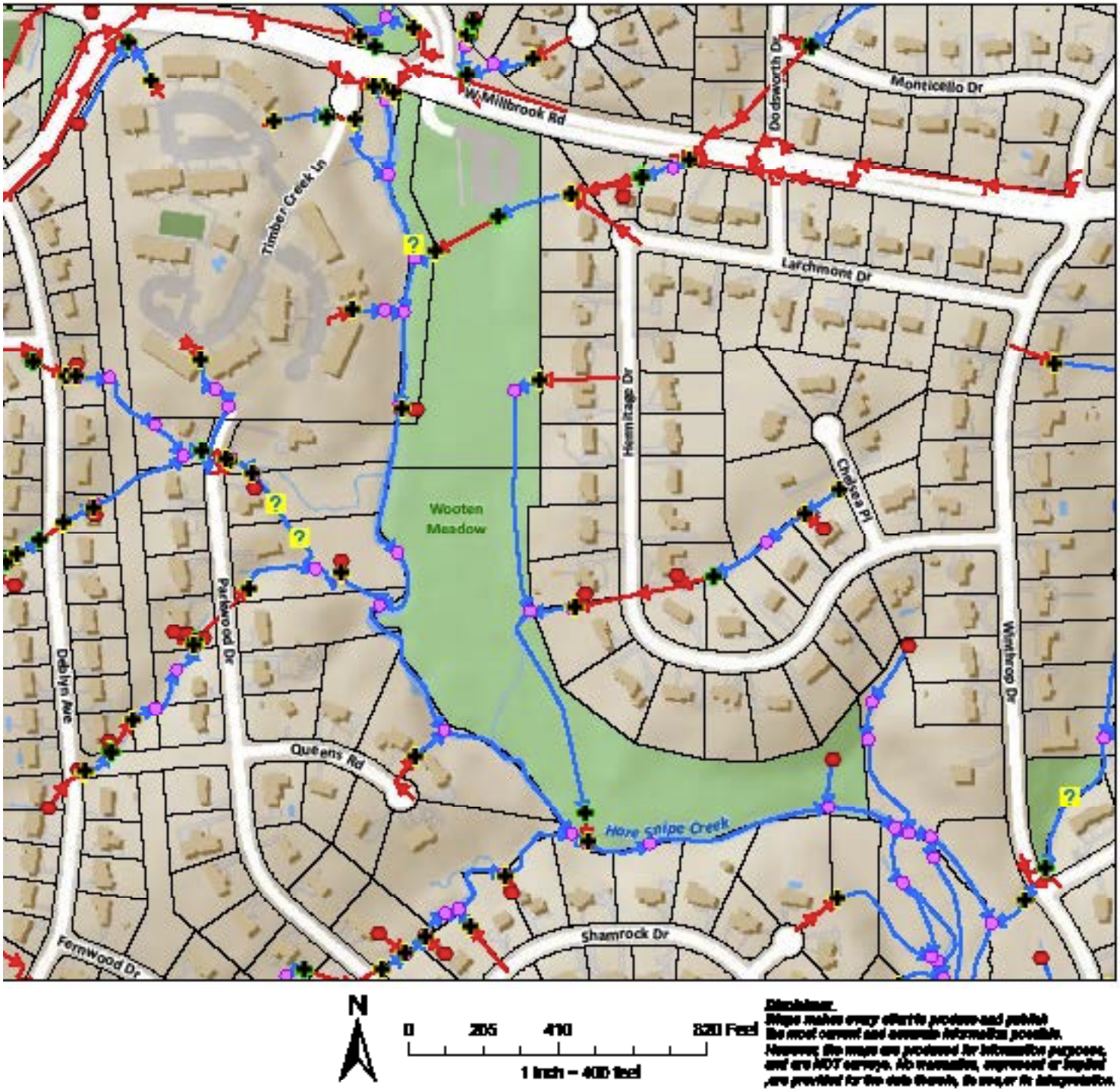
The eastern sewer easement traverses several habitat types, from upland forest to floodplain. A portion of the easement follows what is potentially an old road bed. Several adjacent property owners on the east side of Wooten Meadow have fences erected. Park encroachment at this park is minimal. Park encroachment occurs when adjacent property owners use park property as their own yard, for example by dumping yard waste in the park, clearing park vegetation to expand their yard or modify their view, creating private paths into the park, or setting up a swingset on park property.

A gate is installed at a sewer easement extension intersection with Winthrop Drive. Photo above is from 2010, taken in late winter with meandering Hare Snipe Creek visible in the distance.

Stormwater Utilities

The map below indicates City of Raleigh stormwater features that convey storm runoff. The Department of Public Works designs and manages stormwater features on public property to control the flow of public stormwater, remove pollutants and capture, treat, store and then slowly release stormwater runoff downstream or into the ground. Stormwater features included on the map below include pipe inlets and outlets (symbolized by black crosses; inlets are green, outlets are yellow), stub points (red dot), break points (purple dots), pipes (red lines), and stormwater channels (blue lines). Stormwater channels can include natural surface waters, such as Hare Snipe Creek and its tributaries. Further detail on site hydrology is included beginning on page 48 of this report.

Wooten Meadow Stormwater Features



Adjacent to the Wooten Meadow Park property, on the west side of Hare Snipe Creek, is a greenway easement within the Timbers LLC property (see map on page 32).

Raleigh greenways are defined as linear, natural land areas. Some greenways may be suitable for **greenway trails**, while other greenways may not be suitable for trails and remain undeveloped to benefit the community as buffers, environmental preserves, or wildlife corridors.

Historically, the City of Raleigh acquired greenway **easements** rather than fee or title land ownership where greenways were desired. Easements conserve public space for *potential* greenway trails and provide environmental benefits. Greenway easements are in perpetuity and attached to a deed, therefore it transfers when properties are sold to the next owner. The City also owns "fee simple" parcels along some designated greenway corridors.

Greenway trails are constructed for public access within greenways (easements or fee simple- owned property) or within public utility easements.

Many greenway trails are constructed within City of Raleigh sewer easements. Most of these easements are located within riparian corridors. Parks, Recreation, and Cultural Resources staff works closely with Raleigh Public Utilities to design greenway trails in a way that minimizes greenway trail and sewer line conflicts.

Inventory of Natural Resources: Soils, Water Resources, Flora and Fauna

Site investigations and inventory of natural resources of Wooten Meadow were conducted during May and October of 2009, March and July of 2010, and September 2013.

Soils of Wooten Meadow Park

The following soil data was created by the USGS and the North Carolina Center for Geographic Information and Analysis. Wooten Meadow is underlain by the Cecil soil association. This soil association is described in the *Wake County Soil Survey* as gently sloping to steep, deep, well-drained soils that have a subsoil of firm red clay; derived mostly from gneiss and schist. This soil association is described as being dissected by many streams that form a dendritic drainage pattern. The *Wake County Soil Survey* describes the major soils of this association to have moderate limitations to use as absorption fields for septic tanks, no special limitations if they are used for road construction or to support foundation footings for large buildings. Most of the soils in the Cecil association have been cultivated in the past, however by the time of the 1970 soil survey about 80% of the area was in forest and the remainder in either pasture or still cultivated. There are four soil mapping units within the property. Approximately 75% of Wooten Meadow is underlain by the hydric soil Cm.

A Wooten Meadow Soils Map is provided on the following page.

Cm **Chewacla soils, 0 to 2 percent slopes**

The Chewacla soil series consists of somewhat poorly drained soils on the flood plains of streams. A seasonally high water table is at a depth of about 1.5 feet. Natural fertility and organic matter content are low, infiltration is good. These soils are very acidic. The surface layer is sandy loam to silt loam. Surface runoff is slow. The hazard of flooding is severe, and the hazard of wetness is very severe.

ApD **Appling sandy loam, 10 to 15 percent slopes**

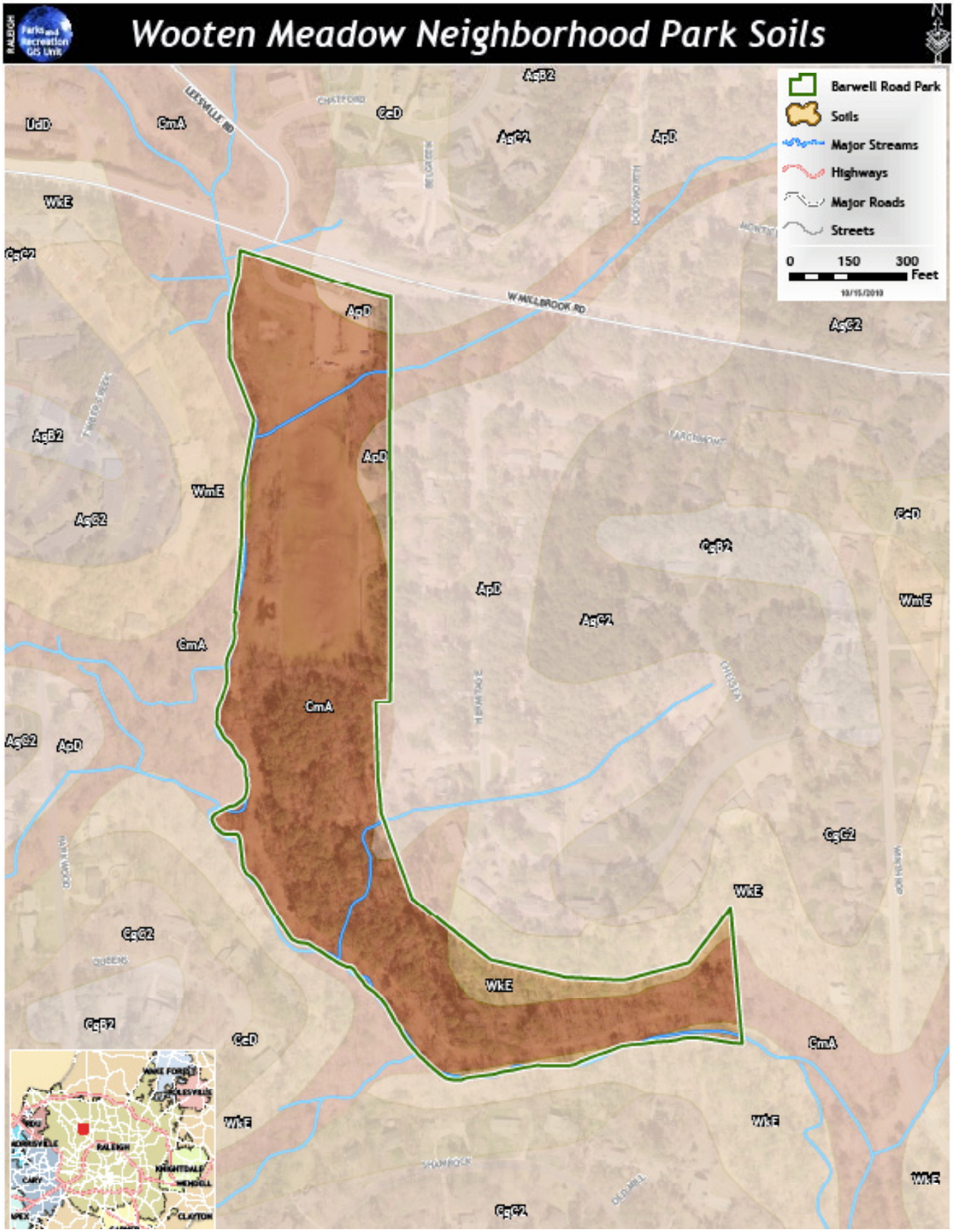
This soil is found on narrow side slopes bordering drainageways in the uplands. Erosion may be slight or moderate. The surface layer is sandy loam to sandy clay. The subsoil is firm clay loam to clay. In many areas pebbles and cobblestones are on and in the surface layer. Infiltration is fair to good, surface runoff is very rapid. The hazard of further erosion is very severe.

WmE **Wedowee sandy loam, 15 to 25 percent slopes**

These soils are located on narrow side slopes bordering major drainageways, and are slightly to moderately eroded. The surface layer is sandy loam to sandy clay loam. The subsoil is firm sandy clay loam to clay loam. Infiltration is good to fair, surface runoff is very rapid, and susceptibility to further erosion is severe.

WkE **Wake soils 10 to 25 percent slopes**

These soils are on side slopes bordering drainage ways in the uplands. Their surface layer is loamy sand or gravelly loamy sand 2 to 10 inches thick. It is underlain with loamy sand 0 to 10 inches thick. Infiltration is good. Surface runoff is very rapid. Because of bedrock near the surface and slopes, these soils should be kept in forest.


Wooten Meadow Neighborhood Park Soils
Barwell Road Park
Soils
Major Streams
Highways
Major Roads
Streets
0 150 300
Feet
W MILLBROOK RD
LEESVILLE RD
AgB2
CcD
AgC2
ApD
UdD
CmA
WkE
CgC2
WmE
CgB2
CmA
WkE
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CgC2
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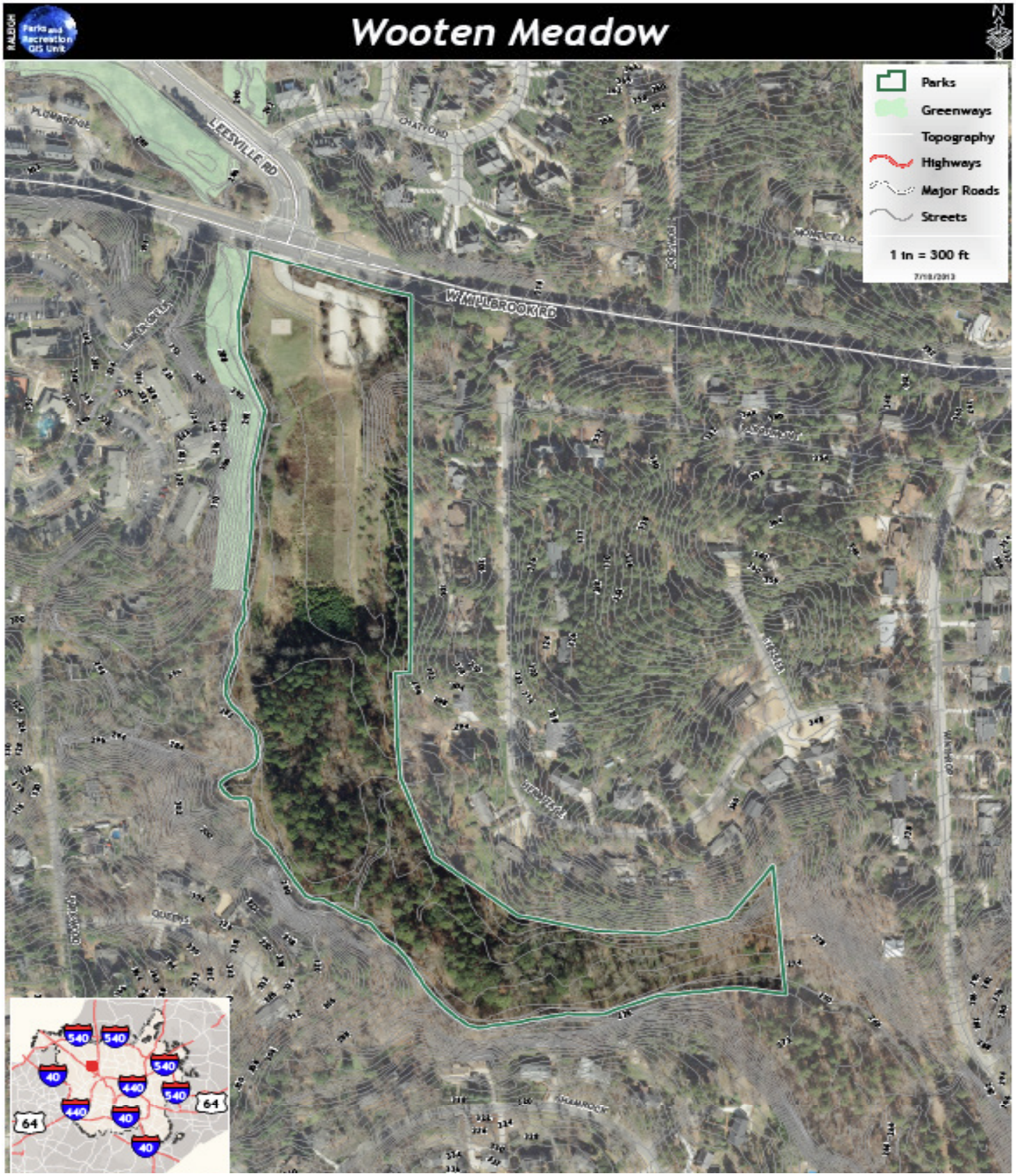
CgC2
WmE
CcD
CgB2
CmA
WkE
CgC2
WkE
CgC2
WkE
CgC2
WAKE FOREST
LEESVILLE
RALEIGH
KNIGHTDALE
WENDELL
CLAYTON
CARY
MORRISVILLE

Topography slopes to the west toward Hare Snipe Creek. The property is situated at an elevation of approximately 300 feet above mean sea level. There are steep slopes present on portions of both sides of the park.



Water Resources of Wooten Meadow

Wooten Meadow is located in the highly urbanized Hare Snipe Creek watershed of the Neuse River Basin. The Drainage Basin map on the following page shows the land area that drains or flows to Hare Snipe Creek or its tributaries. Hare Snipe Creek originates south of Strickland Rd, between Leesville Rd and Ray Rd, and flows south into Lake Lynn. Hare Snipe Creek was a dominant landscape feature on historic maps of Wake County. Research has indicated historic modifications of the watershed, including evidence that the area is a relic mill pond site (see page 13). Lake Lynn dam was constructed in 1976 to dam Hare Snipe Creek for flood control. The dam created Lake Lynn, which is now used for both flood control and recreation. Hare Snipe Creek continues flowing south out of Lake Lynn, eventually flowing into Crabtree Creek.

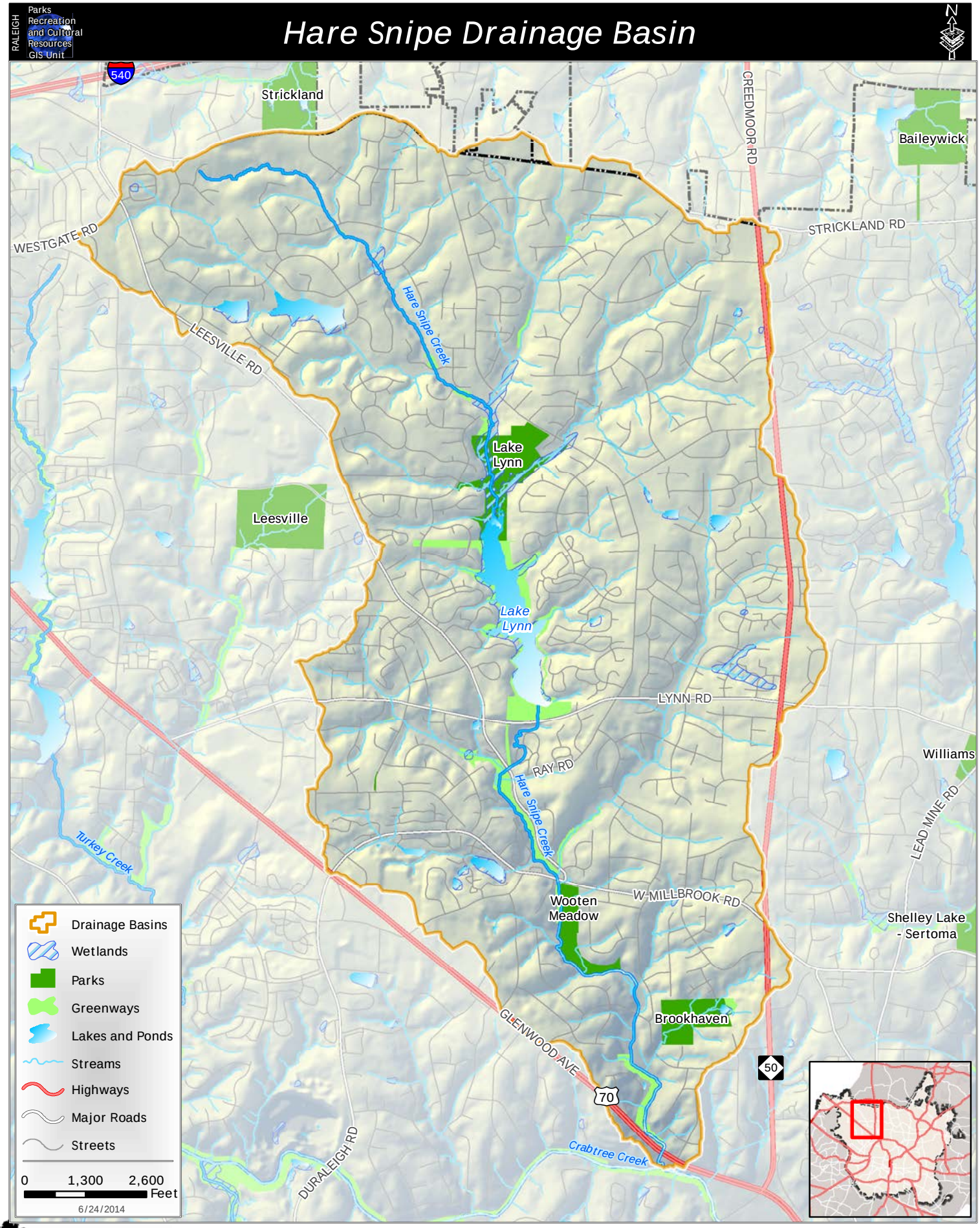
Hare Snipe Creek is subject to state and federal jurisdictional regulation under Section 404 of the Clean Water Act and North Carolina's Neuse River Riparian Buffer Rules. Hare Snipe Creek, like most urban streams in Wake County, is listed as *impaired* by the USEPA. *Impaired* waters are defined as those that cannot support one or more of their state designated uses because of water quality impairment. The state *Designated Use* of Hare Snipe Creek is **Aquatic Life Propagation and Survival** and the EPA *Designated Use Group* is **Aquatic Life Harvesting**.

The *Cause of Impairment* for Hare Snipe Creek is **Ecological/Biological Integrity Benthos, Cause Unknown - Impaired Benthos**. The benthic community normally expected in a healthy waterway is unhealthy, reduced, or absent, and the exact cause of the problem is unknown.

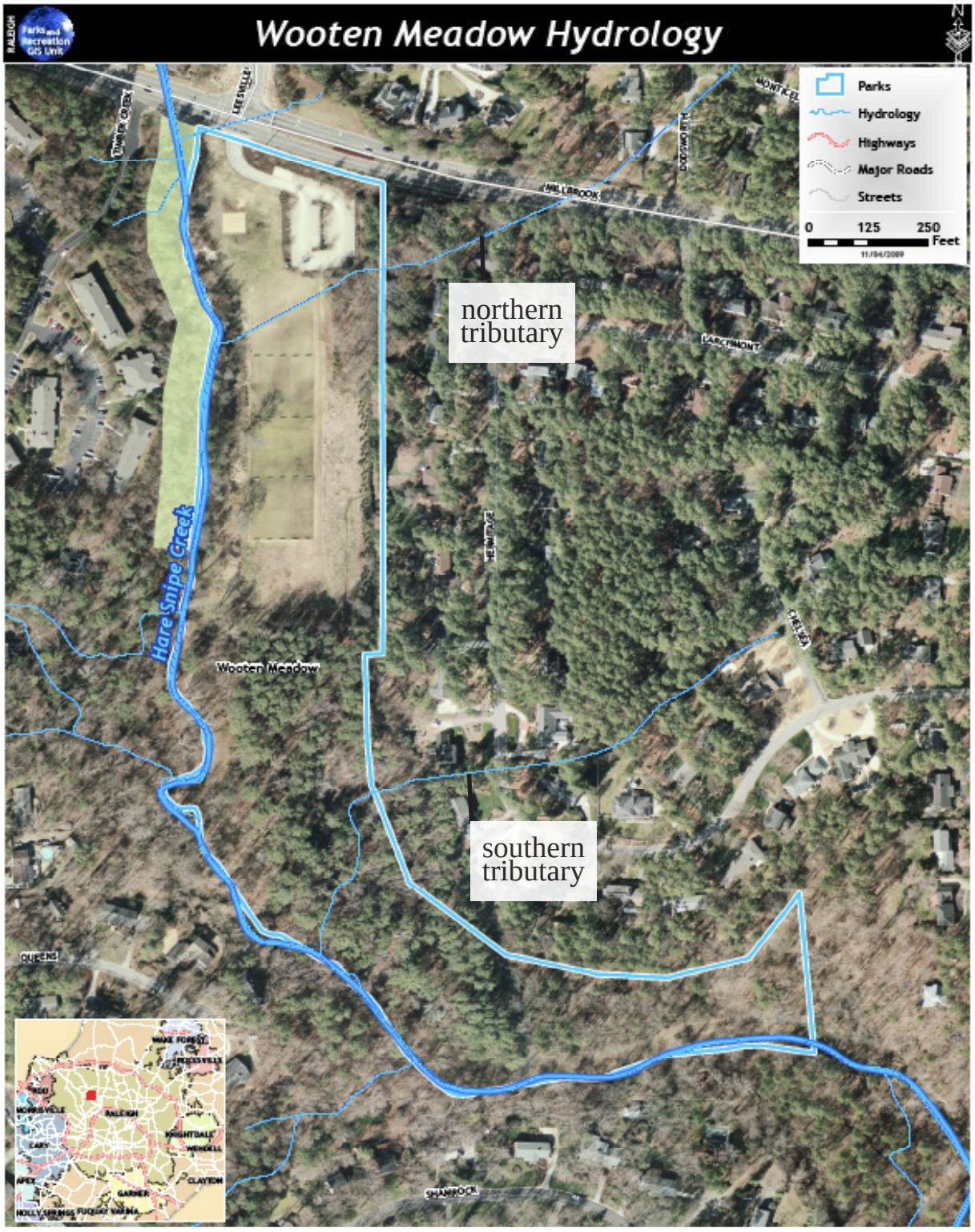
The benthic community involves aquatic organisms known as *benthos* which live on, in, or near the bottom of water bodies. Benthos include animals such as clams, snails, worms, crayfish, and the larvae of many aquatic insects (such as dragonflies, mayflies, stoneflies, caddisflies), primary producers (such as algae and aquatic plants), and decomposers (bacteria, fungi) are involved in the recycling of energy and essential nutrients. Some of the benthos spend part of their life cycle in other habitats, such as riparian uplands.

Large benthic animals are referred to as macroinvertebrates. They consume algae, coarse particulate matter (such as fallen leaves) and its associated fungi and bacteria, fine suspended organic matter, and prey organisms. Macroinvertebrates are an important part of the food supply for fish and other aquatic animals. Macroinvertebrates are often used as water quality indicators because they are sensitive to changes in chemical and physical conditions.

When the benthos community is impaired, the ecological and biological integrity of the entire system is impacted.


RALEIGH
Parks
Recreation
and Cultural
Resources
GIS Unit
Hare Snipe Drainage Basin
N
540
Strickland
CREEDMOOR RD
Baileywick
STRICKLAND RD
WESTGATE RD
Hare Snipe Creek
LEESVILLE RD
Lake
Lynn
Leesville
Lake
Lynn
LYNN RD
RAY RD
Hare Snipe Creek
Williams
LEAD MINE RD
Turkey Creek
W MILLBROOK RD
Wooten
Meadow
Shelley Lake
- Sertoma
Brookhaven
GLENWOOD AVE
50
70
Crabtree Creek
DURALEIGH RD
Drainage Basins
Wetlands
Parks
Greenways
Lakes and Ponds
Streams
Highways
Major Roads
Streets
0
1,300
2,600
Feet
6/24/2014

The main branch of Hare Snipe Creek is a perennial stream that flows along the western boundary of the park, with two first-order tributaries flowing across park property into Hare Snipe. Perennial streams have a well-defined channel that contains water year round under normal rainfall conditions. The tributary on the north side of the park is piped across the managed field, but is visible on the map below and discussed in detail on page 57. The southern tributary flows into Hare Snipe in the forested portion of the park. The main channel of Hare Snipe flows south, and then somewhat abruptly flows east about midway through the park, hence the odd shape of the park's south parcel. Many urban streams such as Hare Snipe are very "flashy", meaning water levels rise very quickly during rain events.



Hare Snipe creek is deeply entrenched and straight as it enters the north side of the park. Barbed wire fencing left over from when the property was a horse pasture, still runs along the east side of the creek, and is embedded in the trees in some places.

The main Hare Snipe Creek channel is quite picturesque, particularly along the southern end of the park where the topography on the west and south side of the creek is steep and the channel meanders.

Hare Snipe Creek has well developed riffle-pool-run complexes. Several riffles and rapids within the lower reaches of the creek mask the sound of road traffic. Natural exposed rock and wildflowers along the creek bank add stream features that are not overly common in Raleigh.

The stream bed substrate is a diverse mixture of pebbles, cobbletones and sand. Vegetation along portions of the creek bank is moderately diverse, discussed in more detail under the Flora Section.

Major stream bank failures occur in several locations along Hare Snipe Creek adjacent to park property. Streams in North Carolina are under the jurisdiction of NC DENR Division of Water Resources and the US Army Corps of Engineers, so the City of Raleigh has limited options for stream bank management even on park property. The western park property line runs generally down the center of the creek.

This large tree fell in September 2013, near the location of the bank failure shown in the top photo.

Tree root depth and density along Hare Snipe is unstable in some locations, sometimes leading to tree collapse, with large organic debris such as logs and tree limbs being deposited in the stream channel. Large piles of organic debris can lead to debris jams, which can impact stream bank stability, channel development, and flow.

Trash and other solid waste (often deposited in stream channels during surface flow from storm events) can contribute to debris jams.

Significant bank erosion occurs along the creek, particularly in steep slope areas.

Tributaries of Hare Snipe Creek

Two first order stream channels (tributaries of Hare Snipe Creek) cross park property (shown on the Hydrology Map on page 50). The northern tributary begins in the neighborhood north of Millbrook Road, flows through the woods east of the park, and then is piped across the majority of the managed field section of the park.

Northern tributary stream channel, eastern area of park property, before being piped across the managed field (photo taken near southeast corner of parking lot).

Drainage ditch/intermittent stream along center of horse pasture

Image of northern tributary above is from Phase 1 report, 1995

Current location of northern tributary pipe outlet

During the growing season, the visibility of the northern tributary pipe outlet is blocked.

The southern intermittent stream branch runs through the eastern sewer easement, then flows south and through the western sewer easement to join the main channel of Hare Snipe Creek. The majority of the park is within the floodplain of Hare Snipe Creek, and inundated areas are scattered throughout the Wooten Meadow property, particularly in winter months. The green plants visible in the photo above are invasive chinese privet, abundant along the eastern easement.

Southern intermittent tributary as it crosses the western sewer easement as a dry channel during the growing season, a characteristic of the stream's intermittent nature.

The riparian area around the southern tributary is particularly wet, and regularly has standing water. Plants growing near the tributary have adaptations to hydric conditions, such as epicormic sprouting, visible in the photo above.

Scouring, standing water and ephemeral flow channels occur throughout the park's riparian area, indicating the active nature of the Hare Snipe Creek floodplain.

Debris accumulation from strong stormwater flow is particularly strong in the northern portion of the forested area, where hydrology has been altered.

The southern portion of the park is more natural hydrologically. Winter inventory for salamanders is conducted in the ephemeral wet areas of the forest.

Wetland conditions are visible in the riparian zone of Hare Snipe Creek, particularly in the southwestern portion of the managed area of the park, nearest the Creek. Saturated conditions, hydric soils, obligate wetland plants, hummocks, and nesting Canada Geese occur in this area.

The red gate leading to the western sewer easement is visible in the upper right corner of the lower photo.

Natural hydrologic processes have been altered within the park, particularly on the northern parcel. Numerous artificial ditches from past agricultural land use, disturbance of riparian vegetation, and soil compaction all contribute to altered hydrology.

Drainage ditch in northern wooded area

Altered hydrology along eastern sewer easement

Groundwater

The location of the Wooten Meadow property appears to be situated within an area dominated by metamorphic rocks of the Raleigh Belt. The rocks at this general location would consist primarily of injected gneisses such as biotite gneiss and schist. The hydrogeological system in the area of the subject property includes both the surficial sediments and underlying bedrock. Groundwater in sediments is present in pores between individual sediment grains. In bedrock, groundwater is present predominantly in horizontal and subhorizontal unloading fractures, and in near, vertical stress fractures. Groundwater depths are variable and generally approach ground surface near streams and rivers. Based on the historical groundwater flow characteristics in this area, groundwater flow typically mirrors surface topography.

There is a significant groundwater seep near the southeastern property boundary, as well as groundwater at or near the surface in various locations throughout the floodplain. Because the majority of the park is underlain by hydric Chewacla soils, the water table can be close to the soil surface at least part of the year. Vegetation in the seep area includes lady fern, royal fern, lizard's tail.

Groundwater seep near southeast area of park

Flora Resources of Wooten Meadow Park

Flora inventory at Wooten Meadow began in 2009 and will be ongoing as staff time and resources allow. Species naming follows *Flora of the Southern and Mid-Atlantic States* by Alan S. Weakley, November 2012. A detailed plant list for the entire site is included in Appendix D. Diversity of native flora on this site is moderate to good, compared to other urban parks, despite the presence of invasives throughout the park.

Wooten Meadow includes a variety of forest types, including Piedmont Dry-Mesic Oak and Hardwood Forest, Dry-Mesic Oak Pine Forest, Piedmont Deciduous Mesic Forest, and Piedmont Bottomland Forest. Levee Forest is located on the deposits adjacent to the Hare Snipe Creek channel. River birch (*Betula nigra*) is common along the creek bank.

14.24 acres (of 20.5 total acres) on the property are underlain by hydric Chewacla soils. The Chewacla soil series are poorly drained and intermittently flooded. Bottomland Forest is located on the floodplain ridges and terraces of the creek. The floodplain canopy is dominated by a mix of flood-tolerant species, such as Sweet gum (*Liquidambar styraciflua*), American elm (*Ulmus americana*), Willow oak (*Quercus phellos*), Swamp chestnut oak (*Quercus michauxii*), Red maple (*Acer rubrum*), Black willow (*Salix nigra*), and Green ash (*Fraxinus pennsylvanica*). Some of the green ash are quite large, and will create temporary large canopy gaps if attacked by the incoming invasive pest Emerald Ash Borer (*Agrilus planipennis*). Understory trees include Northern spicebush (*Lindera benzoin*), Red chokeberry (*Aronia arbutifolia*), Musclewood (*Carpinus caroliniana*), and Possumhaw (*Ilex decidua*).

Bottomland Forests usually have a well developed herb layer. Unfortunately, much of the floodplain and adjacent upland forests are covered with invasive non-native English ivy (*Hedera helix*). Vegetation is moderately diverse, however many native species have just a few individual plants trying to maintain a foothold within an abundance of invasive plants.

Invasive English ivy carpets the ground and grows up the tree trunks in several areas of the park

The nothernmost section of the southern wooded parcel is a Coniferous Cultivated Plantation, consisting mostly of loblolly pine (*Pinus taeda*). The extent of pine throughout the park is visible on the Topography map on page 43. Pine seedlings are abundant in the area adjacent to the woodline, and are a favorite of beaver (see photo on page 77).

Forest canopy dominated by loblolly pine, facing south

Some of the pine trees are quite large.

The managed sewer easements on the western and eastern boundaries are maintained by mowing to control woody vegetation. Native herbaceous species within the easements include Ironweed (*Vernonia noveboracensis*), Green-headed coneflower (*Rudbeckia laciniata*), Cardinal flower (*Lobelia cardinalis*), Jumpseed (*Persicaria virginiana*), Giant cane (*Arundinaria gigantea*), Jewelweed (*Impatiens capensis*), Camphorweed (Pluchea *camphorata*), Seedbox (*Ludwigia alternifolia*), Water hoarhound (*Lycopus virginicus*), and many more. Portions of the easements are dominated by invasive plants such as Marsh dayflower (*Murdania keisak*) and Japanese stiltgrass (*Microstegium vimineum*).

Lateral sewer easement, fall 2012

There are two small forested areas in the park underlain by non-hydric soils. The steepest area along the northeast side of the property has Appling sandy loam with slopes of 10-15%. This forested area is a Piedmont Dry-Mesic Oak Hardwood Forest. Beech, oak and hickory trees are dominant on this hill.

Hardwood forest, northeast section of park, facing Millbrook Road

Oaks, beech, and hickories growing on hill with sandy loam soil

The steep southeastern area of the park is underlain by Wake Soils with 10-15 percent slopes. This area contains a few uncommon mountain laurel (*Kalmia latifolia*) and American witchhazel (*Hamamelis virginiana*).

Mature forest underlain by Wake soils in southeastern portion of park

Poison ivy (*Toxicodendron radicans*) occurs throughout the Wooten Meadow property, and though it can be a troublesome plant in public areas where it comes into contactwith humans, poison ivy is a native plant that is beneficial to wildlife and has other conservation values. Removal of plants occuring on park or greenway property without permission is unlawful. Parks Maintenance staff make every effort to maintain public areas of developed parks to control poison ivy and other nuisances.

Rare and Protected Plant Species of North Carolina

The North Carolina Natural Heritage Program (NCNHP), North Carolina Plant Conservation Program (NCPCP), and United States Fish and Wildlife Service (USFWS) work cooperatively to ensure the survival of North Carolina's diverse flora. The City of Raleigh works with these partner agencies to inventory and conserve rare plants, important natural areas, and rare species habitats within the City of Raleigh.

The NCNHP maintains a List of Rare Plant Species for plant taxa native to North Carolina that are officially recognized by federal or state agencies as protected or otherwise rare. Some plants are rare but are not under any legal protection.

Plants are evaluated by both a federal status and a state status. Federally listed species are protected by the *Endangered Species Act of 1973*. US Fish and Wildlife is the federal agency responsible for listing and protection of endangered and threatened species. Federally protected plants are categorized as *Endangered*, *Threatened*, *Candidate*, or *Federal Species of Concern*. The Endangered Species Act requires that any action likely to adversely affect a federally protected species is subject to review by USFWS.

The NC Plant Conservation Program (NCPCP), a unit of the NC Department of Agriculture and Consumer Services, is the state agency responsible for listing and protection of North Carolina's endangered and threatened plants. State listed species are protected under provisions of the *North Carolina Plant Protection and Conservation Act of 1979*. Removal of listed plants from the wild is illegal without appropriate permits from the NCPCP.

State listed plant categories are *Endangered* (E), *Threatened* (T), *Candidate* (C), *Special Concern* (SC), *Significantly Rare* (SR), and *Watch* (W). Significantly Rare and Watch species currently have no legal protection, and the designation is used to convey information about the species rarity in the state or region.

Additionally, plant species may be locally uncommon within the City of Raleigh Parks, Greenways, and Open Space system. City of Raleigh staff, partner agencies, and local Subject Matter Experts assist with inventory and monitoring of these species.

Federally Listed Plants in Wake County

Michaux sumac (*Rhus michauxii*) is a federally protected plant known to occur in Wake County and listed as *Endangered*. Michaux sumac grows in sandy or rocky open woods on basic soils. City of Raleigh staff has conducted a thorough survey for Michaux sumac on the Wooten Meadow property. No specimens of this endangered plant were found, and the Wooten Meadow property does not appear to support the type of habitat preferred by Michaux sumac.

The USFWS lists the following plants known to occur in Wake County as Federal Species of Concern (FSC): Bog Spicebush (*Lindera subcoriacea*), Virginia least trillium (*Trillium pusillum var. virginianum*), and Carolina Birdsfoot-trefoil (*Acmispon helleri*). Sweet Pinesap (*Monotropis odorata*) and Grassleaf Arrowhead (*Sagittaria weatherbiana*) occured historically in Wake County. None of these plant species are likely to have suitable conditions available on the Wooten Meadow property, and no specimens of these plants have been observed on the site.

State Listed Plants in Wake County

Plants from the *List of Rare Plant Species of North Carolina 2012 (revised February 27, 2013)* that occur in Wake County in known locations, and plants with historic records in Wake County that have not been documented in 20 years (with some expectation of rediscovery), are tallied below. The tally does not include rare plants that are not well known and do not yet have adequate inventory and may occur in Wake County, and rare plants with known populations in nearby or adjacent counties that may also occur in Wake County.

Twelve plant species listed as **Endangered** in the State of North Carolina are found in Wake County (six of the twelve are historic records). Piedmont quillwort (*Isoetes piedmontana*), Swamp saxifrage (*Micranthes pensylvanica*), Michaux's sumac (*Rhus michauxii* which is also federally endangered), Low Wild-petunia (*Ruellia humilis*), Veined skullcap (*Scutellaria nervosa*), and Virginia least trillium (*Trillium pusillum var. virginianum*, a Federal Species of Concern) are all state Endangered plants with known populations in Wake County. No specimens of these plants have been observed at Wooten Meadow Park.

Nine plant species liste as **Threatened** in North Carolina are found in Wake County (two are historic records). Douglass's Bittercress (*Cardamine douglassii*), Granite flatsedge (*Cyperus granitophilus*), Indian psychic (*Gillenia stipulata*), Bigleaf magnolia (*Magnolia macrophylla*), Small's portulaca (*Portulaca smallii*), Virginia spiderwort (*Tradescantia virginiana*), and Buffalo Clover (*Trifolium reflexum*) are all state Threatened plants with known populations in Wake County. No specimens of these plants have been observed at Wooten Meadow Park. There are records of Indian psychic occuring within the vicinity of Wooten Meadow, however these records have a low mapping accuracy. The habitat for Indian psychic is Piedmont forests and open woods, mainly over mafic rocks.

Four plant species listed as **Special Concern** in North Carolina are found in Wake County (two are historic records). Carolina Birdsfoot-trefoil (*Acmispon helleri*, a Federal Species of Concern) and Appalachian Golden-banner (*Thermopsis mollis*) are both state species of Special Concern with known populations in Wake County. There is a record of Appalachian Golden-banner within one mile of the Wooten Meadow property, but the record is of low or very low mapping accuracy and has not been mapped directly on the property, but within the vicinity. Appalachian Golden-banner is a yellow spring-flowering legume that grows on dry slopes and ridges.

Twenty-one plant species listed as **Significantly Rare** in North Carolina are found in Wake County (six are historic records). Water purslane (*Didiplis diandra),* Large Witch-alder (*Fothergilla major*), Multiflowered mud-plantain *(Heteranthera multiflora*), Earle's blazing star (*Liatris squarrulosa*), Bog Spicebush (*Lindera subcoriacea, also* a Federal Species of Concern), Glade milkvine (*Matelea decipiens*), Sadie Price's Yellow Wood Sorrel (*Oxalis priceae*), Horsetail Crown Grass (*Paspalum fluitans*), Seneca snakeroot (*Polygala senega*), Heller's Rabbit-Tobacco (*Pseudognaphalium helleri*), and Virginia mountain-mint (*Pycnanthemum virginianum*) are all Significantly Rare plants with known populations in Wake County. No specimens of these plants have been observed at Wooten Meadow Park.

Fifty-eight plant species currently listed on the *North Carolina Plant Watch List* are found in Wake County (Twenty-four are historic records). To date, the only **Watch** species observed at Wooten Meadow is Sweet Bay (*Magnolia virginiana*). Sweet Bay is in *Watch Category 6 - Regionally Rare*. Regionally Rare Watch plants include species which are rare in one region of North Carolina, and uncommon to abundant in another region. Regionally rare plant populations are important for protection of genetic variation and long term viability of species. Sweet Bay is common in the NC Coastal Plain region, but uncommon in the Piedmont.

Summary of Rare and Protected Plant Species Occuring at or near Wooten Meadow Park (according to both the NHP List of Rare Plants and the City of Raleigh Inventory)

Sweet Bay, Umbrella Magnolia, Mountain Laurel

Tree Conservation Ordinance: The City of Raleigh Tree Conservation Ordinance is designed to protect trees during pre-development of a site by defining allowable tree removal activity. During site development tree preservation will be required through the establishment and protection of Tree Conservation Areas (TCAs). At present, four types of Primary TCAs must be identified and established wherever they occur on a site: tree protection areas required in Resource Management Districts and conditional-use zoning or re-zoning tree protection areas, Champion Trees, Neuse River Riparian Buffer Zone 2, and slopes greater than or equal to 45% adjacent to or within floodways.

The following tree removals and disturbance are not allowed without a Tree Conservation Permit:

- Champion trees
- Trees in Resource Management Districts
- Trees in natural protective yards
- Timber harvests
- Trees related to installation of a use, structure, driveway, or facility improvement
- Trees related to a subdivision or a site plan
- More than 15 trees on parcels greater than or equal to 2 acres in size
- Healthy trees greater than or equal to ten inches dbh within the following protected buffer areas: 50 feet of a thoroughfare, 32 feet of a vacant property line, 65 feet of any other property line including non-thoroughfare roadways

At the time of this report, TCA requirements for Wooten Meadow Park (zoned R-10 and) will be 10% of acres, or approximately 2 acres. TCAs are often not dedicated until the site development phase and will need to be re-evaluated at that time.

Control and removal of non-native invasive tree species to promote the vigor and diversity of native trees is appropriate under “Urban Forestry” practices within the context of the Tree Conservation Ordinance.

Invasive Plants

A variety of invasive plants occur throughout the Wooten Meadow property. Some of the invasives are typical urban landscape plants that spread through birds or other wildlife dispersing the seed nearby, such as Leatherleaf Mahonia (Mahonia bealei), Heavenly Bamboo (Nandina species), Mimosa (Albizia julibrissin), and Japanese Holly (Ilex crenata). Some invasive plants have spread to the park site from adjacent property by runners, spreading root systems, or yard waste dumping, such as Periwinkle (Vinca minor), Chinese Wisteria (Wisteria sinensis), Day lilies (Hemerocallis), Monkeygrass (Liriope), and English Ivy (Hedera helix).

Yard waste dumping can introduce invasive plants, pests, and plant diseases into the forest.

English ivy is quite extensive in the park and on adjacent property, and is one of the most problematic and challenging invasive plants in forested ecosystems. In some cases, English ivy was planted with gusto by garden clubs and plant enthusiasts in the 1960s and 70s.

English ivy spreads initially along the ground - outcompeting almost all other ground vegetation and inhibiting tree regeneration. as it spreads it growsup tree trunks - occupying both the midstory and eventually even the upper canopy layer. As it grows vertically, it also starts to produce seed, which is eaten by birds and then spreads readily to new areas. English ivy will eventually destroy the trees it grows on.

Hand removal of ivy from tree trunks is possible but time consuming and is done by volunteer groups in high value forests or with high value yard trees. It needs to be removed from tree trunks on a regular basis, as it will continue to thrive on the forest floor.

Some steep highly eroding soils, such as those along some of the steepest Creek Banks along Hare Snipe must be carefully evaluated for soil stability and vegetation. English ivy can provide valuable soil stabilization.

Invasive plant control is complex, costly, and time consuming, especially where invasives are well established with avery urban, active stream system that createsregular site disturbance andbrings in a continual source of invasive plants.

Invasive plant control at Wooten Meadow requires careful evaluation in the context of other park and greenway sites, presence of rare plants or plant communities, high value trees, steep slope stabilization, visibility and public safety, etc.

Invasive plant control is most effective when initiated early, for example if there are just a few individual plants.

At Wooten Meadow, English ivy should be removed from cultural or historical site features as long as they will not be damaged by invasive plant removal efforts.

Wildlife and Habitat of Wooten Meadow Park

Wildlife using Wooten Meadow are typical urban wildlife. Habitat consists of upland forest, floodplain forest and the aquatic habitat and riparian corridor of Hare Snipe Creek. Pollinator habitat is available within the sewer easements and in the northern meadow. The park and greenway provide an important wildlife habitat corridor from Lake Lynn to Crabtree Creek and beyond.

Wildlife sightings and signs observed during site investigations are recorded in Appendix E. Water fowl have been observed in the standing water of the floodplain, woodpeckers have been observed utilizing standing dead trees, and white tailed deer have been observed throughout the property. Raccoon tracks are abundant in the stream area. Snakes and a variety of amphibians have been observed.

Beaver

Beaver inhabit various areas within the Hare Snipe Creek watershed, including the Wooten Meadow property. Beaver imapacts to the Wooten Meadow site are generally minor, but have occasionally been more extreme. Beavers are found where preferred foods are in good supply and there is a year-round source of water. They live along rivers and streams, in lakes, marshes and even roadside ditches that have adequate year-round water flow. Beavers living on water bodies such as large rivers or lakes that maintain a constant water level, do not build dams. Beavers can manipulate their own environment to increase food abundance and improve access to their favorite food. In areas where deep, calm water is not available beavers can build dams across streams to slow the flow of water and create a pond behind the dam. Beavers build dams to create deep water for access to their food supply, protection from predators, and to provide underwater entrances to their den.

Downed wood provides important wildlife habitat and is abundant in the forest and within Hare Snipe Creek.

Beaver are large aquatic mammals that live in colonies of around 4-8 related beavers. They live in a variety of aquatic habitats, and have a relatively long life span, typically living 10 years in the wild. They are territorial and resist new beaver moving into the area. Young beavers are commonly displaced from the colony shortly after they become mature, at about 2 yrs old. They often move to another area to begin a new colony.

Beaver were trapped to near extinction by the late 1890s to meet the demand for beaver pelts. From 1939 to the 1950s, the predecessor of the NC Wildlife Resource Commission initiated efforts to restock and manage beaver in North Carolina to meet the continued public demand. Beaver were eventually re-established throughout North Carolina and are now common in many areas, including urban settings.

Bank dens

Beaver are most active at night, from late afternoon to shortly after daybreak, but can also be seen during the day. They live in lodges or bank dens, where they sleep, raise their young, and sometimes store food. Both bank dens and lodges consist of one or more underwater entrances, a feeding area, and a dry nest den. It can be difficult to locate bank dens. They may be covered with mud, sticks, and rocks, and may have tree limbs, branch cuttings and plant debris around them. Bank dens may be located under stumps or logs. Beaver repair minor den cave-ins when part of the bank collapses by piling sticks and mud on top of the hole. Beavers often have a series of dens in case one den becomes unsuitable. Beavers establish runs or trails which they habitually use while traveling from their shelter to the dam or feeding areas. They also create slides where they enter and leave the water. Slides are 15 to 20 inches wide, at right angles to the shoreline, and have a slicked down or muddy appearance.

Beaver Feeding Habits

The size and species of trees the beaver cuts is highly variable. Beavers don't actually eat wood, only the cambium, a soft tissue close to the tree surface where new wood and bark grow. They especially like the cambium from fast-growing trees such as pine, sweetgum, and poplar. When beaver fell a tree, they will first eat the bark and buds off, then cut up branches and any sections of the trunk they can carry for use in their dams or lodges. Sometimes beaver will just strip the bark off a standing tree. If they remove bark from the entire circumference of the tree trunk, the tree becomes girdled and will die. Some beaver will girdle large pines and sweetgums because they like the resin that seeps out of the girdled area.

Beavers winter diet consists mainly of woody material such as shrubs, saplings, and branches. They may create an underwater food cache of edible branches near their winter den. Beaver food caches look like brush piles located in the water but branches will have the bark chewed off. Preferred winter foods include sweet gum, ash, willows, poplar, pines and fruit trees.

During spring and summer, beavers depend less on trees and instead relish aquatic plants and lush tender green shoots of terrestrial plants. Some of their favorite foods include water lily tubers, clover, and apples but they will eat leaves, twigs, and bark of most plant species that occur near water.

Musclewood (*Carpinus caroliniana*) felled by beaver along Hare Snipe Creek in September 2013. Notice the large girdled tree on the opposite creek bank.

Colony Expansion

Beaver are like many aquatic creatures, quick and agile in the water, but clumsy on land. Beaver prefer to find food close to their habitat, so they can quickly get into the water if predators or threats appear. Beaver will extend their foraging as food supplies dwindle, but longer trips increase the beaver's exposure to predators, and the time it takes to reach the food source. Beaver will travel 300 feet or more from a pond or stream to forage for food. Foraging levels are most intense during late fall as beaver prepare for winter. Beavers will use and expand a pond area until the food supplies are exhausted, usually up to ten years or more. When an area's food supply has been exhausted, the beaver will migrate to a new home. They will also look for new areas with suitable habitat as a beaver colony grows larger. Once beavers have become abundant in a watershed, periodic reinvasions of suitable aquatic habitat can be expected to occur.

Benefits of Beaver

Beaver create beneficial wildlife habitat for a variety of species, including waterfowl, shorebirds, reptiles, amphibians, fish, and mammals such as the river otter. The wetlands created by beaver provide foraging areas for bats, owls and hawks. Flooding and large tree girdling creates standing dead trees which are important for cavity nesters and insectivores. Fallen logs create habitat for reptiles and amphibians. To enhance wildlife benefits, bat boxes can be placed close to rivers, lakes, ponds, marshes, or other permanent water sources where insects are abundant. Beaver wetlands improve water quality by absorbing dissolved nutrients, processing organic wastes, and detoxifying runoff such as heavy metals and pesticides. Beaver ponds act as a reservoir to impound and store water, therefore reducing erosion and down stream flooding. The stored water is released slowly, to better maintain stream flows during droughts. Beaver ponds also recharge our drinking water aquifers and stabilize the water table. Beaver wetlands add diversity to the landscape, and provide human recreation and education opportunities.

Conflicts/ Beaver Damage

In some cases the beaver ponds have been established for many years. In other cases, the impacts are new and occur where there is existing human use of an area, such as greenway trails. Beaver damage to humans is primarily a result of dam building, flooding, and tree cutting. Damage includes timber loss, loss of landscape plants, crop loss, flooded roads, houses and property, destroyed bridges and drain pipes. Dam building and the subsequent flooding of new areas can be the biggest complaint. Most vegetation can survive longer periods of flooding in winter, but trees and plants can die within two weeks in spring or summer.

Small pine trees on the Wooten Meadow property were chewed by beaver in February 2010. Pine trees regenerate very quickly and are one of the first tree species to grow in an abandoned field.

Beaver Damage Prevention and Control Methods

Once beaver colonies become well established over a large area, achieving control is difficult and costly. State regulations in NC determine that it is unlawful to open or damage a beaver lodge without a permit from the NC Wildlife Resources Commission. Landowners whose property is or has been damaged by beaver may take beaver on their property anytime by any lawful method without obtaining a permit. It is unlawful to relocate beaver to a new location.

Exclusion techniques include fencing small critical areas such as culverts, drains or other structures, and installing barriers around important trees or landscape areas.

Habitat Modification

1. Continually destroying dams will sometimes cause a colony or beavers to move to another site. Destruction of beaver dams alone does not make the area unattractive for beavers. If you destroy the dam without eliminating the beaver they will rebuild, often starting the same day. They will use some new trees for repairs and this may accelerate the damage you were trying to stop in the first place. Removal of a beaver dam that has been in place for more then a few years will release a sudden surge of water and silt downstream. The breaching of a beaver dam and the subsequent release of a large volume of water, silt and debris may have undesirable impacts. A flood event could occur in the area, or the released debris could plug road culverts. Complete removal of a large dam may require precautions to ensure public safety and the protection of wildlife habitat and private property downstream.

2. Install a structural device to maintain a lower pond level. Levelers, or Flow devices are systems that prevent or control beaver damming activity to control beaver-related flooding problems. After placement of the flow device, check the beaver pond drains at least once a month to ensure the desired water levels are maintained. Always leave at least 1/3 to ½ of the pond undrained during drawdown, as overdraining may cause the beaver to seek new areas. Drain ponds to a level of 1 to 2 feet annually to promote natural emergent vegetation and productive moist-soil areas. Remove drains and allow water to stand from November to February when the trees are dormant, to provide feeding and resting areas for wintering ducks. Delay pond drawdowns until after July 1 in ponds with nesting wood ducks.

Trapping is one of the most common control techniques used in North Carolina. Non-target wildlife can sustain damage caused by Conibear traps, the type of traps typically used to trap beaver in North Carolina.

Beaver dam in Hare Snipe Creek, north side of Wooten Meadow Park, September 2013

The beaver dam shown on the previous page blocked stream flow, causing Hare Snipe Creek to flow over its banks during a large storm event. Portions of the creek bank collapsed, causing significant bank failure on the northwest park boundary.

The photo above shows a new hole in the ground in the western sewer easement near the beaver dam. The hole may be a beaver bank den that collapsed after the large storm event and subsequent creek bank failure shown above.

Vegetation in the riparian buffer is flattened and indicates the direction of surface water flow after beavers built a dam in Hare Snipe Creek.

Western easement gate in Sept 2013 after damage from beaver dam in the Creek.

Rare and Protected Animal Species of North Carolina

North Carolina Natural Heritage Program (NCNHP), North Carolina Wildlife Resources Commission (NCWRC), and Scientific Councils consisting of biologists with considerable knowledge of mammals, birds, reptiles and amphibians, freshwater fishes, mollusks, and crustaceans, work cooperatively to develop and maintain the Natural Heritage Program *List of Rare Animal Species of North Carolina*. Animal species on the list are endangered, threatened, or otherwise occur in small or unknown numbers in North Carolina. The City of Raleigh works with the NCNHP and the NCWRC to evaluate park and greenway projects for potential impacts to listed animals or their habitats.

The NCNHP maintains the *List of Rare Animal Species of North Carolina* to provide a tool for determining priority natural areas and animals for protection, determining priorities for inventory, and for environmental assessment and land management purposes. Updates to the rare species list occur on a regular basis.

Federally listed animal species are protected by the *Endangered Species Act of 1973*, and are under the jurisdiction of the US Fish and Wildlife Service (USFWS). Federal Status categories are Endangered, Threatened, Candidate, and Federal Species of Concern. The Endangered Species Act requires that any action likely to adversely affect a federally protected species is subject to review by USFWS.

State listed animal species are protected by state law through the *1987 General Statute, Article 25, Chapter 113 Endangered and Threatened Wildlife and Wildlife Species of Special Concern*, under the jurisdiction of the North Carolina Wildlife Resources Commission (NCWRC). State Status categories are Endangered (E), Threatened (T), and Special Concern (SC) species of vertebrates (mammals, birds, reptiles, amphibians, and freshwater fishes), and invertebrates (mollusks and crustaceans).

NCNHP also collects data for rare species under the categories of Significantly Rare (SR) and Watch List (W). The majority of these species receive no special legal protection, and the designation is used to convey information about the species rarity in the region.

State law does not provide formal protection of invertebrate groups other than mollusks and crustaceans, however the Natural Heritage Program List of Rare Animal Species does track other invertebrate groups under the Significantly Rare (SR) and the Watch List (W) category, such as butterflies, dragonflies, and macro-invertebrates often used as indicators of water quality. Certain categories of invertebrates are no longer tracked by NCNHP due to lack of data and scarcity of biologists working with these groups to provide the data needed to update the lists.

Animal species may also be locally uncommon within the City of Raleigh Parks, Greenways, and Open Space system. City of Raleigh Staff, partner agencies such as Audubon, and local Subject Matter Experts assist with inventory and monitoring of locally uncommon species.

Federally Listed Animal Species in Wake County

Currently, only one animal occuring in Wake County is federally protected as endangered through the *Endangered Species Act of 1973*: Dwarf wedgemussel (*Alasmidonta heterodon*). The Endangered Species Act requires that any action likely to adversely affect a federally protected species is subject to review by USFWS.

The Dwarf wedgemussel is listed as federally *endangered* and has an *endangered* state status in North Carolina. The Dwarf wedgemussel is known to occur in the Neuse River basin, inhabiting large rivers to small streams. In the southern portion of its range it is often found buried under logs or root mats in shallow water (USFWS 1993). It is unknown whether Dwarf wedgemussel may occur on the Wooten Meadow property, and additional investigation is needed. The NCNHP has no records of known populations of the Dwarf wedgemussel on the property.

Historic Records of Federally Endangered Species

Historic Records have generally not been documented in Wake County in over 20 years.

The Red-cockaded woodpecker (*Picoides borealis*) occured historically in Wake County, and is listed as federally *endangered* with an *endangered* state status in North Carolina. The Red-cockaded woodpecker is found in open, old-growth pine stands greater than sixty years old. No Red-cockaded woodpeckers or their cavity trees were observed during field investigations of the Wooten Meadow property. The NCNHP has no records of known populations of this species within a one mile radius of the site. Development of the park is not likely to adversely affect the Red-cockaded woodpecker. The *List of the Rare Animal Species of North Carolina 2012* also lists the American Burying Beetle (*Nicrophorus americanus*) as federally endangered, with a historical occurence in Wake County.

The USFWS lists approximately eleven Federal Species of Concern (FSC) in Wake County. A table is included listing the habitat requirements of the species, and whether suitable habitat for is available on the Wooten Meadow property. At least three of the species are historic records in Wake County, with some expectation of rediscovery.

	Habitat Requirements	**Habitat available at Wooten Meadow?**
Bachman's sparrow *Aimophila aestivalis*	**Historic Record:** Prefer longleaf pine woodlands with grassy areas, particularly those that have been burned recently; 'Special Concern' in North Carolina	No
Carolina darter **Etheostoma collis lepidinion**	Small to moderate sized streams with low current velocity, preferring substrates of mud, sand and sometimes bedrock; tolerant of fine sediments covering the substrate; 'Special Concern' in North Carolina	possible but unlikely
Carolina madtom *Noturus furiosus*	**Historic Record:** Occupies relatively larger streams that flow into the Neuse and Tar rivers; commonly seen in mussel shells, under logs and rocks, in piles of leaves and sticks; 'Threatened' in North Carolina	unlikely
Roanoke bass **Ambloplites cavifrons**	Creeks to medium rivers with rock, gravel, sand and silt substrates	unlikely
Southeastern myotis *Myotis austroparius*	**Historic Record:** Roost in caves or abandoned buildings with standing water and forage over open water; Can also roost in hollow trees	unlikely
Southern hognose snake **Heterodon simus**	Open xeric areas with well-drained sandy soils, and river floodplains	unlikely
Atlantic pigtoe **Fusconaia masoni**	Inhabits mostly medium to large streams with moderate gradients, clean fast water, and sand or gravel bed under riffles	unlikely
Diana fritillary **Speyeria diana**	Breed in deciduous or mixed woods; feed in grasslands and shrub lands	possible but unlikely
Green floater **Lasmigona subviridis**	Small to medium freshwater streams with slow current gravel and sand substrates, in water depths of one to four feet, in the Neuse River Basin	possible but unlikely
Yellow lance **Elliptio lanceolata**	Freshwater streams and rivers with clean coarse to medium sized sandy substrates, rocks, and in mud in slack water areas of Neuse River Basin	possible but unlikely

Add Septima's clubtail

State Listed Animal Species in Wake County

Animals from the *Natural Heritage Program List of the Rare Animal Species of North Carolina 2012 (revised February 27, 2013)* that occur in Wake County in known locations, and animals with historic records in Wake County that have not been documented in 20 years (with some expectation of rediscovery), are tallied below. The tally does not include rare animals that are not well known and do not yet have adequate inventory and may occur in Wake County, and rare species with known populations in nearby or adjacent counties that may also occur in Wake County.

Five animal species listed as state **Endangered** in North Carolina are found in Wake County (one of the five is a historic record). Four Freshwater Bivalves that occur in Wake County are State Endangered: Dwarf Wedgemussel, Yellow Lance, Atlantic Pigtoe, and Green Floater. The Red-cockaded woodpecker has a State Status of Endangered, with a historical occurence in Wake County.

Approximately eight animal species listed as state **Threatened** in North Carolina are found in Wake County (one is a historic record). The Bald Eagle (*Haliaeetus leucocephalus*), although delisted from the Federal Endangered Species Act, is still threatened in North Carolina. The Eastern Tiger Salamander (*Ambystoma tigrinum*) and the Least Brook Lamprey (*Lampetra aepyptera*), along with four Freshwater Bivalves (Triangle Floater, Roanoke Slabshell, Eastern Lampmussel, Creeper) are Threatened in North Carolina. There is also a Historic record for Carolina Madtom (*Noturus furiosus*) in Wake County. There is a record of the freshwater bivalve Creeper (*Strophitus undulatus*) within one mile of the Wooten Meadow property, but this record has a low or very low mapping accuracy.

Nine animal species listed as **Special Concern** in North Carolina are found in Wake County, including the Star-nosed Mole (*Condylura cristata*), North Carolina Spiny Crayfish (*Orconectes carolinensis*) and Neuse River Waterdog (*Necturus lewisi*). The freshwater fish Carolina Darter and Southern Hognose Snake are listed as Special Concern at both the State and Federal level, as are two historically recorded Wake County species, the Southeastern Myostis Bat and Bachman's Sparrow (see chart on page 77).

Two animal species of Special Concern in North Carolina do still occur in Wake County, and both have historical records on or within the vicinity of the Wooten Meadow Property. The Four-toed Salamander (*Hemidactylium scutatum*) lives in forests surrounding marshes and swamps and temporary bodies of water that are free of fish. They live mostly underground and only move towards water during breeding season. There is a historic record for the Four-toed salamander (*Hemidactylium scutatum*) occuring within one mile of the Wooten Meadow property.

There is also a historic record within the park boundaries for a freshwater bivalve or "mussel" Notched Rainbow (*Villosa constricta*), in the northern part of the tract in Hare Snipe Creek. However, this species has not been observed since 1951. The Notched Rainbow is found in riffles, runs, and pools of streams and large rivers. It prefers sand or gravel substrates and tolerates only very clean high-quality habitat. Like most mussel species, the Notched Rainbow is sensitive to pollution, sedimentation, low oxygen conditions, and stream channel modifications, and is vulnerable throughout its range.

There are at least thirteen animal species found in Wake County that are listed as **Significantly Rare** in North Carolina (three are historic records, with some anticipation of rediscovery). They include the Tricolored Bat, Warbling Vireo, Slender Glass Lizard, Roanoke Bass, a stonefly called Vernal Stone, a caddisfly, two dragonflies, and a tiger moth. Historic records exist for the Northern Myotis bat, a moth, and a beetle. The Significantly Rare Carolina Ladle Crayfish (*Cambarus davidi*) has a record of occurrence within one mile of the Wooten Meadow property, however the record has low mapping accuracy. The Carolina Ladle Crayfish is endemic to North Carolina, and is only found in the Neuse River and Cape Fear River drainages. It inhabits intermittent streams, seepages, springs and burrows. Population and locality data for the Carolina Ladle Crayfish is insufficient, however new occurrences are being discovered continually.

Animal species on the **Watch List** of the *Natural Heritage Program List of the Rare Animal Species of North Carolina 2012* are rare or uncommon, are not well-studied, or are otherwise threatened with serious decline. An animal may be on the Watch List rather than the main *List of Rare Species* due to lack of adequate data on historic or present extent in North Carolina, especially for invertebrates. Some Watch List species are known to be rare or uncommon, but may or may not be declining. Others are not rare yet, but are undergoing significant loss or disturbance of their habitats. The NCNHP requests information about the Watch List animal species to clarify their status and reclassify them if appropriate. Counties of known occurrence are listed for many animal groups, but not yet listed for others; updates are expected for all Watch List species in 2014. Birds on the Watch List include the Loggerhead Shrike (*Lanius ludovicianus*) previously listed as Special Concern, and the American Kestrel (*Falco sparverius*). Mammals include the Hoary Bat, Seminole Bat, Long-tailed Weasel, and Eastern Fox Squirrel. Reptiles include the Smooth Earth Snake (*Virginia valeriae*).

No specimens of rare or protected animal species from either the *List of Rare Species* or the Watch List have been observed on the Wooten Meadow property. Natural resources inventory throughout the City of Raleigh park, greenway and open space system is ongoing, and utilizes partners such as Audubon, NCNHP, USFWS, and other partner agencies and Subject Matter Experts. The inventory and database of animals observed at Wooten Meadow and other City of Raleigh property will be updated as information is collected.

Wooten Meadow Park is located within a sub-watershed that contains fish or mussels listed with the state of North Carolina as Priority Species in the Wildlife Action Plan. Priority Species are species that are declining, threatened, endangered, and/or have limited data, indicating a need for survey, monitoring, and research attention in order to improve overall understanding of them. Staff from the *North Carolina Wildlife Resources Commission* assisted the City of Raleigh in developing a listing of Priority Species that may *potentially* occur on the property.

Invasive Fire ants

Imported fire ants constitute a hazard to both people and wildlife. Imported fire ants are found throughout much of eastern North Carolina and spread to new areas through transport of fire ant infested nursery stock and sod. Areas with fire ants are currently under quarantine by the U.S. Department of Agriculture and the North Carolina Department of Agriculture and Consumer Services. Quarantine is directed at nursery operators.

Fire ants appear to be present within the sewer easements of Wooten Meadow. Management of fire ants is complex and depends on the species of ant present. If fire ants are determined to be invasive imported fire ant species, the City should develop a plan and initiate fire ant management on the site before the park is developed, in order to reduce the spread of fire ants during site disturbance.

Appendices

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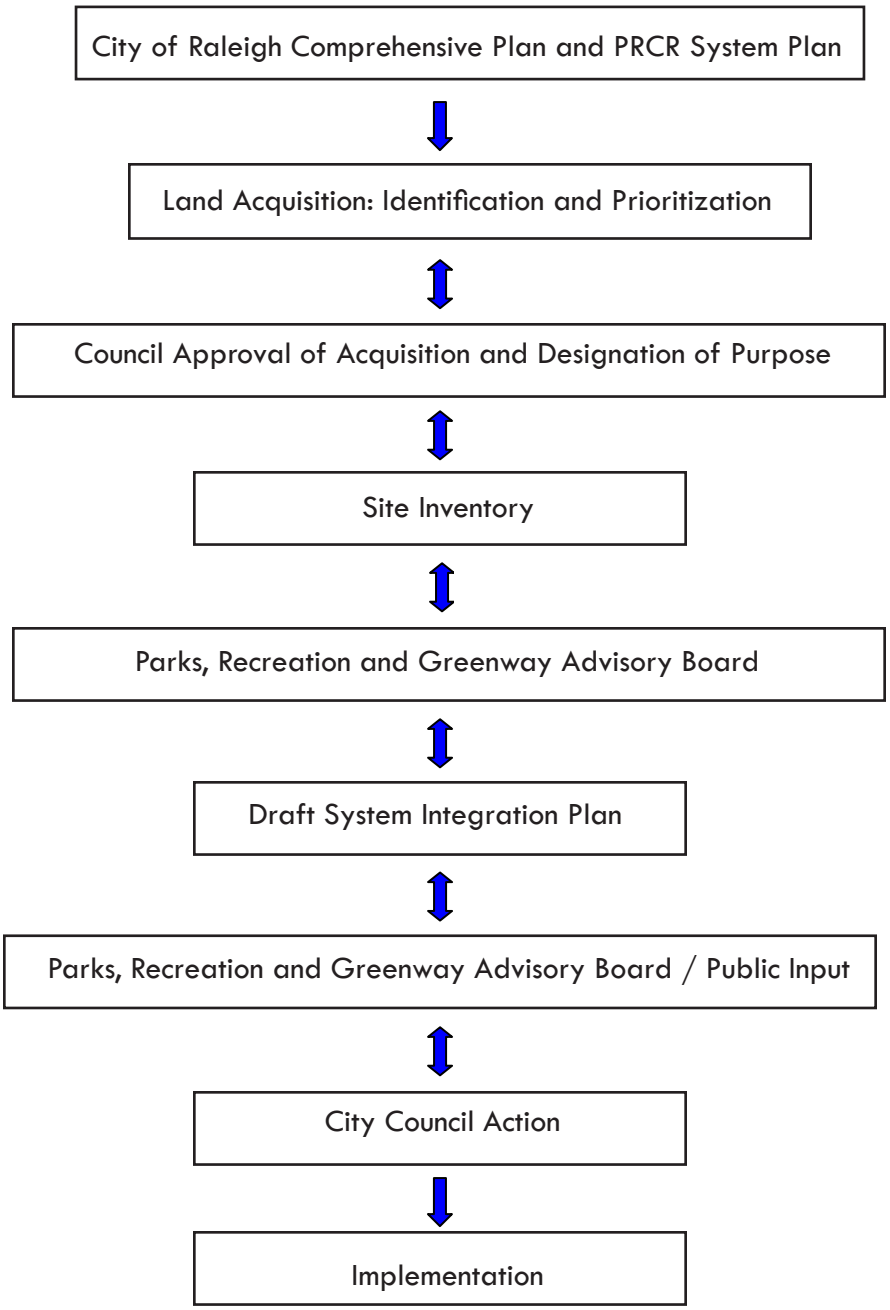
Appendix A

Wooten Meadow

System Integration Plan and Master Plan Process

Introduction: What is a System Integration Plan?

The System Integration Plan (SIP) is a sub-section of the overall City Park Master Planning process described in *City of Raleigh Council Resolution (2003) – 735*. The City of Raleigh Parks, Recreation, and Cultural Resources Department undertakes a public master plan process to help determine the specific elements that are desired in a particular park. The purpose of the site specific System Integration Plan is to develop a set of guidelines for the interim management of parkland prior to the initiation of a Master Plan. The SIP will document existing site conditions and constraints, establish the park's classification consistent with the Comprehensive Plan, and if applicable, any proposed special intent for the park. The SIP is not intended to restrict the Master Plan Process. A System Integration Plan Conceptual Flow Model demonstrates the interaction between the City of Raleigh Park Plan, acquisition of a park property, the City of Raleigh Parks staff, the public, City Council, and the Parks, Recreation and Greenway Advisory Board (PRGAB) in the SIP process.



Appendix B

Wooten Meadow

Phase 1 Environmental Assessment Report

Executive Summary

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5 Conclusions and Recommendations

Based on the review of the public record and interviews with various personnel and agencies, Aquaterra concludes the following for the subject property:

- Based on interviews and the historical aerial photography review, the property's only use has been farmland or horse pasture. The past aerial photography did not identify any surface staining, stressed vegetation, seeps, or depressions indicative of oils or hazardous substances releases or deposition.

- There were no local, state, or federal records indicating a release of hazardous substances or oils on the subject site or surrounding properties. Six LUST sites were identified by the database search, all located nearly 0.5 miles southwest of the subject site. These sites are separated from the subject site by a substantial drainage feature (Hare Snipe Creek) and would not likely be considered a significant environmental liability. There were no other environmental permits, violations, or enforcement actions found for the subject site or surrounding properties within the ASTM search radii.

Based upon the on-site reconnaissance and interviews, Aquaterra offers the following conclusions and recommendations:

- There was no storage or use of fuels, oils, or hazardous substances observed at the site.

- There were two discarded tires observed along the west property boundary. Aquaterra would recommend these be removed and properly disposed of in accordance with local, state, and federal regulations.

- We would recommend asbestos sampling of the roofing materials prior to any removal or demolition activities.

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Appendix C

City of Raleigh Nature Preserves Criteria

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Wooten Meadow Neighborhood Park
20.5 acres

OBJECTIVE CRITERIA: GIS Evaluation

1. Parcel contains species or natural communities that are endangered, threatened or rare as identified by the NC Natural Heritage Program (Element Occurrence (EO) with an Extant status and Estimated Accuracy of Medium or Higher).
No, there are no known current Element Occurrences on this property. In the Natural Heritage Program database, there are some Element Occurrences within the vicinity that are considered Historic Records or have a low mapping accuracy.

2. Parcel contains identified area or species within the Wake County Natural Areas Inventory as identified by the NC Natural Heritage Program (Significant Natural Heritage Area, or SNHA)
No, there are no Significant Natural Heritage Areas (SNHA) known to occur on this property.

3. Parcel is in close proximity to or provides connection between other properties that are currently protected.
Connectivity is limited to the Hare Snipe Creek corridor. The property is located in the Hare Snipe Creek floodplain. Portions of the floodplain receive some protection through the Neuse River Riparian Buffer Rules. City of Raleigh greenway property is located to the north of the property, but is intersected by a busy thoroughfare W. Millbrook Rd. There is a narrow greenway easement on the west side of Hare Snipe Creek along the northwest portion of the park.

4. Parcel contains appreciable water features in the landscape, such as wetlands, lakes, ponds, perennial stream systems, or floodplains.
Yes. Hare Snipe Creek is a dominant landscape feature in the park. Portions of two first order tributaries of Hare Snipe Creek traverse the park. The majority of the park is within the floodplain of Hare Snipe Creek. Areas of the floodplain are inundated, particularly during the winter months, creating ephemeral wetland conditions. Hydrology on the site has been altered. Adjacent parcels contain significant wetlands and groundwater seeps.

5. Parcel contains hydric soils which may be indicative of wetlands.
Yes. Approximately 75% (14.24 acres) of the Wooten park property is underlain by the hydric soil Chewacla (Cm). The hydric soil Chewacla, 0 to 2 percent slopes consist of nearly level somewhat poorly drained soils in the flood plains of streams. A seasonally high water table is at a depth of approximately 1.5 feet. Natural fertility and organic matter content are low, infiltration is good. Chewacla soils are very acidic. The surface layer is sandy loam to silt loam. Surface runoff is slow. The hazard of flooding is severe. The hazard of wetness is very severe. (Wake County Soil Survey, USGS)

6. Parcel contains steep slopes (> 8%) near streams or river.
Yes.

ADDITIONAL CRITERIA:

7. The property contains species that are uncommon as identified and mapped by staff.

The NC Natural Heritage Program maintains a List of Rare Plant Species for plants native to North Carolina that are officially recognized by federal or state agencies as protected or otherwise rare. Some plants are rare but are not under any legal protection. Additionally, plants may be locally uncommon within the City of Raleigh Parks, greenways and open space system. Consulting the most recent List of Rare Plant Species (updated February 27, 2013), the following rare plants occur at or near Wooten Meadow:
Sweet bay Magnolia virginiana
Umbrella magnolia Magnolia tripetala
Mountain laurel Kalmia latifolia

8. The property contains outstanding geologic characteristics, such as cave, waterfall, cliffs, granite outcrop, etc. as identified and mapped by staff.
The Hare Snipe Creek corridor contains some areas of exposed rock.

9. The conservation benefit outweighs the expense of stewarding the property due to location, maintenance of structures, resource management (invasives), liability, multiple owners, trespassing concerns, irreparable contamination, cost prohibitive cleanup, or other factors.
Considerations:
A significant portion of the park contains hydric soils and the active floodplain of Hare Snipe Creek. This park plays an important role in stormwater management. The Hare Snipe Creek corridor does provide wildlife habitat.
Invasive species are found on much of the property. Invasive English ivy (Hedera helix) is abundant on several portions of the site, carpeting the ground and growing up the trees. Native vegetation is moderately diverse, however many native species have just a few individual plants trying to maintain a foothold within an abundance of non-native invasive plants and within an environment regularly disturbed by stormwater. The property has been historically altered. Impacts from adjacent urban development occur.

At the time of the Wooten Meadow SIP report, the park does not appear to support large areas of exceptionally high quality wildlife habitat or natural resources. Significant Historical Resources are located on the property.

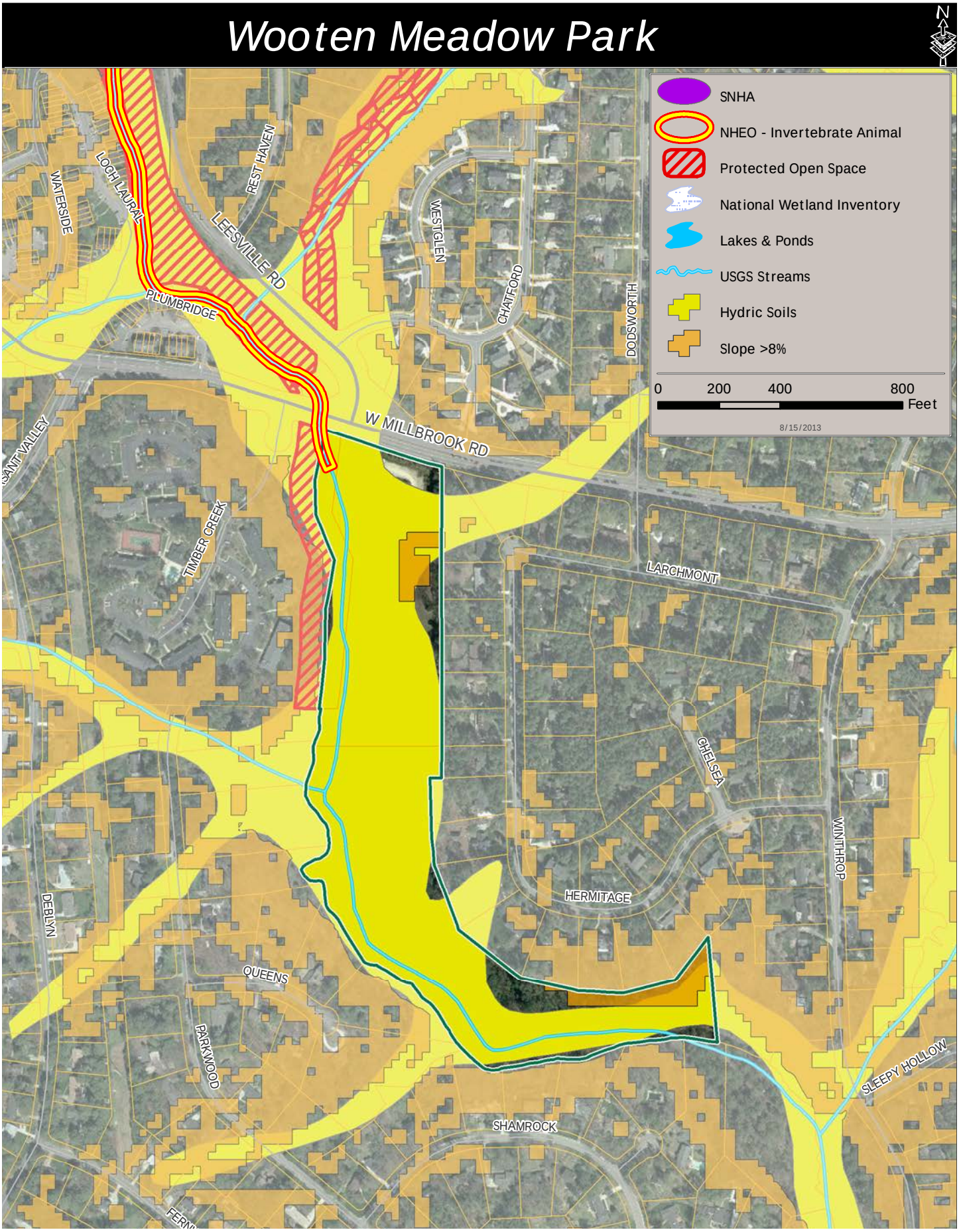
10. The property is of sufficient size and shape that its conservation resources are likely to remain intact, even if adjacent properties are developed; or sufficient neighboring property is either already protected or to be included as to achieve the same result.
The property is 20.5 acres with a narrow linear shape.

11. The area can be sufficiently buffered.
The park vicinity is highly developed with large lot residential housing and a busy thoroughfare W. Millbrook Rd.

12. Compatibility of existing use or condition, in whole or part, is conducive to being a Nature Preserve.
The park does not currently support exceptionally high quality wildlife value or natural resources.

13. The larger context for Park Planning should be considered when designating new Nature Preserves and Protected Natural Areas.

Nature Preserve Criteria map



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Appendix D

Flora Resources

Wooten Meadow Park

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Inventory of Flora Observed on Wooten Meadow Park

Wetland Indicator Status is a system used to designate a plant species' preference for occurrence in a wetland or upland. A hydrophyte is a plant adapted to grow in water. Wooten Meadow lies in the floodplain of Hare Snipe Creek, and the majority of the site is floodplain and wetland habitat.

Wetland Indicator Status includes the following designations:

- Obligate Wetland (OBL): Plant is almost always a hydrophyte, rarely occurs in uplands
- Facultative Wetland (FACW): Plant is usually a hydrophyte but occasionally is found in uplands
- Facultative (FAC): Plant commonly occurs as either a hydrophyte or non-hydrophyte
- Facultative Upland (FACU): plant is occasionally a hydrophyte but usually occurs in uplands
- Obligate Upland (UPL): Plant is rarely a hydrophyte, almost always occurs in uplands

Trees and Shrubs

Acer rubrum	Red maple
Alnus serrulata	Tag alder FACW+
Aronia arbutifolia	Red chokeberry FACW
Baccharis halmifolia	Groundsel tree FAC
Betula nigra	River birch FACW
Carpinus caroliniana	Ironwood FAC
Carya cordiformis	Bitternut hickory
Carya glabra	Pignut hickory
Carya tomentosa	Mockernut hickory
Cornus amomum	Silky dogwood FACW+
Cornus florida	Flowering dogwood
Euonymus americana	Strawberry bush
Fagus grandiflora	American beech
Fraxinus americana	White ash FACU
Fraxinus pennsylvanica	Green ash FACW
Hamamelis virginiana	American witchhazel FACU
Ilex decidua	Possumhaw FACW-
Ilex opaca	American holly
Ilex verticillata	Winterberry FACW
Juniperus virginiana	Eastern redcedar
Lindera benzoin	Northern spicebush FACW
Liriodendron tulipifera	Tulip poplar
Liquidambar styraciflua	Sweet gum FAC+
Magnolia tripetala	Umbrella magnolia FAC Uncommon in City parks
Magnolia virginiana	Sweet bay FACW+ NC Rare Plant List Watch 6 – Regionally Rare
Morella cerifera	Wax myrtle
Ostrya virginiana	Ironwood

Pinus echinata	Shortleaf pine relatively uncommon
Pinus taeda	Loblolly pine
Platanus occidentalis	American sycamore
Populus deltoids?	Cottonwood FAC-
Quercus nigra	Water oak FAC
Quercus phellos	Willow oak
Quercus rubra	Red oak
Rhus copallinum	Winged sumac
Rubus sp.	Blackberry
Salix sp.	Willow
Ulmus americana	American elm

Vines

Mikania scandens	Climbing Hempvine FACW+
Parthenocissus quinquefolia	Virginia Creeper
Passiflora lutea	Yellow Passionflower somewhat uncommon
Smilax sp.	Greenbriar
Toxicodendron radicans	Poison Ivy
Vitis rotundifolia	Muscadine Grape
Vitis spp.	Grape

Ferns

Athyrium filix-femina	Common Lady Fern FAC
Botrychium dissectum	Cutleaf Grapefern FAC
Osmunda cinnamomea	Cinnamon Fern FACW+
Osmunda regalis	Royal fern
Polystichum acrostichoides	Christmas Fern FAC
Woodwardia areolata	Netted Chain Fern FACW

Herbacious Plants

Agalinis purpurea	Gerardia FAC
Agrimonia parviflora	Harvestlice FAC
Arctium	Burdock
Arisaema triphyllum	Jack in the Pulpit FACW-
Arundinaria gigantea	Giant Cane FACW
Aster spp.	Asters
Bidens sp.	Beggarticks
Boehmeria cylindrica	False Nettle FACW+
Carex spp.	Carex species FACW to OBL
Chasmanthium latifolium	River Oats FAC-
Cinna arundinacea	Sweet Woodreed FACW
Commelina erecta	Whitemouth Dayflower
Desmodium sp.	Tick-trefoil
Diodia virginiana	Virginia Buttonweed FACW
Echinochloa crus-galli	Barnyard Grass FACW-
Elephantopus tomentosa	Elephant's Foot
Elymus hystrix	Eastern Bottlebrush Grass

Eupatorium capillifolium	Common Dog Fennel
Eupatorium pilosum	Rough leaved Boneset FACW
Eupatorium sp.	Eupatorium
Hexastylis arifolia	Littlebrownjug
Impatiens capensis	Jewelweed FACW
Lobelia cardinalis	Cardinal Flower FACW+
Ludwigia alternifolia	Seedbox OBL
Lycopus virginicus	Water Hoarhound OBL
Persicaria spp.	Smartweed
Persicaria virginiana	Jumpseed FAC
Phytolacca americana	Pokeweed
Pilea pumila	Clearweed FACW
Pluchea camphorata	Camphorweed FACW
Polygonum virginianum	Jumpseed FAC
Rhexia sp.	Meadowbeauty FACW+
Rudbeckia laciniata	Green Headed Coneflower FACW
Rumex sp.	Sheep Sorrel
Scirpus sp.	Bulrush
Solanum sp.	Nightshade (could be non-native)
Solidago spp.	Goldenrod
Verbesina occidentalis	Yellow Crownbeard
Vernonia sp.	Ironweed
Xanthorhiza simplicissima	Yellowroot FACW-
Zephyranthes atamasca	Atamasco lily FACW

Invasive and Non-native Plants

Albizia julibrissin	Mimosa
Convolvulus arvensis	Field bindweed
Elaeagnus sp.	Olive
Hedera helix	English ivy
Hemerocallis sp.	Day Lily
Ilex crenata	Japanese Holly
Ipomoea sp.	Morning Glory
Lespedeza cuneata	Lespedeza
Ligustrum japonicum	Japanese Privet
Ligustrum sinense	Chinese Privet
Liriope sp.	Monkeygrass
Lonicera japonicum	Japanese Honeysuckle
Magnolia grandiflora	Southern magnolia (not native to Piedmont)
Mahonia bealei	Leatherleaf Mahonia
Microstegium vimineum	Japanese Stiltgrass
Murdannia keisak	Marsh dayflower
Nandina sp.	Heavenly Bamboo
Pyrus calleryana	Callery Pear
Rosa multiflora	Multiflora Rose
Vinca minor	Common Periwinkle
Wisteria sinensis	Chinese Wisteria

Hexastylis arifolia	Littlebrownjug
Impatiens capensis	Jewelweed FACW
Lobelia cardinalis	Cardinal Flower FACW+
Ludwigia alternifolia	Seedbox OBL
Lycopus virginicus	Water Hoarhound OBL
Persicaria spp.	Smartweed
Persicaria virginiana	Jumpseed FAC
Phytolacca americana	Pokeweed
Pilea pumila	Clearweed FACW
Pluchea camphorata	Camphorweed FACW
Polygonum virginianum	Jumpseed FAC
Rhexia sp.	Meadowbeauty FACW+
Rudbeckia laciniata	Green Headed Coneflower FACW
Ruellia carolinensis	Carolina wild petunia
Rumex sp.	Sheep Sorrel
Solanum sp.	Nightshade (could be non-native)
Solidago spp.	Goldenrod
Verbesina occidentalis	Yellow Crownbeard
Vernonia sp.	Ironweed

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Appendix E

Fauna Resources

Wooten Meadow Park

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Inventory of Wildlife Observed: Wooten Meadow Park

Birds

Ardea herodias	Great Blue Heron
Baeolophus bicolor	Tufted Titmouse
Branta canadensis	Canada Goose
Cardinalis cardinalis	Northern Cardinal
Cyanocitta cristata	Blue Jay
Dumetella carolinensis	Gray Catbird
Geothlypis trichas	Common Yellowthroat
Melanerpes carolinus	Red-bellied Woodpecker
Melospiza melodia	Song Sparrow
Passerina caerulea	Blue Grosbeak
Pipilo erythrophthalmus	Eastern Towhee
Poecile carolinensis	Carolina Chickadee
Spinus tristis	American Goldfinch
Thryothorus ludovicianus	Carolina Wren
Turdus migratorius	American Robin

Mammals

Castor canadensis	Beaver
Odocoileus virginianus	White-tailed deer
Procyon lotor	Raccoon

Amphibians

Pseudacris crucifer	Spring Peeper
Rana catesbeiana	Bullfrog

Reptiles

Agkistrodon contortrix	Copperhead

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Wooten Meadow Park

Comments and Records

Wooten Meadow Park

Work Progression and Updates

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