



System Integration Plan

Perry Creek Road Property

Raleigh, North Carolina

April 13, 2015



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Cover Photos from Perry Creek Road Vicinity, left to right:

Fowler's Toad (*Bufo fowleri*) on park parcel

Neuse River with Levee Forest and River Oats (*Chasmanthium latifolium*)

Greenway bridge on Neuse River Trail, over stream and wetland system

White Turtlehead flower (*Chelone glabra*) in wetland

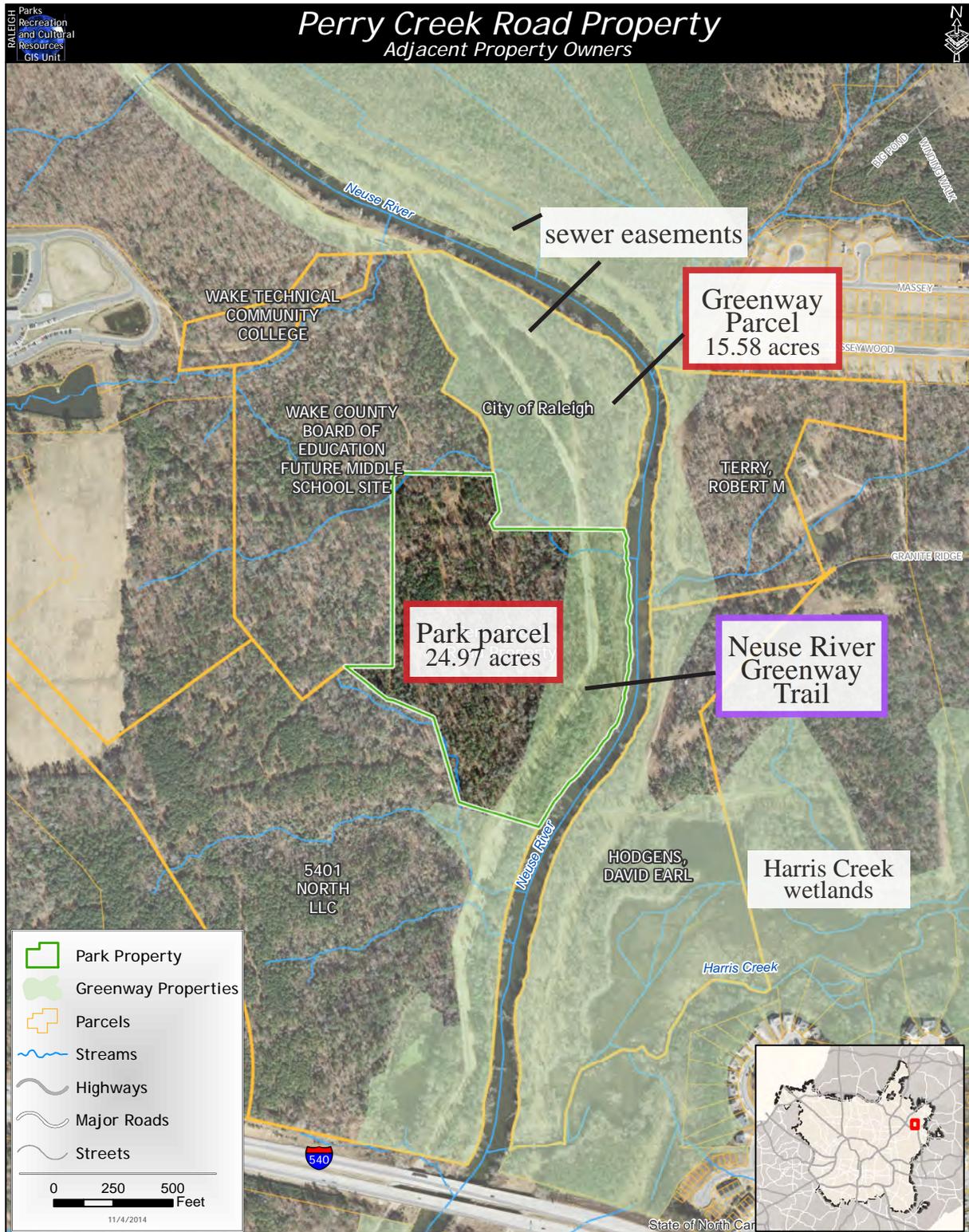
Pearl Crescent butterfly (*Phyciodes tharos*) mated pair, along Neuse River

System Integration Plan

Perry Creek Road Property

Executive Summary

The Perry Creek Road future park property (24.97 acres) is located at **6580 Perry Creek Road** north of the intersection of Lousiburg Road and I-540 in North Raleigh. This future park site is within a proposed development of residential and mixed use known as **5401 North LLC**. The area has an existing year round Wake County Elementary School. An adjacent Middle School is planned for completion in August 2017. The Northern campus of WakeTech Community College is north of the future park site. The Neuse River Greenway Trail and a greenway parcel of 15.58 acres is also adjacent to the park site.



The City of Raleigh Parks, Recreation and Cultural Resources Department has developed a System Integration Plan as part of the Park Master Plan process for the Perry Creek Road future park property in northeast Raleigh. The intent of the System Integration Plan (SIP) is to document existing site conditions, develop interim management recommendations for the property, and review the intended park classification, which includes an evaluation of the property with City of Raleigh Nature Preserve Criteria. 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 (PRGAB). This report is shared with City of Raleigh Parks, Recreation, and Cultural Resources staff, other City of Raleigh Departments, partner agencies including the Wildlife Resources Commission and Natural Heritage Program, PRGAB, City Council, the park Master Plan Committee and consultants, adjacent property owners, park stakeholders, and the public.

City of Raleigh 2030 Comprehensive Plan Goals

The City of Raleigh 2030 Comprehensive Plan and the Parks, Recreation, and Cultural Resources System Plan promote partnerships and intergovernmental coordination. Partnership opportunities are particularly valuable for the Perry Creek Road property, with multiple property owners designing, developing, and managing an area within several state designated natural communities and priority wildlife habitat in a landscape with far-reaching and cumulative impacts due to the property location along the Neuse River. Natural Resources Inventory on the greenway parcel and adjacent property owned by partners is important to evaluate in order to effectively manage ecological systems, so an initial review of existing conditions within both the park and greenway parcel, as well as other important natural resource features in the vicinity are included in this report.

The Perry Creek Road property and its System Integration Plan contribute to several Action Items called for in the City's 2030 Comprehensive Plan. Inventory and evaluation of natural resources and other existing conditions in the vicinity of the Perry Creek Road property will contribute to the 2030 Comprehensive Plan goals, Master Plan design, park development, and the future establishment of Operational and Management plans for this site as well as other sites along the Neuse River corridor.

Comprehensive Plan directive for Wildlife Habitat Conservation

The City of Raleigh 2030 Comprehensive Plan includes several Action Items directing the City's efforts toward wildlife habitat conservation and sustainable development that are particularly relevant to the Perry Creek property and vicinity. Natural resources evaluation in the vicinity of the Perry Creek Road property includes soils, water resources, flora inventory, wildlife habitat, and a preliminary invasive plant and animal review. Almost half of the Perry Creek park property and the entire greenway parcel are located within a designated Natural Heritage Program Significant Natural Heritage Area (SNHA), identified as an ecologically valuable natural area with rare species or high quality natural communities that are important for conservation of North Carolina's biodiversity.

The Perry Creek Road future park property and adjacent greenway parcel are partially located within the *Upper Neuse River Floodplain SNHA*. The park property has 11.38 acres within the SNHA along the Neuse River floodplain. A majority of the adjoining 15.58 acre City of Raleigh greenway parcel is also within the SNHA. A map of the SNHA is provided in the Flora Resources Section of this report. Both the park and greenway parcels contain Riparian and Floodplain Habitat, Bottomland Hardwood Forest, and Ephemeral Pool Wetland Habitat, all identified by the Wildlife Resources Commission as Priority Habitat.

The park and greenway parcels as well as other land in the vicinity are also located within the Neuse/Tar River Priority Amphibian and Reptile Conservation Area (PARCA), designated to preserve biodiversity of priority amphibian and reptile species and their habitats. Landscape viability is evaluated and must be relatively undisturbed. The Neuse/Tar River PARCA (shown on a map within the Wildlife and Habitat Section of this report) is the only PARCA within the Piedmont of North Carolina and supports endemic species, rare and protected species, and priority species from the WRC Wildlife Action Plan. The Perry Creek Road property is within this designated Priority Amphibian and Reptile Conservation Area. The southeastern PARCA project aims to raise the profile of high priority species or areas, increase public awareness of locally important conservation areas, and elevate the importance of proper management at these sites.

The Perry Creek park location adjoins the Neuse River and includes a substantial portion of Neuse River floodplain (13.32 acres). The Neuse River creates interesting depositional topographic features such as natural levees, point bars, ridge-and-swale systems, and sloughs. The Neuse River floodplain often has differentiated levee, bottomland, and terrace zones large enough to support distinct natural communities. Some of these landscape features are significant within the park parcel and vicinity. Natural communities within the future park include Levee Forest, Floodplain Forest, Upland Hardwood Forest, and some previously disturbed early successional areas dominated by herbaceous plants and shrubs.

The NC Natural Heritage Program maintains a *List of Rare Plant Species of North Carolina* that are officially recognized by federal or state agencies as protected or otherwise rare. Some plants are rare but are not under 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 Plants, no federal or state protected rare plants have been observed on the Perry Creek Road future park property, however there are a number of uncommon plants in the vicinity. Natural resources inventory is ongoing.

Much of the park west of the Neuse River Greenway Trail has been historically altered and disturbed, including logging, agriculture, small roads, and other human influences. Impacts to the floodplain have occurred with past land use, Public Utility easements, and the Neuse River Greenway Trail. Invasive plants are established on portions of the property. The park property location along the Neuse River requires vegetated buffer zones. Existing City of Raleigh *Tree Conservation Areas* limit development and therefore offer some land protection within the floodplain. Most non-park development is planned west and south of the park. Conservation of natural areas will be maximized by clustering park development and minimizing impacts within the Significant Natural Heritage Area and Neuse River floodplain.

Interim Management Recommendations

In addition to documentation of existing site conditions, an SIP provides interim management recommendations for the property. Site management is an ongoing stewardship challenge. Management goals and implementation strategies are important to establish, review and then adapt over time to maintain priority site functions and manage human impacts.

Interim Management Recommendations for the Perry Creek Road property include removal of barbed wire fencing after documentation of fence locations for historical records, removal of old silt fences that are no longer needed because of their negative impact on wildlife, facilitating natural regeneration of degraded riparian areas with native plants, continuation of inventory and mapping of natural resources (making inventory and mapping of ephemeral pools a priority) and sharing inventory data with partners.

Evaluation of the Perry Creek Park Property with the City of Raleigh Nature Preserve Criteria

At the time of the Perry Creek Road SIP, the property does not appear to support exceptionally high quality natural resources or habitat for any rare or endangered species to support classification of the park parcel as a Nature Preserve. The Neuse River floodplain on the park parcel may not currently be of exceptionally high quality because of previous land use and existing impacts, however the area still has substantial conservation value as part of the Significant Natural Heritage Area, Priority Amphibian and Reptile Conservation Area, and extensive connectivity to other undeveloped property along the Neuse River corridor.

**System Integration Plan
Perry Creek Road Property
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Perry Creek Road Property Interim Management Recommendations

- System Integration Plan Overview
- Interim Management Recommendations



Neuse River near southeast corner of Perry Creek Road future park property.

System Integration Plan Overview

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 park. The System Integration Plan (SIP) is a component of the Park Master Planning process. The purpose of the System Integration Plan is to document existing site conditions, develop guidelines for interim management of the site, and review the park classification and any proposed special intent for the park. The SIP process incorporates input from Subject Matter Experts with partner agencies, involves public review, and is developed with input and oversight from the Parks, Recreation, and Greenway Advisory Board. The SIP audience is multilayered and includes City of Raleigh Parks, Recreation, and Cultural Resources staff, as well as staff from other City Departments, the public, park neighbors, PRGAB, City Council, consultants designing or developing the Park Master Plan, the Master Plan Committee, and other park stakeholders.

The City of Raleigh 2030 Comprehensive Plan and the 2014 Park System Plan incorporate System Integration Plan Implementation along with building Stewardship Capacity, Identifying Conservation Lands, Awareness of Natural Resource Areas, developing a Wildlife Habitat Plan through coordination with partner agencies, and using Sustainable Practice Development to incorporate sustainable design principles and best management practices in park design and development.

Further details on System Integration Plans and the Park Master Plan process are included in Appendix A.

Interim Management of Perry Creek Road Property

Interim management recommendations and documentation of existing site conditions are developed during the SIP phase of the Park Master Plan process. Park development 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.

The Parks, Recreation, and Cultural Resources Department should conduct regular site investigations to monitor existing site conditions, and review and adapt interim management strategies.

Interim Management Recommendations

The following interim management recommendations are proposed for the Perry Creek Road future park property and adjacent greenway parcel. 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.

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

Interim Management Recommendations: Safety

- The Perry Creek Road property 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.
- Prohibited activities such as geocaching without prior approval, walking dogs without a leash, hunting, and ATV use are not allowed on park or greenway property. Interim management of unlawful park and greenway use may be needed.
- Remove hazard trees as needed. Standing dead trees (snags) that do not constitute a hazard should remain on site for wildlife habitat. If snags are a safety concern, do not cut the tree to its base but cut to a safe height. Downed wood could be left on site for wildlife habitat. Consider location of cut tree and avoid placing the felled tree on top of rare or uncommon plants or altering hydrology on the site.
- Remove barbed wire fencing after documenting barbed wire locations for historical records

Interim Management Recommendations: Environment

- The Perry Creek Road park property and adjacent greenway parcel are located in a NC Natural Heritage Program Significant Natural Heritage Area (SNHA) as well as within a Priority Amphibian and Reptile Conservation Area (PARCA). Both of these designated conservation areas are described in more detail in the Flora Inventory and Wildlife Habitat Sections of this report. Sustainable design and development principles should be incorporated into the Master Plan for this site and reviewed by partner agencies to enhance Stewardship, Sustainability, and Best Management Practices, highlighted as goals in the City of Raleigh 2030 Comprehensive Plan.
- Sustainable design and development principles are important to implement at an early stage in park design. Some examples of Sustainable Development and Best Management Practices include 1) Concentrating development and public use along priority habitat edges rather than within the habitat core to reduce habitat fragmentation, 2) Use of erosion control netting that is sensitive to wildlife and made of flexible natural materials such as jute or coconut netting, 3) Avoid placing exterior and road lighting within core wildlife habitat, and 4) Avoid using traditional curb and gutter structures since they can disrupt reptile and amphibian movement. Instead use curbing with a 1:4 slope that small animals can cross, or use no-curb alternatives and 5) Use Sustainable Trail Design techniques. Additional recommendations are provided in the Wildlife Habitat Section of this report.
- Request removal of old green silt fence along Public Utility easement down the length of the Neuse River, and coordinate removal of other silt fences in the area that are no longer needed. Although silt fences provide important water quality benefits during site disturbance, they disrupt wildlife migration and increase the amount of energy wildlife must exert to meet their needs, particularly difficult for small wildlife such as amphibians and reptiles.
- Continue inventory and mapping of natural resources in the vicinity of the Perry Creek Road property. Consult with NC Natural Heritage Program and NC Wildlife Resources Commission on newly discovered occurrences of rare plants and wildlife. Map highest quality natural resources into City's GIS system, and share data with partners.
- There may be small wetlands within the vicinity that are not yet fully inventoried and delineated. Even small wetlands that are not currently "jurisdictional" may still be important for wildlife. Consult with Subject Matter Experts to determine the potential occurrence of isolated and/or ephemeral wetlands before installing trails or other park elements. Review changing definition for "Waters of the U.S." to determine potential impacts to site design and development.
- Facilitate natural regeneration of native plants in disturbed riparian buffers where possible. Use native plants for landscaping and re-vegetation, or allow sites to re-vegetate naturally with native species during and after site development. Plants should be native to Wake County. Do not revegetate easements or trails with fescue or lespedeza. Preserve native cane stands (*Arundinaria*), described in the Flora Resources and Wildlife Habitat sections of this report.

Interim Management Recommendations: Environment continued

- The City of Raleigh 2030 Comprehensive Plan includes the goal of Invasive Species Control. Invasive species management is part of a long term management plan for the park and greenway system, however some invasive species control can be initiated as interim management projects in priority areas. Priority areas and priority invasive plants are important to consider when investing staff time and cost associated with invasives control. Priority considerations include areas with rare plants, invasives with prolific or long-lived seeds, areas where the ecological functions of the community are being impacted, and new or small patches of the most aggressive invasives because the cost and amount of time and effort is greatly reduced at this early establishment stage. Interim management of invasive plants in the vicinity of the Perry Creek Road property should focus on the priorities of removal of mature seed producing Princess Trees (*Paulownia tomentosa*) in the northwest portion of the park property and control of small invasive plants occurring on the adjacent greenway property (particularly English ivy (*Hedera helix*) and Chinese privet (*Ligustrum sinense*) seedlings, and possibly controlling Japanese stilt grass (*Microstegium viminium*) before it sets seed in the fall). The greenway parcel is a priority for interim management because it contains high quality uncommon plants and the invasives are currently seedlings or young plants that could be efficiently removed with a minimum of effort at this stage, possibly by hand with volunteers during the winter when site sensitivity is reduced and uncommon or desirable native plants are dormant. Sensitive parcels such as the greenway parcel should utilize small groups of volunteers to minimize soil compaction. Herbicide use should be evaluated very carefully and only used if deemed necessary and without surfactants. The source of mature seed producing English ivy likely growing up tree trunks in the vicinity should be identified and controlled to manage the further spread of English ivy throughout the area.
- Plant debris from invasive plant removal or landscaping maintenance should generally be removed from the site. Woody debris is a desirable and important component of some natural communities, however the system is capable of processing and decomposing only the amount of dead material that it produces on its own. There are multiple potential negative impacts to dumping piles of invasive plants, yard waste, or landscaping plant debris into natural systems, including smothering uncommon or desirable native plants, increasing fire hazard, providing a continued source of invasive plants that can sprout or set seed even after they have been cut, and introducing plant diseases and insects.
- 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.
- If management is needed to maintain areas without trees, use mowing, hand-cutting of trees, careful selective herbicide application without surfactants, or prescribed fire. Broad herbicide application can impact desirable herbaceous vegetation that supports pollinators and other wildlife. Disking is not recommended - disking can provide a beneficial vegetation response but can be harmful to priority species of reptiles and amphibians.
- Minimize chemical herbicide use and only use surfactant-free products, because surfactants have been shown to cause harm to amphibians
- Establish a rotational maintenance and vegetation control schedule. In areas where mature trees are not desirable, try to manage only portions of the areas each year on a 2-3 year rotational basis to maintain a constant source of food and shelter for wildlife that uses this type of habitat. Prohibit mowing between April 1 and October 1 to minimize impacts to wildlife. Mowing is best done in late winter to allow winter cover and food source for wildlife that early successional habitat provides.

Interim Management Recommendations: Environment continued

- If a right-of-way or maintained shoulder is needed along a trail or road, attempt to mow the shoulder only once per year, in mid to late winter so herbaceous plants can bloom and provide habitat for pollinators and other wildlife. Blooming herbaceous plants along a trail also provide visual interest as well as educational and programming opportunities for park and greenway users. If mowing once per year is not frequent enough, try not to mow during breeding season, mid-March to mid-October.
- Parks maintenance staff should not drive their equipment on unpaved forest trails or unpaved old roads unless necessary, as it can cause tree root damage, erosion, destruction of desirable herbaceous vegetation and other site impacts.
- It is important to determine the species of fire ants present on the site well before the site is developed, so there is time for effective fire ant control. If fire ants are determined to be imported invasive fire ant species, a plan should be developed and fire ant management should be initiated on the site as soon as possible, in order to reduce the spread of fire ants during site disturbance. Fire ant baiting takes longer but is the most effective method of long term control. The most important component of an imported fire ant management plan is to protect and conserve North Carolina's native ant populations, so it is important to distinguish between native ant mounds and imported fire ant mounds. Native ants are beneficial and control the invading fire ants. Adjacent landowners and partner agencies should coordinate BMPs for fire ant control.
- Consider coordinating seed collection/plant rescue from adjacent 5401 North LLC Development and other areas in the vicinity that will be developed, particularly for early successional plant species such as splitbeard bluestem, liatris, flattop goldenrod, and other desirable plants in order to preserve local genotypes.

Interim Management Recommendations: 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
- Remediate any potential future 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.
- Manage any potential cultural and historical remains if discovered on the site in the future, in cooperation with adjacent property owners. Any historic trash piles or other historic remains including barbed wire fencing should be documented for historical records before removal.

Completed and Ongoing Interim Management responsibilities

- Inventory of natural and cultural resources have been initiated
- Site surveying has been started around the perimeter of the park site
- Partnership with the Wake County Board of Education has been initiated, and the Perry Creek Road Park Master Plan Project Manager is participating in review of the future Middle School site design.

Perry Creek Road Property Introduction

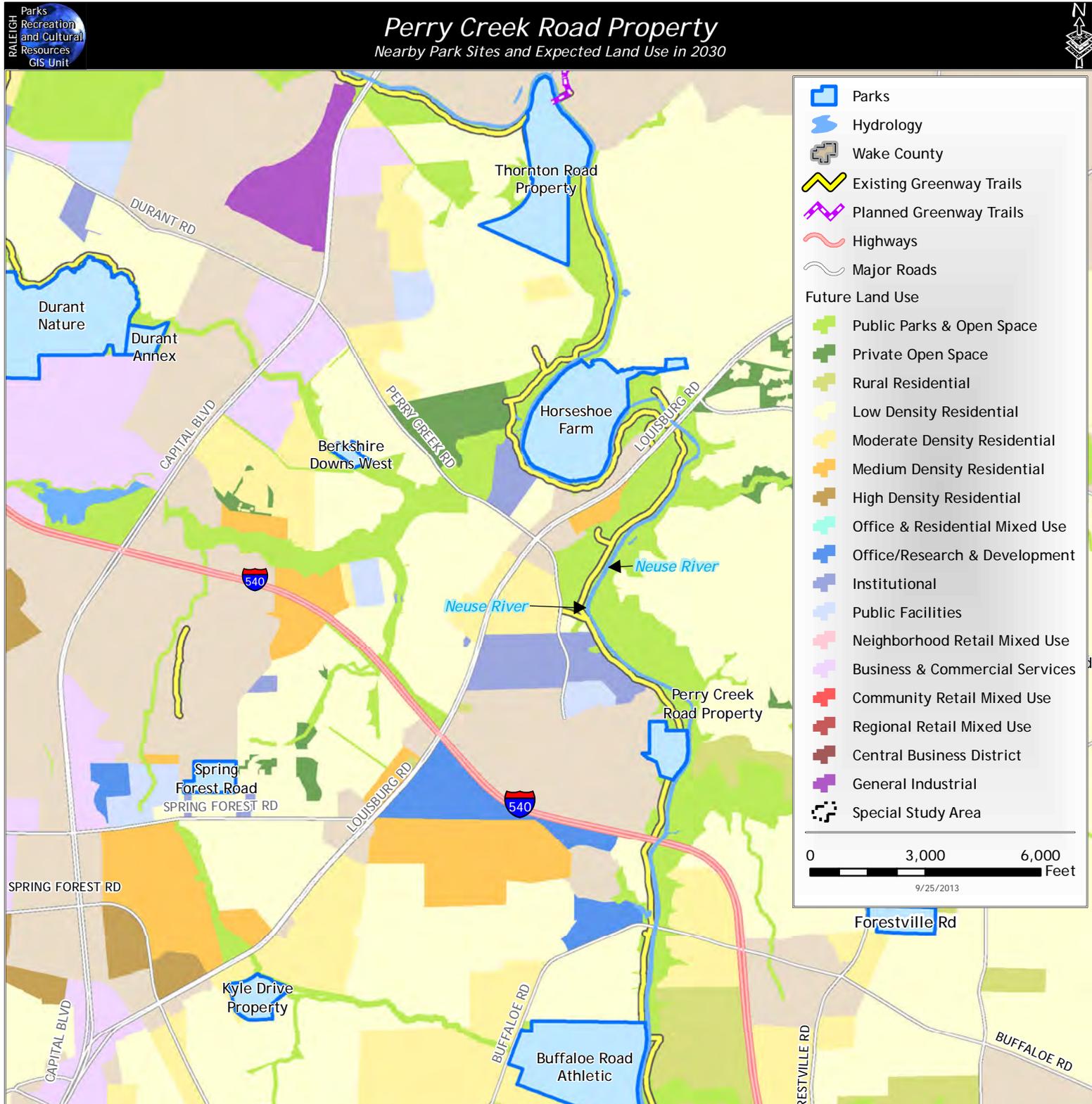
- Property Location
- Expected Land Use in 2030
- Other Park Sites in the Vicinity
- Zoning and Overlay Districts



Neuse River Greenway Trail in vicinity of Perry Creek Road property.

Perry Creek Road Park Property Location

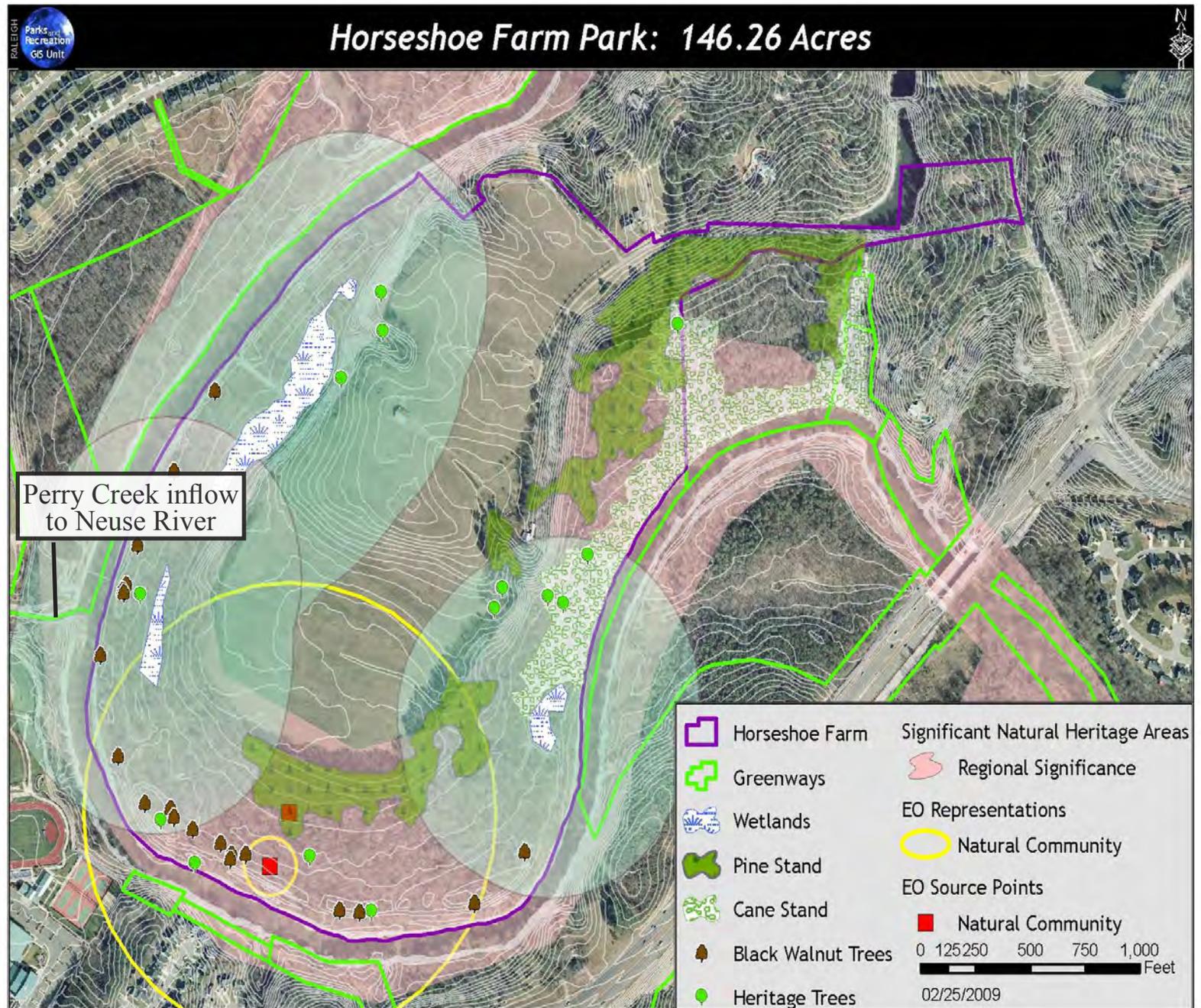
The 24.97 acre site known as the Perry Creek Road future park property is located at **6580 Perry Creek Road** north of the intersection of Lousiburg Road and I-540 in North Raleigh. The map below shows additional park property in the vicinity and Future Land Use projected in the area of the Perry Creek Road park property for the year 2030. Horseshoe Farm Nature Preserve is located north of the Perry Creek Road property, and Thornton Road Property is a future park site located to the north. The City of Raleigh Parks, Recreation, and Cultural Resources Department owns greenway land along the Neuse River labeled as "Public Parks and Open Space". The Neuse River Greenway Trail is marked on the map with a yellow line.



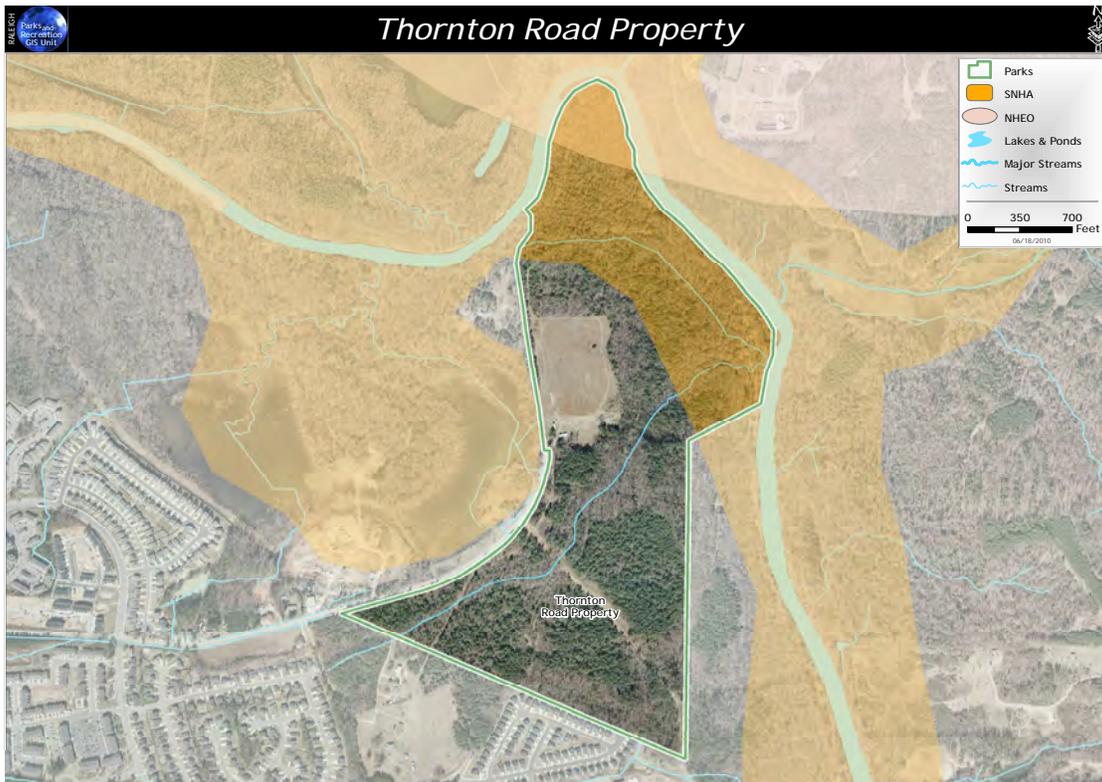
Park Sites in Vicinity of Perry Creek Road Property

- Horseshoe Farm Nature Preserve
- Thornton Road Property
- Buffalo Road Athletic Park

Horseshoe Farm Nature Preserve is located north of the Perry Creek Road property, along the Neuse River. Horseshoe Farm is located within the *Upper Neuse River Floodplain*, a Natural Heritage Program Significant Natural Heritage Area (SNHA) that stretches for 12 miles along the Neuse River. Several Natural Heritage Program Element Occurrences (EOs) are located at Horseshoe Farm, described in more detail in the Flora Inventory section of this report. Perry Creek (the creek used to name the road that eventually leads to the Perry Creek park property) flows into Horseshoe Farm.



The **Thornton Road** future park property is a 66.5 acre site located north of Horseshoe Farm and is also located within the Significant Natural Heritage Area (SNHA) *Upper Neuse River Floodplain* that stretches along the Neuse River for 12 miles. Much of the Thornton Road property was previously agricultural land with several residences, and a significant portion of the property is disturbed. The Neuse River Greenway Trail passes through the Thornton Road property along the Neuse River.

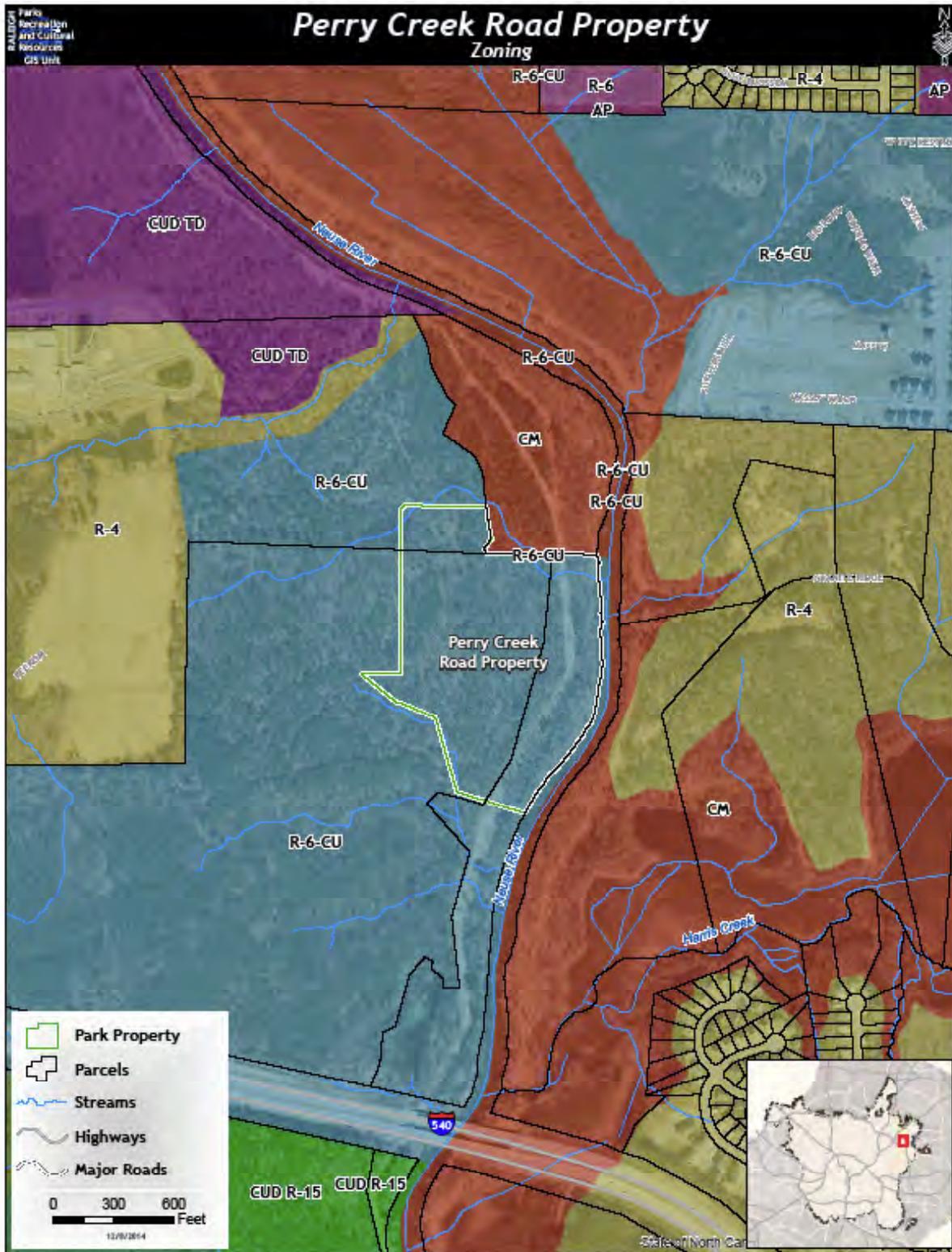


Buffalo Road Athletic Park is an almost 166 acre park located south of the Perry Creek Road property.

Zoning of the Perry Creek Road Property

The park parcel is zoned as Residential-6-CU, an R-6 zone overlaid by a Planned Development Conditional Use Overlay District (PDD), described in detail on the following page.

The greenway parcel located north of the park parcel is zoned as a Conservation Management (CM) District. Conservation Management Districts include environmentally sensitive natural areas such as floodplains, buffers between incompatible land uses, and parks.

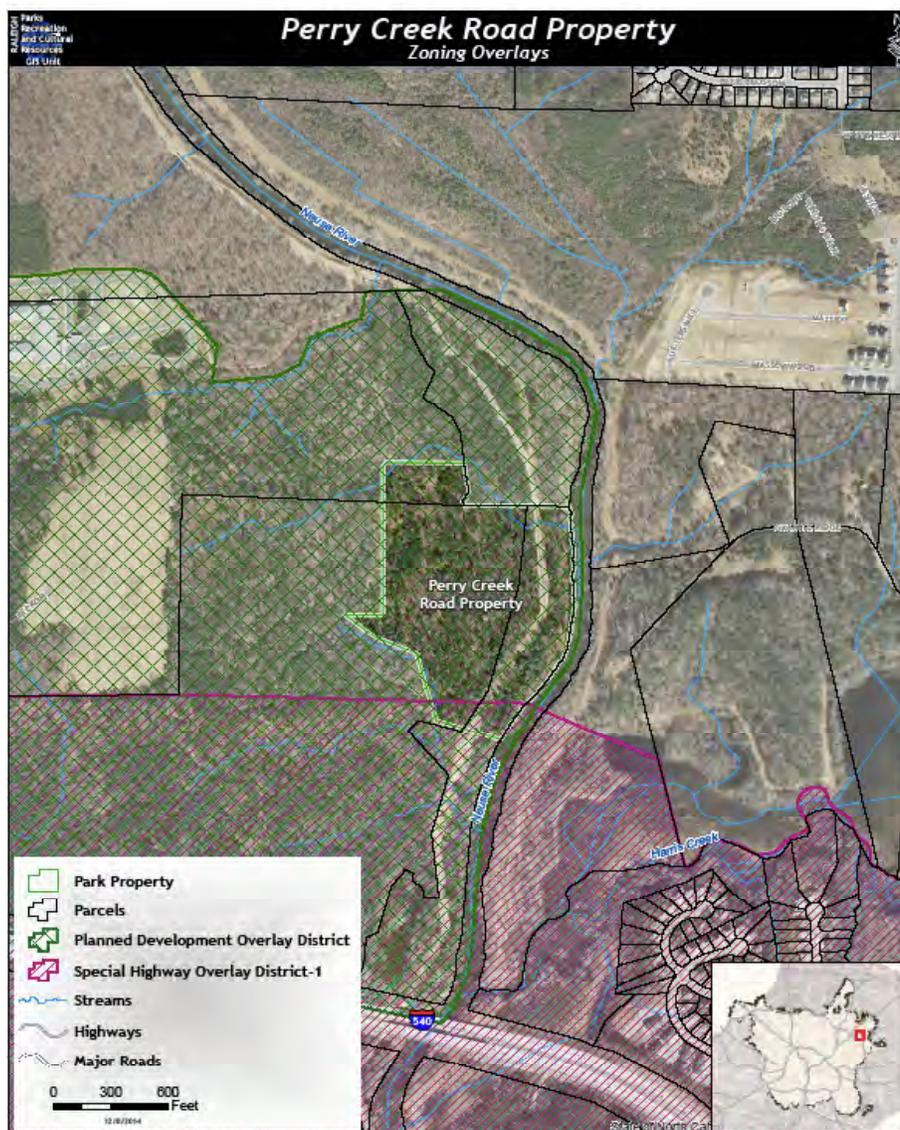


Overlay Districts of Perry Creek Road Property Planned Development Overlay District - 5401 North

The entire park parcel and the adjacent greenway parcel are located within an Overlay District identified as a *Planned Development Conditional Use Overlay District (PDD-5401 North)*, defined by the City of Raleigh Planning Department as an area intended to provide an opportunity on contiguous tracts of property to incorporate alternative designs involving a mixture of uses to promote transit, usable open space, affordable housing, preserve land for economic uses, facilitate economic arrangement of buildings, preserve significant natural features, protect roadway corridors from strip development, contain innovative architectural design, and provide for community-wide public services and amenities. Flexibility is achieved through the use of an approved Master Plan which has demonstrated its superiority to the underlying district. Another purpose of this Overlay District is to establish a more efficient and responsive decision-making process for mixed use developments. A copy of the **5401 North Planned Development Master Plan** is included in the Background Section of this report.

Special Highway Overlay District 1

A small southern portion of the park parcel is located within a *Special Highway Overlay District 1 (SHOD 1)*, defined by the City of Raleigh Planning Department as an area with certain restrictions designed to preserve the natural scenic beauty along designated roadway corridors, requiring that buildings and structures be set back from the right-of-way for the purpose of protecting the public investment and lengthening the time during which highways can continue to serve their functions without expansion or relocation, reducing potential traffic hazards arising from unnecessary points of ingress and egress and roadside development, and achieving a common unified appearance along a roadway with other jurisdictions of the county.



Perry Creek Road Property Background

- Property Acquisition
- Phase 1 Environmental Assessment
- Park Property Deed
- Recorded Map of Park Parcel
- *5401 North LLC Development Master Plan*
- Wake County Middle School Draft Design



Neuse River Greenway Trail at Mile Marker 10, adjacent to Public Utility sewer line with raised manhole.

Property Acquisition

The Perry Creek Road future park property was purchased by the City of Raleigh in 2012 from the “5401 NORTH LLC” Developer as a potential neighborhood park site. The Developer has proposed a substantial residential and mixed use development in close proximity to the proposed park site. Because of the proximity and potential for use and enjoyment of the park’s facilities (commonly referred to as the “Perry Creek Road Property”) by residents, their guests, and others, the Developer is interested in the design and development of the proposed park, and has offered to support a portion of the cost of planning the park. The Perry Creek Road Park (24.97 acres) will be a public park, to be developed and used for the enjoyment of the citizens of Raleigh.

Phase 1 Environmental Assessment Report

A *Phase 1 Environmental Site Assessment* was completed in August 2009 by Geotechnologies, Inc. for the Developer 5401 North LLC, and included the entire approximately 148 acre site located north of the intersection of I-540 and Lousiburg Road in North Raleigh. The purpose of the Phase 1 Report is to evaluate the current and historical conditions of the property in an effort to identify Recognized Environmental Conditions (RECS), defined as *The presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products.* The identification of RECs on a property may impose an environmental liability on owners or operators of a site, reduce the value of a site, or restrict the use or marketability of a site, and would generally warrant further investigations to evaluate the scope and extent of potential environmental liabilities. A Phase 1 Report is a standard step completed for most sites during the site acquisition phase of a property purchase. The Phase 1 report conducted for the 5401 North LLC Developer was subsequently shared with the City of Raleigh because the park portion of the overall property was included in the Phase 1 evaluation. The Phase 1 Report Summary provided by Geotechnologies, Inc. is included in Appendix B.

The *Phase 1* report concludes no significant evidence of stained soil, distressed vegetation, debris disposal, or other indicators of Recognized Environmental Conditions (RECs) in association with the Perry Creek Road property.

Park Deed

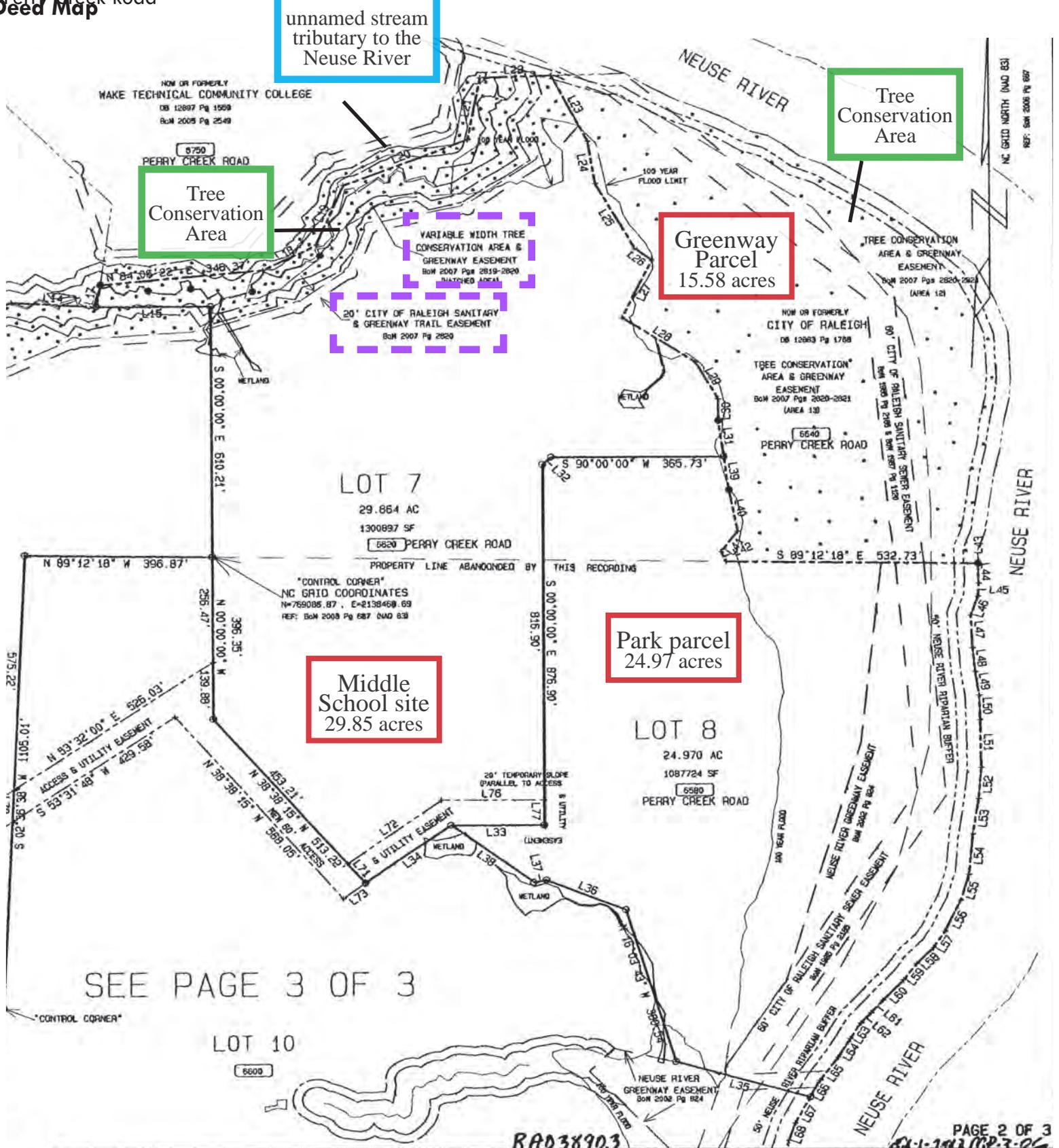
The park parcel is recorded in Book 014896, pages 02266-02269 and is recorded with the following description: **“Being all of Lot 8 (24.97 acres) on that map entitled “Exempt Subdivision, Recombination, Access & Utility Easement Map 5401 North, LLC Lots 7-10” dated Sept 6, 2011 and last revised August 15, 2012, and recorded in Book of Maps 2012, pages 883-885.”**

The park parcel includes the following rights:

“Together with and including all rights within that Access Easement recorded in Book 14896 page 2255. Until such time as Improvements are constructed in the Easement Area described in the Access Easement, Grantee shall have a right of access, ingress and regress over existing farm roads located adjacent to the property.”

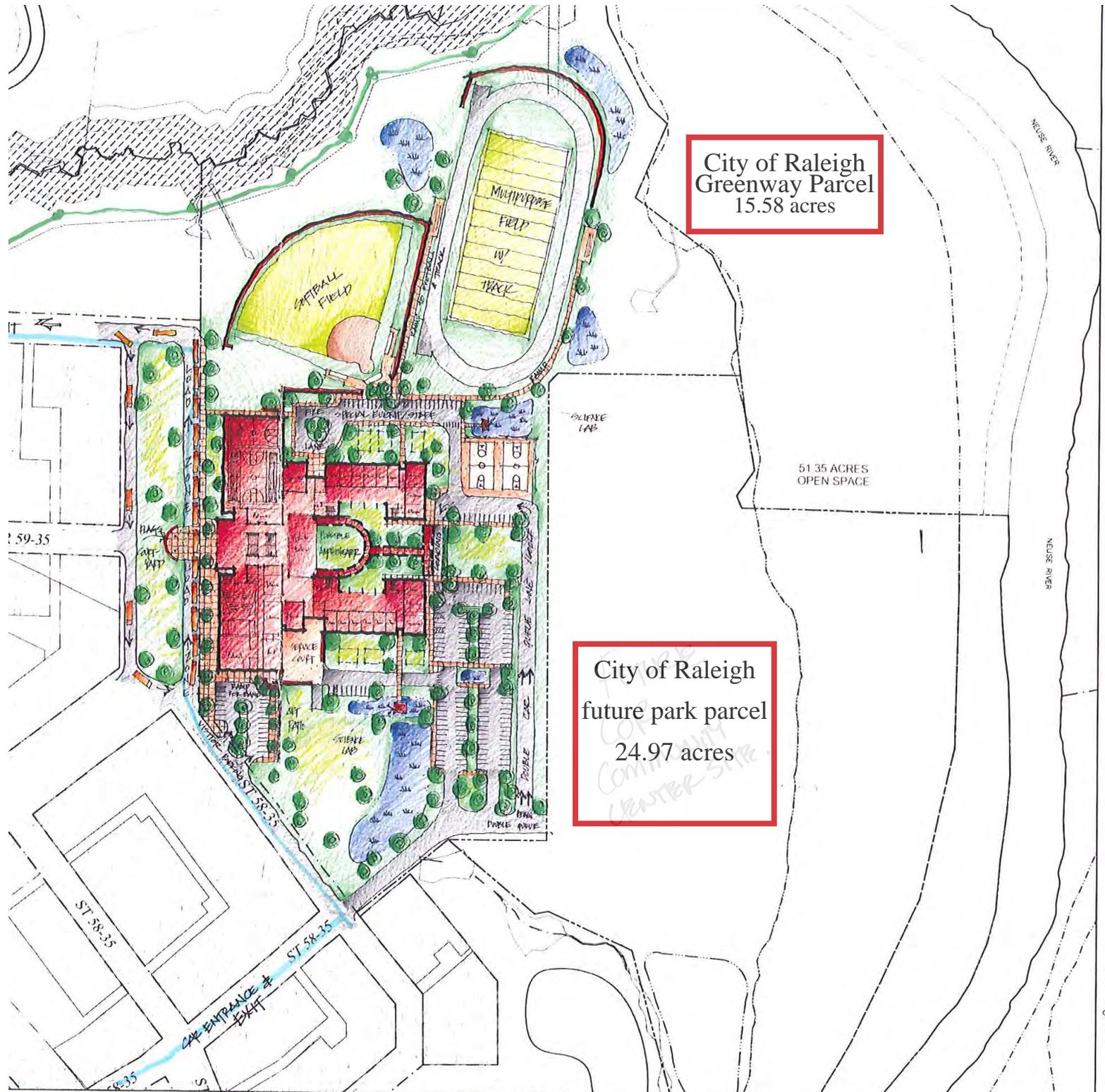
A copy of a portion of the recorded Deed Map highlighting the park parcel “lot 8” is provided on the following page. 5401 North LLC Construction Drawings are included in the Site Description Section of this report to illustrate planned Public Utilities and other site features, including updated Tree Conservation Areas.

Lot 9 shown on the Deed Map is planned for a Wake County Middle School. A DRAFT plan drawing for the Middle School is included in this section of the report. Middle School design plans are in preliminary stages, with estimated construction in 2017. The City of Raleigh Parks, Recreation, and Cultural Resources Department has identified a Project Manager for the Perry Creek Road future park property who is involved in communication and collaboration with the Wake County Board of Education to facilitate design and development of both the park and Middle School.



<p>SULLIVAN SURVEYING 1143-D EXECUTIVE CIRCLE CARY, NC 27511 (919) 469-4738 FAX: (919) 469-8447</p>		<p>EXEMPT SUBDIVISION, RECOMBINATION, ACCESS & UTILITY EASEMENT MAP: 5401 NORTH, LLC LOTS 7 - 10</p>	
<p>OWNER (s): 5401 NORTH, LLC 5630 BANKERS AVENUE BATON ROUGE, LA 70808 DB 12836 Pg 2325 & DB 12386 Pg 2378</p>		<p>CITY OF RALEIGH WAKE COUNTY SCALE: 1" = 200'</p>	
<p>DATE OF REVISION 11 JUNE, 2012 14 JUNE, 2012</p>		<p>NORTH CAROLINA PINS: SEE OWNER'S BLOCK</p>	

Wake County Middle School Draft Design



City of Raleigh
Greenway Parcel
15.58 acres

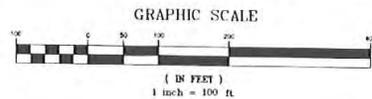
City of Raleigh
future park parcel
24.97 acres

51.35 ACRES
OPEN SPACE

DESIGN NARRATIVE

M-13 MIDDLE SCHOOL

Raleigh, Wake County, NC



Date: 04-17-14

Perry Creek Road Property Cultural Resources and Historical Site Use

- Historic Maps
- Aerial Photographs 1949-1994



Old farm road with Elementary School in background.

Cultural Resources and Historical Site Use

Land use history in the vicinity of the subject property is evaluated with historic maps, aerial photos, and other supporting information.

The cultural resources and historic land use review for the Perry Creek Road 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 Perry Creek Road property on historic maps are the Horseshoe Bend of the Neuse River, Louisburg Road, Perry Creek, Powell Creek, and Hodges Mill Creek.

- 1871 Fendol Bever's Map of Wake County
- 1887 Shaffer's Map of Wake County
- 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 and Wake County imaps aerial photographs:

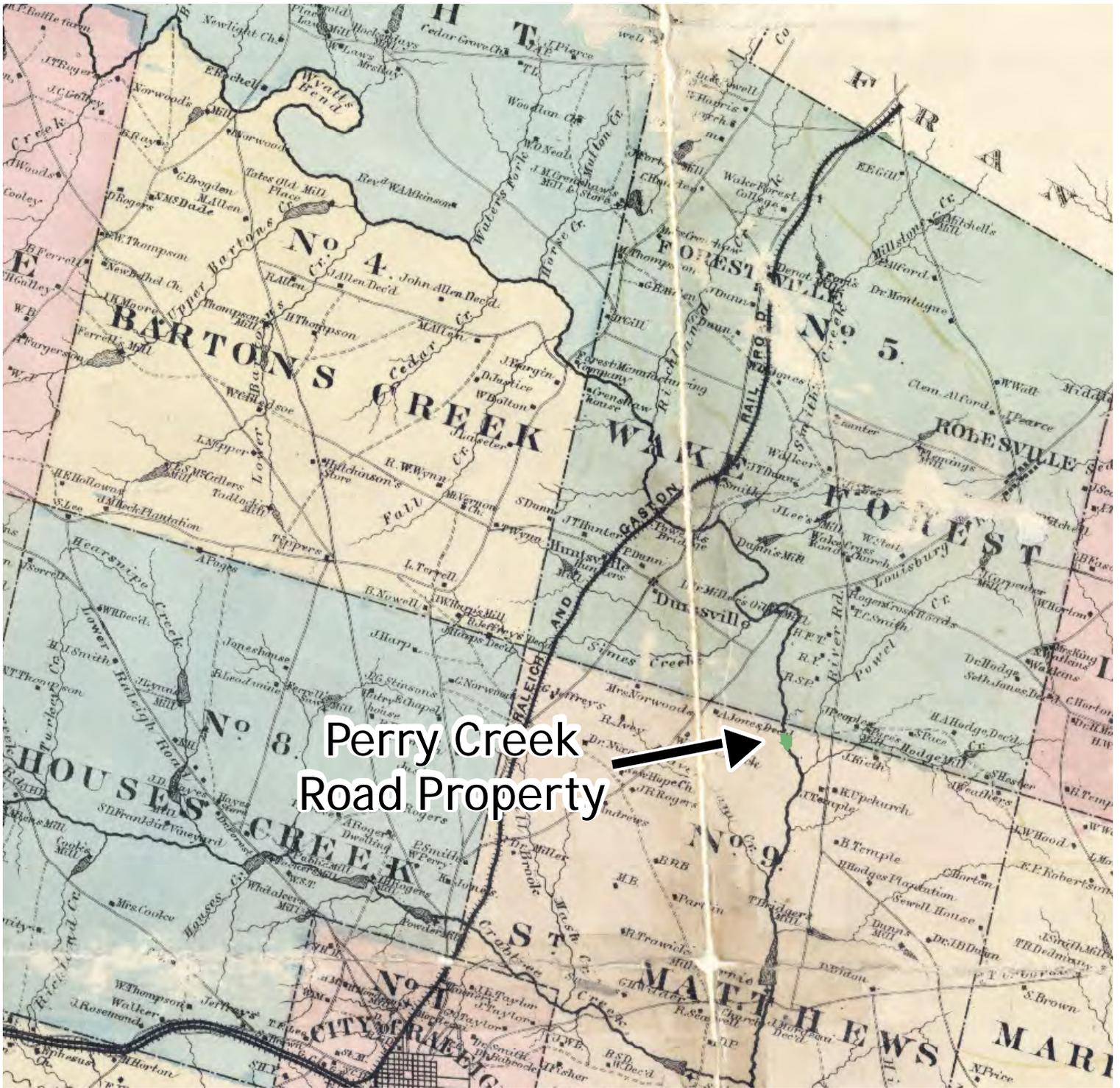
- a. Photo BOP-3F-188, Grid N-6, flown March 29, **1949**
- b. Photo BOP-3N-50, Grid N-6, flown October 10, **1954**
- c. Photo BOP-7FF-154, Grid N-6, flown March 15, **1965**
- d. Photo BOP-6MM-181, Grid N-6, flown March 5, **1971**
- e. Photo 37183-1988, M-7, 186L, flown **1988**
- f. Photo NAPP 6137-94, Grid H-6, flown **1994**

3. Phase 1 Environmental Site Assessment 5401 North Property, Raleigh, NC, August, 2009 by GeoTechnologies, Inc.

4. Deed records from the property.

Through preliminary investigation of historical and cultural resources of the Perry Creek Road property, no significant resources have been identified, however on the 1949 aerial photograph there are potentially areas with possibly out-buildings or tenant houses off of the main farm road leading east toward the Neuse River (in the vicinity of the current park parcel and/or Wake County parcel). The quality of the aerial photographs makes it difficult to tell with certainty. There is always potential for future discovery of cultural resources, particularly during site development.

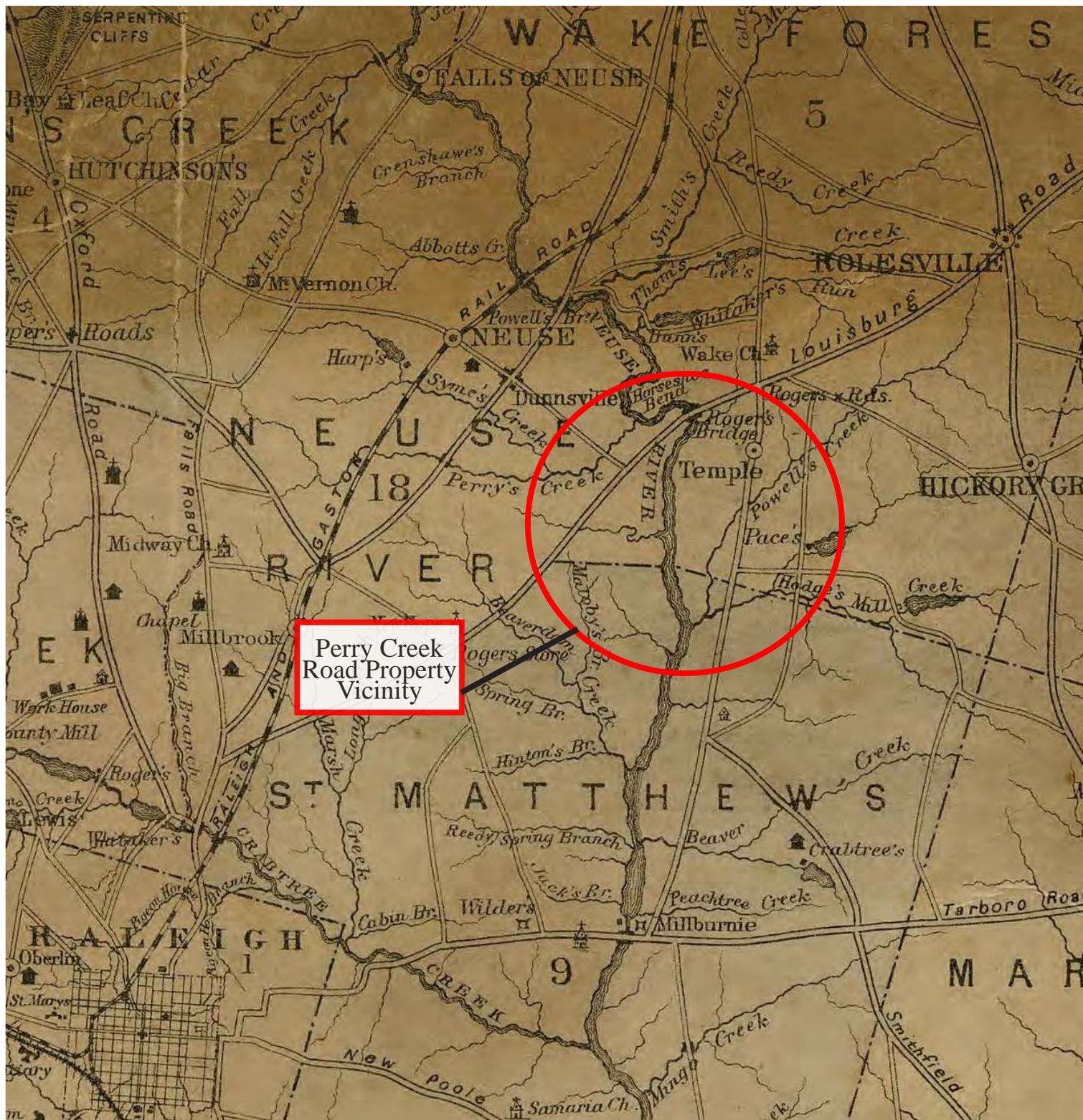
Vicinity of Perry Creek Road Property, 1871



St. Matthews Township on the 1871 Fendol Bever's Map of Wake County

The Perry Creek Road Property was located in St. Matthews Township near Wake Forest Township along the Neuse River. Early maps depicted main roads, property owners, mills, and main streams.

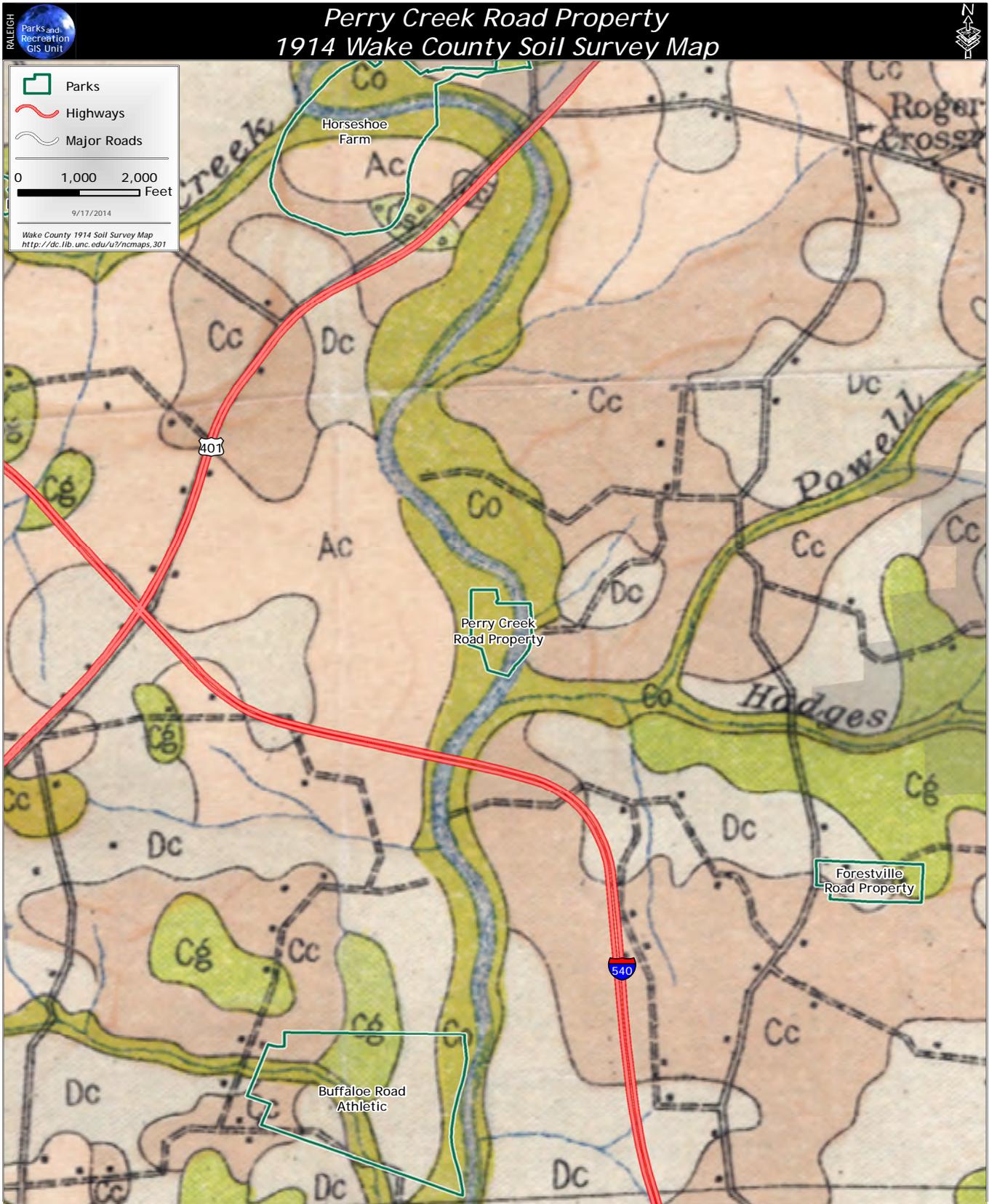
Vicinity of Perry Creek Road Property, 1887



Perry Creek Road Property Vicinity

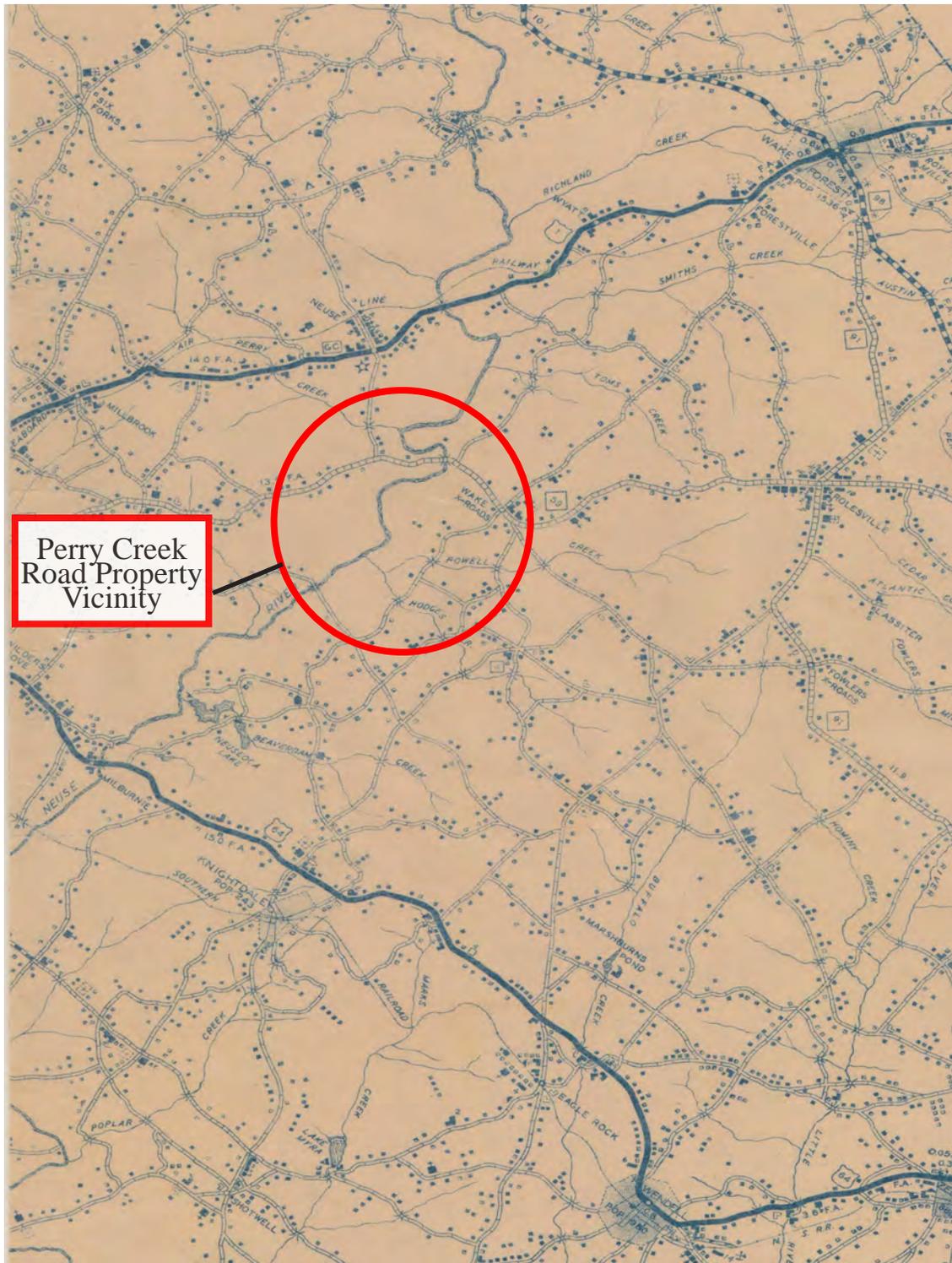
St. Matthews Township on the 1887 Shaffer's Map of Wake County

The Horseshoe Bend of the Neuse River (now a City of Raleigh Nature Preserve) is a distinctive feature on historic maps. Historic maps also often include major streams and old roads. Louisburg Road is on the 1887 Shaffer's Map, and streams depicted on the map in the vicinity of the Perry Creek Road property include Hodges Mill Creek, Powell Creek, and Perry Creek.



The historic 1914 Wake County Soil Survey Map (US Department of Agriculture, Bureau of Soils) is overlaid on a 2013 map, showing the location of the Perry Creek Road future park property as well as other parks in the vicinity. This historic map has been geo-referenced for accuracy.

Vicinity of Perry Creek Road Property, 1938



Perry Creek Road Property location on 1938 North Carolina State Highway and Public Works Commission Map
This map depicts major roads and structures in the vicinity of the Perry Creek Road property.

Vicinity of Perry Creek Road Property, 1949



Neuse River

Greenway Parcel
15.58 acres

Old farm road
running straight
west to east from
main farm to
Neuse River

Vicinity of
Perry Creek
Road future park

Harris Creek
wetlands

US Department of Agriculture, BOP-3F-188, Grid N-6, flown March 29, 1949

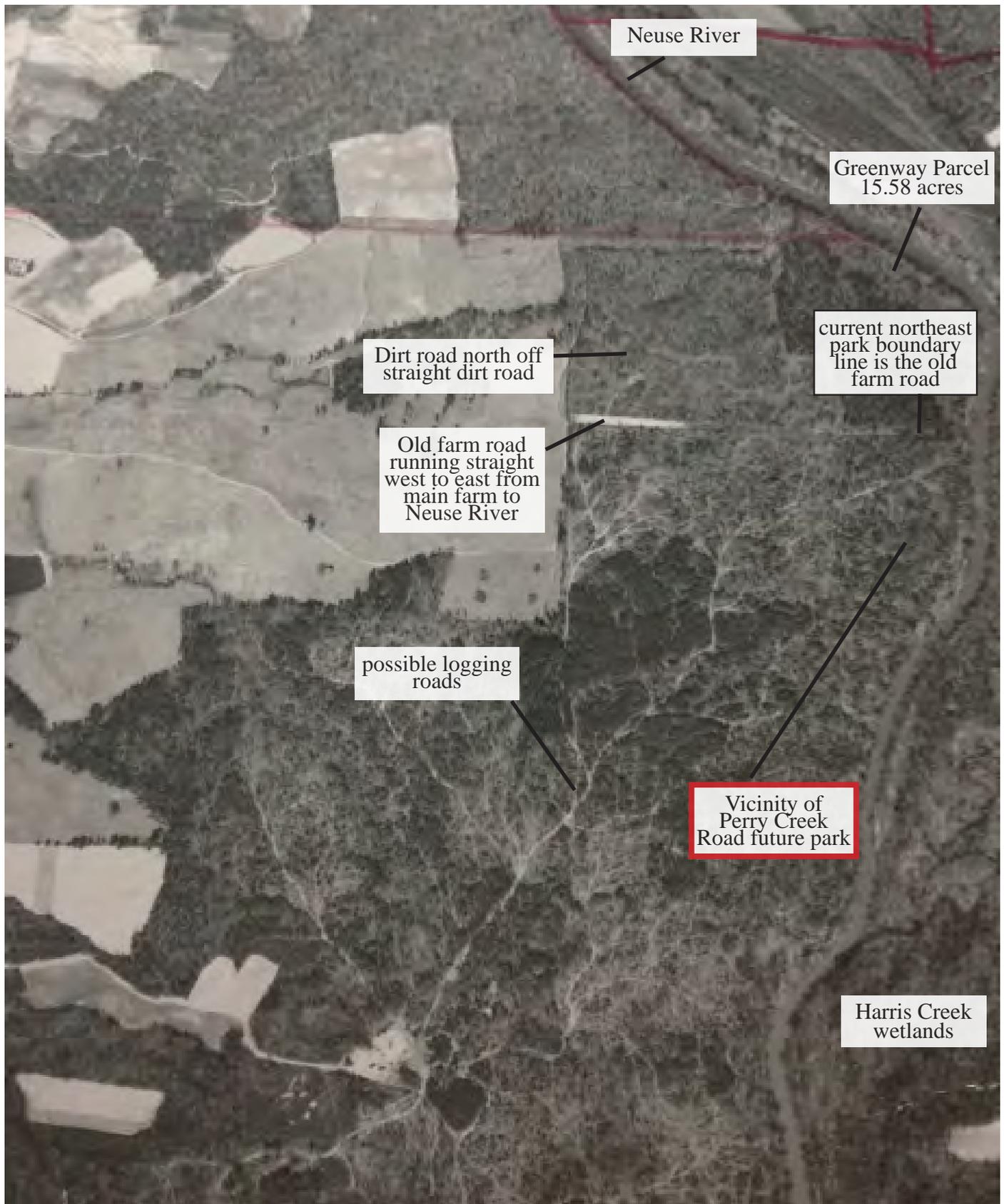
Vicinity of Perry Creek Road Property, 1954



US Department of Agriculture, BOP-3N-50, Grid N-6, flown October 10, 1954

Vicinity of Perry Creek Road Property, 1965

The Phase 1 Environmental Assessment report (GeoTechnologies, Inc August 2009) reports “pathways related to previous logging activities, recreation, and the completion of geotechnical soil borings”. These pathways are visible on the 1965 aerial photo below.



US Department of Agriculture, BOP-7FF-154, Grid N-6, flown March 15, 1965

Vicinity of Perry Creek Road Property, 1971



US Department of Agriculture, BOP-6MM-181, Grid N-6, flown March 5, 1971

Vicinity of Perry Creek Road Property, 1988



US Department of Agriculture, USDA 37183, Grid M-7, flown 1988

Vicinity of Perry Creek Road Property, 1994



Horseshoe Farm Nature Preserve

Perry Creek Road

Neuse River

Sewer easement along west side of Neuse River

Louisburg Road Hwy 401

Granite Ridge Trail

Vicinity of Perry Creek Road future park

Harris Creek wetlands

Millbrook Rd

US Department of Agriculture, USDA NAPP 6137-94, Grid H-6, flown 1994

Perry Creek Road Property Site Description

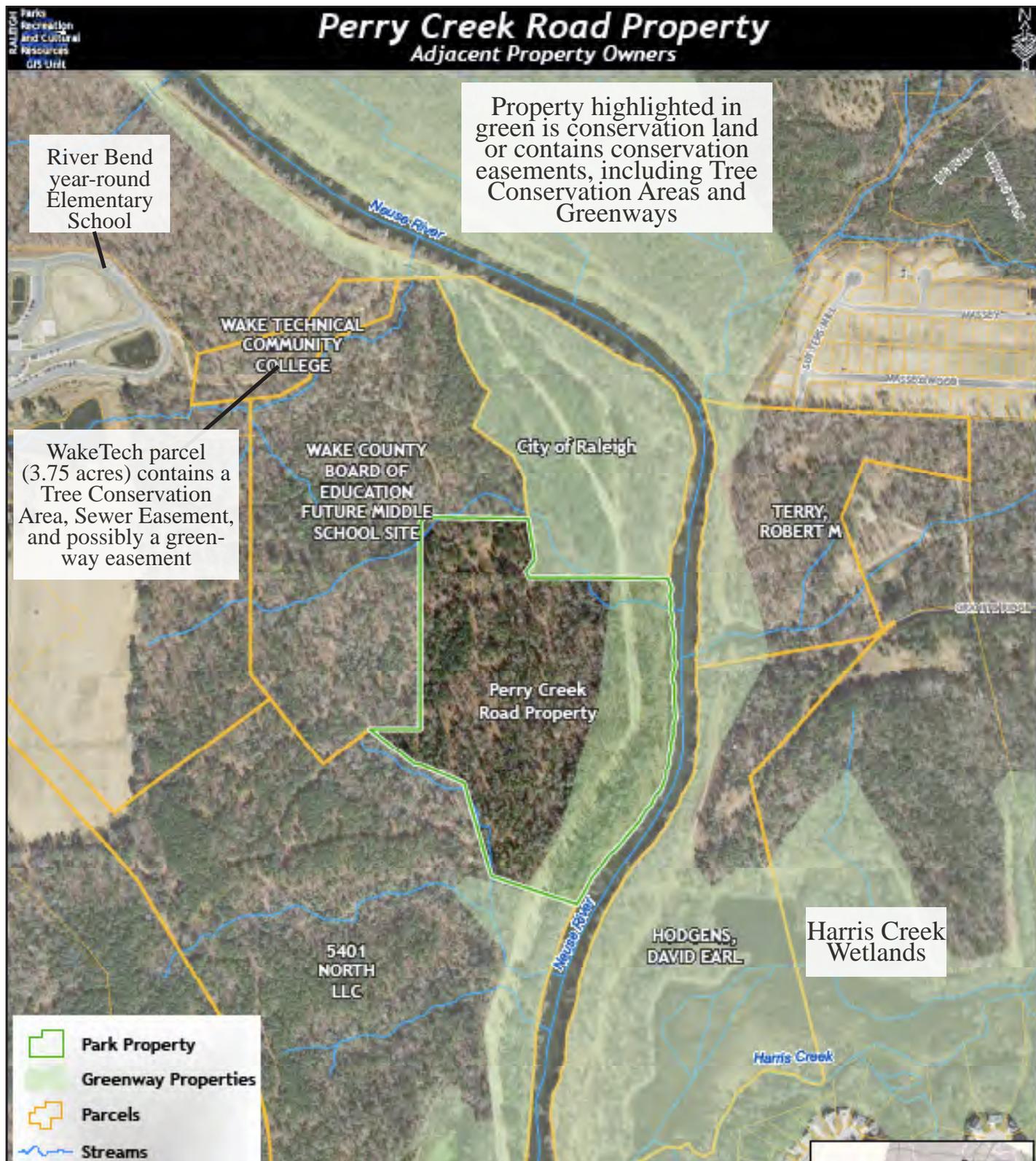
- Map of Adjacent Property Owners
- Construction Drawings *5401 North LLC Development*
 - Greenways
 - Greenways Overview
 - Neuse River Greenway Trail
 - Greenway Land in Vicinity of Perry Creek Road Park
 - River Access
- Public Utility Easements



New Public Utility sewer easement under construction will provide services to new development, including the planned Middle School site.

Property Owners in the Vicinity of the Perry Creek Road Future Park Property

The 24.97 acre site known as the Perry Creek Road future park property is located at **6580 Perry Creek Road**, northeast of Lousiburg Road (Hwy 401) and Interstate Highway I-540 in Raleigh. This future park site is within a proposed development of residential and mixed use known as *5401 North LLC*. The area includes River Bend Elementary School, and a Middle School is planned for completion in August 2017. The Northern campus of WakeTech Community College is north of the *5401 North LLC* planned development area. Extensive greenway land and other natural areas are located along the Neuse River (highlighted in light green on the map below).



Greenways Overview

City of Raleigh greenways are more than greenway trails. Greenways are actually preserved natural land areas, some of which include trails, however many greenway lands remain as undeveloped natural land areas that benefit the community as natural buffers, environmental preserves, or wildlife corridors. The City of Raleigh 2030 Comprehensive Plan identifies the goal to inventory and map the greenway system and address the means by which greenway stewardship can be promoted.

Greenways can be land parcels owned by the City of Raleigh that have been designated as greenway, or greenway easements located on property that is privately owned or owned by another public agency or organization. Greenway land parcels owned by the City of Raleigh are extensive, covering approximately 3,700 acres at the time of this report. Historically, the City of Raleigh often acquired greenway easements where greenways were desired, which allowed just portions of land parcels to be designated for greenway use. Greenway easements are often acquired along stream and river corridors to provide water quality benefits and create habitat connectivity. Greenway easements provide environmental benefits and conserve public space for potential future greenway trails. Greenway easements are in perpetuity and attached to the property deed, therefore the easements transfer when properties are sold to the next owner (*Capital Area Greenway Planning and Design Guide*, November 2014).

Greenway trails are likely the most familiar feature of the greenway system. The City of Raleigh Parks, Recreation, and Cultural Resources Department leads the design and development of greenway trails under the guidance of the Capital Area Greenway Corridor Master Plan. Greenway trails may be constructed within greenway parcels, greenway easements, or within Public Utility easements. When possible, greenway trails are constructed within existing City of Raleigh sewer easements to minimize site impacts. Most of the sewer easements where greenway trails are developed are located within riparian corridors. PRCR staff work closely with Raleigh Public Utilities to design greenway trails in a way that minimizes greenway trail and sewer line conflicts.



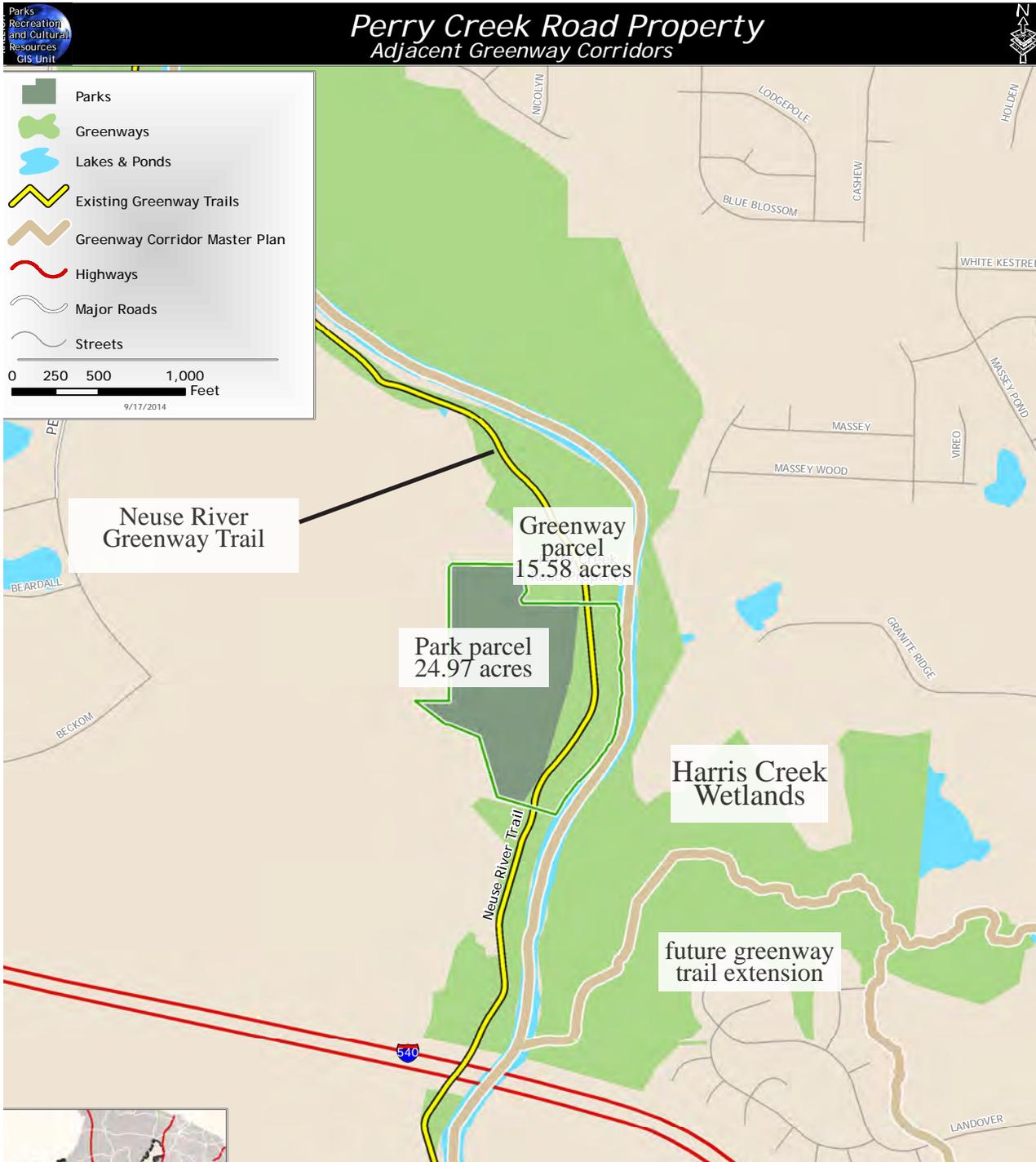
Greenway Easement Boundary Marker



Gerardia flowers occur along the Greenway Trail edges.

Greenway Land near Perry Creek Road Property

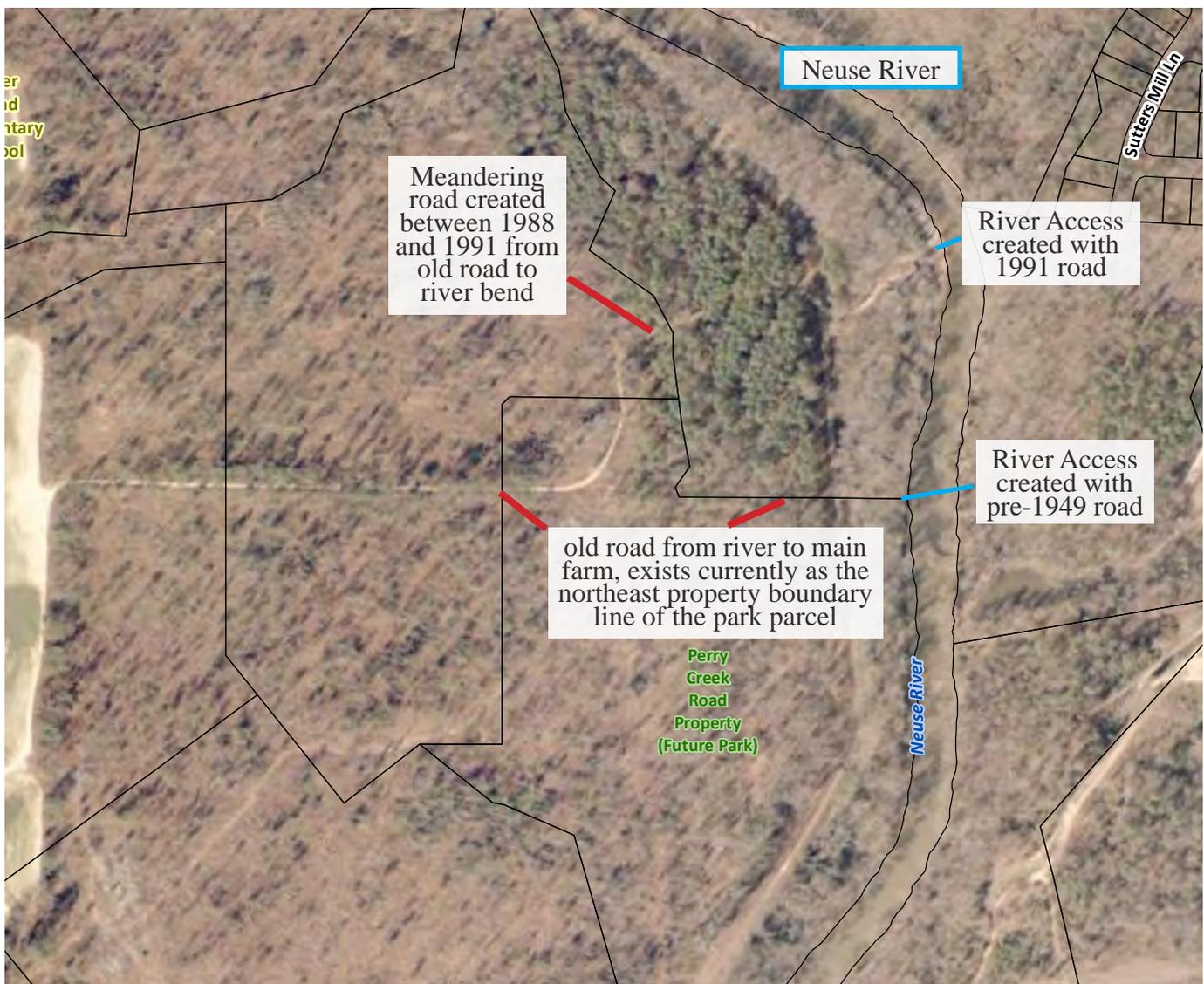
The Neuse River Greenway Trail occurs along the west side of the Neuse River, shown on the map below as a yellow line. In the vicinity of the Perry Creek Road property, the Neuse Trail follows greenway easements on WakeTech owned land, then crosses through the 15.58 acre greenway parcel owned by the City of Raleigh, then crosses through the eastern portion of the 24.97 acre future park parcel, then continues south of the park through greenway easements along the river. The City of Raleigh Greenway Corridor Master Plan includes a greenway trail extension across the Neuse River west to Harris Creek (shown as a tan line on the map below). The future Harris Creek Greenway Trail has not yet been designed and has no planned funding, therefore the Harris Creek Greenway Trail is in the long range plan for estimated design and construction in the year 2024. Extensive greenway land and protected open space is located within the vicinity of the Perry Creek Road property, providing valuable habitat connectivity and wildlife corridors.



Existing Neuse River Access

Best Management Practices will minimize new development impacts within the Neuse River floodplain and NC Natural Heritage Program Significant Natural Heritage Area (described in detail in the Vegetation Inventory Section of this report). Existing river access points should be utilized for public or educational access points if they are appropriate. Considerations should include stability of existing access points and degree of environmental sensitivity of the existing river access points, which were created during historic land use that did not necessarily consider environmental sensitivity.

Neuse River access is currently available at existing openings created by previous land disturbance and on existing sewer easements. A strong landscape feature in the area is a straight old dirt farm road running west-east that is visible as far back as the 1949 historic aerial photographs of the site. The dirt road extended from the main old farm along Louisburg Road all the way to the Neuse River. This “pre-1949” dirt road is located along the northeast park property boundary. An additional informal road that created river access was built some time between 1988 and 1991, probably for agricultural, logging, or recreational purposes. The “1991 road” has returned to a forested condition along much of its length, but is still visible along some portions, particularly near the Neuse River. The “1991 road” crossed through what is now the northwest portion of the park parcel, through a corner of what will be the Middle School site, and then through the 15.58 acre greenway parcel. A third existing river access point is near the southeast corner of the park parcel, within a Public Utility sewer easement.



Aerial photo of park and greenway parcel in 1991. Parcel lines were not present at the time and are only included here for reference. The 1991 aerial photo shows a road created off the main farm road, meandering through what is currently three separate parcels, and ending at the Neuse River within the 15.58 acre greenway parcel.

Sewer Easements on Perry Creek Road Property and Vicinity



City of Raleigh Public Utility sewer easements run along both sides of the Neuse River in the vicinity of the Perry Creek Road property (the western 60 foot wide sewer easement was installed between 1988 and 1991, see historic aerial photos). Sewer lines are marked with green lines and manhole locations are labeled with round symbols on the aerial photo above. The western sewer easement is 60 feet wide. A Neuse River sewer crossing is located near the southeast corner of the park property, crossing to a location north of the Harris Creek wetlands. The sewer system has a connecting sewer line and easement originating north of the greenway parcel then running west to support sewer services at River Bend Elementary School. This sewer line is located on WakeTech property near a high quality natural area with a stream, wetlands, and a riparian corridor supporting rare plants. This stream and wetland system has been designated as a Tree Conservation Area, and is described in more detail in other sections of this report. Sewer easement photos and information are interspersed throughout this report, as the sewer easements impact or occur near water resources, vegetation, and other area resources.



The sewer easement and access road to the elementary school is forested on both sides with permanent Tree Conservation Areas. The sewer easement is located near a high quality stream and wetland system located on multiple properties, including a portion on a City of Raleigh greenway easement. Once the *5401 North LLC* property is developed, if Public Utilities could abandon this access road and allow this area to re-vegetate with native plants and close the tree canopy, this Tree Conservation Area would have higher conservation value and would provide better wildlife habitat.



The City uses large boulders to prevent unauthorized use of the Public Utility access road. The location above is where the elementary school sewer easement spur adjoins the main sewer line near the paved Neuse River Greenway Trail.



2013 Aerial Photograph of Neuse River Greenway Trail and sewer easement split within 15.58 acre greenway parcel

The paved Neuse River Greenway Trail along the west side of the Neuse River is located within the Public Utility sewer easement for much of the length of the Greenway Trail. Many greenway trails are constructed within existing City of Raleigh sewer easements to minimize site impacts. However within the 15.58 acre greenway parcel located north of the Perry Creek Road park property, the Greenway Trail was constructed west of the existing sewer easement, creating two cleared swaths on the west side of the Neuse River, visible in the aerial photo above. Portions of the greenway parcel support a high quality bottomland hardwood forest with uncommon plants, located in the Significant Natural Heritage Area *Upper Neuse River Floodplain* described in more detail in the Flora Inventory and Wildlife Habitat sections of this report.



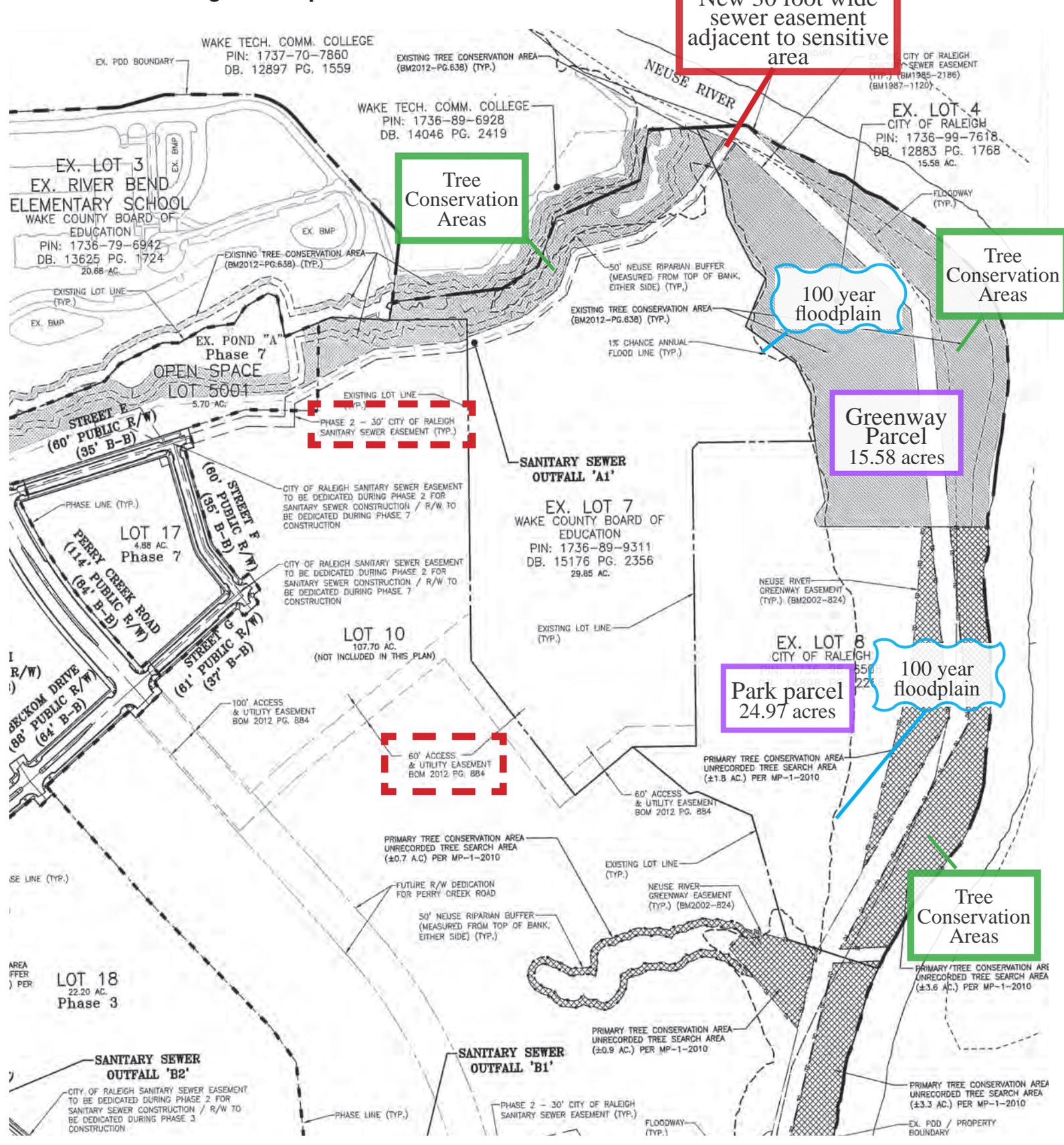
Green silt fence remaining from sewer easement construction continues down much of the length of the sewer easement.



Manhole within old sewer easement east of paved Greenway Trail, facing hardwood forest between the sewer easement and the Neuse River. Manholes are sometimes built as a raised structure to increase visibility and facilitate maintenance and emergency response. Sewer easements are monitored annually.



Tree island within sewer easement. Wet conditions in parts of the original sewer easement sometimes have saturated soil or standing water and support wetland plants and wildlife. Sewer easement vegetation is managed by mowing with a bush hog, on a 4 to 7 year rotation.



Construction Drawings above show locations of planned sewer easements to provide services for new development. The Tree Conservation Area along the northern stream and wetland system has an adjacent 30 foot sewer easement that begins on the PRCR greenway parcel, discussed in more detail beginning on the next page and in other sections of this report. This sewer easement is adjacent to a sensitive area and potential impacts need to be minimized and monitored.



New 30 foot sewer easement being installed south of the 3.75 acre WakeTech parcel where the easement begins on the City of Raleigh greenway parcel, at the paved Neuse River Greenway Trail. The new easement (shown above, photographed in October 2013) is being created for service to the planned Wake County Middle School site. See Construction drawing map for the location of planned sewer easements within the area. Invasive plants and fire ants spread very easily during site disturbance, and are often found on sewer easements. Invasives can then continue to spread on construction and maintenance equipment and other means during site development. Precautions to manage priority invasives before site development, including cleaning of equipment, should be incorporated into development guidelines.



New sewer easement at top of slope along northern stream system, being cleared of trees and other vegetation to prepare for installation of sewer pipes (photo taken in October 2013). Installation of sewer lines requires clearing of an area almost twice the width of what is required as a permanent easement width to maintain the sewer lines. This sensitive area should be allowed to re-vegetate with native plants to maintain a closed tree canopy. If immediate soil stabilization is needed, a native seed mix should be used. This area should be carefully monitored for aggressive invasives and other site impacts.



Stormwater drainage feature within new Public Utility easement adjacent to sensitive habitat within Tree Conservation Area. The steep slope supporting uncommon plants is visible in the background, and is discussed in greater detail in the Flora Inventory and Water Resources sections of this report.



Dumping of tree and plant debris in a natural area when clearing for any development should be carefully evaluated. Woody debris and brush piles are beneficial to wildlife, however in the situation photographed above, tree debris was dumped on top of rare plants growing on the steep slope above the stream.

Sewer Easement at the Northern Boundary of the Park Parcel



View of sewer manhole at northeast park boundary. The location where the paved greenway trail splits from the old sewer easement is visible in the background. The muddy tire tracks on the paved greenway trail lead to the old farm road that runs along the northern park boundary.



The muddy tire tracks visible in both the photos on this page lead to the old dirt farm road (created before 1949) that marks the northeast park boundary.

Sewer Easement at the Southern Boundary of the Park Parcel



Public Utility manholes near southern park boundary, with greenway bridge stream crossing in the left background. The combination of the Greenway Trail with its mowed or maintained “shoulder” and the sewer easement create a wide swath and a significant impact to the ecological quality of the area. Maintaining, or re-creating if necessary, a continuous tree canopy over the greenway trail and sewer easements is a valuable natural resources management practice.



Public Utility sewer easement crossing at Neuse River near southern park boundary. This area provides an existing river access point.

Perry Creek Road Property Natural Resources Inventory

- Soils
- Geology
- Topography



Neuse River at existing river access from old dirt road created circa 1991

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

Natural resources inventory generally focuses on observable aspects of the physical environment, including soils, topography, hydrology, and vegetation. Evaluation of existing conditions includes review of past land use, human impacts, and natural disturbance. Site investigations and inventory of natural resources of the Perry Creek Road future park property and vicinity were conducted during April 2011, September, October, and November 2013, and October 2014. Inventory will be ongoing as staff and resources allow.

Soils of the Perry Creek Road Future Park Property and Adjacent Greenway Parcel

Soils data was developed in 1999 by the North Carolina Center for Geographic Information and Analysis and USGS. The Perry Creek Road property is underlain by the Appling-Louisburg-Wedowee soil association. This soil association is described in the 1970 Wake County Soil Survey as “gently sloping to steep, deep and moderately deep, well-drained and somewhat excessively drained soils that have a subsoil of very friable coarse sandy loam to firm clay; derived mostly from granite, gneiss, and schist”. This soil association is described as being droughty in many places. The 1970 Wake County Soil Survey describes the major soils of this association to have moderate to severe limitations to use as absorption fields for septic tanks, no special limitations if they are used to support foundation footings for large buildings, and a main limitation of bedrock near the surface for road construction. The Louisburg soils of Wake County are strongly acid and are low in natural fertility and content of organic matter (Cawthorn 1970).

A Perry Creek Soils Map is provided following the soil mapping unit descriptions.

Soils of the Perry Creek Future Park Parcel

There are four soil mapping units within the future park property. Two of these soil units are hydric soils.

Cm (or CmA) Chewacla soils, 0 to 2% slopes, **Hydric Soil**

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.

Co (or CoA) Congaree silt loam soils, 0 to 2% slopes, **Hydric Soil**

Congaree silt loam is mapped in Neuse River floodplain areas. This soil is nearly level and well-drained with moderate permeability. The seasonal high water table is approximately 2.5 feet below the ground surface. Congaree silt loam is a Class B soil-mapping unit, indicating that it may contain hydric soil inclusions or wet spots.

WmC Wedowee sandy loam soils, 6 to 10% slopes

Wedowee sandy loam is on side slopes in upland areas. The surface layer is sandy loam 6 to 10 inches thick. The subsoil is firm sandy clay loam to clay loam that is 8 to 26 inches thick. Included with these soils were some areas in which 20 to 50 percent of the surface is covered with gravel and from 20 to 50 percent of the surface layer consists of gravel. Infiltration is good, and surface runoff is rapid. The hazard of erosion is severe.

DuB Durham Loamy Sand soils, 2 to 6% slopes

This soil is on broad smooth interstream divides in the uplands. The surface layer is loamy sand 8 to 20 inches thick. The subsoil is friable sandy clay loam or clay loam that is 30 to 50 inches thick. Infiltration is good, and surface runoff is medium. The hazard of erosion is moderate.

Soils of Greenway Parcel

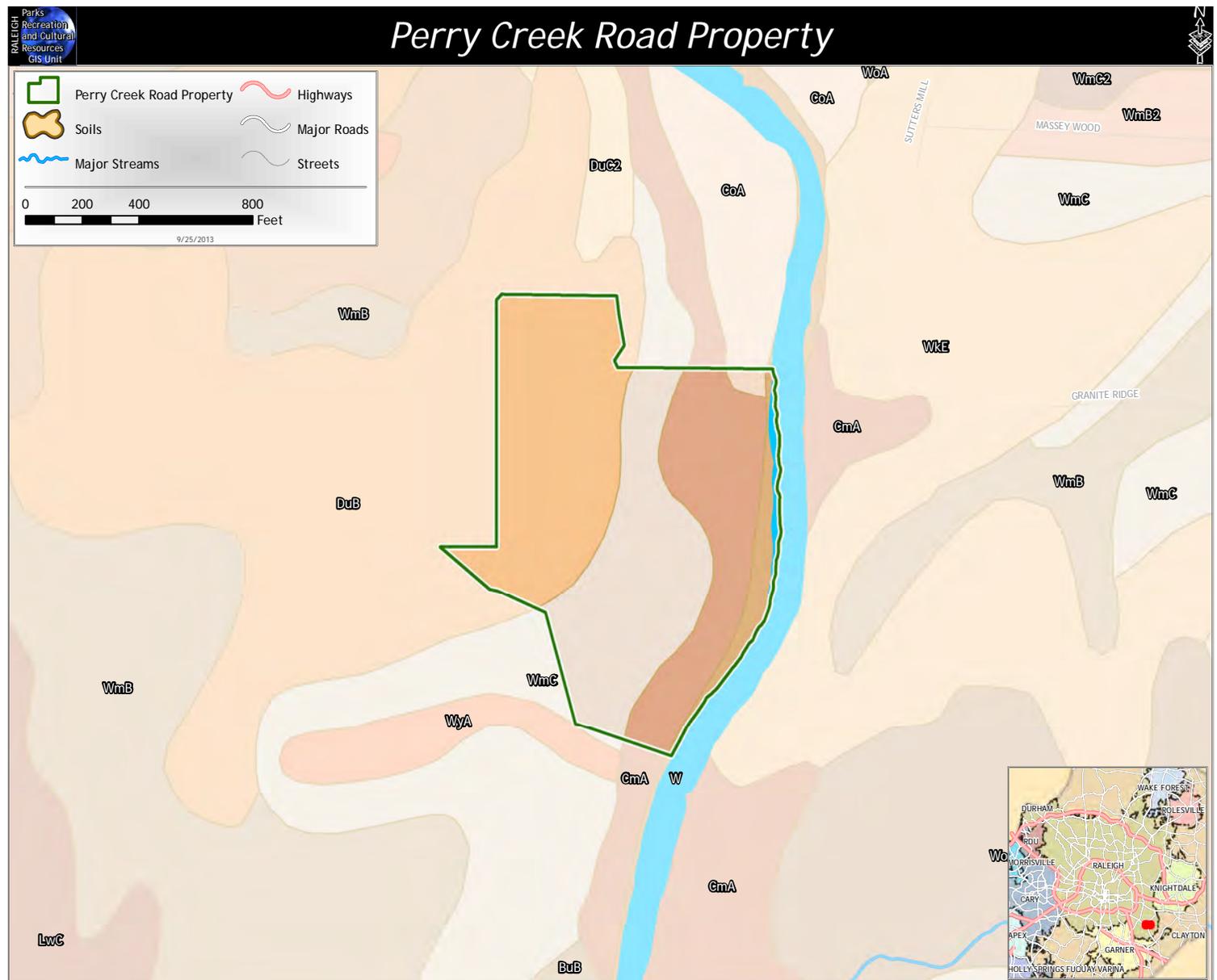
The soil mapping units on the adjacent 15.58 acre greenway parcel are the same as the park parcel, with the addition of small areas of eroded Durham Loamy Sand (DuC2), 6 to 10% slopes, and Durham Loamy Sand (DuC), 6 to 10% slopes.

DuC2 Durham Loamy Sand soils, 6 to 10% slopes, eroded

This soil is on narrow side slopes in the uplands. The surface layer is 3 to 7 inches thick and in many places is a mixture of the remaining original surface layer and material from the subsoil. In the less eroded areas, the surface layer is loamy sand. In the more eroded spots, the surface layer is sandy clay loam. The subsoil is friable sandy clay loam that is 30 to 40 inches thick. Infiltration is fair, and surface runoff is rapid. The hazard of further erosion is severe. Included with this soil were some severely eroded spots where the subsoil is exposed.

DuC Durham Loamy Sand soils, 6 to 10% slopes

This soil is on narrow side slopes in the uplands. The surface layer is loamy sand 7 to 15 inches thick. The subsoil is friable sandy clay loam to clay loam that is 30 to 40 inches thick. Infiltration is good, and surface runoff is rapid. The hazard of erosion is severe.



Geology of Perry Creek Road Property

A **Geologic Map of Wake County** is provided on the following page.

The following geologic information is from the Phase 1 Environmental Assessment Report by Geotechnologies, Inc. prepared in August 2009. The vicinity of the Perry Creek Road property is underlain by an extensive granite intrusive known as the **Rolesville Batholith**, comprised of various types of igneous rock, which is rock that was once molten. The site is located in an area which has experienced significant geologic change over time. The Carolina Slate Belt (a geologic formation created by volcanics) exists through Central North Carolina to the west of the site, while Coastal Plain sediments are present a short distance to the east of the site.

It is currently believed that the geology of this area 500 million years ago consisted of a volcanic chain through Central North Carolina west of the site, and the remnants of a small continent known as the Raleigh Belt in approximately the area of Wake County, with an inland sea between. Approximately 220 million years ago, tectonic activity resulted in the volcanics over-riding portions of the Raleigh Belt, and the introduction of the extensive granite intrusion known as the **Rolesville Batholith**.

The **Rolesville Batholith**, which underlies the vicinity of the Perry Creek Road property, is composed of the principal minerals feldspar and quartz, with feldspar dominating. Due to the variable feldspar content of the parent rock, significant variations in depth of weathering have occurred. Areas of feldspar rich rock typically will weather much more deeply than those which have higher quartz content. It is believed that these variations in mineralogy coupled with shearing which occurred shortly after cooling of the rock mass explain the differential weathering pattern which results in seams of partially weathered rock embedded within the more weathered mass of soil which overlies hard bedrock in this geologic formation.

Geology of Perry Creek Road Property and Vicinity

NC Department of Environment
and Natural Resources
Division of Land Resources
James D. Simons, Director

North Carolina Geological Survey
Geologic Note 9



This map was created for Historic Yates Mill County Park and accompanies the geology GIS data layers at the GIS station in the Historic Yates Mill County Park Visitor Center.

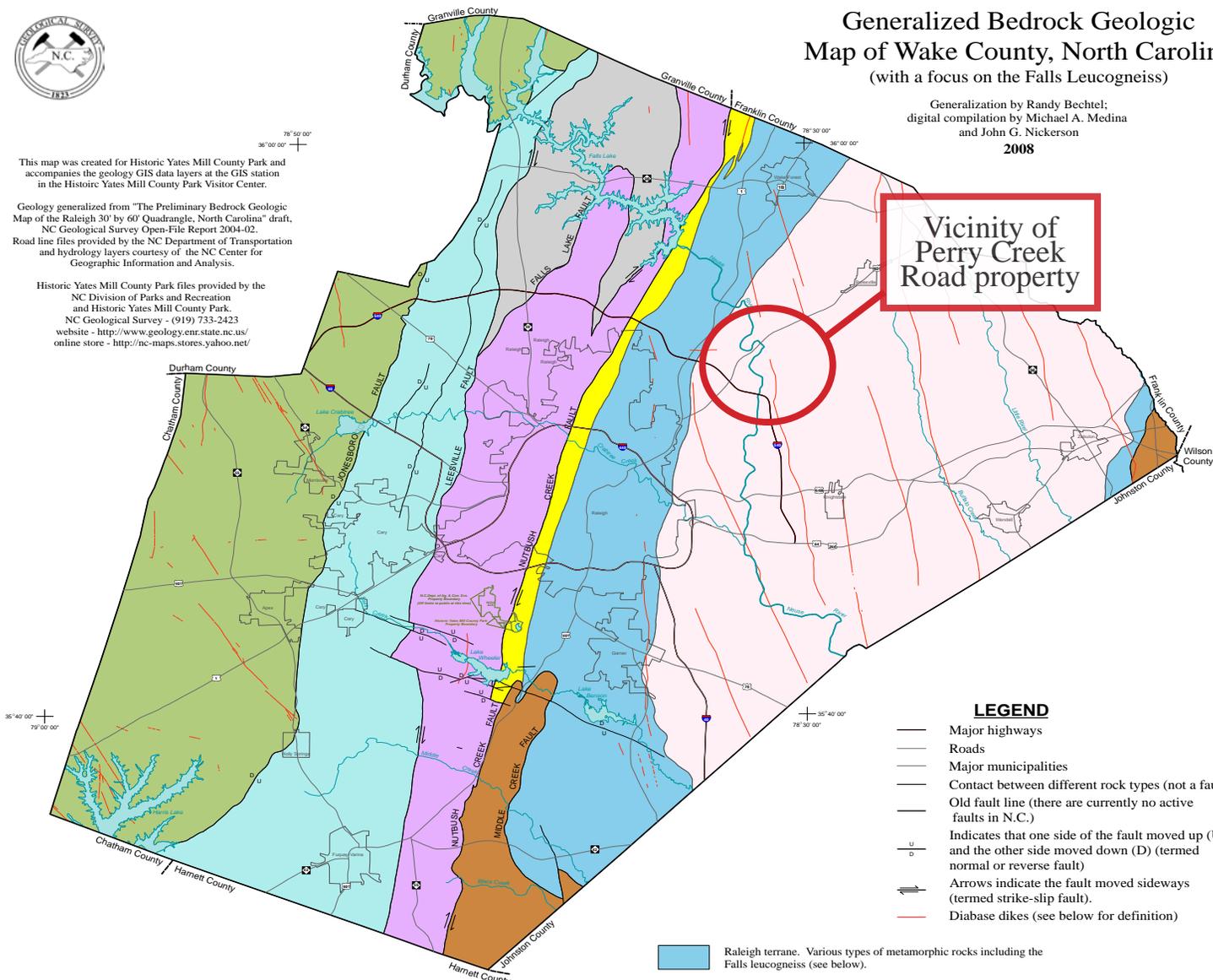
Geology generalized from "The Preliminary Bedrock Geologic Map of the Raleigh 30' by 60' Quadrangle, North Carolina" draft, NC Geological Survey Open-File Report 2004-02. Road line files provided by the NC Department of Transportation and hydrology layers courtesy of the NC Center for Geographic Information and Analysis.

Historic Yates Mill County Park files provided by the NC Division of Parks and Recreation and Historic Yates Mill County Park. NC Geological Survey - (919) 733-2423 website - <http://www.geology.enr.state.nc.us/> online store - <http://nc-maps.stores.yahoo.net/>

Generalized Bedrock Geologic Map of Wake County, North Carolina (with a focus on the Falls Leucogneiss)

Generalization by Randy Bechtel;
digital compilation by Michael A. Medina
and John G. Nickerson
2008

Vicinity of Perry Creek Road property



LEGEND

- Major highways
- Roads
- Major municipalities
- Contact between different rock types (not a fault)
- Old fault line (there are currently no active faults in N.C.)
- Indicates that one side of the fault moved up (U) and the other side moved down (D) (termed normal or reverse fault)
- ↔ Arrows indicate the fault moved sideways (termed strike-slip fault).
- Diabase dikes (see below for definition)

- Raleigh terrane. Various types of metamorphic rocks including the Falls leucogneiss (see below).
- Part of the Raleigh terrane, the Falls leucogneiss ('lou-ko-nice) is the resistant rock body that the mill and dam is built on at Historic Yates Mill County Park. Notice that dams for Falls Lake, to the north, and Lake Wheeler to the south, are also located on this rock body. There is a sample of the rock in the Historic Yates Mill County Park Visitor Center.
- Deep River basin. Various types of sedimentary rocks.
- Carolina terrane. Various types of metamorphic rocks.
- Falls Lake terrane. Various types of metamorphic rocks.
- Crabtree terrane. Various types of metamorphic rocks.
- Spring Hope terrane. Various types of metamorphic rocks.
- Rolesville batholith. Various types of igneous rock.

Geologic Terms:

Bedrock – Solid rock that is sometimes covered by soil, vegetation, roads and buildings.

Terrane – Group of rocks that have a similar geologic history.

Metamorphic – Rocks that have been changed from their original form by heat and pressure.

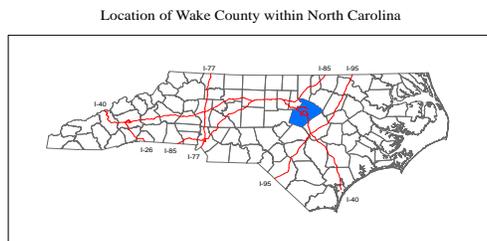
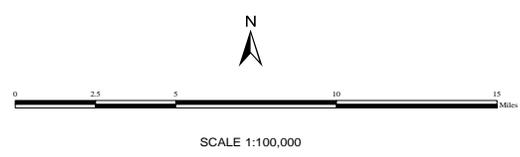
Igneous – A rock that was once molten.

Sedimentary – A rock made of pieces of other rocks or fossils.

Leucogneiss ('lou-ko-nice) - Leuco means light-colored and gneiss is a type of metamorphic rock.

Diabase dike - Diabase is a type of basalt (igneous rock) and a dike is a type of igneous rock body that cuts through the surrounding rocks.

Batholith - A large mass of igneous rock that was intruded into the surrounding rock.



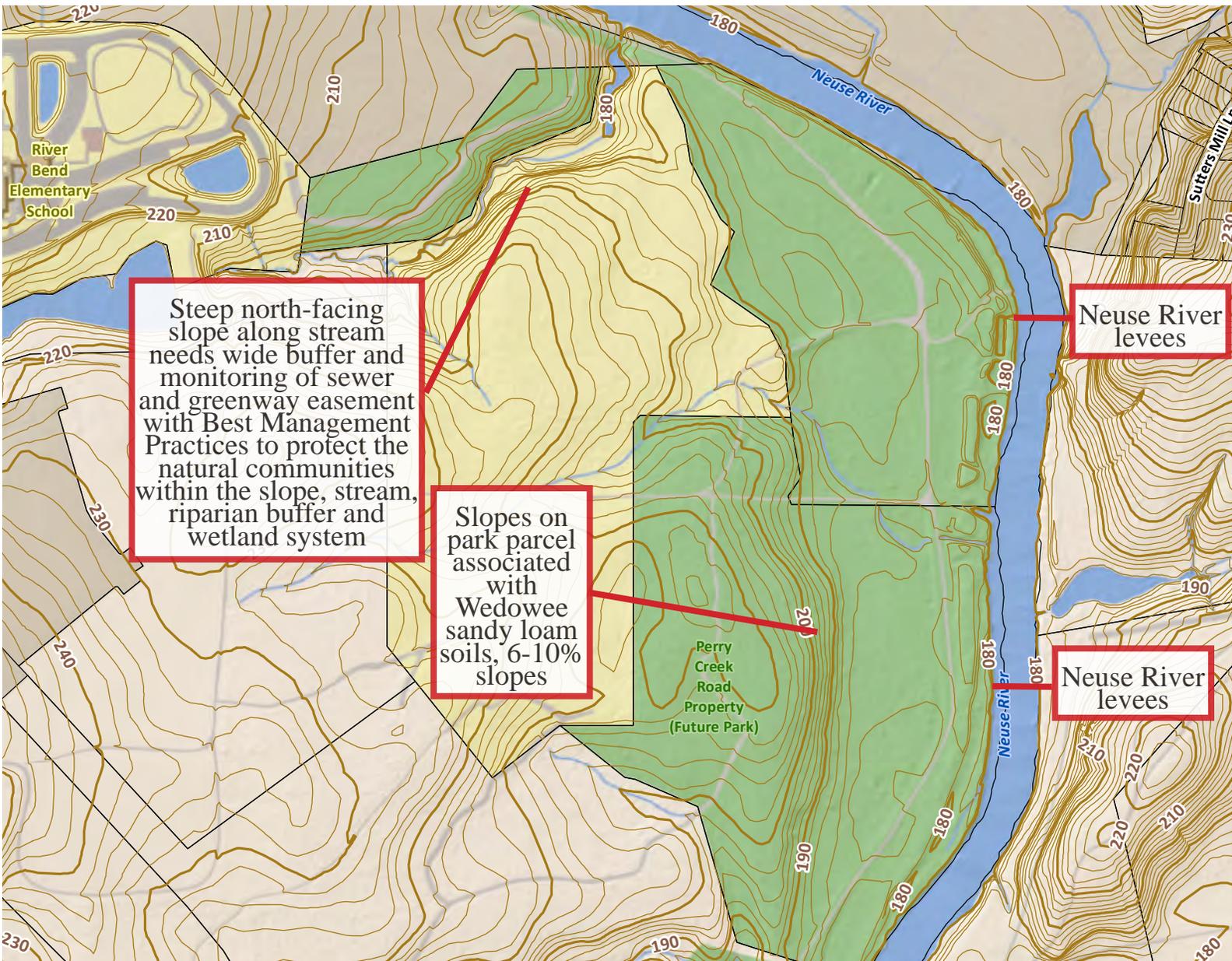
Research supported by the U.S. Geological Survey, National Cooperative Geologic Mapping Program. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government.

Topography

Topography generally slopes to the east and southeast towards the Neuse River. The park property is situated at elevations of approximately 180 feet near the Neuse River to 210 feet in the west section of the park.

There are some steep slopes present in the vicinity. Slopes in the center of the park parcel, associated with Wedowee sandy loam soils of 6 to 10 percent slopes, are described in more detail in the Vegetation Inventory Section of this report. There are also steep north facing slopes on Wake County/WakeTech property on the south side of the stream near the northwest corner of the greenway parcel (with portions designated as a Tree Protection Area and greenway easement), also described in more detail in the Vegetation Inventory Section. One of the landscape features evaluated during a site review for potential City of Raleigh Nature Preserve or Protected Natural Area classification is a review and inventory of slopes greater than 8% near streams or rivers, for potential rare or high quality intact natural communities. Slope areas greater than 8% are shown on the Water Resources Map in this report.

Low topography represented on the map below, for example contour lines labeled as 180 feet along the Neuse River, represents depositional topographic features associated with the Neuse River, including natural levees, point bars, ridge-and-swale systems, and sloughs. These important natural communities are described in more detail in the Vegetation Inventory and Wildlife Habitat sections of this report.



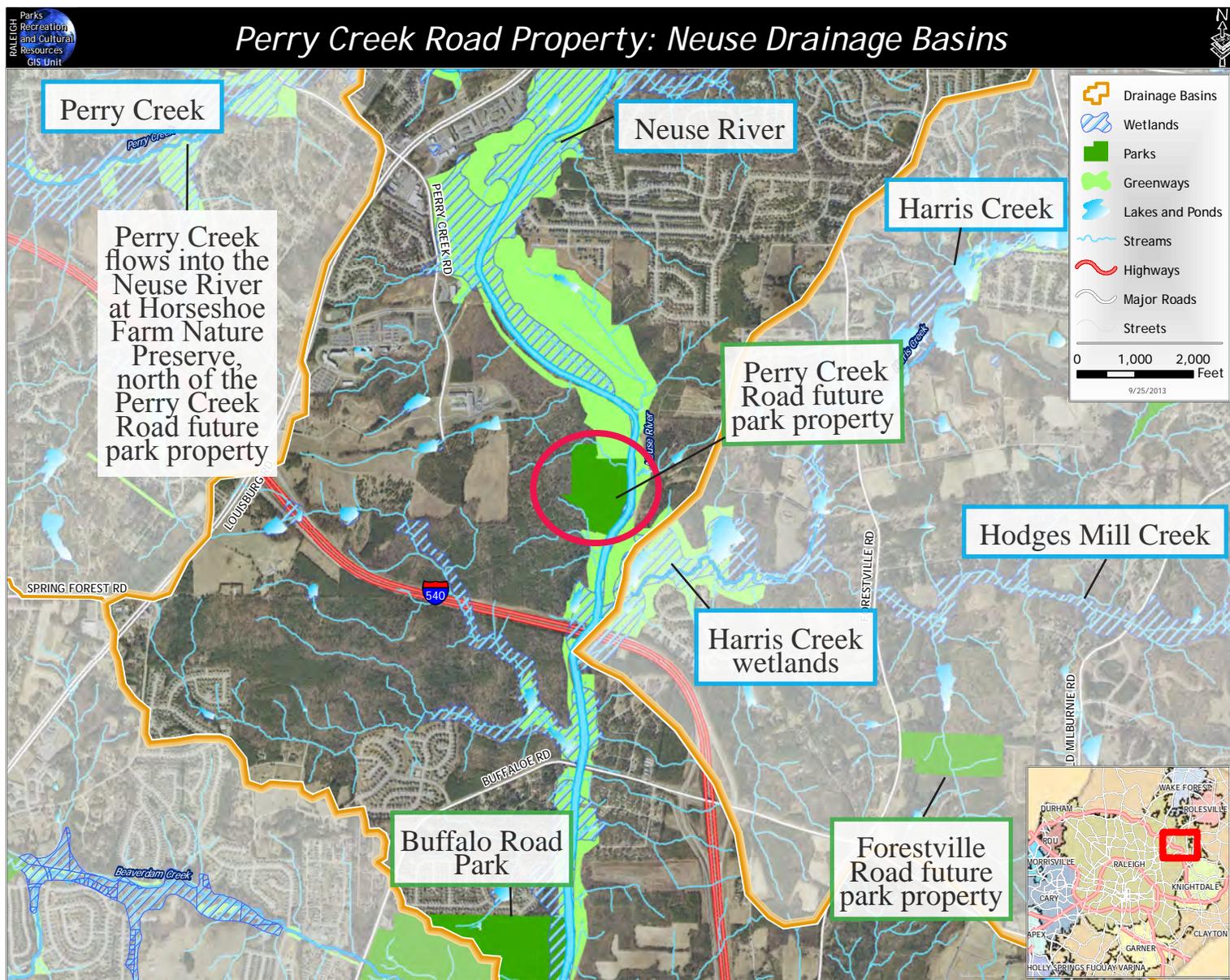
Perry Creek Road Property Water Resources

- Neuse River Drainage Basin
 - Flood Zones
 - Streams and Wetlands
- Stormwater Management



Greenway Trail bridge over wetland near northwest corner of Raleigh greenway parcel.

Water Resources of Perry Creek Road Property and Vicinity



The Perry Creek Road future park property is located along the Neuse River. The Drainage Basin map above shows the land area that drains or flows directly to the Neuse River or its tributaries. Streams in the vicinity of the Perry Creek Road property flow toward the Neuse River. All waters of the Neuse River Basin have been classified as “Nutrient Sensitive Waters”. Nutrient Sensitive Waters is a classification developed by the NC Department of Environment and Natural Resources (DENR) for certain waters of North Carolina with a history of water quality issues from exceeding nutrient and chlorophyll standards. Nutrient Sensitive Waters may have more stringent laws and regulations than conventional statewide water quality regulations. The Neuse River and its tributaries are subject to state and federal jurisdictional regulation under Section 404 of the Clean Water Act and North Carolina’s Neuse River Riparian Buffer Rules. The Neuse River, like most urban water resources 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.

Perry Creek Road Property Flood Zones

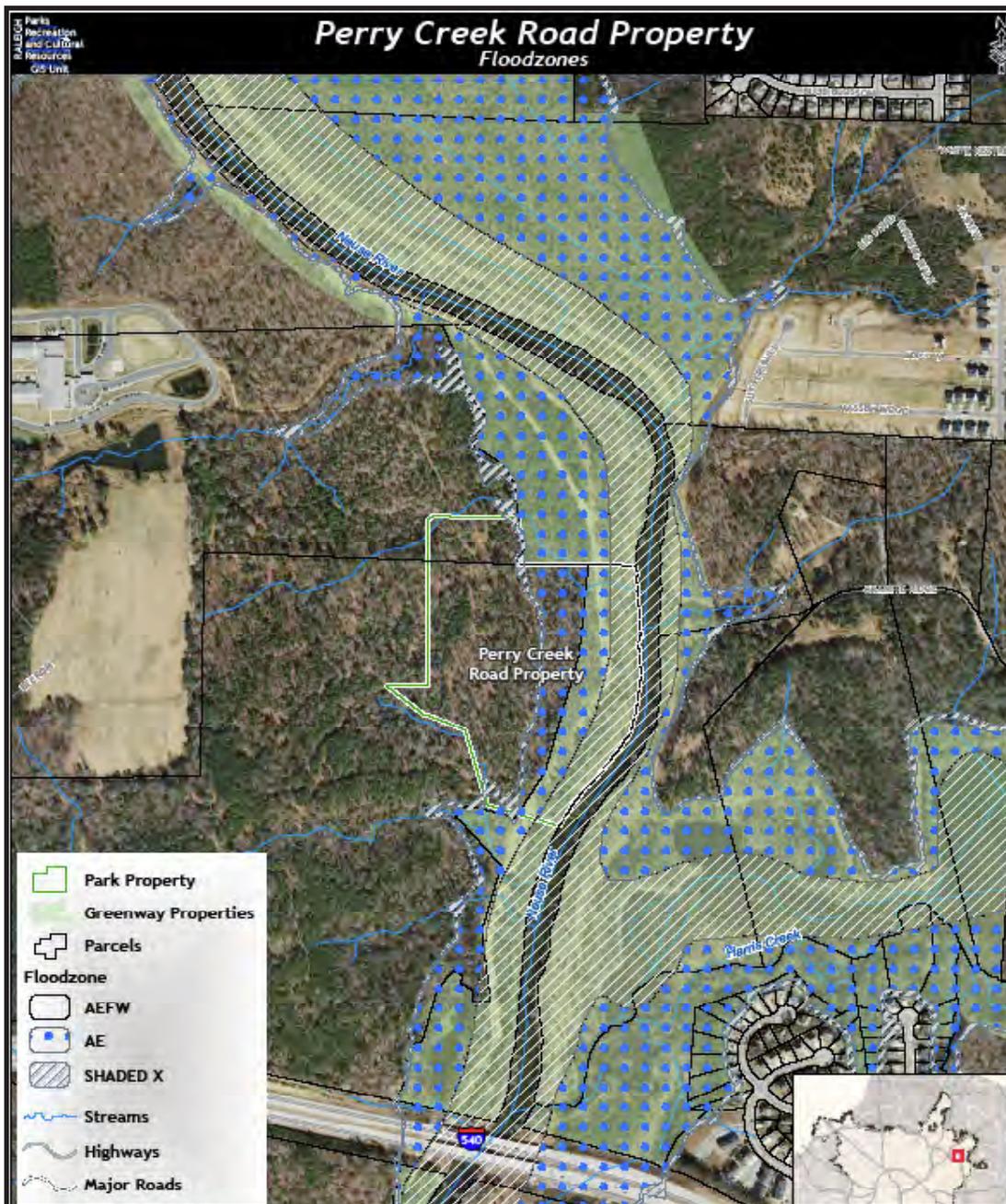
The Perry Creek Road future park property (Total Acres: 24.97 acres) has 13.32 acres within the Neuse River floodplain. The entire greenway parcel north of the park parcel is located within the floodplain. The Perry Creek Road property map below shows the estimated Flood Zones in the vicinity. Special Flood Hazard Areas (SFHAs) are defined as areas that will be inundated by a flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood.

The park property and adjacent greenway parcel include several flood zones:

North Carolina Flood Zone AEFW shows the 100-year floodway, an area that includes the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water-surface elevation by more than a designated height.

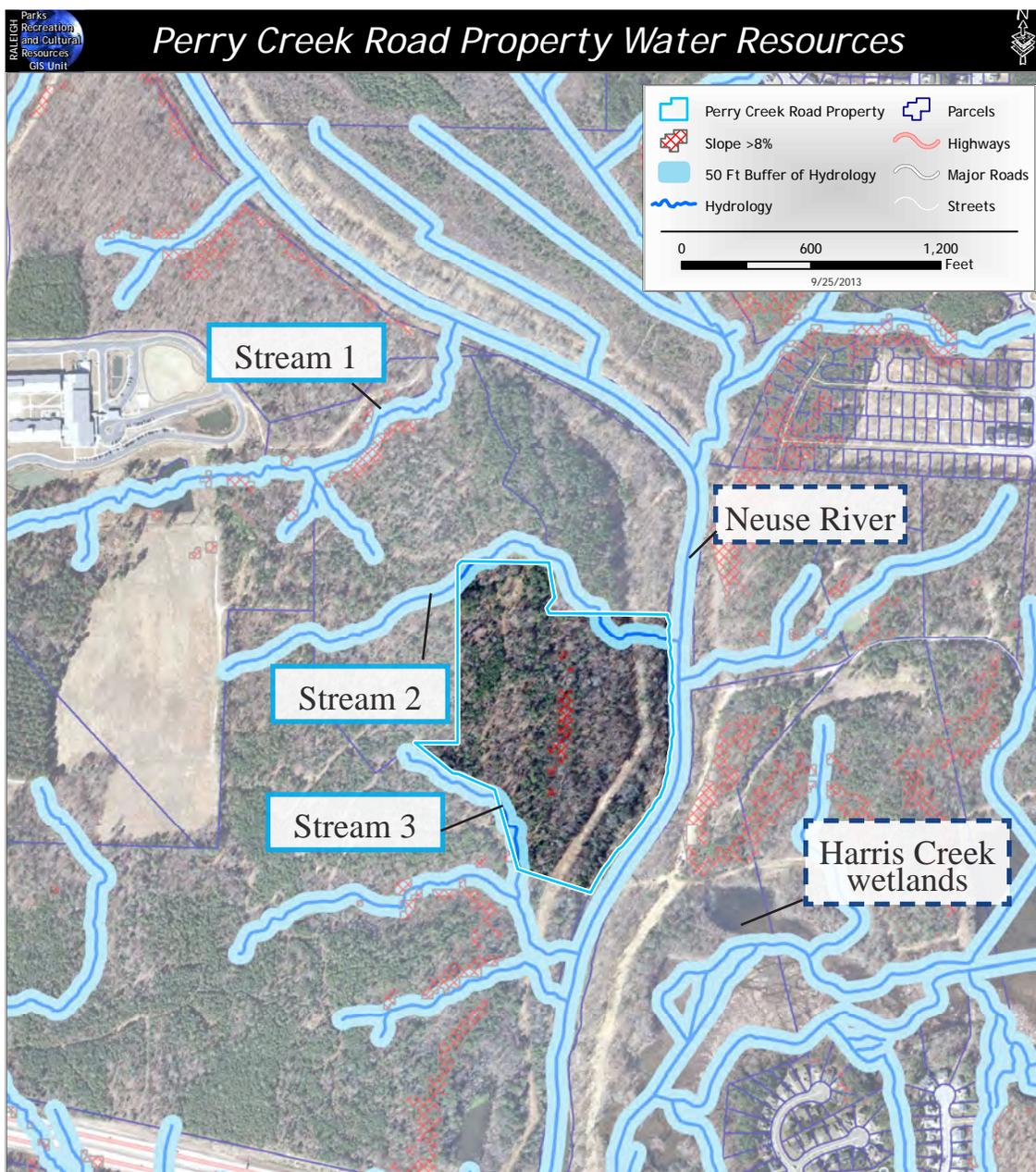
North Carolina Flood Zone AE shows the estimated 100-year flooding with base flood elevation determined.

Flood Zone Shaded X shows areas of moderate flood hazard, usually the area between the limits of the 100-year and 500-year floods.



Perry Creek Road Property and Vicinity Streams

Streams are a body of concentrated flowing water in a natural low area or natural channel on the land surface (DENR) and can be perennial, intermittent, or ephemeral. Natural streams can be modified, and man-made ditches or canals can also carry concentrated flowing water. A stream channel supporting a continuous conveyance of water exhibits typical biological, hydrological, and physical characteristics. The DENR Division of Water Resources (DWR) determines the presence and location of Waters of the State, including streams, and regulates Waters along with the U.S. Army Corps of Engineers. In areas where there are riparian buffer protection programs, other entities may make stream determinations for buffer rules. Streams that appear on maps, including the map below, may not actually be true streams, and streams do not have to appear on a map to be determined present and regulated. The City of Raleigh GIS Department uses numerous data sources to estimate stream length and location on preliminary maps. Stream data sources include the USGS, NRCS, and other sources. Stream determination is a field-verified review by trained Subject Matter Experts conducted during future park Master Plan phases. Estimated stream locations provided in this initial baseline inventory report and the map below are an estimate and starting point only. Future field review of streams in the vicinity of the Perry Creek Road property will include evaluation of whether the water body provides a nexus (connectivity) to another “Water of the State”, has a defined bed and bank, and displays a natural high water mark.



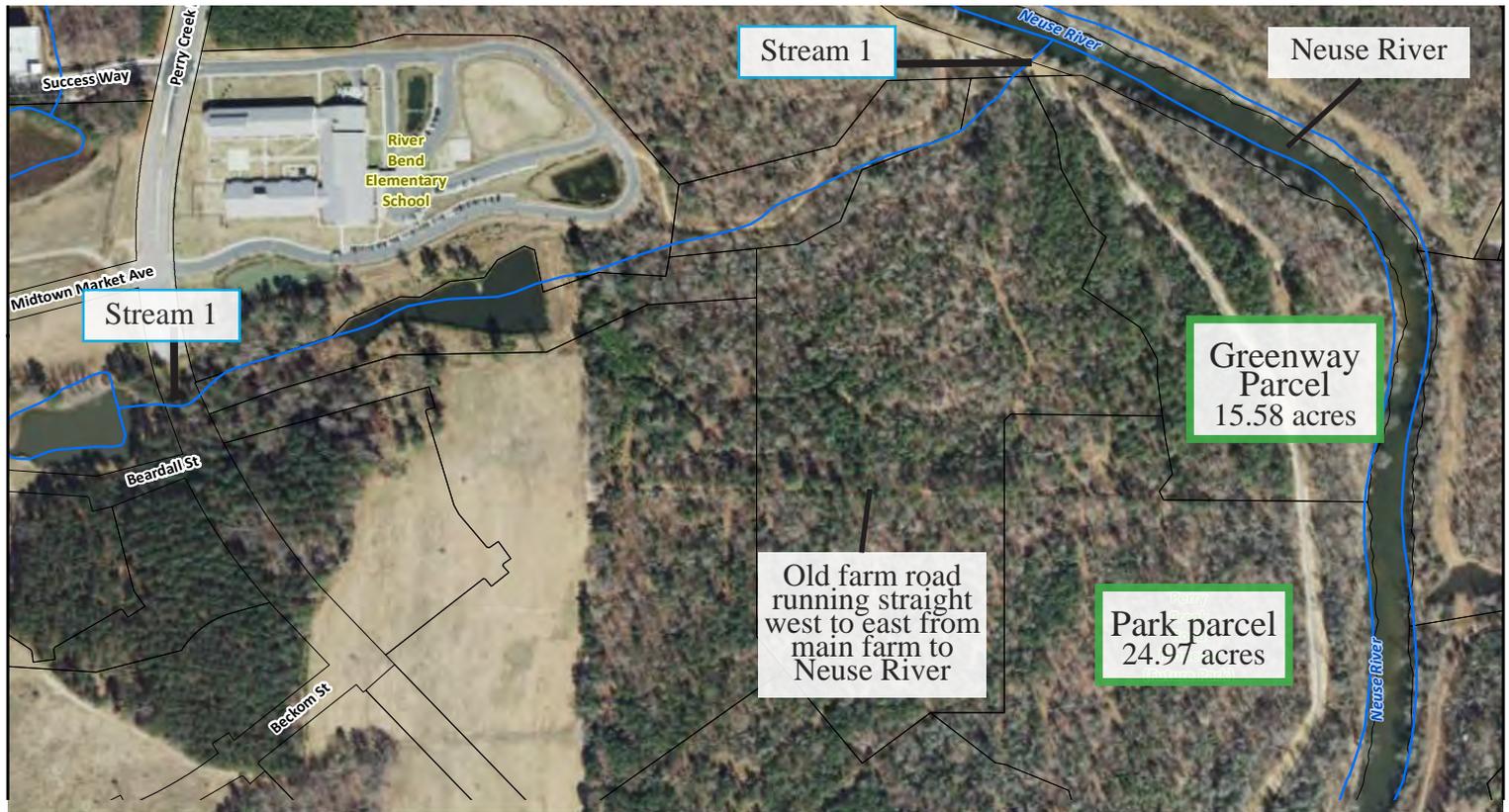
Blue lines represent estimated stream locations shown with a 50 foot buffer. Red hatch marks symbolize slopes greater than 8%. For reference purposes, stream areas discussed in this report are labeled as Stream 1, Stream 2, and Stream 3.

Stream 1

Stream 1 is an unnamed tributary of the Neuse River, characterized by a hydrological system of a perennial stream, riparian floodplain, and wetlands. The stream is located in the northern section of the Perry Creek Road vicinity reviewed in this report. Stream 1 crosses and impacts several different property owners, including the City of Raleigh, as the stream and wetland outflow directly to the Neuse River at the north side of the City of Raleigh greenway parcel. This stream and wetland system is one of the more dominant landscape features in the vicinity. It has significant impacts to Neuse River water quality, wildlife habitat, natural area connectivity, and the public experience of the Neuse River Greenway Trail in this area.



Stream 1 and the adjacent riparian area and upland forested buffer supports a high quality hardwood forest with good tree diversity. The stream has full canopy coverage which is important to maintain stream water quality. Tree canopy coverage moderates stream temperatures and stabilizes stream banks. The stream buffer is permanently preserved as a Tree Conservation Area, however a Public Utility sewer easement has been constructed near the stream, described in more detail in other sections of this report. Other development in the area is also likely to impact this stream system and should be monitored.



Stream 1 system on 2013 aerial photo



Stream 1 system on 1949 aerial photo

The northern “Stream 1” system is visible on aerial photos back to 1949, and appears to have originally stretched all the way at least to Louisburg Rd, but has been historically altered, with farm ponds and now stormwater detention ponds. The old road running west-east from the farm to the Neuse River is visible on both the 1949 and 2013 aerial photos.



Stream 1 showing a defined channel, with a narrow slope between stream and Public Utility easement, and the floodplain on the north side of the stream with River Cane and other floodplain plant and tree species. Much of the southern stream buffer is a sensitive steep north facing slope with uncommon plants. The buffer between the sensitive slope and the sewer easement meets legal requirements but is ecologically inadequate.



Portions of the Stream 1 system are braided channels, floodplain, and wetlands.

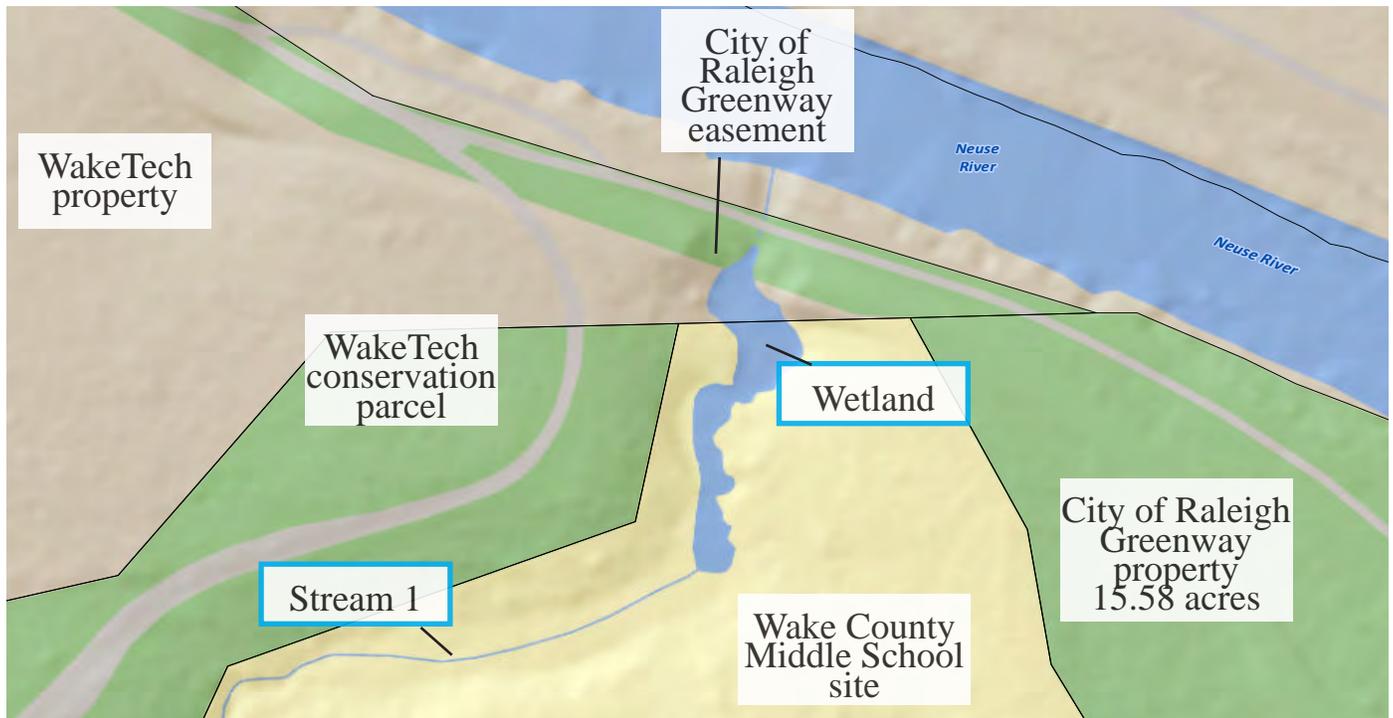


Flow from sewer easement under construction in upland area south of Stream 1. The sewer easement is discussed in more detail in the Site Description and Flora Inventory sections of this report.



Stream 1 bank undercutting and bank failure.

Wetland associated with Stream 1



Stream 1 and its associated wetlands are located across multiple property boundaries, with property owners sharing stewardship responsibility of the wetland, stream, Neuse River riparian buffer, and other natural resources in the area. The map above is only a general illustration of the property owners in the wetland vicinity; property lines vary between maps, and should be surveyed for accuracy.



Wetland is located partially within a City of Raleigh greenway easement with a greenway bridge crossing. The beginning of the sewer easement split from the paved Greenway Trail is visible on the right side of the aerial photo above.



Wetland associated with Stream 1 near the Neuse River.



Wetland view from the Greenway Trail bridge. The wetland provides important wildlife habitat and connectivity to the Neuse River.



Stream 1 where it transitions into a wetland near the Neuse River, with the steep north facing slope in the background.



Stream 1 overflowing its banks as it transitions into a wetland in the winter. There may be several wetland areas associated with this stream along its full length.



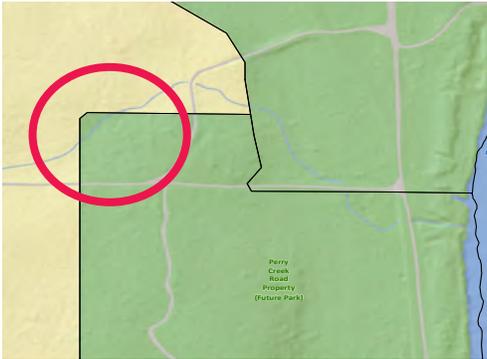
Greenway bridge over Stream 1 and wetland, facing north.



Stream 1 outflow to the Neuse River. Stream channel stabilization at the bridge includes riprap.

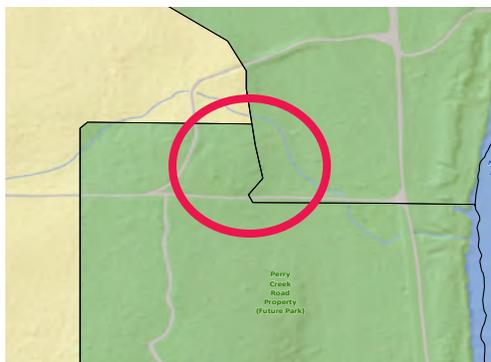
Stream 2

A potential Stream 2 is shown near the north park property boundary, with the stream mapped on multiple properties including the City's greenway parcel and the adjacent Wake County parcel. The potential Stream 2 location and extent needs further investigation.



Northwest park parcel corner, shown on the map section above with a potential stream (referred to in this report as Stream 2). No actual stream channel with a bed and bank was visible in this area at the time of the site visit. The old road bed from approximately 1991 is shown as a grey line on the map.

Photos of the park parcel boundary lines areas are shown below.



Vicinity of photo to the right.



Silt fence and property line at north park parcel boundary line where the property line turns south.



Silt fence and property line at north park parcel boundary line where the property line turns east again. There is a short break in the silt fence in this location. The topography slopes down to the Neuse River flood-plain east of this ridge.



Low wooded area in vicinity of mapped potential Stream 2. The area is moist, with moss covered logs, and should be checked for potential ephemeral wetland areas and amphibian habitat.

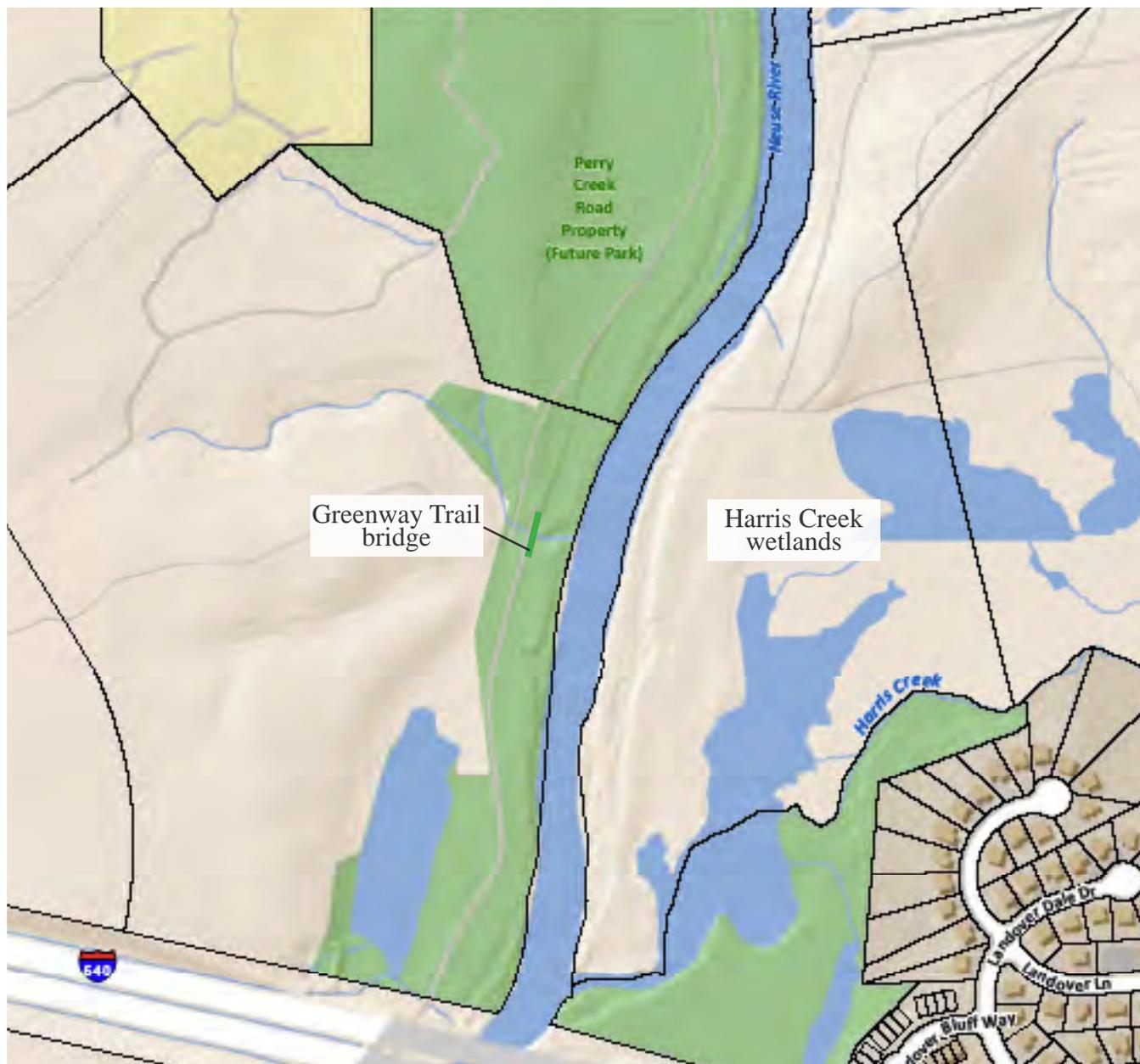


Low areas with ponded water in November 2014 were scattered in the vicinity of the potential Stream 2 area. Northern Cricket Frogs in various stages of development and water invertebrates were located in the ponded area shown above. There were also some wetland plants in this small pool. Ephemeral Pools are small wetland habitats that dry out seasonally and are a Priority Habitat particularly threatened by development because they are often not considered “jurisdictional” and are therefore not given legal protection. It is important that inventory for small ephemeral wetlands be conducted at the right time of year, generally winter and spring, so their occurrence is not missed. Additional information on ephemeral pools, including inventory guidelines and Wildlife Resources Commission Conservation Recommendations for Ephemeral Pools are included in the Wildlife Habitat section of this report.



Stream channel at northeast boundary of park parcel where it intersects paved Greenway Trail. This was the only part of “Stream 2” where a bed and bank, sign of concentrated water flow and a potential nexus to the Neuse River were observed.

Stream 3 and other Water Resources in Southern Section of Park Parcel and Vicinity



The southern portion of the park parcel has numerous water resources in the vicinity. A stream is located near the southwest property boundary, flowing into the Neuse River south of the park. A greenway bridge is constructed over the stream, just south of the park. A pond is located south of the park, just north of I-540. The Harris Creek system of streams, wetlands, and ponds is located on the east side of the Neuse River, near the southeast park boundary. The City of Raleigh Greenway Trail Corridor Master Plan calls for an eventual greenway trail connection south of the park leading east through the Harris Creek Wetland system to connect with areas further east.



Neuse River Greenway Trail bridge south of park parcel



Stream channel at south bridge did not have standing water in October 2013.

Stormwater Management in Vicinity of Perry Creek Road Property



The 2013 aerial photo above shows Public Utility easements (in green), Stormwater features, and a Neuse River Greenway Trail bridge location crossing a stream located near the southern park boundary. The Harris Creek wetlands on the east side of the Neuse River are extensive, and are located near the southern portion of the Perry Creek Road park property.

The full length and tributaries of the southern stream can be seen on the Water Resources map in this section of the report.

Stormwater Utilities

The map above 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 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 streams and wetlands.

Perry Creek Road Property Flora Resources

- Vegetation Overview
- Significant Natural Heritage Area
 - Natural Communities
 - Levee Forest
 - Floodplain Forest
 - Upland Hardwood Forest
 - Early Successional Areas
 - Riparian Stream Corridor
- Rare and Protected Plant Species
 - Tree Conservation Areas
 - Invasive Plants



Flattop Goldenrod *Euthamia caroliniana*

Flora Resources of the Perry Creek Park Property and Vicinity

Vegetation Inventory includes the Perry Creek Road future park parcel, adjoining greenway property, greenway easements, and other land in the vicinity. The Perry Creek Road park and greenway properties are partially located within a North Carolina Natural Heritage Program designated Significant Natural Heritage Area, described in more detail on the following pages.

Sources for Vegetation Inventory include the following:

1. *Flora of the Southern and Mid-Atlantic States* by Alan S. Weakley, Working Draft of 30 November 2012.
2. *Classification of the Natural Communities of North Carolina Third and Fourth Approximation* by Michael P. Schafale.
3. *An Inventory of Significant Natural Areas in Wake County, North Carolina*, Harry E. LeGrand, June 2003.
4. *List of Rare Plant Species of North Carolina 2014*, NC Natural Heritage Program.
5. United States Department of Agriculture Natural Resources Conservation Service Plants Database.
6. *North Carolina Wildlife Action Plan*, NC Wildlife Resources Commission 2005.
7. *North Carolina GAP Analysis Project Vegetation Mapping* sponsored by the Biological Resources Division of the USGS.
8. Other resources available.

Vegetation inventory and site observations are completed by City of Raleigh PRCR staff, with input and review by Subject Matter Experts from partner agencies. Data is supplemented and confirmed by existing inventory data available from partner agencies or consultants. Partner agencies that may have existing inventory data for a site include the North Carolina Natural Heritage Program, US Fish and Wildlife Service, and the NC Department of Environment and Natural Resources.

As part of the inventory process, the PRCR Land Stewardship Program develops and maintains a list of plants present on the subject property. Habitat Types were estimated using Weakley's Third and Fourth Approximation of Natural Communities in North Carolina. Plant Lists are generally inventoried and maintained using the following categories: Trees and Shrubs, Vines, Ferns, Herbaceous Plants, and Invasives. A detailed plant list for the Perry Creek Road property and vicinity is included in Appendix C.

Overview of Vegetation in Perry Creek Road Property Vicinity

Vegetation inventory for this SIP includes the 24.97 acre Perry Creek Road park parcel, the 15.58 acre adjacent greenway parcel north of the park, and other significant habitats in the vicinity. Vegetation inventory in the area began in 2011 and will be ongoing as staff time and resources allow. The majority of undeveloped land use in the area is forested, with a variety of forest types, including Piedmont Mesic Forest, Piedmont Oak Forest, Piedmont Floodplains, and Bottomland Hardwood Forest. Piedmont Levee Forest habitats are located along the Neuse River. Past land use in the area includes both logging and agriculture. Early successional plant communities and disturbed habitats are located throughout the area, within sewer easements, old road beds, and formerly disturbed sites. There are forest areas dominated by young loblolly pine stands. The 15.58 acre greenway parcel north of the park property is designated as a Tree Conservation Area and contains mesic forest with some uncommon plants. A stream and wetland habitat with steep north facing slopes designated as a Tree Conservation Area with greenway and sewer easements is located near the northwest property boundary of the greenway parcel, with the majority of the feature located on adjacent Wake County and WakeTech parcels and a portion of the system located within a greenway easement, including the inflow point to the Neuse River. There is also a stream system near the southern boundary of the park parcel. There are areas within the forested floodplain that contain ephemeral pools. Extensive wetlands associated with Harris Creek are located on the east side of the Neuse River near the southern boundary of the park parcel. Details on vegetation in the vicinity of the Perry Creek Road future park property are described in greater detail in the Flora Inventory section of this report, with additional details in the Water Resources Inventory and Wildlife Habitat sections.

Significant Natural Heritage Area along the Neuse River

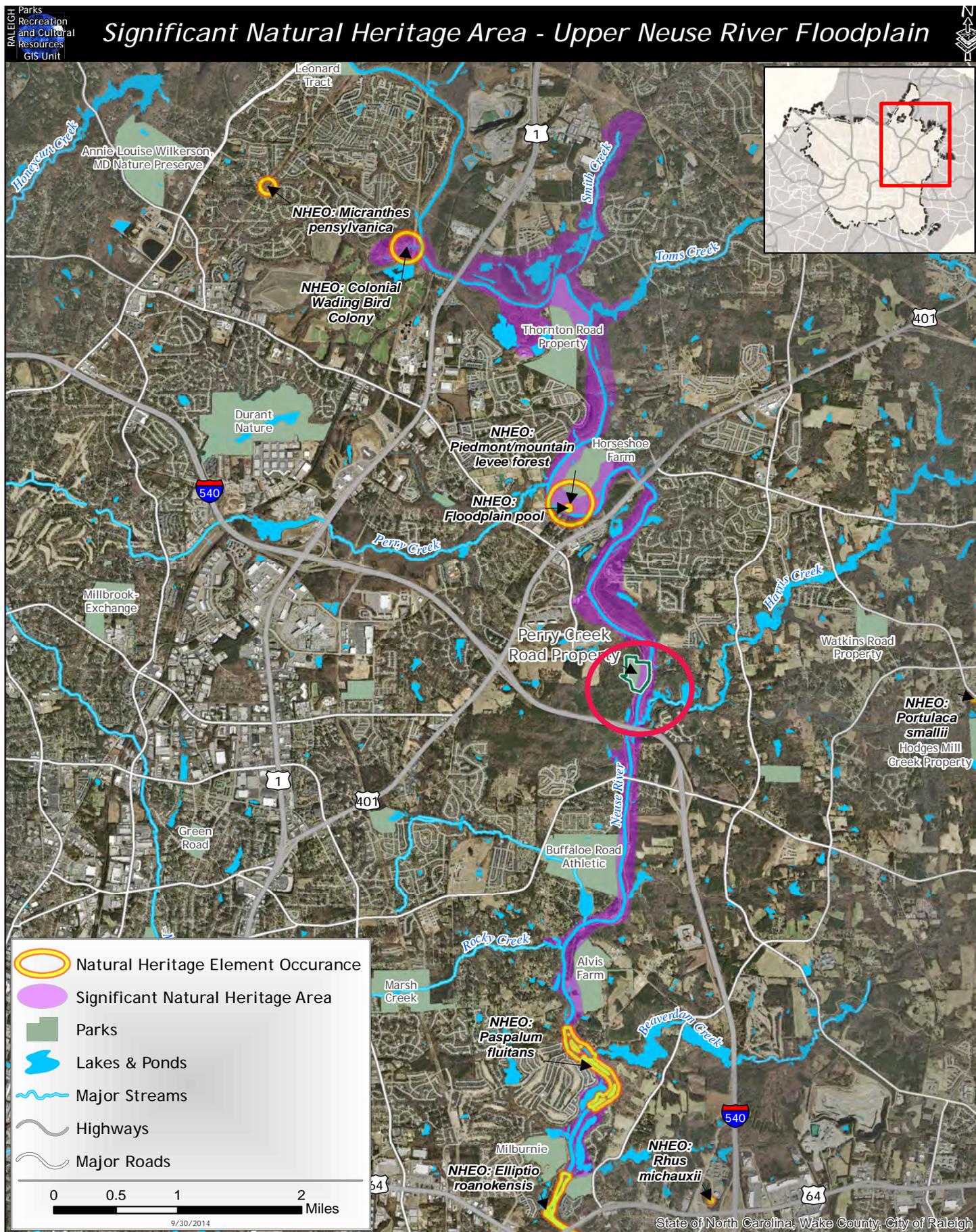
The NC Natural Heritage Program (with support from partner agencies) identifies a Significant Natural Heritage Area (SNHA) as an ecologically valuable natural area with rare species or high quality natural communities that are important for conservation of the state's biodiversity. Specific occurrences of rare plants and animals, exemplary or unique natural communities, and important animal assemblages are referred to as Natural Heritage Element Occurrences (NHEO). "Rare" species are plants and animals that are uncommon to rare in the state or region and may be endangered or threatened on a global level. SNHAs contain one or more Natural Heritage Element Occurrences.

The Perry Creek Road future park property and adjacent greenway parcel are partially located within the Significant Natural Heritage Area *Upper Neuse River Floodplain* (a map of this SNHA is located on the next page). The entire SNHA covers approximately 12 river miles, or about 1,675 acres (1676.54 acres) and is of Regional Significance. The entire site extends along the Neuse River for about .5 mile upstream of US 1 down to Milburnie Dam, north of US Hwy 64. This SNHA contains a variety of natural areas, including the *Neuse River Bottomlands*, *Horseshoe Farm Bottomland Forest*, and the northern portion of the *Neuse River Forests and Aquatic Habitat* from Beaverdam Lake to Poole Road.

The Perry Creek Road park property (Total Acres: 24.97 acres) has 11.38 acres within the SNHA. The portion of the park parcel within the larger SNHA is along the Neuse River floodplain. A map of the Perry Creek Road property showing the extent of the SNHA within the park parcel boundaries follows the map of the entire SNHA. A majority of the adjoining 15.58 acre City of Raleigh greenway parcel is also within the *Upper Neuse River Floodplain* SNHA.

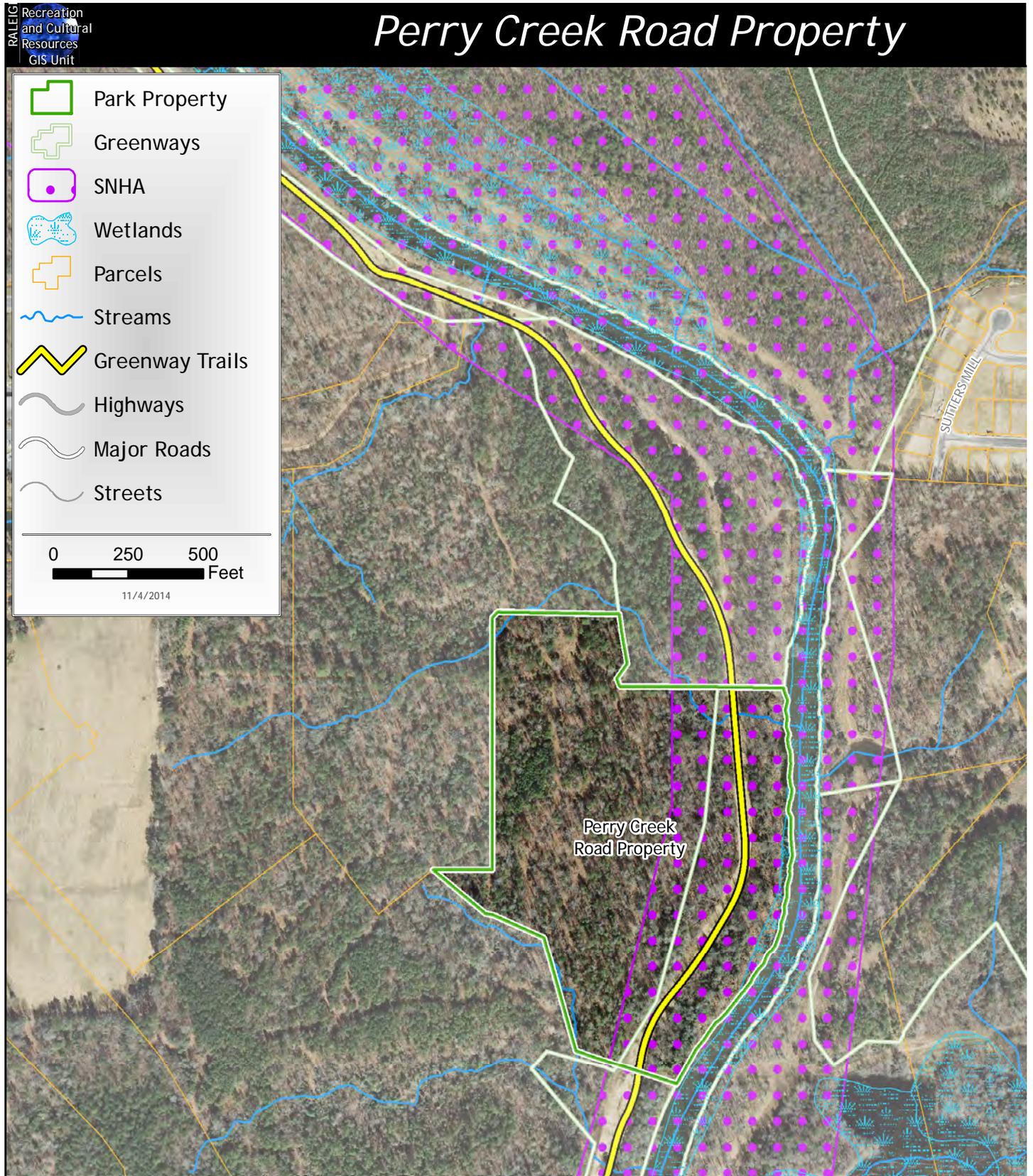
Although no Natural Heritage Element Occurrences are located in the vicinity of the Perry Creek Road future park property, a number of Element Occurrences do occur within the *Upper Neuse River Floodplain* SNHA. The State Special Concern Four-toed Salamander (*Hemidactylium scutatum*) occurs in wetlands within the floodplain of Smith Creek, in the northern section of the SNHA. A heronry is located within the Neuse River floodplain in a beaver pond. Two Significantly Rare Dragonfly Element Occurrences have been discovered within the SNHA in recent years. Several rare plants occur in the SNHA. Horsetail Crown Grass (*Paspalum fluitans*), a Significantly Rare plant with a State Rank of S1 (Critically Imperiled) is located in the Neuse River floodplain within the SNHA. Kidneyleaf Mud-plantain (*Heteranthera reniformis*) is located along the greenway trail in the southern section of the SNHA. Several other Element Occurrences are found within the *Upper Neuse River Floodplain* SNHA, including two within Horseshoe Farm Nature Preserve, north of the Perry Creek Road property.

One of the most important features of the *Upper Neuse River Floodplain* SNHA is the size and connectivity provided by the extent of the area. The SNHA on the portion of the Perry Creek Road park property and greenway parcel provide valuable connectivity between protected natural areas along the approximately 12 river miles of the designated SNHA. The Perry Creek Road PRCR properties, Neuse River Greenway Trail, and greenway easements adjoin the Harris Creek wetlands and extensive additional greenway land and other conservation parcels along the Neuse River corridor. The Nature Preserve Criteria review for the Perry Creek Road property, in the Park Classification Section of this report, provides a map showing the connectivity with other protected lands. Several other City of Raleigh PRCR parks occur within a portion of the *Upper Neuse River Floodplain* SNHA as well as other SNHAs designated in Wake County. The SNHA *Upper Neuse River Floodplain* is just upstream from the SNHA *Neuse River (Clayton) Forests*, which includes a portion of Anderson Point Park. The NC Natural Heritage Program, which designates and monitors the SNHAs, is an important partner for the PRCR Department.



Perry Creek Road property vicinity highlighted with red circle.

SNHA in the Vicinity of Perry Creek Road Property



Perry Creek Road property vicinity within the *Upper Neuse River Floodplain* Significant Natural Heritage Area. The park parcel contains 11.38 acres within the SNHA. The portions of the park and greenway parcels located within the *Upper Neuse River Floodplain* SNHA occur primarily in the floodplain of the Neuse River.

Levee System in SNHA

The Neuse River creates depositional topographic features such as natural levees, point bars, ridge-and-swale systems, and sloughs. The Lidar map below shows various features of the river's levee system. The Neuse River floodplain often has differentiated levee, bottomland, and terrace zones large enough to support distinct natural communities.



Levee lower floodplain within SNHA



Levee system

Lidar Map of Levee System in SNHA along the Neuse River



River Oats (*Chasmanthium latifolium*) is dominant on portions of the lower levee.



Steep slope along Neuse River. Topographic features along the Neuse River within the SNHA are varied, with an interesting mix of steep river bank slopes, levees, low and high terraces, swales and ridges, and exposed sand bars.

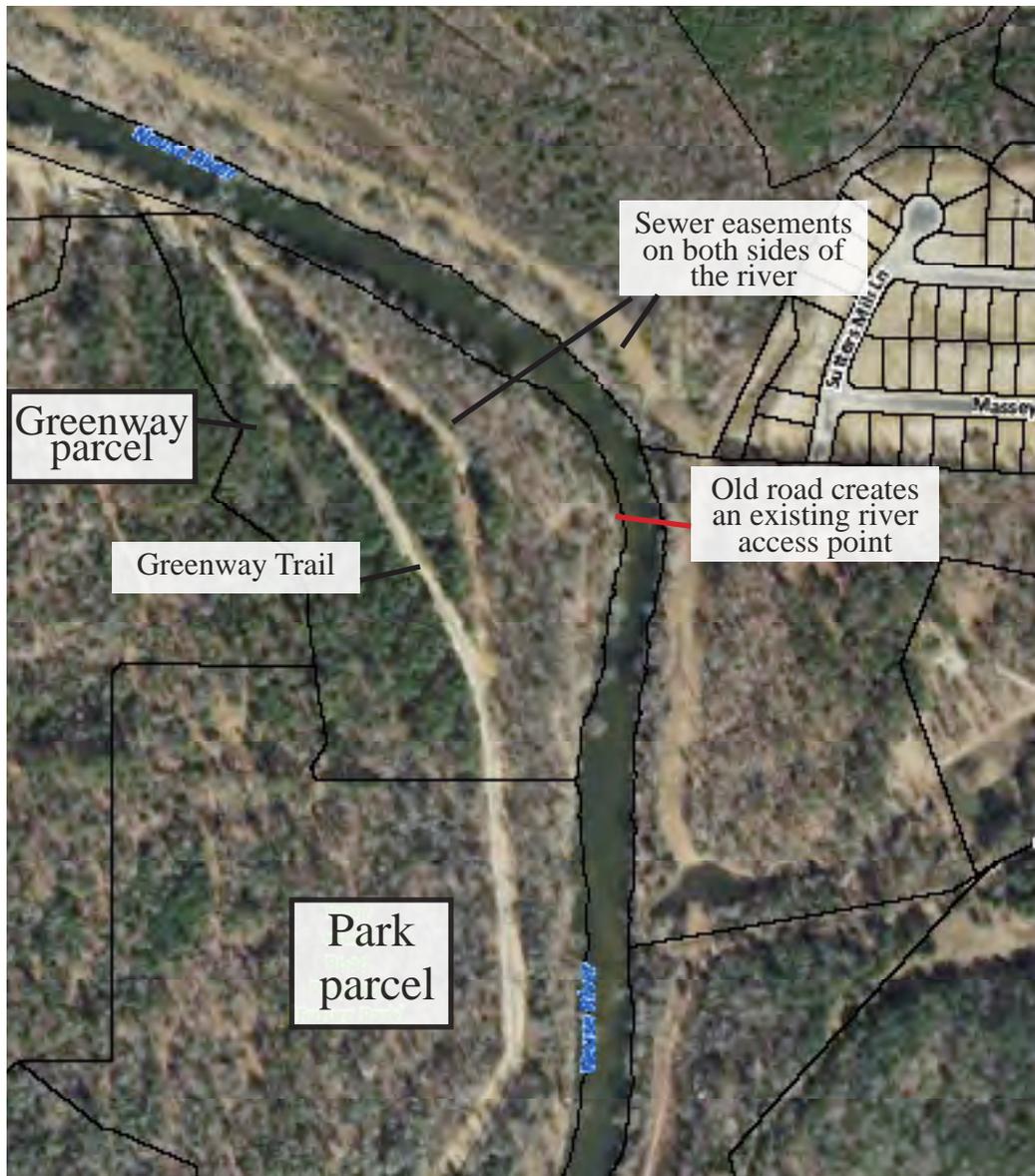


View of Neuse River downstream from existing river access point on greenway parcel. River Oats are dominant on the river bank, cattails are growing on the exposed sandy point bar in the river, and the view across the river is undeveloped.



View of Neuse River looking upstream from same river access point as top photo. There are a number of downed trees in this area, providing important wildlife habitat.

Floodplain Forest along Neuse River



Aerial photo from 1993 shows the Neuse River floodplain with sewer easements visible on both sides of the river.

The aerial photo above shows the 15.58 acre greenway land parcel located north of and adjacent to the Perry Creek Road future park property. The majority of the greenway parcel is within the Upper Neuse River Floodplain SNHA. The greenway parcel is a designated Tree Conservation Area, considered Protected Open Space because development is limited in Tree Conservation Areas. The Neuse River floodplain is relatively narrow, just several hundred yards at maximum (LeGrand 2004).



The Neuse River Greenway Trail runs through the forested Neuse River floodplain and the Significant Natural Heritage Area. To protect the quality of the Floodplain Forest and maintain the wildlife value of the Neuse River corridor, it is important to maintain the forest canopy over trails, roads, and sewer easements. Protecting large trees on the edges of construction areas will help accomplish this goal.

High quality forests generally have large trees interspersed with standing snags and woody debris on the forest floor, high native plant diversity, natural tree regeneration, and forest layers. The extent of invasive plants is low in a high quality forest, soils are stable, and there are canopy gaps. Zones of distinct plant communities are tied to topography, soil, and hydrology. Forest types can overlap and transition into a another plant community type or subtype (Weakley, 2014). In addition, past disturbance can alter the species of plants that occur. There has been a variety of human disturbance on both the greenway and park parcels, some of which is visible in the historic aerial photographs included in the Cultural Resources and Historical Site Use section of this report. Past land use includes logging, agriculture, and other land clearing activities and road creation.



The Neuse River floodplain forest near the southern park boundary is dominated by holly trees (*Ilex opaca*) and a short species of River Cane (*Arundinaria*) in the understory. Other areas of the floodplain have some very tall River Cane.



An old green silt fence remains located along much of the 60 foot sewer easement along the west side of the Neuse River, installed in the 1980s. This silt fence needs to be removed along the Neuse River sewer easements, even beyond the Perry Creek property.

Floodplain Forest on Greenway Parcel



The forested greenway parcel is some of the highest quality forest in the vicinity. The greenway parcel occurs primarily on hydric Conagree Silt Loam soils, with a seasonally high water table at a depth of about 2.5 feet. The parcel includes multiple Black Walnuts (*Juglans nigra*), which were tagged (with blue metal tree tags) during previous land valuation, and rumored to have been planted in that location by a previous land owner. The understory forb layer includes some uncommon plants including Ginger (*Asarum canadense*) and Bloodroot (*Sanguinaria canadensis*). There are some invasive plants, including *Microrostegium* and English ivy seedlings, and a small amount of Chinese privet.



An old road (visible on the 1991 aerial photograph) creates an existing river access point on the greenway parcel. During park development, there is conservation value in locating public river access at existing disturbed locations if the sites are appropriate and further disturbance would not threaten sensitive resources. If existing river access locations are inappropriate, efforts should be made to “abandon” these sites and make them unattractive for further use.



The Floodplain Forest on the greenway parcel includes large Black Walnut trees, large Grape vines (*Vitis* sp.), and Sugar Maple (*Acer floridanum*) tree seedlings.



Ginger (*Asarum canadense*) with scattered invasive Japanese Stilt Grass (*Microstegium vimineum*). It is important to start managing invasives on the greenway parcel as soon as possible. Most of the invasives could be hand pulled with volunteers or as a service learning project. The source of mature English Ivy vines in the vicinity, likely growing up trees and fruiting, needs to be identified and controlled for better long term control of ivy seedlings in the greenway parcel.



Witches broom is present in several trees in the vicinity. Witches broom is a symptom of tree stress resulting in a deformed mass of twigs and branches resembling a broom. The stress is brought on by pests, disease, or environmental factors.



Swath of quality early successional plants west of the field in the northwest area of the park parcel.

The swath of quality early successional plants near the northwest park parcel boundary appears to be located in an old road bed or potentially an area with shallow soils over rock, which would make it difficult for trees to regenerate in this area. The vegetation is patchy and dominated mostly by grasses and other herbaceous vegetation, without substantial areas of open rock. The topography and soil chemistry may create conditions for a xeric woodland, possibly a Piedmont Acidic Glade. There are some interesting plants in this narrow swath, some of which may be worth relocating if this area is developed. Plants include splitbeard bluestem, indian grass, a narrow-leaved goldenrod which is possibly Flattop Goldenrod (*Euthamia caroliniana*), which is uncommon in Wake County, as well as reindeer lichen, spikemoss, various grasses, and Vaccinium.

This area of the park is adjacent to the Wake County parcel and will be right next to the planned Middle School, and almost certainly will be developed. It is worthwhile to collect seed or dig up and move some of the plants from this early successional area. Most early successional areas require regular disturbance in order to remain in the early successional stage, otherwise they will transition into forest. Many birds and other wildlife associated with early successional habitat are declining. Seed collection or plant relocation of native, quality early successional plants will help preserve diversity of local genotypes. The best place to relocate plants from this area may be an area close by that has similar habitat conditions but will not be developed. Close-up photographs of some of the plants are on the following page.

Upland Forest on Park Parcel

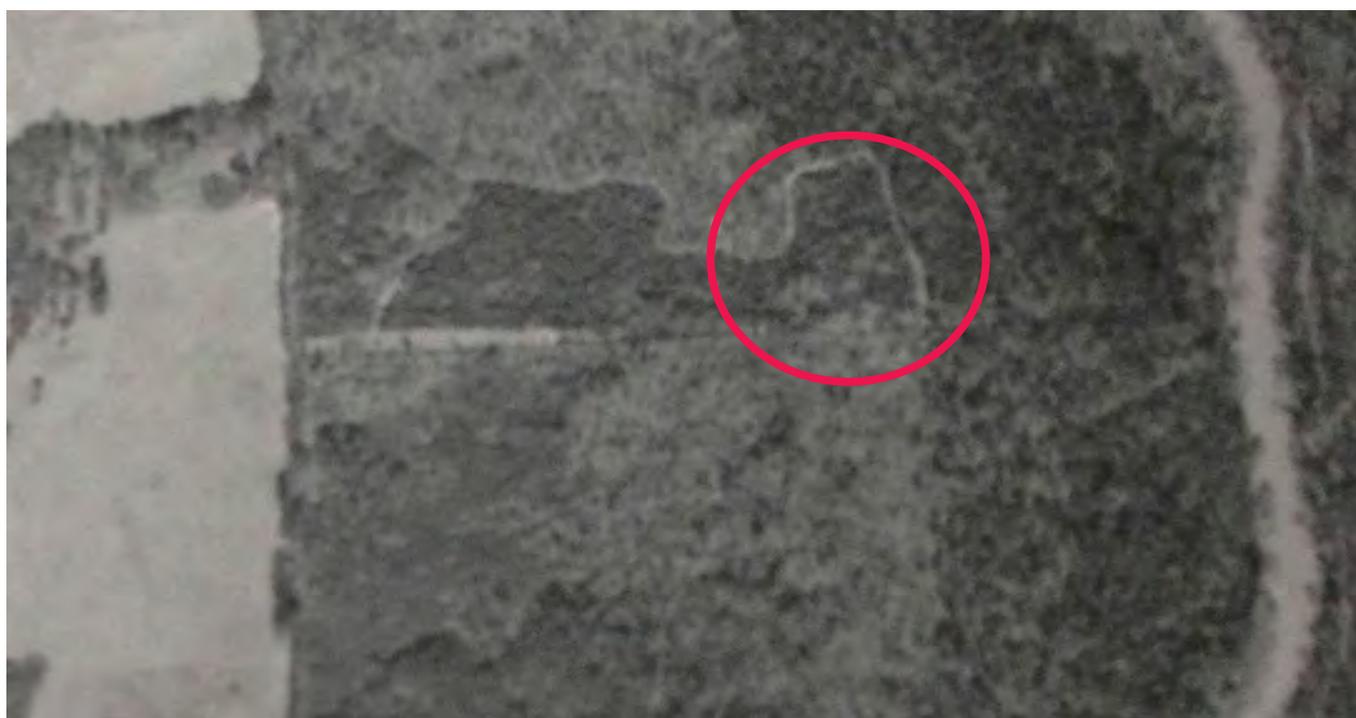


Some sections of forest in the northern portion of the park parcel are good quality upland hardwood forest, transitioning to bottomland hardwood forest. The upland areas of the park site are primarily sandy loam.



Upland forest near the northern park parcel boundary where it adjoins the greenway parcel. At the time of this report there are sections of silt fence in this area, some of which appear old. It is important to remove silt fences when construction projects are complete and sites have been stabilized. Though silt fences are needed to protect water quality during site disturbance activities, silt fences have negative impacts on wildlife trying to move between habitats. Old barbed wire fencing is also harmful to wildlife and should be removed after the location of old fencing is recorded for historic records.

Northwest Section of Park Parcel



1971 Aerial photo showing area that is now the northwest section of the park parcel. The area was mostly forested, with a meandering road connected on both ends to the main farm road (visible as far back as the 1965 aerial photos of the site).



1991 Aerial photo showing vicinity of what is now the northwest section of the park parcel. Between 1988 and 1991, an area was cleared and a road was created from the old farm road to the river. This road is still visible at the time of this report, and the cleared area remains an early successional field of herbaceous weedy plants and invasive lespedeza (see photo on next page).

Early Successional Areas



Field with invasive Lespedeza in northwest section of park, underlain by Durham Loamy Sand.



Field in winter, showing abundance of pine east of the field. There is a swath of quality early successional vegetation on the park parcel just west of the large double-trunked tree visible on the left side of the photo above, described in more detail on the following page.



Reindeer Moss



Spikemoss



Flat-topped Goldenrod



Splitbeard Bluestem



possibly a species of Dicranthelium grass

Southern Park Parcel



The southern portion of the park parcel is mostly forested but contains a young forest with a weedy, disturbed undergrowth.



Invasive Japanese Honeysuckle is abundant in the understory of the southern portion of the park.

Riparian Vegetation along Northern Stream 1

Perhaps the highest quality habitat in the vicinity of the Perry Creek Road property is the mesic hardwood forest along the stream and wetland system on the WakeTech and Wake County adjacent parcels near the northwest corner of the 15.58 acre City of Raleigh greenway parcel.



Large oak and uncommon Rusty Blackhaw represent the high quality of the riparian habitat along the stream.



Another large oak and Cane stand in the riparian area. Additional information and photos of this stream and riparian area are located in the Water Resources Section and the Site Description Section about Public Utility Easements in the vicinity of the Perry Creek Road property.

Slope on South Side of Stream 1

The steep slope between the stream and the new Public Utility easement contains uncommon plants and is very sensitive to impacts from development. This high quality natural area is protected as a Tree Conservation Area, but is very narrow, with buffers that meet the legal requirements for Neuse River Riparian Buffer Rules but are inadequate ecologically to protect the area from impacts to the rare plants and wildlife that occur in this area. Wildlife using the stream and wetland require adjacent upland woodland areas as well as the water resources.

The Public Utility corridor on the south side of the stream, adjacent to the steep slope, and the Public Utility road created on the north side of the stream create a very narrow riparian corridor. Impacts to the riparian area and steep slope will easily occur from the Public Utility easements and other development in the area. The planned Wake County Middle School will hopefully plan for an increased buffer between their development and the stream system and steep slope.



The steep slope on the south side of the stream supports uncommon plants such as Ginger (*Asarum canadense*) and Devil's-Bit (*Chamaelirium luteum*). Past and current land use (including logging, with an old logged stump visible in the photo above, agriculture, roads, and development) has impacted the entire area.

Rare and Protected Plant Species of North Carolina

The North Carolina Natural Heritage Program (NHP), 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 habitats within the City of Raleigh.

The Natural Heritage Program maintains a *List of Rare Plant Species of North Carolina 2014* that are 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 Perry Creek Road property, and no specimens of this endangered plant were found.

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*) occurred historically in Wake County. No specimens of these plants have been observed on the Perry Creek Road property.

State Listed Plants in Wake County

Plants from the *List of Rare Plant Species of North Carolina 2014* 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 re-discovery), are listed below. The information provided below 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). No specimens of these plants have been observed on the Perry Creek Road property.

Nine plant species listed 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*). No specimens of these plants have been observed on the Perry Creek Road property.

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*). No specimens of these plants have been observed on the Perry Creek Road property.

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 squarulosa*), Bog spicebush (*Lindera subcoriacea*, also a Federal Species of Concern), Glade milkvine (*Matelea decipiens*), Sadie Price's yellow wood sorrel (*Oxalis priceae*), Seneca snakeroot (*Polygala senega*), Heller's rabbit-Tobacco (*Pseudognaphalium helleri*), Virginia mountain-mint (*Pycnanthemum virginianum*), and Horsetail crown grass (*Paspalum fluitans*).

The Significantly Rare Horsetail crown grass (*Paspalum fluitans*), considered Critically Imperiled, is located within the southern portion of the Significant Natural Heritage Area *Upper Neuse River Floodplain*, but is not within the immediate vicinity of the Perry Creek Road property. The general location of the Significantly Rare Horsetail crown grass is shown on the map of the SNHA *Upper Neuse River Floodplain* earlier in the Flora Inventory section of this report.

Approximately fifty-eight plant species currently listed on the *North Carolina Plant Watch List* are found in Wake County (Twenty-four are historic records). The Watch List plant Kidneyleaf mud-plantain (*Heteranthera reniformis*) is located within the southern portion of the Significant Natural Heritage Area *Upper Neuse River Floodplain*, but is not within the immediate vicinity of the Perry Creek Road property. The Kidneyleaf mud-plantain is in *Watch Category 7- Rare and Poorly Known*.

At the time of this report, the only plant species observed in the vicinity of the Perry Creek Road property that are highlighted in the *Natural Heritage Program List of Rare Plant Species of North Carolina 2014* are Bloodroot (*Sanguinaria canadensis*) and Devil's bit (*Chasmanthium luteum*), both listed under *Exploited Plant Taxa in North Carolina*. Exploited Plants include species that are either rare or generally widespread that are in commercial demand and are often collected from wild populations. Such collections can cause local extirpation and are not sustainable over time. The NHP requests information on illegal collection incidents of plants on the Exploited List.

Summary of rare and protected plant species occurring in the vicinity of the Perry Creek Road property (according to both the *NHP List of Rare Plants of North Carolina 2014* and an inventory of locally uncommon plants tracked within the City of Raleigh system):

Bloodroot (*Sanguinaria canadensis*), Devil's Bit (*Chasmanthium luteum*), Ginger (*Asarum canadense*), Flattop goldenrod (*Euthamia caroliniana* (?)), Rusty Blackhaw (*Viburnum rufidulum*), White Turtlehead (*Chelone glabra*), Blazing star (*Liatris* sp.), Splitbeard bluestem (*Andropogon ternarius*)

Inventory of natural resources in the vicinity is ongoing.

Invasive Plants

The City of Raleigh 2030 Comprehensive Plan includes the goal of Invasive Species Control. Invasive species management is part of a long term management plan for the park and greenway system, however some invasive species control can be initiated as interim management projects in priority areas. Priority areas and priority invasive plants are important to consider when investing staff time and cost associated with invasives control. Priority considerations include areas with rare plants, invasives with prolific or long-lived seeds, areas where the ecological functions of the community are being impacted, and new or small patches of the most aggressive invasives because the cost and amount of time and effort is greatly reduced at this early establishment stage.

It is important to start managing invasives on the greenway parcel as soon as possible because of the occurrence of rare plants in this area and the small size of the invasives plants, including *Microstegium*, Chinese Privet, and English Ivy. Most of the invasives could be hand pulled at this stage with volunteers or as a service learning project. The source of mature English Ivy vines in the vicinity, likely growing up trees and fruiting, needs to be identified and controlled for better long term control of ivy seedlings in the greenway parcel.

There is a small area with mature invasive Princess Trees (*Paulownia tomentosa*) in the northwest section of the park parcel, south of the field with lespedeza. These seed producing trees should be controlled as soon as possible before they spread further.



Invasive Princess Tree (*Paulownia tomentosa*)

The Princess Tree has conspicuous upright clusters of showy, pale violet, fragrant flowers in the spring. The fruit is a dry brown capsule with four compartments that may contain several thousand tiny winged seeds. It reproduces by wind- and water-dispersed seeds and root sprouting. It is very tolerant of a wide range of conditions. The Princess Tree has the ability to sprout prolifically from adventitious buds on stems and roots, allowing the tree to survive fire, cutting, and even bulldozing in construction areas. It grows and spreads rapidly in disturbed natural areas.

Princess Tree Control and Management Recommendations from the US Forest Service:

Manual control- Hand pulling may be effective for young seedlings. Trees can be cut at ground level with power or manual saws. Because Princess Tree spreads by suckering, re-sprouts are common after cutting. Cutting should be considered an initial control measure that will require either repeated cutting of re-sprouts or an herbicidal treatment.

Chemical control- Cutting or girdling followed immediately by an application of glyphosate or triclopyr is the most effective control method. Basal bark treatment with triclopyr or a foliar application of triclopyr or glyphosate has been effective on smaller trees.

Perry Creek Road Property Wildlife and Habitat

- Wildlife Habitat Overview
 - Early Successional Areas
- Trail Design and Development for Wildlife
 - Significant Natural Heritage Area
- Priority Habitat, Wildlife Resources Commission
 - Riparian and Floodplain Habitat
 - Bottomland Hardwood Forest Habitat
 - Wetland Habitat
 - Ephemeral Pools
- Priority Amphibian and Reptile Conservation Areas (PARCAs)
 - Rare and Protected Animal Species
 - Invasive Animals



Northern Parula Warbler (*Setophaga americana*) bathing in stream near northeast corner of greenway parcel. Northern Parula primary habitat in the Piedmont is bottomlands, hardwood forest and floodplains, especially where “Old Man’s Beard” lichens (*Usnea* lichen species) grow.

Overview of Wildlife and Habitat in Perry Creek Road Property Vicinity

Wildlife is a public resource. The City of Raleigh 2030 Comprehensive Plan includes the goal to develop a Wildlife Habitat Plan. The Comprehensive Plan specifies that the Parks, Recreation and Cultural Resources Department will lead the initiative to “Formulate a wildlife habitat plan to define, map, protect and restore Raleigh’s native and priority habitats, particularly those identified in the North Carolina Wildlife Action Plan. The plan should establish a program of action for protecting and enhancing wildlife habitats and preserving biodiversity through a range of strategies including land acquisition, park and greenway conservation and interpretation, augmented development regulations, and intergovernmental coordination. If priority habitats occur outside current City control, seek methods and partnership to conserve the ecological areas.”

The Comprehensive Plan also specifies that the City of Raleigh “Coordinate wildlife habitat conservation, restoration, and management with Wake County municipalities, the North Carolina Wildlife Resources Commission, WakeNature Preserves Partnership, and other relevant stakeholders.”, “Identify lands that can be conserved and managed for their outstanding natural features, landscapes and assets, and cultural heritage values as part of a system of open spaces and green infrastructure.”, and “Implement strategies through traditional methods and emerging technologies to increase public awareness of natural resource areas within the Raleigh park system and adjoining communities.”

The City of Raleigh’s Natural Resources Inventory, System Integration Plans, and other PRCR efforts aim to evaluate and incorporate Rare Animal Occurrences, Significant Natural Heritage Areas (SNHA), Priority Amphibian and Reptile Conservation Areas (PARCA), and Priority Habitat and Wildlife Species from the Wildlife Resources Commission Wildlife Action Plan into protection and management of wildlife resources and habitat within Raleigh and Wake County. The PRCR Department is currently working with multiple partners including the North Carolina Natural Heritage Program (NHP), North Carolina Wildlife Resources Commission (WRC), US Fish and Wildlife Service (USFWS), Audubon, and Subject Matter Experts.

In the vicinity of the Perry Creek Road property, the overlap of designated conservation areas such as the SNHA and PARCA is very apparent, as is the extensive connectivity of protected lands along the Neuse River corridor. These designated areas are described in more detail in the following pages. Protected lands along the Neuse River often have multiple layers of conservation designation and protection, with the addition of Neuse River Riparian Buffer Zones and Tree Conservation Areas.

The Wildlife Resources Commission document *Conservation Recommendations for Priority Terrestrial Wildlife Species and Habitats in North Carolina* and other science-based design/development and management guidelines for Best Management Practices for wildlife resources are being reviewed for potential incorporation in the City of Raleigh’s stewardship practices. All of these efforts will contribute to a future Wildlife Habitat Plan for the City of Raleigh.



Wild turkey tracks next to mountain bike tracks in the Perry Creek Road park vicinity.

The balance of conservation and wildlife habitat protection and the City of Raleigh’s PRCR Department’s aim to provide a diverse, well balanced and accessible range of recreational opportunities can be challenging. The vicinity of the Perry Creek Road park property is undergoing residential and mixed use development, including an existing Elementary School, a planned Middle School, and Wake Tech Community College. The Neuse River Greenway Trail draws people to the area from all over Raleigh and provides a recreation destination as well as a travel corridor for commuting.



Northern Carrion Beetles (*Necrophila americana*) prefer moist forest habitats and feed on carrion, dung, and rotting fruit. Carrion Beetles provide an important role in the recycling of nutrients in the forest ecosystem.

Habitat in the Perry Creek Road Vicinity

The quality and type of habitat in the vicinity of the Perry Creek Road property varies. Habitat is primarily forested, with a mix of upland and floodplain forest. The Neuse River is a dominant landscape feature, and includes both the riparian habitat and the aquatic habitat of the river. Connectivity between conservation lands along the Neuse River is an important attribute of the area, providing a wildlife habitat corridor to move between a variety of habitat types required by many animals to meet their needs.

The Neuse River corridor is known to support a wide range of wildlife at the landscape level, including birds, amphibians, reptiles, mammals, insects, freshwater fishes and other aquatic wildlife. Wildlife sightings and signs observed during site investigations in the vicinity of the property are recorded in Appendix D.

Wildlife Habitat includes Upland Hardwood Forest, Riparian and Floodplain Forest, Bottomland Hardwood Forest, Wetland Habitat, Ephemeral Pools, and some Early Successional Areas. The quality of the different habitats varies. The forest quality on the 15.58 acre greenway parcel is good, and is described in more detail in the Flora Inventory Section of this report. High quality forests with the most wildlife value generally have large trees interspersed with standing snags and woody debris on the forest floor, high native plant diversity, and an abundance of mast-producing hardwood trees (oaks and hickories) that produce important wildlife food. The forest quality is also good along the steeper forested areas in the central portion of the park parcel.



Much of the understory of the floodplain forest habitat on the park parcel is dominated by Cane (*Arundinaria* sp.), a colonial woody grass that is an important plant for wildlife. Cane stands should be preserved.



Pearl Crescent (*Phyciodes tharos*) butterflies in sewer easement crossing along the Neuse River at the southeast corner of the park. Butterflies and other pollinators use flowering herbaceous plants in sewer easements and other non-forested areas within the vicinity of the Perry Creek Road property.

Early Successional Areas

Early successional habitat is habitat where most of the trees have been removed either through natural means or by human activity. In the vicinity of the Perry Creek Road property, the types of early successional habitat scattered throughout the area include old fields, areas previously farmed or cleared, old roads, sewer easements, greenway right of way edges, old river crossings that were previously cleared, and floodplain areas where frequent flooding makes it difficult for trees to grow. The highest quality early successional areas with diverse, native or quality vegetation include filed borders of the original large farm fields (located on the neighboring 5401 North LLC), floodplain areas, a small area west of the large field in the northwest corner of the park parcel, and some old small road beds. Within the City owned park and greenway parcel, there is not sizeable early successional habitat that is likely to provide suitable habitat for priority wildlife species that require early successional upland habitat.

WRC Conservation Recommendations applicable to Early Successional Habitat in the Perry Creek Road vicinity include:

- Utility corridors, road and greenway right of way borders should be re-vegetated or allowed to re-generate with native species. Do not use fescue.
- If management is needed to maintain the area without trees, use mowing, hand-cutting of trees, careful selective herbicide application without surfactants, or prescribed fire. Disking is not recommended - disking can provide a beneficial vegetation response but can be harmful to priority species of reptiles and amphibians.
- Establish a rotational maintenance and vegetation control schedule. Manage only portions of the corridors each year on a 2-3 year rotational basis. Prohibit mowing between April 1 and October 1 to minimize impacts to wildlife. Mowing is best done in late winter to allow winter cover and food source for wildlife that early successional habitat provides.

Trail Design and Development for Wildlife

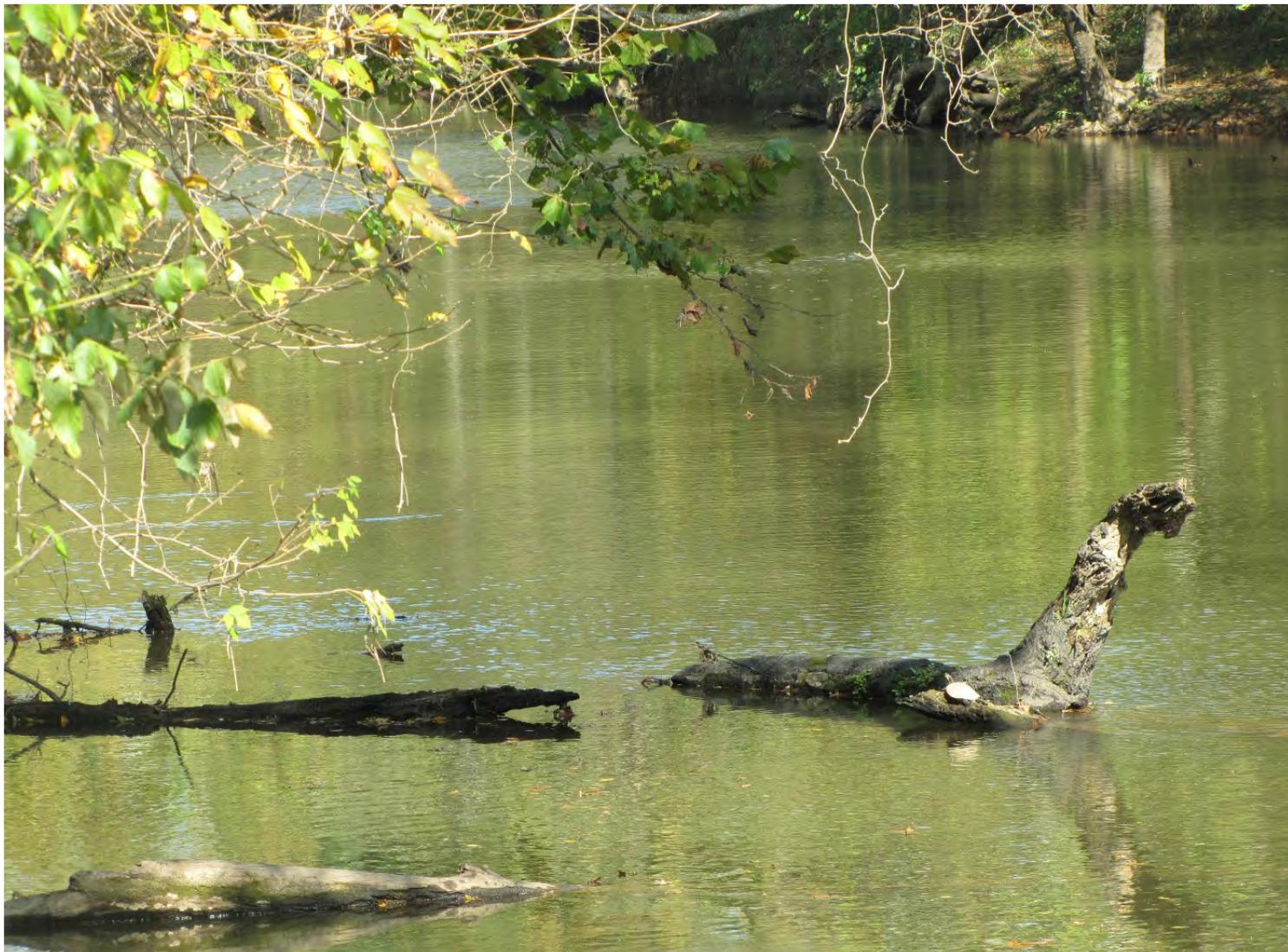
- Cluster trails or infrastructure associated with recreation activities within a 25% developed area.
- Attempt to concentrate development and public use along priority habitat edges rather than within the habitat core to reduce fragmentation of the habitat.
- Trails for nature-based recreation activities and interpretive trails are recommended along the periphery of habitats. Minimizing bisecting trails, as trails cutting through the interior of habitats opens up the area to edge predators, invasives, and other human impacts, and may ultimately reduce the diversity of wildlife using the habitat.
- Attempt to develop trails with a more direct route, rather than meandering, to minimize the area disturbed.
- Avoid (or abandon) public trails in sensitive areas or areas with rare plants or animals. If this is not possible, prioritize maintenance of these trails to control erosion and other trail impacts. Post signs at several locations along trails in sensitive areas: 'This is a sensitive area, please stay on the trail'. Sensitive areas could have limited access for resource professionals and educators.
- High-use trails in wetland areas should be built on a boardwalk to minimize impacts to the wetlands. Avoid disturbing migration corridors between wetlands. Do not create trails bisecting multiple wetland pools. If wetland access is desired for educators and special programs, cluster trails and recreation infrastructure to a concentrated 25% developed area within a wetland area.
- Minimize negative impacts of recreation trails by keeping the tree canopy intact and minimizing trail width. Reforest old timber roads to mature forest, creating as much of a closed tree canopy as possible. Utilize existing roads rather than building new ones.
- Minimize "edge effects" to protected forest lands. Establish "soft edges," or edges with curvilinear boundaries and a gradual thinning of vegetation (smaller shrubs grading into larger bushes and taller trees) at the edge of a forest.
- Create trails with pervious surface, following areas with low erosion potential. Minimize run-off and erosion from trail construction and trail use, using wildlife-friendly erosion netting (made of natural fibers with ample flexibility) where needed.
- Avoid creating trails or other park development within the critical root zone of large canopy trees (1.25 feet for every inch of tree dbh).
- If a right-of-way or maintained shoulder is needed along a trail or road, attempt to mow the shoulder only once per year, in mid to late winter so herbaceous plants can bloom and provide habitat for pollinators and other wildlife. Blooming herbaceous plants along a trail also provide visual interest as well as educational and programming opportunities for park and greenway users. If mowing once per year is not frequent enough, try not to mow during breeding season, mid-March to mid-October.
- When creating trails for nature study, signage is needed to keep vehicles and bicycles off the foot trails. Consider a design feature, where possible, to make it harder for ATVs, motorcycles and bicycles to access the trails. Parks maintenance staff should not drive their equipment on the forest trails unless absolutely necessary, as it causes root damage and erosion.
- Evaluate trail design and location with considerations for conservation of natural resources along with successful nature programming and public accessibility where desired. Consider designing areas where groups can gather for interpretation and education that will not create impacts to sensitive plants and resources.

Significant Natural Heritage Area Upper Neuse River Floodplain

As described in the Flora Resources Section of this report, the Perry Creek Road future park property and adjacent greenway parcel are partially located within the Significant Natural Heritage Area *Upper Neuse River Floodplain*, an SNHA of Regional Significance that extends along the Neuse River for approximately 12 river miles. A majority of the 15.58 acre greenway parcel and 11.38 acres of the Perry Creek Road park property occur within this SNHA (see maps in the Flora Resources Section). One of the most important features of the *Upper Neuse River Floodplain* SNHA is the size and connectivity between protected natural areas along the Neuse River. The Perry Creek Road PRCR properties, Neuse River Greenway Trail, and greenway easements adjoin the Harris Creek wetlands on the east side of the Neuse River and extensive additional greenway land and other conservation parcels along the Neuse River corridor. The Nature Preserve Criteria review for the Perry Creek Road property, in the Park Classification Section of this report, provides a map showing the connectivity of protected lands.

Rare animals and important animal assemblages occur as Natural Heritage Element Occurrences within the *Upper Neuse River Floodplain* SNHA, including the state listed Special Concern Four-toed Salamander (*Hemidactylium scutatum*), a Colonial Wading Bird Colony of Great Blue Herons (*Ardea herodias*), and two Significantly Rare dragonflies (Septima's Clubtail and Skillet Clubtail). None of the Element Occurrences are in close proximity to the Perry Creek Road park 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. Images of the Four-toed Salamander and the two rare dragonflies are shown in the Rare and Protected Animals sub-section of this report.



River Cooter Turtle basking on log in the Neuse River Significant Natural Heritage Area Upper Neuse River Floodplain
River Cooters (*Pseudemys concinna*) are found in rivers and large streams. River Cooters are conspicuous basking turtles. They bask on exposed logs and rocks, and quickly enter the water when approached.

Priority Habitat from NC Wildlife Action Plan

The City of Raleigh 2030 Comprehensive Plan includes the goal to develop a Wildlife Habitat Plan. The Comprehensive Plan specifies that the Parks, Recreation and Cultural Resources Department will lead efforts to “Formulate a wildlife habitat plan to define, map, protect and restore Raleigh’s native and priority habitats, particularly those identified in the North Carolina Wildlife Action Plan.”

The North Carolina Wildlife Action Plan is a comprehensive management tool developed by the N.C. Wildlife Resources Commission (WRC) and partners to conserve and enhance wildlife species and their habitats in North Carolina. The Commission worked with expert biologists statewide to identify 371 priority wildlife species targeted for conservation action to strategically target imperiled animals and their required habitats early, preventing them from becoming extinct. The Wildlife Action Plan matches each priority species to the habitat type or river basin where it is found, identifies the most important threats facing each habitat, and details the critical actions required to protect and conserve these habitats.

Priority Habitats and River Basins were identified as an integral part of the Wildlife Action Plan in order to accomplish conservation at the landscape level. Priority wildlife can be specifically targeted by carefully considering conservation or management options within Priority Habitats.

Priority Habitats within the NC Piedmont that are located in the vicinity of the Perry Creek Road property include Bottomland Hardwood Forest, Riparian and Floodplain Habitat, Wetland Habitat, and Ephemeral Pools. Some of the Perry Creek Road area Priority Habitats are highlighted on the next several pages, along with Conservation Recommendations that are important to consider during Design and Development of the site.



Downed wood provides important wildlife habitat and is abundant within and along edges of the Neuse River. The Neuse River and its floodplain supports extensive Priority Habitats and Priority Wildlife Species from the NC Wildlife Action Plan.

WRC Priority Habitat: Riparian and Floodplain Habitat in Perry Creek Road Vicinity



Northern Flicker (*Colaptes auratus*), a type of woodpecker, on a snag along the Neuse River. A variety of lichens are visible on the snag, including species of “Old Man’s Beard” lichen, used by Northern Parula Warblers for nesting.

Riparian and Floodplain Habitats are considered Priority Habitats in the WRC Wildlife Action Plan. These habitats are terrestrial upland habitats that are adjacent to streams and rivers of all sizes. A map estimating the location and extent of the Neuse River floodplain and floodplains of streams in the vicinity of the Perry Creek Road property are located in the Water Resources Inventory Section of this report.

The WRC document *Conservation Recommendations for Priority Terrestrial Wildlife Species and Habitats in North Carolina* provides useful guidelines for conserving Riparian and Floodplain Habitat. The document defines “Core Terrestrial Habitat” as the stream or river itself and a buffer width of 300-600 feet on each side of perennial streams, or to the edge of the 100 year floodplain.

WRC Conservation Recommendations for Riparian and Floodplain Habitat:

- Identify riparian habitats that have the highest value for wildlife, and focus the most protection and management on those areas
- To benefit neotropical migratory birds, prioritize protection of riparian areas with the widest bottomland hardwood forests
- Minimize negative impacts of recreation trails within the riparian buffer by keeping the tree canopy intact (by minimizing trail width and building trails on the upland edge of the riparian buffer, and minimizing run-off and erosion from trail construction and trail use).
- Use bridges instead of culverts for stream crossings. Maximize the span of the bridge to allow passage of terrestrial animals on either side of the river. When bridges are not possible, use multi-cell or bottomless culverts designed for wildlife.
- Restore degraded portions of riparian buffers by planting native species or facilitating natural regeneration of native plants

WRC Priority Habitat: Bottomland Hardwood Forest Habitat in Perry Creek Road Vicinity



Northern Parula warbler in floodplain forest of Perry Creek Road property. Many species using wetlands and floodplains require a variety of habitat types to meet all their needs for shelter, food, water and dispersal.

Bottomland Hardwood Forest Habitat is a Priority Habitat in the WRC Wildlife Action Plan. These habitats are floodplain forests dominated by hardwood trees. In the vicinity of the Perry Creek Road property, Bottomland Hardwood Forest occurs along portions of the Neuse River floodplain.

WRC Conservation Recommendations applicable to Bottomland Hardwood Forest Habitat include:

- Prioritize conservation and management of high quality forests, characterized by high native plant diversity and large trees interspersed with standing snags and other woody debris
- Minimize edge effects of forested areas. Edge effects extend approximately 350 feet from a forest's edge into the forest interior. Establish "soft edges" or edges with curvilinear boundaries and a gradual thinning of vegetation (smaller shrubs grading into larger bushes and taller trees).
- Concentrate development and recreation activities along the edges of forests rather than within the interior of the forest
- Retain snags and brush piles. If snags are a safety concern, do not cut the tree to its base but cut to a safe height. Consider location of brush piles and do not create brush piles on top of rare or uncommon plants or block water flow.
- Maintain a well developed understory of native plants. Many species of birds require the food, nest sites, and cover provided by the forest understory.
- If deer are over-browsing the forest understory, consider implementing a management strategy such as exclosures or a managed deer harvest

WRC Priority Habitat: Wetland Habitat in Perry Creek Road Vicinity

Wetland Habitats are considered Priority Habitats in the WRC Wildlife Action Plan, including both jurisdictional and non-jurisdictional wetlands. There are many types of wetlands and most wetland types in North Carolina have wildlife value. Wetland Habitat is important for a variety of wildlife, including birds, amphibians, reptiles and mammals. Many animals that require wetland habitat also require suitable adjacent upland habitat to carry out all life functions.

The WRC document *Conservation Recommendations for Priority Terrestrial Wildlife Species and Habitats in North Carolina* provides useful guidelines for conserving Wetland Habitat. The document defines “Core Terrestrial Habitat” as the wetland and 750 feet of protected upland habitat beyond the water’s boundary, and a “Critical Habitat Zone” of 150 feet of undisturbed buffer around the habitat. If development must occur within the Core Terrestrial Habitat, the WRC recommendation is to cluster development to a 25% concentrated area.

WRC Conservation Recommendations for Wetland Habitat include:

- Erosion Control: The best netting or erosion control blankets to use for soil stabilization during site development or other site disturbing activities or management of eroding areas is netting made of natural materials (such as jute or coconut netting or matting) that have some flexibility. Avoid using plastic or synthetic materials and netting with a tight weave of materials. Flexible netting made of natural materials allows animals to slip through if temporarily trapped, including birds, mammals, and reptiles.
- Preserve naturally vegetated wildlife corridors between wetlands that are up to 1 mile apart
- Avoid placing exterior and road lighting within the core habitat
- Avoid using traditional curb and gutter structures since they can disrupt reptile and amphibian movement. Instead use curbing with a 1:4 slope that small animals can cross, or use no-curb alternatives
- Minimize chemical herbicide use and only use surfactant-free products, because surfactants have been shown to cause harm to amphibians



Wetland at northwest corner of the 15.58 acre greenway parcel (photo taken from greenway bridge). Muskrat (*Ondatra zibethicus*) runs created through the vegetation are visible on the bottom of the wetland.

WRC Priority Habitat: Ephemeral Pools in Perry Creek Road Vicinity

Ephemeral Pools are small wetland habitats that dry out seasonally. Ephemeral pools are a type of Priority Wetland Habitat that are particularly threatened by development because often small ephemeral wetlands are not considered “jurisdictional” and are therefore not given legal protection. It is also important that inventory for small ephemeral wetlands be conducted at the right time of year, generally winter and spring, so their occurrence is not missed. Ephemeral pools provide critical habitat for salamanders and frogs because they generally dry out during part of the year so they do not support fish, which are a major predator of amphibian larvae. The absence of fish allows amphibian larvae to thrive. Many salamanders and frogs spend their aquatic life stage in ephemeral pools, then move into adjacent forested uplands as adults, returning to the ephemeral pools when it is time for adults to mate and lay their eggs.

Small ephemeral pools in the vicinity of the Perry Creek Road property are located in several places, and need further inventory and mapping to determine their extent and locations, as well as their wildlife value. Near the northern park boundary and the southern portion of the greenway parcel, in the area where a stream is shown (see Water Resources Section of this report for a map of the streams) there is a small pool in the old roadbed, and the adjacent forest on both sides of the old road bed appear to have low lying areas, with moss covered logs on the ground, that may support water in the winter or after heavy rains. There are also a number of pools in the old sewer easement, where it remains separated from the paved greenway trail. There may be additional ephemeral pools in the vicinity.

The Wildlife Resources Commission recommends the following inventory considerations for ephemeral pools: Many ephemeral wetlands are not flooded year-round and may be dry when encountered. When found to be dry, classification of an ephemeral wetland should document:

- 1) the presence of a depression with evidence of stained leaves and water marks **and**,
- 2) the presence of fingernail or pea clams (*Pisidiidae*), amphibious air-breathing snails (*Basommatophora*), or caddisfly larvae casings (*Trichoptera*), **or**
- 3) at least one wetland plant species

The WRC document *Conservation Recommendations for Priority Terrestrial Wildlife Species and Habitats in North Carolina* provides useful guidelines for conserving Ephemeral Pools.

WRC Conservation Recommendations for Ephemeral Pools include:

- Allow piles of coarse woody debris and standing dead trees to decompose naturally on the ground in the adjacent uplands and import or create cover objects (logs or stumps) for wildlife
- Restore the natural hydroperiod of ephemeral pools. This could include filling old ditches if necessary.
- Remove invasive exotic plants
- Where opportunities exist, create clusters of ephemeral pools in the landscape

Northern Cricket Frog (*Acris crepitans*) under water in small ephemeral pool

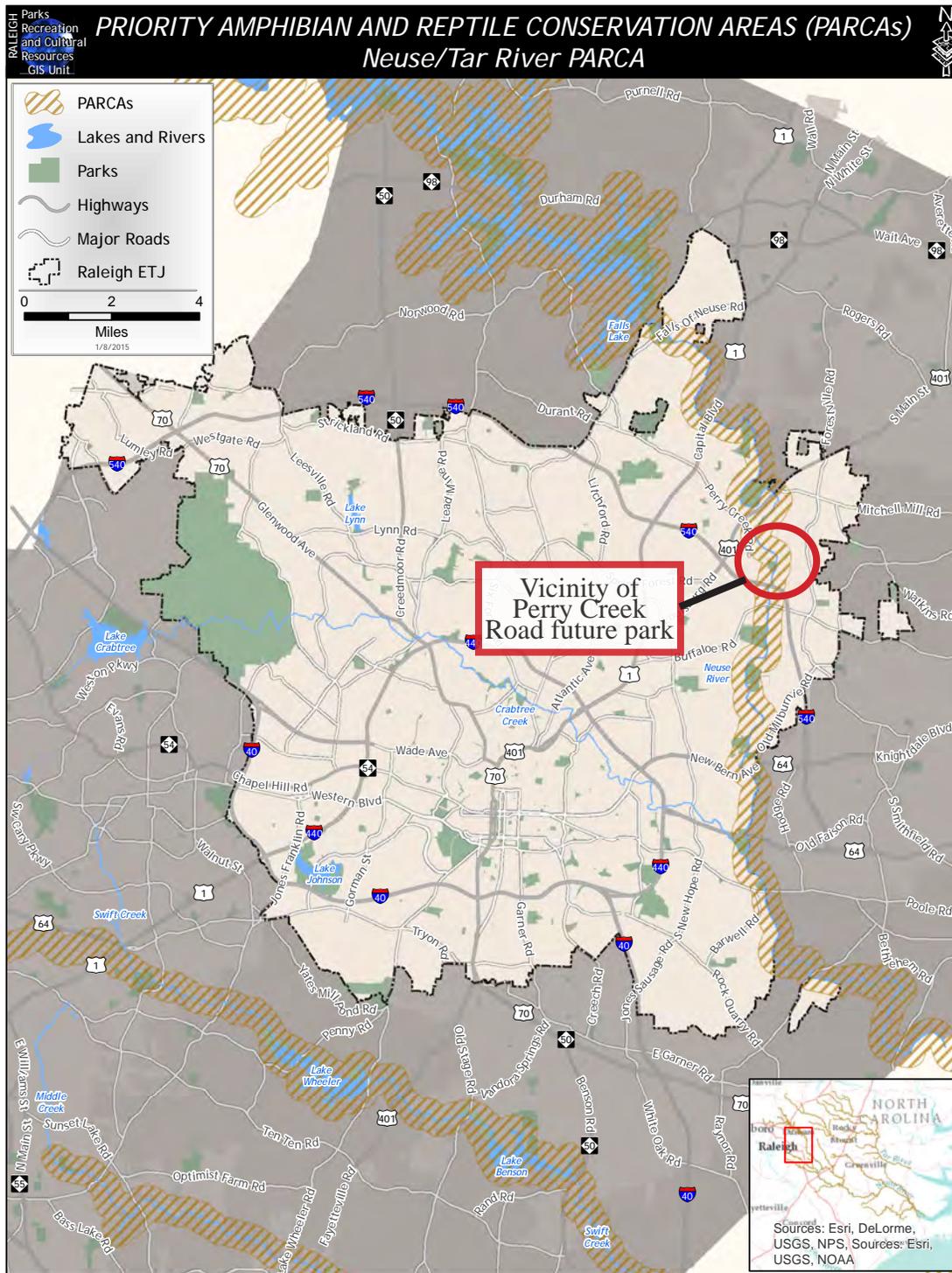


A small ephemeral wetland pool in an old road near the northern park boundary had numerous frogs in November 2014.

Priority Amphibian and Reptile Conservation Areas (PARCAs)

Multiple partners collaborated to develop criteria for designating Priority Amphibian and Reptile Conservation Areas (PARCAs) across the country. The mission of PARCA designation is to preserve biodiversity through protection of viable populations of priority amphibian and reptile species and their habitats. PARCA criteria is stringent, and includes the presence of globally or locally imperiled species, narrowly distributed (endemic) species, or areas with exceptionally high diversity. Landscape viability is evaluated and must be relatively undisturbed.

The Neuse/Tar River PARCA (shown on the map below) is the only PARCA within the Piedmont of North Carolina. The Perry Creek Road property is within this designated Priority Amphibian and Reptile Conservation Area. This PARCA supports endemic species, rare and protected species, and priority species from the WRC Wildlife Action Plan. The southeastern PARCA project aims to raise the profile of high priority species or areas, increase public awareness of locally important conservation areas, and elevate the importance of proper management at these sites.



Rare and Protected Animal Species of North Carolina

North Carolina Natural Heritage Program (NHP), North Carolina Wildlife Resources Commission (WRC), 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 NHP and the WRC to evaluate park and greenway projects for potential impacts to listed animals or their habitats. The Natural Heritage Program List of the Rare Animal Species of North Carolina 2014 was reviewed as part of the environmental assessment of the Perry Creek Road property.

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.

Rare animals can have both a federal status and a state status; sometimes the status is the same, sometimes it is different. 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 macroinvertebrates (aquatic macroinvertebrates such as aquatic insects, snails, clams, crayfish and worms are often used as indicators of water quality), butterflies, and dragonflies. 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 data needed to update the lists.

Animal species may also be locally uncommon within the County and City of Raleigh. 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

Wake County, including City of Raleigh property, is monitored for animal occurrences in any of the federal status categories, including Endangered, Threatened, and Federal Species of Concern.

Currently, the only federally Endangered animal that occurs in Wake County is the Dwarf Wedgemussel (*Alasmidonta heterodon*) which also 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).

Federally endangered animals are protected under the *Endangered Species Act of 1973*, which requires that any action likely to adversely affect a federally protected species is subject to review by the US Fish and Wildlife Service. It is unknown whether Dwarf Wedgemussel occurs in the vicinity of the Perry Creek Road property. The NCNHP has no current records of Dwarf Wedgemussel in the vicinity of the property.

No animals in the federally Threatened category currently occur in Wake County or the vicinity of the Perry Creek Road property.

Historic Records of Federally Listed Species

Historic Records are documented animal occurrences that were recorded in the past, however they have not been confirmed or observed in over 20 years. Historic Records are still generally tracked and some animals have the possibility of rediscovery. The Red-cockaded Woodpecker (*Picoides borealis*) occurred 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 in the vicinity of the Perry Creek Road 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 *Natural Heritage Program List of the Rare Animal Species of North Carolina 2014* also includes a Wake County Historic Record for the Northern Myotis Bat (*Myotis septentrionalis*), proposed to be listed as federally Endangered. The Northern Myotis Bat roosts in hollow trees and buildings during the warmer months, and in caves and mines in the winter, and lives primarily in the mountains. No Northern Myotis Bats were observed during field investigations in the vicinity of the Perry Creek Road 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 this species.

Wake County Records of Federal Species of Concern

Federally listed Species of Concern occur in a variety of habitats in Wake County or neighboring counties with similar habitats. The species are listed below along with their habitat requirements, and whether suitable habitat may be available in the vicinity of the Perry Creek Road property. Some of the species are Historic Records in Wake County, with some expectation of rediscovery. A number of Rare Animals that may occur in the Neuse River but have not been observed for many years tolerate only very clean high quality habitat and are sensitive to pollution, sedimentation, low oxygen conditions, and stream channel modifications.

Mammals - Species of Federal Concern

Wake County has a Historic Record for the **Southeastern Myotis Bat** (*Myotis austropariarius*) which roosts in caves, abandoned buildings, or hollow trees near standing water where they forage. It is unlikely that the Southeastern Myotis Bat occurs within the vicinity of the Perry Creek Road property.

Birds - Species of Federal Concern

Wake County has a Historic Record for **Bachman's Sparrow** (*Aimophila aestivalis*) which prefers longleaf pine woodlands with grassy areas, particularly those that have been burned recently. Bachman's Sparrow is state listed as 'Special Concern'. The Perry Creek Road property does not have suitable habitat available for this species.

Reptiles - Species of Federal Concern

The **Southern Hognose Snake** (*Heterodon simus*) inhabits sandy woods, open xeric areas with well-drained sandy soils, and river floodplains. It is possible but unlikely that the Perry Creek Road property includes suitable habitat for this species.

Amphibians - Species of Federal Concern

Wake County, as well as several neighboring counties, includes habitat for the **Neuse River Waterdog** (*Necturus lewisi*), a type of aquatic salamander that is endemic to North Carolina, occurring in rivers and large streams only in the Neuse and Tar River drainages. Typical habitats include areas with leaf litter as well as stream reaches with harder clay or soil beds. Logjams serve as particularly good habitat for these salamanders. Stream pollution and clearing of logjams both threaten the species. The Neuse River waterdog remains mostly hidden during the day, coming out to forage at night. It is most active during the fall and spring. The Neuse River Waterdog has a state status of Special Concern. It is unknown whether the Neuse River Waterdog occurs in the vicinity of the Perry Creek Road property.

Freshwater Fishes - Species of Federal Concern

The **Carolina Darter** (*Etheostoma collis*) inhabits small to moderate sized streams with low current velocity, preferring substrates of mud, sand and sometimes bedrock. It is tolerant of fine sediments covering the substrate. The Carolina Darter is state listed as 'Special Concern'. Suitable habitat may exist in the vicinity of the Perry Creek Road property.

Wake County has a Historic Record for **Carolina Madtom** (*Noturus furiosus*), an endemic freshwater fish which occupies relatively larger streams that flow into the Neuse and Tar rivers. It is commonly seen in mussel shells, under logs and rocks, and in piles of leaves and sticks. It is listed as 'Threatened' in North Carolina. It is unknown whether this species occurs in the vicinity of the Perry Creek Road property.

Roanoke Bass (*Ambloplites cavifrons*) inhabits creeks to medium rivers with rock, gravel, sand and silt substrates in the Neuse and Tar drainages. Roanoke Bass occurs in multiple neighboring counties. It is unknown whether this species occurs in the vicinity of the Perry Creek Road property.

Pinewoods Shiner (*Lythrurus matuinus*) is a freshwater fish endemic to North Carolina that occurs only in the Neuse and Tar River drainages. There are records of the Pinewoods Shiner in neighboring counties. It is unknown whether the Pinewoods Shiner occurs in the vicinity of the Perry Creek Road property.

Mollusks: Freshwater Bivalves - Species of Federal Concern

The **Atlantic pigtoe** (*Fusconaia masoni*) mollusk inhabits mostly medium to large streams with moderate gradients, clean fast water, and sand or gravel bed under riffles in the Neuse River and other drainages in neighboring counties. It currently has a state status of Endangered. It is unknown whether this species occurs in the vicinity of the Perry Creek Road property.

The **Green floater** (*Lasmigona subviridis*) mollusk inhabits 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. It occurs in Wake County as well as in neighboring counties. It currently has a state status of Endangered. It is unknown whether this species occurs in the vicinity of the Perry Creek Road property.

The **Yellow lance** (*Elliptio lanceolata*) mollusk inhabits freshwater streams and rivers with clean, coarse to medium sized sandy substrates, rocks, and in mud in slack water areas of the Neuse River Basin. The Yellow Lance occurs in Wake County and neighboring counties. It currently has a state status of Endangered. It is unknown whether this species occurs in the vicinity of the Perry Creek Road property.

Insects - Species of Federal Concern

There is a Historic Record for the butterfly **Diana Fritillary** (*Speyeria diana*) in Wake County. There are no current records for the Diana Fritillary in neighboring counties. This butterfly breeds in deciduous or mixed woods and feeds in grasslands and shrub lands. The Diana Fritillary is on the North Carolina Watch List. It is unlikely that the Perry Creek Road property supports this species.

Septima's Clubtail dragonfly (*Gomphus septima*) inhabits rocky rivers. It occurs in neighboring counties as well as in Wake County, and is state listed as 'Significantly Rare'. There is an occurrence of this dragonfly within the Significant Natural Heritage Area *Upper Neuse River Floodplain*. A small portion of this SNHA occurs on the Perry Creek Road property, however no specimens of this dragonfly have been observed in the vicinity of the park property.

State Listed Animal Species in Wake County

State listed animals are under the jurisdiction of the Wildlife Resources Commission (WRC). State Status categories are Endangered (E), Threatened (T), and Special Concern (SC) for vertebrates (mammals, birds, reptiles, amphibians, and freshwater fishes), and invertebrates (mollusks and crustaceans). The NHP also collects data for rare species under the categories of Significantly Rare (SR) and Watch List (W).

Animals from the *Natural Heritage Program List of the Rare Animal Species of North Carolina 2014* 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 listed below. The list 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.

State Endangered Animals

Five animal species listed as state Endangered in North Carolina are found in Wake County (one of the five is a historic record). Four Endangered Freshwater Bivalves that occur in Wake County are the Dwarf Wedgemussel, Yellow Lance, Atlantic Pigtoe, and Green Floater. The Red-cockaded woodpecker also has a state status of Endangered, with a historical occurrence in Wake County. There are no known occurrences of any State Endangered animals in the vicinity of the Perry Creek Road property.

State Threatened Animals

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 List, is still state listed as 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 are no known occurrences of any State Endangered animals in the vicinity of the Perry Creek Road property.

State Special Concern Animals

Animal species listed as Special Concern in North Carolina are found in Wake County, including the Four-toed Salamander (*Hemidactylium scutatum*), a salamander called Neuse River Waterdog (*Necturus lewisi*), the Star-nosed Mole (*Condylura cristata*), the North Carolina Spiny Crayfish (*Orconectes carolinensis*), and a freshwater bivalve or “mussel” Notched Rainbow (*Villosa constricta*). 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.

The Four-toed Salamander (a NHP Element Occurrence) does occur within the SNHA Upper Neuse River Floodplain, which is partially located within the Perry Creek Road property along the Neuse River, however the known Four-toed Salamander occurrence is not in close proximity to the park property.



Four-toed Salamander



Four-toed Salamander Habitat

State Significantly Rare Animals

There are approximately 23 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, the Little Brown Myotis Bat, Warbling Vireo, Slender Glass Lizard, Roanoke Bass, the Carolina Ladle Crayfish (*Cambarus davidi*), a caddisfly, three dragonflies (Regal Darner, Septima's Clubtail and Skillet Clubtail), 2 butterflies (Giant Swallowtail and Checkered White), 6 moths, and the Northern Barrens Tiger Beetle. Historic records exist for the Northern Myotis bat, a freshwater fish called Mimic Shiner, and the Mottled Duskywing butterfly.

Population and locality data for many animal species is insufficient, however new occurrences are being discovered continually. For example, two of the Significantly Rare dragonflies (Septima's Clubtail and Skillet Clubtail) were observed within the SNHA Upper Neuse River Floodplain in 2010. The SNHA Upper Neuse River Floodplain is partially located within the Perry Creek Road property, however the known rare dragonfly occurrences are not in close proximity to the park property.

Septima's Clubtail Dragonfly



Skillet Clubtail Dragonfly



State Watch List Animals

There are approximately 50 animal species on the Watch List which occur in Wake County. Animal species on the Watch List portion of the *Natural Heritage Program List of the Rare Animal Species of North Carolina 2014* are on the Watch List because they 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. Invertebrate data is particularly inadequate. 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 Watch List animal species to clarify their status and reclassify them if appropriate. Counties of known occurrence are listed in the Rare Animal List for many animal groups, but not yet listed for others.

No specimens of rare or protected animal species from either the *List of Rare Species* or the Watch List have been observed on the Perry Creek Road park property at the time of this report. 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 in the vicinity of the Perry Creek Road property and other City of Raleigh sites will be updated as information is collected, and any rare species observed will be recorded and shared with the NHP and other partner agencies.

Invasive Animals

Imported Fire Ants

Fire ants may be present within sewer easements or other previously disturbed areas in the vicinity of the Perry Creek Road property. Imported fire ants constitute a hazard to both people and wildlife. They are particularly detrimental to amphibians, reptiles, and ground nesting birds. The most important component of an imported fire ant management plan is to protect and conserve North Carolina's native ant populations. Native ants are beneficial and control the invading fire ants.

There are different species of Imported fire ants and they are found throughout much of eastern North Carolina. It is beneficial to identify the type of fire ants present on a site in order to develop the best management plan for controlling the imported fire ants.

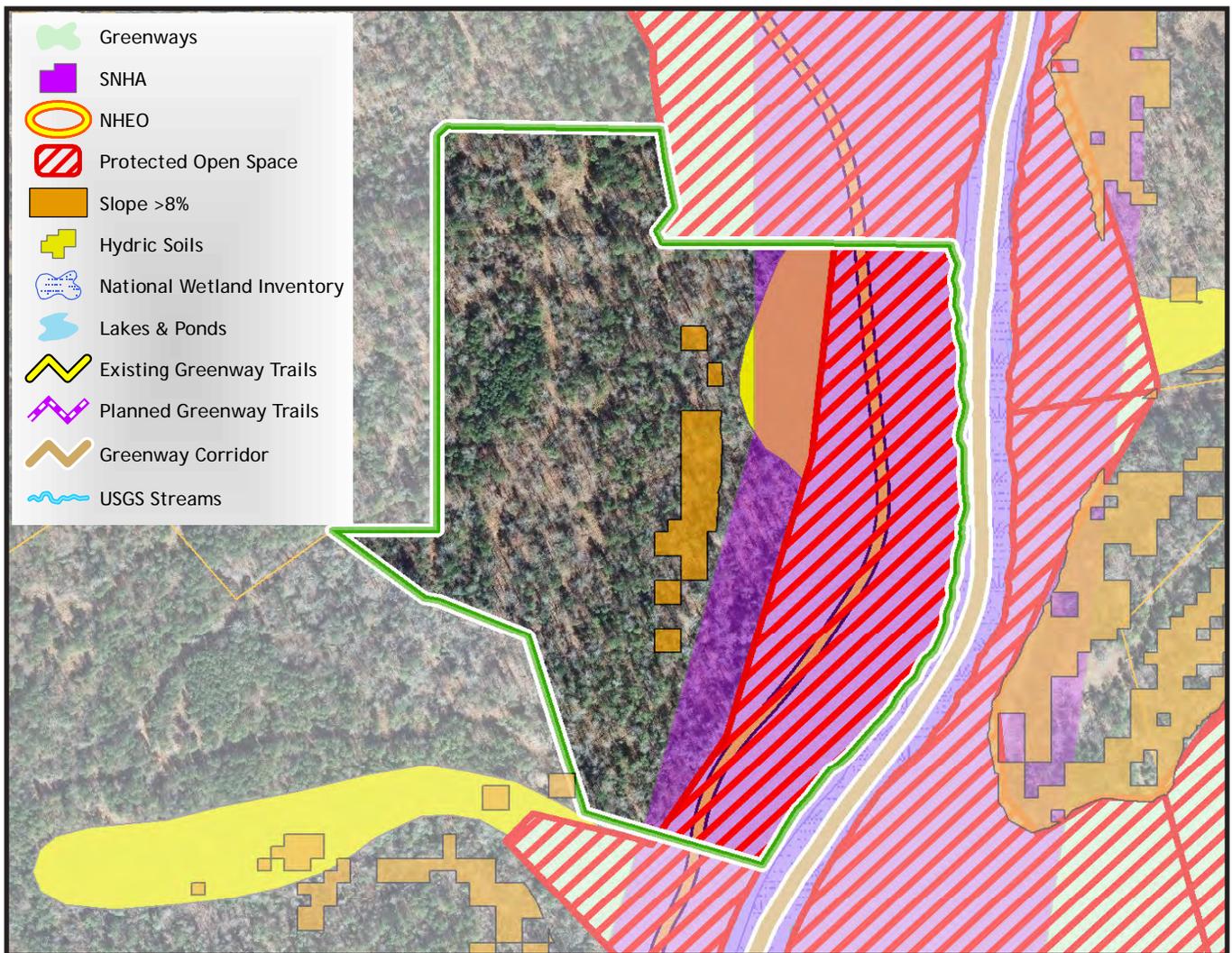
It is not uncommon for fire ants to be introduced to new disturbed areas in a variety of ways, including introduction to new sites on construction equipment that has previously been used on infested sites, and through transport of fire ant infested nursery stock and sod. Areas with fire ants are currently 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.

Once established on a site, further site disturbance spreads the imported fire ants.

Management of fire ants is complex and depends on the species of ant present. If fire ants are determined to be present on the site and are identified as invasive imported fire ant species, a management plan should be developed. It is very important to initiate fire ant management on the site before the park is developed, in order to reduce the spread of fire ants during site development. Fire ant baiting takes longer but is the most effective method of long term control. Fire ant management works most effectively with collaboration and cooperation between adjacent property owners, including the Public Utility Department.

Perry Creek Road Property Park Classification and Nature Preserve Criteria

- Park Classification and Experience Based System
from Parks, Recreation, and Cultural Resources System Plan
- Nature Preserve and Protected Natural Area definitions
- Nature Preserve Criteria for Perry Creek Road Property



Perry Creek Road Property: Map of Nature Preserve Criteria

Neighborhood Park Classification and Experience Based System

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.

The Perry Creek Road future park property will be classified as a Neighborhood Park. Neighborhood Parks 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.

The recently adopted System Plan has established a new “experience-based” Parks, Recreation and Cultural Resources system to remain flexible and to provide better service to the community. As a priority identified by citizens, a set of inherent park, recreation and cultural experiences have been identified that the city will prioritize with equal access for all citizens. These experiences are grouped into two categories: core neighborhood experiences and area-wide experiences. The area-wide experiences and activities are grouped into two types: ‘at-will;’ or programmed. Programmed activities are traditional types of recreation that are scheduled at specific times and for specific activities. ‘At-will’ activities encompass activities that can be done at the user’s will. People are increasingly interested in activities such as walking or biking that do not require them to meet an exact schedule or to be coordinated with large numbers of people. Core neighborhood experiences are identified as walk-to activities whereas area-wide experience are activities citizens would be willing to travel a longer distance for due to the experience being tied to a specific resource or larger park development.

Activities included in the core neighborhood-based experience are all ‘at-will’ activities such as:

- Sitting outside, reading, contemplating, meeting friends (socializing)
- Going to a playground
- Informal open play (may include an open lawn)
- Walking or riding a bike in a park or on a greenway trail

Area-wide ‘at-will’ activities include:

- Athletic Field or Court Play
- Enjoying the Outdoors
- Fitness
- Aquatic Recreation
- River and Lake-related Activities
- Cultural Opportunities

Each experience is tied to a series of amenities that provide or contribute to the experience. While the park property is classified as a neighborhood park the master plan process should evaluate the need for amenities contributing to both core neighborhood and area-wide experiences to serve both the immediate neighborhood and the larger community. 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 should also be taken into account when planning for the park.

City of Raleigh Nature Preserves

A City of Raleigh *Nature Preserves Task Force* was established in May 2010 at the request of Raleigh City Council, following public support for this initiative. The *Nature Preserves Task Force* consisted of representatives from the City of Raleigh Parks, Recreation, and Cultural Resources Department, WakeNature Preserves Partnership, and the Parks, Recreation and Greenway Advisory Board (PRGAB). The *Nature Preserves Task Force* developed **City of Raleigh Nature Preserves Criteria** as a tool to facilitate park evaluation to determine whether the properties should be classified as “Nature Preserves” or whether portions of a park property should be identified as “Protected Natural Areas”. A copy of the **Nature Preserves Task Force Report** is available at www.raleighnc.gov (search for Nature Preserves).

Definitions of a City Of Raleigh Nature Preserve and Protected Natural Area

A City of Raleigh **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 City of Raleigh **Protected Natural Area** 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, Protected 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 Raleigh Parks, Recreation, and Cultural Resources Department determined that the SIP process, which includes a detailed analysis of Existing Site Conditions and review of intended park classification, would be an appropriate time to evaluate a park property with the City of Raleigh Nature Preserves Criteria to determine if the park should be considered for a Nature Preserve or a Protected Natural Area.

As part of the SIP process for the Perry Creek Road future park, the property has undergone an initial evaluation with the City of Raleigh Nature Preserves Criteria. At the time of this report, the entire park site does not support the high quality ecosystems associated with a Nature Preserve, and there are no known occurrences of protected or rare plant or animal species on the park property. However, almost half of the park site, and the majority of the adjacent 15.58 acre greenway parcel lie within the NC Natural Heritage Significant Natural Heritage Area **Upper Neuse River Floodplain** (described in more detail in the Nature Preserves Criteria review beginning on the next page). Final determination for the best use of the park could occur during a future phase of park planning and development.

Nature Preserves Criteria Review for the Perry Creek Road Property

24.97 acres future park property

See maps in this section of the report highlighting areas within the Perry Creek Road property that support features described in the Natures Preserves Criteria.

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 the Perry Creek Road future park property or the adjoining greenway parcel. No Element Occurrences occur within the immediate vicinity of the property.

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).

Yes, a portion of the Significant Natural Heritage Areas (SNHA) *Upper Neuse River Floodplain* occurs on the Perry Creek Road future park property. The entire SNHA runs along the Neuse River and its floodplain for approximately 12 river miles and is considered to be of Regional Significance. Of the total Perry Creek Road park property almost half of the park property (11.38 acres) lies within the SNHA. A majority of the adjoining 15.58 acre City of Raleigh greenway parcel is also within the *Upper Neuse River Floodplain* SNHA.

Although no Element Occurrences are located in the vicinity of the Perry Creek Road future park property, a number of Element Occurrences do occur within other areas of the *Upper Neuse River Floodplain* SNHA. The State ranked *Special Concern* Four-toed Salamander (*Hemidactylium scutatum*) occurs in wetlands within the floodplain of Smith Creek, in the northern section of the SNHA. A heronry is located within the Neuse River floodplain in a beaver pond. Two Significantly Rare Dragonfly Element Occurrences have been discovered within the SNHA in recent years. Several rare plants occur in the SNHA. Horsetail Crown Grass (*Paspalum fluitans*), a Significantly Rare plant with a State Rank of S1 (Critically Imperiled) is located in the Neuse River floodplain within the SNHA. Kidneyleaf Mud-plantain (*Heteranthera reniformis*) is located along the greenway trail in the southern section of the SNHA. Several other Element Occurrences are found within the *Upper Neuse River Floodplain* SNHA, including two EOs within Horseshoe Farm Nature Preserve, north of the Perry Creek Road property.

3. Parcel is in close proximity to or provides connection between other properties that are currently protected.

Yes. The SNHA on a portion of the Perry Creek Road park property is part of a larger SNHA of approximately 12 river miles (1,676 acres) along the Neuse River. The Perry Creek Road property is adjacent to the Harris Creek wetlands and shares connectivity with significant greenway land and other conservation parcels. A Perry Creek vicinity map is provided at the end of this section of the report showing connectivity to other protected lands.

4. Parcel contains appreciable water features in the landscape, such as wetlands, lakes, ponds, perennial stream systems, or floodplains.

Yes. The Perry Creek Road park property adjoins the Neuse River and contains a substantial portion of Neuse River floodplain (13.32 acres). Several streams occur in the vicinity, with associated wetland areas. The parcel is adjacent to the extensive Harris Creek wetlands. Ephemeral wetland pools are located within the Neuse River floodplain.

5. Parcel contains hydric soils which may be indicative of wetlands.

Approximately 6.75 acres of the Perry Creek Road park property is underlain by the hydric soil Chewacla (CmA) and a small area of hydric soil Congaree silt loam (CoA), both soils associated with the Neuse River floodplain. The hydric soil Chewacla, 0 to 2 percent slopes, consists 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. The hazard of flooding is severe. The hazard of wetness is very severe (Wake County Soil Survey, USGS). The hydric soil Congaree silt loam, 0 to 2 percent slopes, is mapped in Neuse River floodplain areas. The seasonal high water table is approximately 2.5 feet below the ground surface. Congaree silt loam is a Class B soil-mapping unit, indicating that it may contain hydric soil inclusions or wet spots.

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

A small portion of the park property has slopes greater than 8%. The park area with slopes greater than 8% running along a ridge in the central area of the park parcel is associated with Wedowee sandy loam (WmC, 6 to 10% slopes), which is located on side slopes in upland areas. Wedowee soil's surface layer is sandy loam 6 to 10 inches thick. Included with Wedowee soils during the USGS 1970 Wake County Soil Survey were some areas in which 20 to 50 percent of the surface is covered with or consists of gravel. Surface runoff is rapid, and the hazard of erosion is severe.

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, no federal or state protected rare plants have been observed on the Perry Creek Road future park property. Natural resources inventory is ongoing.

The following uncommon plants occur in the vicinity of the Perry Creek Road property (the list is not comprehensive):

<i>Asarum canadense</i>	Wild ginger
<i>Sanguinaria canadensis</i>	Bloodroot
<i>Viburnum rufidulum</i>	Rusty blackhaw
<i>Chelone glabra</i>	White turtlehead
<i>Chamaelirium luteum</i>	Devil's bit
<i>Euthamia caroliniana</i>	Flattop goldenrod
<i>Liatris</i> sp.	Blazing star
<i>Andropogon ternarius</i>	Splitbeard bluestem

8. The property contains outstanding geologic characteristics, such as cave, waterfall, cliffs, granite outcrop, etc. as identified and mapped by staff.

No outstanding geologic features have been observed at the time of this report on the Perry Creek Road park property.

The Neuse River creates depositional topographic features such as natural levees, point bars, ridge-and-swale systems, and sloughs. The Neuse River floodplain often has differentiated levee, bottomland, and terrace zones large enough to support distinct natural communities. Some of these landscape features are significant within the park parcel and vicinity.

9. The conservation benefit outweighs the expense of stewarding the property due to location, maintenance of structures, resource management (such as invasives management), liability, multiple owners, trespassing concerns, irreparable contamination, cost prohibitive cleanup, or other factors.

Considerations:

- Almost half of the Perry Creek Road park property is located within a designated Natural Heritage Program Significant Natural Heritage Area, the *Upper Neuse River Floodplain*
- The property is located in the Neuse/Tar River Priority Amphibian and Reptile Conservation Area (PARCA)
- Almost half of the park property is located within the floodplain of the Neuse River
- The Neuse River corridor (both the river and its riparian habitat and floodplain) provides important wildlife habitat
- The park property is located in an area with extensive connectivity to other protected conservation or open space areas in the landscape, thus increasing the conservation benefits
- Much of the park west of the Neuse River Greenway Trail has been historically altered and disturbed, including logging, agriculture, and other human impacts
- The park property has been impacted by the Public Utility easement and greenway trail, degrading its conservation value
- Invasive plants are established on portions of the property
- Impacts from adjacent planned development are expected to occur

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 park property location along the Neuse River and existing Tree Conservation Areas offer some protection even with planned development to the west and south of the park. Conservation benefits will be maximized by clustering park development and minimizing impacts within the SNHA and Neuse River floodplain, and implementing the Recommendations for Sustainable Development and Best Management Practices provided in the SIP report for the Perry Creek Road property. Partnerships with adjacent landowners and cooperative management planning could maximize protection of natural resources in the area.

11. The area can be sufficiently buffered.

Best Management Practices and quality stewardship of the park property could include careful park planning and design, with consideration for clustering park development and minimizing impact or improving quality of the park portion within the SNHA and the Neuse River floodplain. Significant impacts to the floodplain have already occurred with past land use, Public Utility easements, and the Neuse River Greenway Trail. Utilizing areas that are already impacted whenever possible can minimize additional impacts to natural resources within the area.

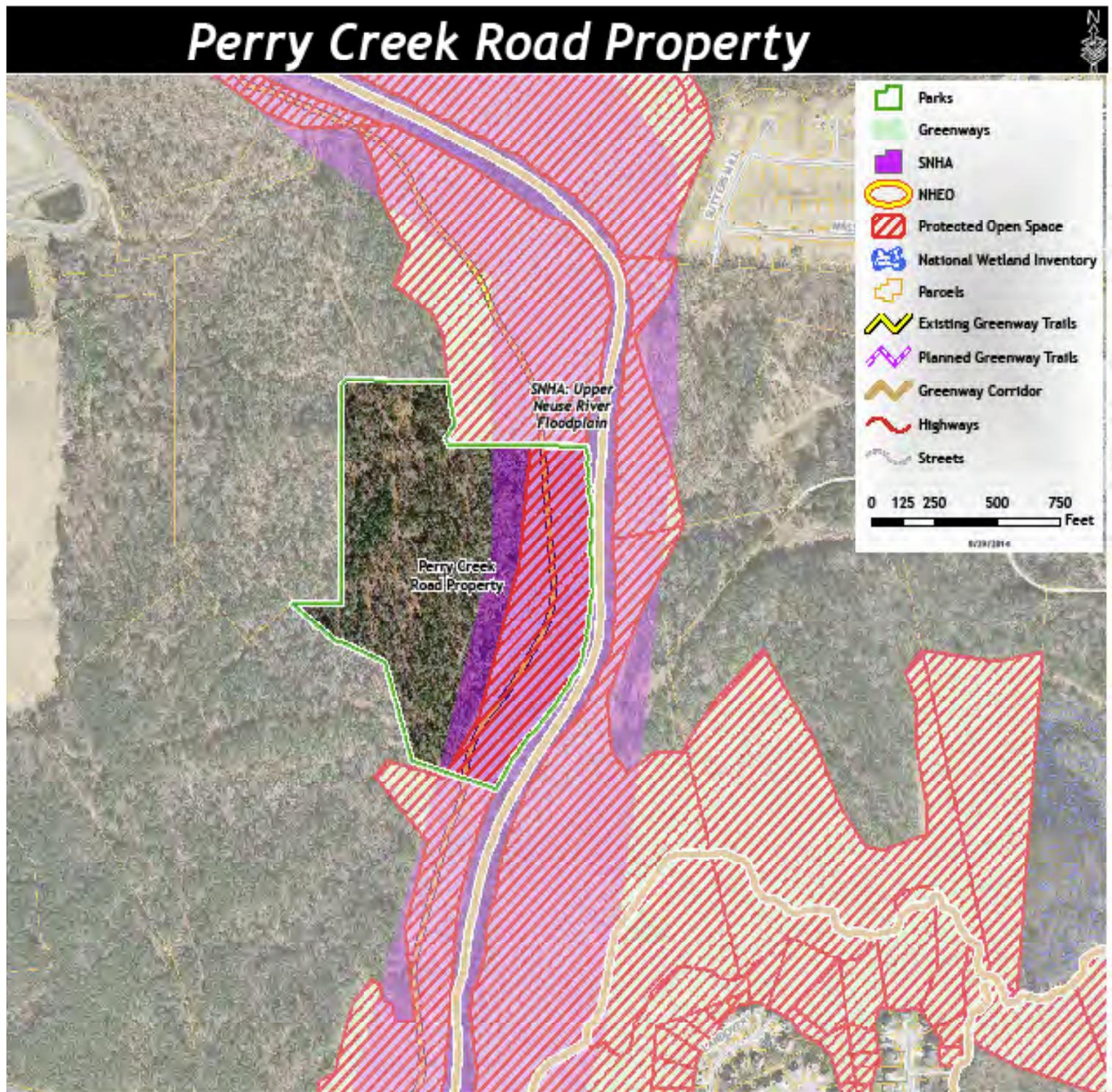
12. Compatibility of existing use or condition, in whole or part, is conducive to being a Nature Preserve.

At the time of the Perry Creek Road park property SIP report, the property does not seem to support large areas of exceptionally high quality wildlife habitat or natural resources. The Neuse River floodplain on the park parcel may not be exceptionally high quality, however the area still has substantial conservation value as part of the Significant Natural Heritage Area and Priority Amphibian and Reptile Conservation Area.

A portion of the park's floodplain would be preserved under the City's planned Tree Conservation Areas along the Neuse River. Clustered park development and utilization of other Design and Development considerations with careful trail design and construction (provided in the SIP report for the Perry Creek Road property) could reduce impacts to the highest value natural areas of the property. The greatest conservation value and sustainable development could be accomplished through partnerships and cooperation with adjacent landowners to coordinate best management practices and stewardship of the area's highest quality natural resources.

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

The map below shows the Perry Creek Road park property and the connectivity between the park property and additional property in the vicinity that is classified as Protected Open Space, enhancing conservation benefits.



Perry Creek Road Property Appendices

- Appendix A
System Integration Plan and Park Master Plan Process
- Appendix B
Phase 1 Environmental Assessment Report Executive Summary
- Appendix C
Flora Resources
- Appendix D
Wildlife
- Appendix E
Comments and Records
- Appendix F
Work Progression and Updates

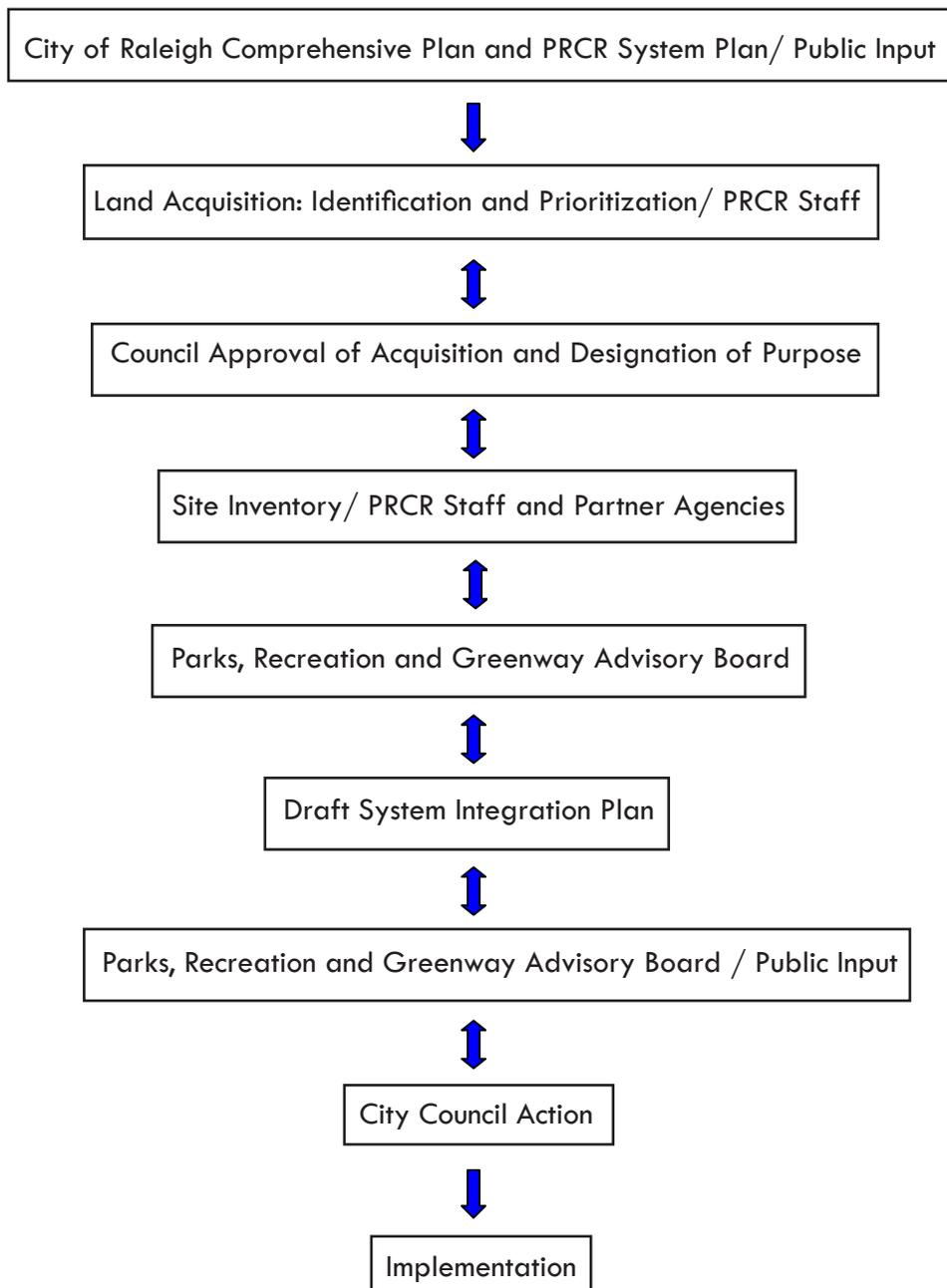
Appendix A

Perry Creek Road Property

System Integration Plan and Master Plan Process

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 document existing site conditions and develop a set of interim management guidelines for the property. The SIP also includes a review of the site’s intended classification including an evaluation of the site with the City of Raleigh Nature Preserve Criteria. The SIP is not intended to restrict the Master Plan Process. A System Integration Plan Conceptual Flow Model below demonstrates the interaction between the City of Raleigh 2030 Comprehensive Plan, PRCR System Plan, acquisition of park property, City of Raleigh Parks staff, the public, City Council, and the Parks, Recreation and Greenway Advisory Board (PRGAB) in the SIP process.



Appendix B

Perry Creek Road Property

Phase 1 Environmental Assessment Summary

Perry Creek Road Property Phase 1 Executive Summary

The future park parcel was included within a Phase 1 Environmental Assessment Report for 5401 North LLC during the process of site acquisition. The Executive Summary for the entire approximately 148 acre 5401 North LLC property is provided below.

GeoTechnologies Project No. 1-09-0378-EA

Phase 1 Environmental Assessment Report

August 2009

Prepared for: 5401 NORTH, LLC

5630 Bankers Avenue

Baton Rouge, LA 70808

SUMMARY

“GeoTechnologies, Inc. has performed a Phase 1 ESA for an approximately 148 acre property located near the intersection of I-540 and Louisburg Road (Hwy 401) in Raleigh, North Carolina. The property is owned by 5401 North, LLC and is designated with the PIN 1736874744.

A site reconnaissance of the property was performed on August 4, 2009. The site was accessible from a dirt road off Hwy 401 to the west. The majority of the property was wooded at the time of our site visit. A dirt pathway providing access to a sewer easement to the east was observed along portions of the approximate northern boundary of the site. Additionally, several other unimproved paths were observed on the site. These pathways appear to be related to previous logging activities on the site, recreation, and the completion of geotechnical soil borings. During our reconnaissance of the property, we did not observe any stained soil, distressed vegetation, debris disposal, or other indications of any Recognized Environmental Conditions (RECs) on the property.

The subject property was bound to the north by wooded areas and fallow farm fields. The Neuse River formed the eastern site boundary. The subject property was bound to the south by I-540 and to the west by wooded lands and fields. We did not observe evidence that nearby properties had likely adversely impacted the environmental condition of the subject site.

An environmental database search from EDR, Inc. did not reveal any regulated facilities or environmental incidents on the subject site. The environmental database report did not document any environmental incidents within the ASTM E-1527 standard search distances. However, we are aware of a Leaking Underground Storage Tank (LUST) at the Bradsher Farms property located about 2,000 feet west/northwest of the site. The incident involved soil contamination discovered in 2006 at the locations of former gasoline and diesel underground storage tanks that were removed around 1970. The incident has received a No Further Action status by the State, and it does not appear that this incident would present an environmental risk to the subject property.

Based on our review of historical information, the property appears to have consisted of woodlands since the late 1940s. The subject property was previously owned by the Union Camp Corporation, and it appears that portions of the site had been used for timber harvesting in the past. No past land uses were found that would indicate likely adverse environmental conditions on the site.

In May of 2008 GeoTechnologies completed an environmental assessment on an adjacent parcel and a portion of the subject property. No RECs were identified during the completion of the previous Phase 1 ESA. The condition of the subject property does not appear to have changed since that time.

GeoTechnologies has conducted a Phase 1 ESA in general accordance with the scope and limitations of ASTM E-1527-05. Any exceptions to, or deletions from, this practice are described in section 2.2.4 of this report. During the course of our investigation, GeoTechnologies did not uncover any Recognized Environmental Conditions (RECs) on the subject property. Therefore, it does not appear that further environmental assessment of the property is required at this time.”

Appendix C

Perry Creek Road Property

Flora Resources

Inventory of Flora Observed in Vicinity of Perry Creek Road Property

Trees and Shrubs

<i>Acer barbatum/Acer floridanum</i>	<i>Southern sugar maple</i>
<i>Acer negundo</i>	<i>Box elder</i>
<i>Acer rubrum</i>	<i>Red Maple</i>
<i>Alnus serrulata</i>	<i>Tag Alder</i>
<i>Aronia arbutifolia</i>	<i>Red Chokeberry</i>
<i>Arundinaria gigantea</i>	<i>Giant cane</i>
<i>Baccharis halmifolia</i>	<i>Groundsel Tree</i>
<i>Betula nigra</i>	<i>River Birch</i>
<i>Carpinus caroliniana</i>	<i>Ironwood</i>
<i>Carya cordiformis</i>	<i>Bitternut hickory</i>
<i>Carya glabra</i>	<i>Pignut hickory</i>
<i>Carya tomentosa</i>	<i>Mockernut hickory</i>
<i>Cercis canadensis</i>	<i>Eastern redbud</i>
<i>Cornus amomum</i>	<i>Silky Dogwood</i>
<i>Cornus florida</i>	<i>Flowering dogwood</i>
<i>Euonymus americana</i>	<i>Strawberry Bush</i>
<i>Fagus grandiflora</i>	<i>American Beech</i>
<i>Fraxinus pennsylvanica</i>	<i>Green ash</i>
<i>Ilex decidua</i>	<i>Possumhaw</i>
<i>Ilex opaca</i>	<i>American Holly</i>
<i>Juglans nigra</i>	<i>Black walnut</i>
<i>Juniperus virginiana</i>	<i>Eastern redcedar</i>
<i>Liriodendron tulipifera</i>	<i>Tulip Poplar</i>
<i>Luquidambar styraciflua</i>	<i>Sweet gum</i>
<i>Ostrya virginiana</i>	<i>Ironwood</i>
<i>Oxydendrum arboreum</i>	<i>Sourwood</i>
<i>Pinus taeda</i>	<i>Loblolly Pine</i>
<i>Platanus occidentalis</i>	<i>American Sycamore</i>
<i>Quercus alba</i>	<i>White oak</i>
<i>Quercus michauxii</i>	<i>Swamp chestnut oak</i>
<i>Quercus phellos</i>	<i>Willow Oak</i>
<i>Quercus rubra</i>	<i>Red oak</i>
<i>Rhododendron periclymenoides</i>	<i>Pink azalea</i>
<i>Rhus copallinum</i>	<i>Winged sumac</i>
<i>Rubus sp.</i>	<i>Blackberry</i>
<i>Sassafras albidum</i>	<i>Sassafras</i>
<i>Ulmus alata</i>	<i>Winged elm</i>
<i>Ulmus americana</i>	<i>American elm</i>
<i>Vaccinium arboreum</i>	<i>Sparkleberry</i>
<i>Viburnum dentatum var. dentatum</i>	<i>Southern Arrowwood</i>
<i>Viburnum prunifolium</i>	<i>Blackhaw</i>
<i>Viburnum rufidulum</i>	<i>Rusty blackhaw</i>
<i>Xanthorhiza simplicissima</i>	<i>Yellowroot</i>

Inventory of Flora Observed in Vicinity of Perry Creek Road Property continued

Vines

Bignonia capreolata	Cross vine
Campsis radicans	Trumpet creeper
Gelsemium sempervirens	Carolina jessamine
Parthenocissus quinquefolia	Virginia creeper
Passiflora lutea	Yellow passionflower
Smilax spp.	Greenbriar
Smilax bona-nox	Saw greenbriar
Toxicodendron radicans	Poison ivy
Vitis spp.	Grape
Vitis rotundifolia	Muscadine grape

Ferns

Asplenium platyneuron	Ebony spleenwort
Athyrium filix femina	Southern lady fern
Botrypus virginianus	Rattlesnake fern
Polystichum acrostichoides	Christmas fern
Thelypteris noveboracensis	New York fern
Woodwardia areolata	Netted chain fern

Lichens, Fungi, Algae, Bacteria, and other Organisms

Usnea sp.	Old man's beard lichen
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Inventory of Flora Observed in Vicinity of Perry Creek Road Property continued

Herbaceous

Agalinus purpurea	Purple gerardia
Andropogon ternarius	Splitbeard bluestem
Andropogon virginicus	Broomsedge
Arisaema triphyllum	Jack in the pulpit
Asarum canadense	Wild ginger
Boehmeria cylindrica	False nettle
Carex spp.	Sedges
Chamaecrista fasciculata	Partridge pea
Chamaecrista nictitans	Sensitive plant
Chamaelirium luteum	Devil's bit
Chasmanthium latifolium	River oats
Chelone glabra	White turtlehead
Cinna arundinacea	Sweet woodreed
Cirsium sp.	Thistle
Claytonia virginica	Spring beauty
Commelina virginica	Virginia dayflower
Conoclinium coelestinum	Blue mistflower
Coreopsis auriculata	Lobed tickseed
Desmodium sp.	Tick-trefoil
Dichanthelium clandestinum	Deertongue grass
Diodia virginiana	Virginia buttonweed
Dioscorea villosa	Wild yam
Echinochloa crus-galli	Barnyard grass
Elephantopus tomentosa	Elephant's foot
Elymus hystrix	Eastern bottlebrush grass
Epifagus virginiana	Beech drops
Erechtites hieracifolia	Burnweed
Erigeron strigosus	Daisy fleabane
Eupatorium capillifolium	Common dog fennel
Eupatorium fistulosum	Hollow-stem Joe-pye weed
Eupatorium hyssopifolium	Hyssopleaf thoroughwort
Eupatorium sp.	Eupatorium
Euphorbia corollata	Flowering spurge
Eurybia divaricata	White wood aster
Euthamia caroliniana?	Flattop goldenrod
Gnaphalium purpureum	Purple cudweed
Goodyera pubescens	Rattlesnake orchid
Hexastylis arifolia	Littlebrownjug
Impatiens capensis	Jewelweed
Krigia virginica	Virginia dwarf dandelion
Liatris sp.	Blazing star
Ludwigia alternifolia	Bushy seedbox
Lycopus virginicus	Water hoarhound
Mitchella repens	Partridge berry
Oxalis stricta	Yellow wood sorrel
Oxalis violacea	Pink wood sorrel

Inventory of Flora Observed in Vicinity of Perry Creek Road Property continued

Herbaceous continued....

Packera anonyma	Small's ragwort
Persicaria spp.	Smartweed
Phytolacca americana	Common pokeweed
Pilea pumila	Clearweed
Pluchea camphorata	Camphorweed
Polygonum virginianum	Jumpseed
Pseudognaphalium obtusifolium	Rabbit-tobacco
Ranunculus recurvatus	Hooked buttercup
Rumex sp.	Dock
Sanguinaria canadensis	Bloodroot
Saururus cernuus	Lizard's tail
Sisyrinchium sp.	Blue-eyed grass
Scirpus sp.	Bulrush
Smilacina racemosa	False Solomon's seal
Solanum sp.	Nightshade (could be non-native)
Solidago caesia	Bluestem goldenrod
Solidago spp.	Goldenrod
Spirodella sp.	Duckweed
Symphyotrichum pilosum	Frost aster
Tipularia discolor	Crane-fly orchid
Tridens flavus	Purpletop
Triodanis perfoliata	Venus's lookingglass
Typha latifolia	Broadleaf cattail
Uvularia perfoliata	Perfoliate bellwort
Verbesina occidentalis	Yellow crownbeard
Viola spp.	Violet

Inventory of Flora Observed in Vicinity of Perry Creek Road Property continued

Non-natives and Invasives

Cerastium vulgatum	Mouse-ear chickweed
Dactylis glomerata	Orchardgrass
Daucus carota	Queen Anne's lace
Duchesnea indica	Mock strawberry
Elaeagnus sp.	Olive
Galium aparine	Bedstraw
Hedera helix	English ivy
Hypochaeris radicata	Hairy cat's ear
Lespedeza cuneata	Lespedeza
Leucanthemum vulgare	Oxeye daisy
Ligustrum sinense	Chinese privet
Liriope sp.	Monkey grass
Lithospermum arvense	Corn gromwell
Lolium arundinaceum	Tall fescue
Lonicera japonicum	Japanese honeysuckle
Medicago lupulina	Black medic
Microstegium vimineum	Japanese stiltgrass
Murdannia keisak	Marsh dayflower
Nandina sp.	Heavenly bamboo
Paulownia tomentosa	Princess tree
Plantago lanceolata	Narrowleaf plantain
Potentilla recta	Sulphur cinquefoil
Pyrus calleryana	Callery pear
Rosa multiflora	Multiflora rose
Stellaria media	Common chickweed (winter annual/ perennial)
Trifolium arvense	Rabbit-foot clover
Trifolium campestre	Field clover
Trifolium repens	White clover
Verbascum thapsus	Common mullein
Veronica hederifolia	Ivyleaf speedwell (winter annual)
Vicia sativa	Common vetch (sewer easement)

Appendix D

Perry Creek Road Property

Wildlife Observed

Inventory of Wildlife Observed: Perry Creek Road Property and Vicinity

Birds

<i>Baeolophus bicolor</i>	Tufted Titmouse
<i>Cardinalis cardinalis</i>	Northern Cardinal
<i>Colaptes auratus</i>	Northern Flicker
<i>Cyanocitta cristata</i>	Blue Jay
<i>Dumetella carolinensis</i>	Gray Catbird
<i>Geothlypis trichas</i>	Common Yellowthroat
<i>Melanerpes carolinus</i>	Red-bellied Woodpecker
<i>Meleagris gallopavo</i>	Eastern Wild Turkey
<i>Pipilo erythrophthalmus</i>	Eastern Towhee
<i>Poecile carolinensis</i>	Carolina Chickadee
<i>Setophaga americana</i>	Northern Parula Warbler
<i>Spinus tristis</i>	American Goldfinch
<i>Thryothorus ludovicianus</i>	Carolina Wren
<i>Turdus migratorius</i>	American Robin

Mammals

<i>Odocoileus virginianus</i>	White-tailed deer
<i>Ondatra zibethicus</i>	Muskrat
<i>Procyon lotor</i>	Raccoon

Amphibians

<i>Acris crepitans</i>	Northern Cricket Frog
<i>Bufo fowleri</i>	Fowler's Toad
<i>Pseudacris crucifer</i>	Spring Peeper
<i>Pseudacris feriarum</i>	Upland Chorus Frog

Reptiles

<i>Pseudemys concinna</i>	River cooter turtle
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Butterflies

<i>Phyciodes tharos</i>	Pearl crescent
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Insects

<i>Necrophila americana</i>	Carrion beetle
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Perry Creek Road Property and Vicinity

Comments and Records

Perry Creek Road Property and Vicinity

Work Progression and Updates