*Existing Conditions Report*

TOWN OF CARRBORO, NC

# BOLIN CREEK GREENWAY


*prepared by:*
**Greenways Incorporated, EcoScience & PBS&J**
February 2009

GREENWAYS INC.
planning & design for open space, parks, trails, & alternative transportation

EcoScience

PBS&J

*prepared for:*
***the* Town of Carrboro, NC**

TOWN OF CARRBORO • NORTH CAROLINA • MARCH 3, 1911

STATE OF NORTH CAROLINA • DEPARTMENT OF TRANSPORTATION

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## A. Overview

In November 2008, the Town of Carrboro commissioned Greenways Incorporated to prepare a conceptual master plan for the Bolin Creek Greenway. The Bolin Creek Greenway project was initiated by the Town for the purposes of alternative transportation, recreation, and environmental restoration.

## B. Project Purpose

Greenways preserve land and provide continuity to an open space system providing multiple benefits to the community and the environment. They connect natural areas and provide habitat for wildlife, as well as corridors for recreation. Greenways help filter sediment and pollutants from runoff thereby improving water quality; they enhance the natural function of streams and floodplains and accomodate stormwater flows. Bolin Creek provides an important opportunity to enhance the environment and quality of life for Town of Carrboro citizens.

## C. Goals

Greenways Incorporated met with Town of Carrboro staff and members of the Carrboro Greenways Commission at the kickoff of the project to discuss overarching goals of the plan. The following are some of the key issues of importance in the development of the Bolin Creek Greenway.

### *Ecology and the Natural Environment*

Bolin Creek is considered to be one of the Carrboro's richest natural resources. Therefore, protecting and improving water quality along the Bolin and Jones Creek corridor are of utmost importance to the Town. In addition, efforts to protect and conserve wildlife habitat within the creek's corridor will be made throughout this planning effort.

### *Transportation*

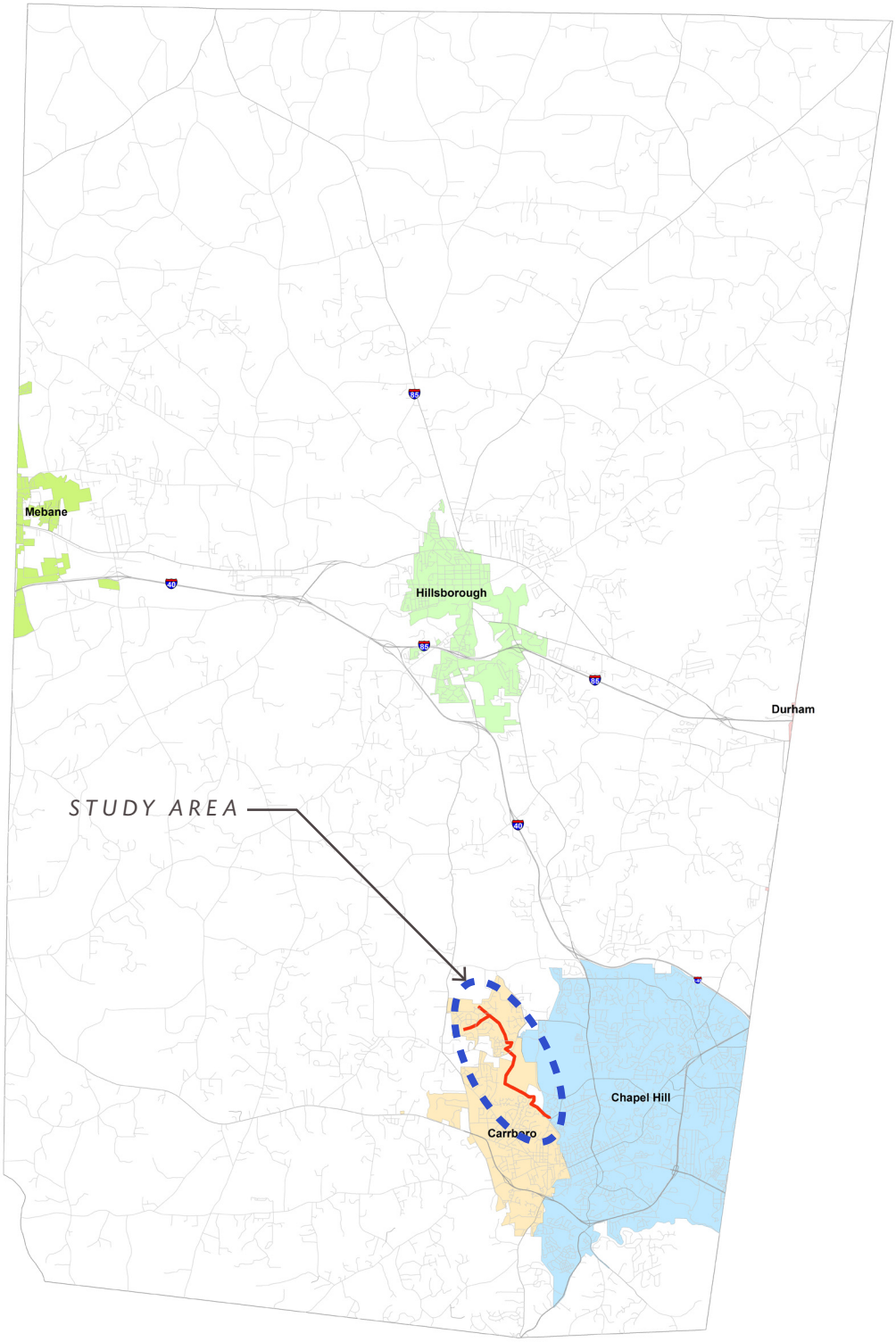
Greenways and off-road trails serve a transportation purpose by providing alternative routes of travel among the places where people live, work, learn, visit, shop and play. The proposed Bolin Creek Greenway has the opportunity to connect various uses along its corridor, thereby decreasing automobile dependency and increasing mode share in Carrboro.

### *Recreation & Quality of Life*

Providing safe access to Bolin and Jones Creek is important to the success of the proposed greenway. Trail accessibility and connectivity to other Carrboro parks and open space will be considered as part of the Town's overall network of recreational facilities.

## D. Study Area

The study area for this segment of the Bolin Creek Greenway extends approximately three miles, and makes up nearly 400 acres. The planning area starts at Estes Drive Extension and follows the creek north through Carolina North Forest to Homestead Road. Greenway tie-ins are anticipated in the neighborhoods along Homestead Rd., including Claremont I and II, Winmore, Tallyho Circle, and Lake Hogan Farms. Where Jones Creek and Bolin Creek converge, the study area travels along Jones Creek and ends at the northernmost edge of Lake Hogan Farms.



# Chapter 2: Existing Conditions

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## A. Overview

Greenways Incorporated (GWI), EcoScience (a division of PBS&J), and PBS&J-Charlotte conducted an existing conditions evaluation in January 2009 of the proposed greenway corridor. Consultant staff walked the majority of the corridor, photo-documenting site features, taking notes, observing use and connections, walking existing trails and mapping specific areas using Global Positioning Systems (GPS). Sites of opportunities and constraints were mapped using Geographic Informational Systems (GIS). The examination and analysis of the corridor included both GIS mapping and fieldwork. A graphic presentation of these results is included in the Opportunities and Constraints chapter.

## B. Green Infrastructure Assessment

Part of the analysis along the corridor includes observing existing vegetation, signs of wildlife, surrounding topography, significant natural features, and adjacent or intersecting streams. The Bolin Creek corridor includes natural features such as Bolin Creek and associated tributaries, Jones Creek and associated tributaries, wetlands, riparian forest, stands of mature hardwood, and rolling topography. The corridor supports abundant flora and fauna. Wildlife sightings and evidence at first glance indicate the presence of deer, raccoon, beaver, owl, and a variety of bird species including the red-shouldered hawk, flocks of blue birds, woodpeckers, and migratory cedar waxwings to name just a few. Stands of mature hardwood can be found along the corridor with tulip poplar, sweet gum, sycamores, and oaks very common.

A Division of PBS&J (EcoScience) personnel conducted a preliminary constraints evaluation of potential environmental red flag issues which may affect the proposed greenway alignment and the findings are illustrated below.

***Methodology***

Natural resources data were gathered from a variety of sources including U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) mapping, Natural Resource Conservation Service (NRCS) soils mapping, N.C. Flood Mapping Program Light Detection and Ranging (LIDAR) topographic data, U.S. Geological Survey (USGS) topographic mapping, USFWS distribution records of federally listed species, N.C. Natural Heritage Program (NCNHP) listed species occurrence data, N.C. Division of Water Quality (NCDWQ) watershed and water quality data, N.C. Gap Analysis Program (NCGAP) Land Use/Land Cover (LULC) data, and aerial photography of Orange County.

Field mapping was prepared and field investigations were conducted January 23 and 29, 2009. Field observations were used to modify the GIS database for the project and natural resources constraint data will be utilized by Greenways, Inc. while developing the greenway alignment.

***Physical Features***

The Bolin and Jones Creek Project Study Area (PSA) is located within the Carolina Slate Belt ecoregion (*Griffith et al. 2002*), which extends from southern Virginia, across the Carolinas, and into Georgia. The mineral-rich metavolcanic and metasedimentary rocks with slatey cleavage are finer-grained and less metamorphosed than most Piedmont regions. Some parts are rugged, such as the Uwharrie Mountains, and many areas are distinguished by trellised drainage patterns. Silty and silty clay soils, such as the Georgeville and Herndon series, are typical. This region contains some of the lowest water-yielding rock units in the Carolinas. The landscape elevation ranges from approximately 370 feet North American Vertical Datum (NAVD 1988) at the southern extent of the PSA to 590 feet NAVD along a ridge in the northwestern portion of the Jones Creek extent of the PSA (Chapel Hill, NC USGS quadrangle).

According to the Orange County soil survey, approximately 12 percent of the PSA is comprised of partially hydric soil map units. Map units with hydric inclusions include Enon and Chewacla series. Approximately 86 percent of the PSA is mapped as non-hydric soils. Partially hydric soil map units generally follow the stream channel and banks in the Jones Creek section, and are mostly confined to interstream flat areas in the Bolin Creek section. Soil units range from somewhat poorly drained interstream flat soils to very poorly drained floodplain soils.

The PSA is located within the Cape Fear River Basin in USGS Hydrologic Unit (HU) 03030002, NCDWQ subbasin 03-06-06. The Jones Creek extent of the PSA contains two named streams, Jones Creek and Buckhorn Branch. Jones Creek flows northwest to southeast through the entire Jones Creek section of the PSA. Buckhorn Branch enters the PSA from its source to the west and flows into Jones Creek. There are two named streams within the Bolin Creek section of the PSA. These streams are Bolin Creek and Jolly Branch. Jolly Branch enters the PSA from the east and connects to Bolin Creek, which flows northwest to southeast through the entire Bolin Creek section of the PSA. Small streams within this subbasin typically stop flowing during low flow periods due to lack of groundwater recharge. All stream systems within the PSA carry the same best usage classification (C, NSW). There are no 303(d) listed streams or National Pollutant Discharge Elimination System (NPDES) permitted dischargers within the PSA.

***Biological Features***
The PSA supports both maintained/managed areas and natural communities. Wildlife directly observed or determined to be present through evidence (tracks, scat) during field investigations are indicated with an asterisk (*).

Maintained/managed areas are dominated by open fields, maintained right of ways and landscaped areas. Vegetation within maintained/managed areas varies from common herbaceous species and horticultural varieties of shrubs and trees to invasive exotics. These areas likely provide habitat for wildlife adapted to disturbance and habitat fragmentation such as white-tailed deer (*Odocoileus virginianus*), raccoon* (*Procyon lotor*), Norway rat (*Rattus norvegicus*), little brown myotis (*Myotis lucifugus*), American robin* (*Turdus migratorius*), blue jay* (*Cyanocitta cristata*), northern cardinal* (*Cardinalis cardinalis*), worm snake (*Carphophis amoenus*), and brown snake (*Storeria dekayi*).

Natural communities (as described in *Classification of the Natural Communities of North Carolina* [Schafale and Weakley 1990]) observed within the PSA include **Piedmont/Mountain Bottomland Forest**, **Basic Mesic Forest** (Piedmont Subtype) and **Mesic Mixed Hardwood Forest** (Piedmont Subtype).

**Piedmont/Mountain Bottomland Forests** occur on parts of floodplains, floodplain ridges, and terraces. Since they do not occur on active levees, greater vegetation diversity as well as a more developed herbaceous layer is typical. Canopy species include tulip poplar (*Liriodendron tulipifera*), cherrybark oak (*Quercus pagoda*), swamp chestnut oak (*Quercus michauxii*), American elm (*Ulmus americana*), ironwood (*Carpinus caroliniana*), green ash (*Fraxinus pennsylvanica*), loblolly pine (*Pinus taeda*), black walnut (*Juglans nigra*), sweetgum (*Liquidambar styraciflua*), American sycamore (*Platanus occidentalis*), and shagbark hickory (*Carya ovata*). The herb and shrub layers are diverse, but can sometimes be heavily invaded by Japanese honeysuckle (*Lonicera japonica*), Russian olive (*Elaeagnus angustifolia*), and Chinese privet (*Ligustrum sinense*), especially near road and utility margins. Other bottomland shrubs include flowering dogwood (*Cornus florida*), tag alder (*Alnus serrulata*), spicebush (*Lindera benzoin*) and pinxter-flower (*Rhododendron periclymenoides*). Herbs include wild ginger (*Hexastylis arifolia*), soft rush (*Juncus effusus*), bottlebrush grass (*Elymus hystrix*), and sedges (*Carex spp.*). A few large areas of joint-head arthraxon (*Arthraxon hispidus*) and microstegium (*Microstegium vimineum*), both invasive exotic grasses, were observed. Vines consist of cat greenbrier (*Smilax glauca*), poison ivy (*Toxicodendron radicans*), and others. Wildlife species that prefer bottomland habitat such as beaver* (*Castor canadensis*), mallard* (*Anas platyrhynchos*), belted kingfisher*(*Ceryle alycon*) and northern water snake (*Nerodia sipedon*) are prevalent. Significant beaver activity was observed within the Bolin Creek section of the PSA.

**Basic Mesic Forests** (Piedmont Subtype) occur along lower slopes, ravines and well-drained stream bottoms with basic or circumneutral soils. They are distinguished from other adjacent communities by richer soils and greater vegetative species richness. The canopy is dominated by mesophytic trees such as tulip poplar, American beech (*Fagus grandifolia*), Eastern red cedar (*Juniperus virginiana*), American holly (*Ilex opaca*), hackberry (*Celtis laevigata*), southern sugar maple (*Acer floridanum*), buckeye (*Aesculus sylvatica*), hop hornbeam (*Ostrya virginiana*), willow oak (*Quercus phellos*), and northern red oak (*Q. rubra*). The herb layer is generally dense and very diverse. Herb layer species observed include Christmas fern (*Polystichum acrostichoides*), wild ginger, cranefly orchid (*Tipularia discolor*), and rattlesnake fern (*Botrychium sp.*). Wildlife species include white-tailed deer*, raccoon*, hermit thrush* (*Catharus guttatus*), winter wren*(*Troglodytes troglodytes*), Cooper's hawk*(*Accipiter cooperii*), barred owl*(*Strix varia*), ringneck snake (*Diadophis punctatus*), and five-lined skink (*Eumeces fasciatus*).

**Mesic Mixed Hardwood Forests** (Piedmont Subtype) occur on lower slopes, steep north-facing slopes, ravines, and acidic well-drained stream bottoms. The canopy is dominated by mesophytic trees such as American beech, white oak (*Quercus alba*), tulip poplar, sourwood (*Oxydendrum arboretum*), shortleaf pine (*Pinus echinata*), mockernut hickory (*Carya alba*), black cherry (*Prunus serotina*), and red maple (*Acer rubrum*). The herb layer is often moderately dense and diverse, though it may be sparse under heavy shade. Mesic Mixed Hardwood Forests can be distinguished from Basic Mesic Forests by more acidic soils, absence of base-loving plants, sparser herb layer, and lower floristic diversity. Some herbs observed were cranefly orchid, with broomsedge (*Andropogon virginicus*), wingstem (*Verbesina occidentalis*), dog fennel (*Eupatorium capillifolium*), and invasive sericea lespedeza (*Lespedeza cuneata*) along sunny edges. The vine component includes muscadine grape (*Vitis rotundifolia*), greenbrier (*Smilax rotundifolia*), and trumpet creeper (*Campsis radicans*). Wildlife species likely include those found in Basic Mesic Forests.

***Protected Species***

The following species are listed by the USFWS as protected (i.e., those with a federal listing of Threatened or Endangered) for Orange County: red-cockaded woodpecker (*Picoides borealis*), dwarf wedgemussel (*Alasmidonta heterodon*), Michaux's sumac (*Rhus michauxii*), and smooth coneflower (*Echinacea laevigata*). The bald eagle (*Haliaeetus leucocephalus*) has been federally delisted but still maintains protection under the Bald and Golden Eagle Protection Act (BGPA). All of the protected species are federally listed as Endangered. According to NCNHP records (as of December 2008), no federally protected species occur within a 3-mile radius of the PSA. Based on preliminary field investigations, habitat for protected species may occur within the PSA and review of additional available information and/or comprehensive surveys may be required by the USFWS.

**Red-cockaded woodpecker – Endangered**

*USFWS optimal survey window*: year round; November-early March (optimal)
*Habitat Description*: The red-cockaded woodpecker (RCW) typically occupies open mature stands of southern pines, particularly longleaf pine (*Pinus palustris*), for foraging and nesting/roosting habitat. The RCW excavates cavities for nesting and roosting in living pine trees, aged 60 years or older, and which are contiguous with pine stands at least 30 years of age to provide foraging habitat. The foraging range of the RCW is normally no more than 0.5 miles.

Based on preliminary field investigations, the project MAY AFFECT, BUT IS NOT LIKELY TO ADVERSELY AFFECT the red-cockaded woodpecker. The PSA does not contain suitable stands of open mature pines for foraging or nesting/roosting.

**Dwarf wedgemussel – Endangered**

*USFWS optimal survey window*: year round
*Habitat Description*: In North Carolina, the dwarf wedgemussel is known from the Neuse and Tar River drainages. The mussel inhabits creek and river areas with a slow to moderate current and sand, gravel, or firm silt bottoms. Water in these areas must be well oxygenated. Stream banks in these areas are generally stable with extensive root systems holding soils in place.

The PSA has streams which exhibit some of the characteristics for dwarf wedgemussel habitat, but is located within the Cape Fear River Basin and therefore will have NO EFFECT on the dwarf wedgemussel.

**Michaux's sumac – Endangered**

*USFWS optimal survey window*: May-October
*Habitat Description*: Michaux's sumac, endemic to the inner Coastal Plain and lower Piedmont, grows in sandy or rocky, open, upland woods on acidic or circumneutral, well-drained sands or sandy loam soils with low cation exchange capacities. The species is also found on

sandy or submesic loamy swales and depressions in the fall line Sandhills region as well as in openings along the rim of Carolina bays; maintained railroad, roadside, power line, and utility rights-of way; areas where forest canopies have been opened up by blowdowns and/or storm damage; small wildlife food plots; abandoned building sites; under sparse to moderately dense pine or pine/hardwood canopies; and in and along edges of other artificially maintained clearings undergoing natural succession. In the central Piedmont, it occurs on clayey soils derived from mafic rocks. The plant is shade intolerant and, therefore, grows best where disturbance (e.g., mowing, clearing, grazing, periodic fire) maintains its open habitat.

The PSA contains many instances of suitable habitat for Michaux's sumac. Artificially maintained clearings include roadway and powerline right-of-ways, as well as maintained sewer easements that extend through the majority of the greenway corridor. Surveys for this species will likely be required during the recommended survey window of May through October. Based on preliminary field investigations, the project's effect on Michaux's sumac is UNRESOLVED.

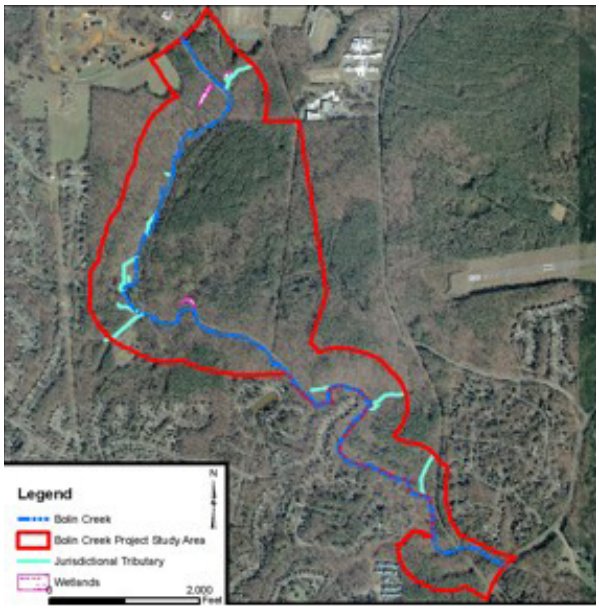
**Smooth coneflower – Endangered**
*USFWS optimal survey window*: late May-October
*Habitat Description*: Smooth coneflower, a perennial herb, is typically found in meadows, open woodlands, the ecotonal regions between meadows and woodlands, cedar barrens, dry limestone bluffs, clear cuts, and roadside and utility rights-of-way. In North Carolina, the species normally grows in magnesium- and calcium- rich soils associated with gabbro and diabase parent material, and typically occurs in Iredell, Misenheimer, and Picture soil series. It grows best where there is abundant sunlight, little competition in the herbaceous layer, and periodic disturbances (e.g., regular fire regime, well-timed mowing, careful clearing) that prevents encroachment of shade-producing woody shrubs and trees. On sites where woody succession is held in check, it is characterized by a number of species with prairie affinities.

The PSA contains substantial areas of Georgeville and Iredell soils, which are known to be pH-neutral at or near the soil surface. Suitable habitat is likely to occur where these soil areas intersect maintained roadway or utility easements. Detailed surveys for this species will likely be required during the recommended survey period of late May through October. Based on preliminary field investigations, the project's effect on smooth coneflower is UNRESOLVED.

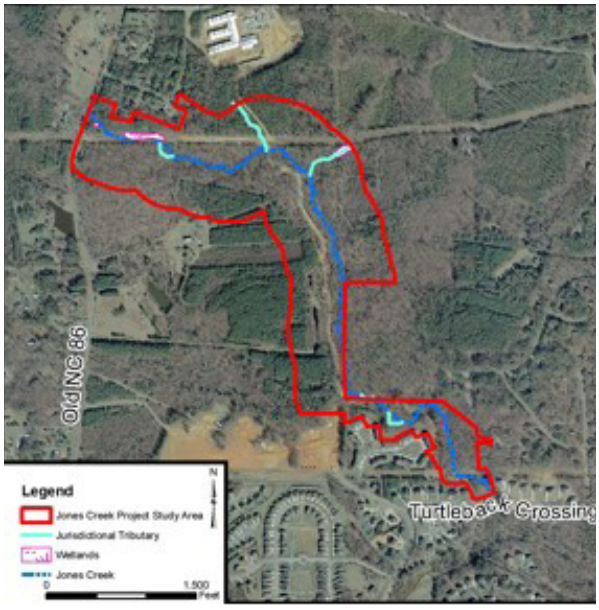
*Looking south down easement along Carolina North Forest property.*

*Jurisdictional Areas and Permitting*

A jurisdictional delineation was not performed as a part of this preliminary constraints evaluation. However, potential jurisdictional areas were documented during field investigations. Streams, wetlands, and waters of the U.S. were observed within the PSA.




*Section 404 Resources within the Bolin Creek PSA*




*Section 404 Resources within the Jones Creek PSA*

Prior to any construction activity, written justification for impacts and potential compensatory mitigation will be required for 404/401 permit issuance by the United States Army Corps of Engineers (USACE) and NCDWQ, respectively. A series of nationwide permits are available through the USACE for minor, specific activities. Nationwide Permit #42 (for Recreational Facilities) may be appropriate, along with the accompanying NCDWQ General Certification 3705. If less than 300 linear feet of stream and less than 0.5 acre of total wetlands and open waters are impacted due to proposed construction activities, a Nationwide Permit (NWP) may be issued by the USACE with an associated 401 Water Quality Certification issued by NCDWQ. Proposed impacts exceeding the above-mentioned thresholds will likely require an Individual Permit (IP).

***Summary of Green Infrastructure Assessment***

- Suitable habitat for federally protected species (Michaux's sumac and smooth coneflower) may be present within the PSA. The USFWS may require additional information and/or comprehensive field surveys to evaluate for the presence of protected species habitat and individuals during Section 404 permitting, if applicable. Current NCNHP records do not indicate the presence of any occurrences of federally protected species within a 3-mile radius of the PSA.

- The PSA contains jurisdictional streams, wetlands, and other waters of the U.S. A jurisdictional delineation of these systems is recommended along the preferred design corridor for the greenway segments once those alignments have been identified.

- Although North Carolina State Historic Preservation Office (SHPO) records were not reviewed for the purposes of this preliminary constraints evaluation, potential historic and other cultural resources may be present within the PSA. A review of SHPO records is recommended during the development of preferred greenway alignments.

- Phase I Environmental Assessment (EA) tasks were not undertaken for the purposes of this evaluation. Thus, the PSA was not examined for the presence of hazardous waste sites, underground storage tanks (USTs), or any other similar potential constraints. While some junk piles and an old car were identified within the PSA, no visible sources of contamination were observed.

*References*

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*Railroad line at Estes Dr. Ext.*

## C. Grey Infrastructure Assessment

Manmade elements, such as existing buildings, structures, utilities, roadways, and railroads, were observed and documented along the study area.

***Utilities***

The Orange County Water and Sewer Authority (OWASA) sewer easement makes up a large portion of the corridor offering open cleared areas suitable for trail development. Sewer trunk lines traverse the corridor in some areas near the Bolin Forest and Spring Valley neighborhoods, as well as Carolina North Forest. If utilized for trail routing, these easements will require negotiations with OWASA and respect to their facilities.

***Railroad Rights-of-Way***

Railroad routes adjacent to or crossing a trail present a significant situation within trail development. The rights-of-way associated with rail lines are typically very wide and their owners fear the liability associated with public access. The proposed Bolin Creek trail will encounter the Norfolk Southern rail line, which parallels and then crosses over the southern portion of the corridor. Depending on final trail alignment, negotiations will need to be made with Norfolk Southern as to the degree of public access allowed within their right-of-way.

*Typical sewer trunk line along Bolin Creek*

***Roadways***

Major roadway intersections are the most hazardous trail intersection. Although less frequent along the corridor, two major roadways occur at Homestead Road to the north and Estes Drive Extension at the south of the study area. Turtleback Crossing, a residential thoroughfare within Lake Hogan Farms, also crosses the corridor but is a less major roadway with lower speed limits. These roadway intersections present significant challenges to the development of the greenway, and providing a safe and environmentally sound solution for crossing these roadways will need to be further studied.

- *Homestead Road* -High speeds (45 miles per hour), and two lanes of traffic make up this roadway which is heavily used to connects northern Carrboro to western Chapel Hill. Poor site lines at grade make a crossing unlikely. Below-grade conditions present feasibility for trail underpass with vertical clearance. North of Homestead Rd., topography and property constraints warrant further analysis depending on final trail alignment.

*Homestead Rd. at grade.*

*Bridge at Homestead Rd.*

• *Estes Drive Extension* - A highly trafficked, north-south thoroughfare connecting Chapel Hill to Carrboro. Roadway crossing is approximately 30-feet above Bolin Creek with 3:1 slopes presenting a topographical challenge for at-grade crossing conditions. Poor site lines at north and south ends present dangerous at-grade crossing conditions.

*Estes Dr. at grade.*

*The box culvert beneath Estes Dr. extension.*

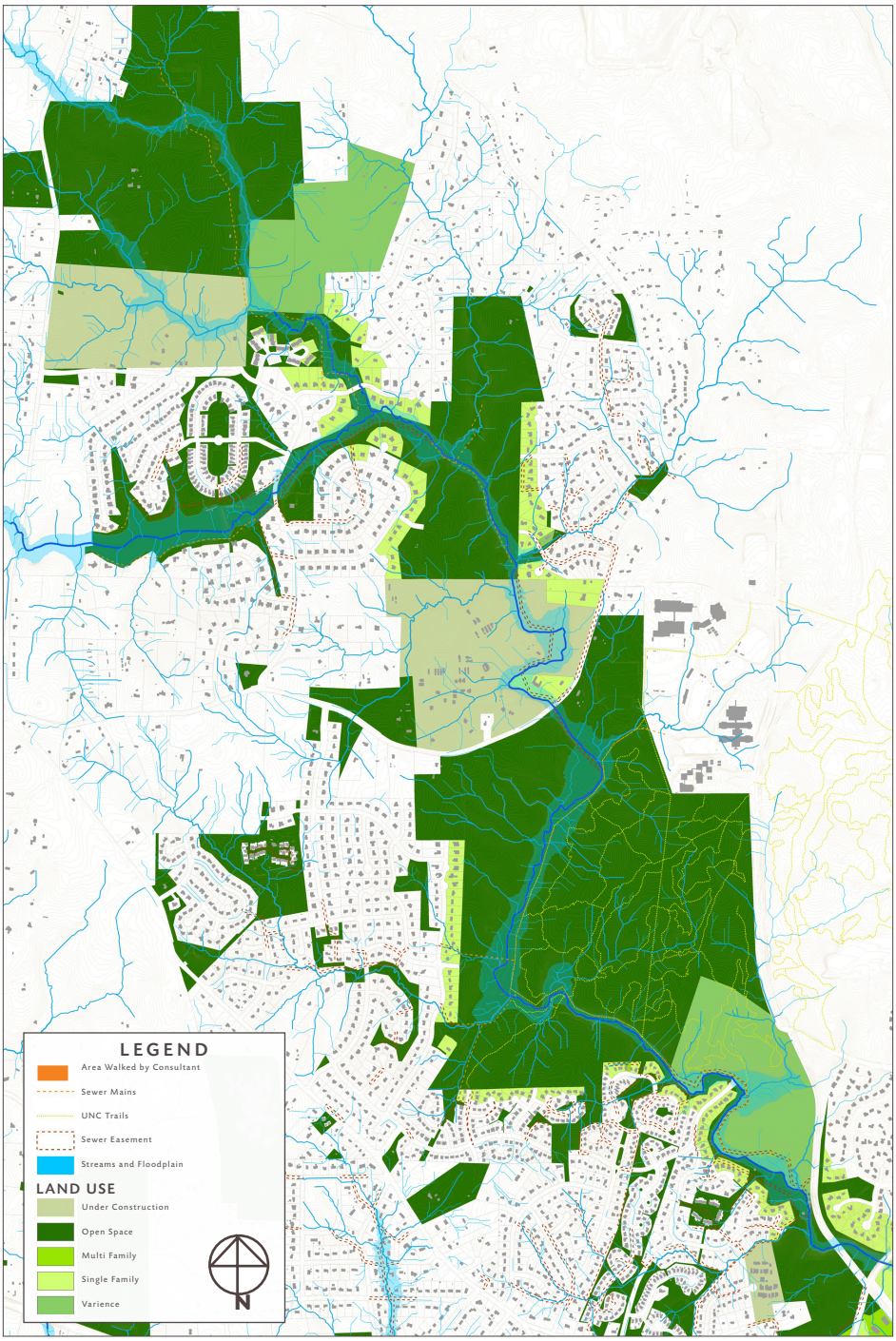
• *Turtleback Crossing* -A residential connector, this roadway is two lanes and has a speed limit of 25 miles per hour. At-grade crossings are more feasible at this location because site lines are open and topography surrounding the roadway crossing is less drastic.

*Turtleback Crossing at grade.*

*Creek crossing conditions beneath Turtleback Crossing.*

## D. Land Use

Residential land use makes up the majority of the study corridor. The corridor is adjacent to the following neighborhoods: Ironwoods, Bolin Forest, Spring Valley, Cates Farm, Claremont I, Winmore, Lake Hogan Farms, and Tallyho Circle. Because of neighborhood development, a sewer trunk line parallels Bolin Creek with connecting lines extending into adjacent neighborhoods. A vast majority of open space is found along the corridor and owned by the University of North Carolina-Chapel Hill (UNCCH), as well as undeveloped privately owned property near Bolin Creek.




*Map showing various land use along study corridor.*

## E. Accessibility and Circulation

The Bolin Creek corridor is a tremendous resource to the Town of Carrboro, providing a contiguous naturalized corridor throughout most of the study area. Due to the high attraction of this resource, neighborhoods surrounding the creek have generated a large network of social trails. In addition, UNC has worked closely with community recreational clubs such as the Trailheads and Triangle Off Road Cyclists (TORC) to build miles of single track throughout the Carolina North Forest and adjacent open space. Ladder bridges, steps, pavilions, play areas and signage have been installed at various locations along the corridor by surrounding home owner's associations.

Adams Tract, an open space area adjacent to Estes Dr., connects to Wilson Park. This park provides parking, athletic fields, a tot lot, and restroom facilities. Nature trails leading down to the creek allow access via foot. The southern part of Adams Tract along Estes Dr. currently serves as an informal soft-surface parking area which creates potential safety concerns and contributes to erosion in this area.

Other areas along Seawell School Road and within the Cates Farm neighborhood have trail access areas with kiosks, waste and recycling, and gates that have been installed by the university. North of Carolina North Forest, neighborhoods with existing paved trails provide the potential for network tie-ins. Winmore, Claremont I, and Lake Hogan Farms have installed 8-foot-wide paved trails within their neighborhoods.

*Trail conditions behind Chapel Hill-Carrboro schools.*

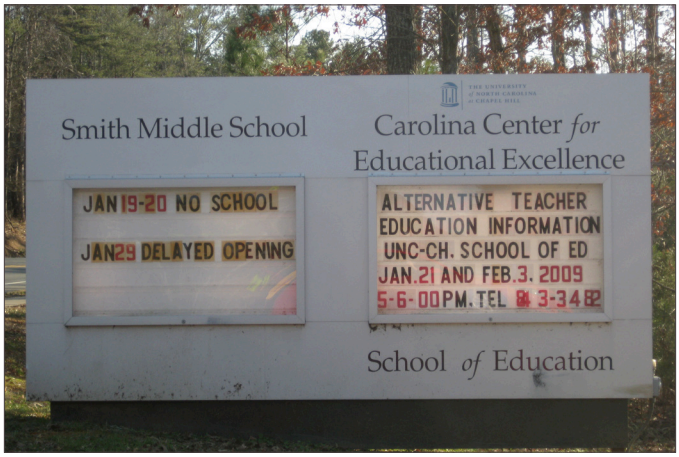
*Foot trails behind Tallyho Circle.*


*Foot trails leading down to Bolin Creek from Pathway Drive.*

*Paved trail behind Morris Grove Elementary School.*

## F. Destinations

The Bolin Creek corridor sees high levels of recreational use within Carolina North Forest as well as targeted travel for commuting patterns. Nearby residents use the sewer easement frequently to connect to adjacent pedestrian facilities leading to downtown Carrboro and Chapel Hill/Carrboro schools. Other surrounding destinations and potential connections include Morris Grove Elementary off Eubanks Rd., MLK Park off Greensboro Rd., the Frances Shetley Bikepath off Greensboro Rd., and future phases of Chapel Hill's Bolin Creek Greenway, which is currently in design development.




*One of four schools along the corridor.*

*Wilson Park in Carrboro, NC.*

## G. Corridor Impacts

The wide, cleared surface of the sewer easement east of Bolin Creek provides innumerable opportunities for walking, mountain biking, running, jogging, dog walking and hiking. This high level of foot and bicycle traffic, combined with maintenance vehicle access, has caused the easement surface to become severely eroded and worn down. Deep ruts caused by bicycle and automobile tires create inundated conditions during storm events, thereby encouraging trail braiding along the path of travel. This sequence of events, in combination with

continuous high use, widens the area of disturbance over time. The agitated suface conditions created by foot and bike traffic lead to increased erosion and sedimentation along the corridor, which has the potential to affect water quality during storm events.

*Maintenance vehicles and overuse have contributed to erosion along the corridor.*

*Visible signs of overuse along Bolin Creek.*

*Hardscape materials imported onsite have furthered erosion problems.*

## H. Trail Feasibility

Key factors contributing to the feasibility of trail development, such as vertical and horizontal corridor clearance, surrounding land use and property ownership, and ancillary features for future trail use (such as crossing areas and trail heads) were observed and noted while in the field. Areas of the corridor may present themselves as more opportunistic for trail alignment, whether from a cost standpoint or an environmental perspective. Constraints were also documented. Both opportunities and constraints are presented in the next chapter.

A significant challenge to trail development along the corridor will be bridge crossings; either across Bolin Creek or its associated tributaries. These and wetland areas will require permitting and further engineering study. For the purposes of this report, PBS&J performed a preliminary evaluation of several potential pedestrian crossing areas along the corridor and the result of their findings is shown on page 17.

## I. Preliminary Evaluation of Possible Hydraulic Impacts of Pedestrian Bridge Locations along Bolin and Jones Creeks

### Description

The defined reach of Bolin Creek is located on Flood Insurance Rate Map (FIRM) Panel 9779 in Orange County, NC, Map Number 3710977900J, effective date February 2, 2007. Greenway development along Jones Creek is primarily captured on FIRM Panel 9870 in Orange County, NC, Map Number 3710987000J, effective date February 2, 2007. Although design alternatives have not been proposed yet, the recommended alignments for the greenway will most likely fall within Zones AE and X as well as the floodway and non-encroachment area. Zone AE represents a special flood hazard area (SFHA), or 100-year floodplain, that has been studied in detail by the North Carolina Floodplain Mapping Program (NCFMP) through the Federal Emergency Management Agency's (FEMA) Cooperative Technical Community partnership initiative; this zone contains base (100-year) flood elevations (BFEs). Zone X represents the 500-year floodplain, areas of 100-year floodplain with average depths less than one (1) foot or drainage areas less than one (1) square mile, or areas of 100-year floodplain protected by levees. The floodway is the stream channel and adjacent floodplain areas required to permit passage of the base flood event without cumulatively increasing the water surface elevation (WSEL) greater than one (1) foot. Similar to a floodway, a non-encroachment area is designated in areas which are studied in limited detail by NCFMP, and are considered enforceable by a community in prohibiting development.

### Purpose

The purpose of this study is to qualitatively assess the hydraulic impacts of potential pedestrian bridge locations for two proposed greenways along Bolin and Jones Creeks. The extent of work performed included data collection, office research, one field visit and generation of this data. Once the greenway alignments (including all bridge locations) have been determined, coordination with the North Carolina Floodplain Mapping Program (NCFMP) will be required to address possible impacts to the base floodplain and associated floodway/encroachment area. Such coordination will most likely require a more detailed flood study.

### Hydraulic Impacts

The following paragraphs will address each potential crossing site individually and correspond to the locations shown on the included exhibits. Please note that crossings #1, #2, #6, and #12 have been omitted from this analysis, but may be discussed at a later date.

*Crossing #3*

This site is located on Buckhorn Branch (tributary to Jones Creek) and currently has rip-rap lined banks with additional rock in channel to facilitate the crossing of vehicles to gain access to a sanitary sewer easement. The channel's confluence with Jones Creek occurs immediately downstream. This site is presently located within the SFHA (~ 120 ft wide) and stream buffer, appears to be contained within a non-encroachment area (~ 40 ft), and experiences a 100-year flood discharge of approximately 450 cubic feet per second (cfs). PBS&J recommends the implementation of a low-flow, curbed concrete bridge connecting the stream banks of Buckhorn Branch, which would permit the greenway to utilize the existing sanitary sewer easement northward.

*Crossing #4*

This site is located on Bolin Creek at the Homestead Road Bridge with a large sanitary sewer ductile iron pipe (SSDIP) crossing immediately downstream of the bridge. This site is presently located within the SFHA (~ 130 ft wide) and stream buffer, is contained within a floodway (~ 60 ft), and experiences a 100-year flood discharge of approximately 2,790 cfs. PBS&J recommends utilizing the existing sanitary sewer easement along the west bank of Bolin Creek as the proposed greenway alignment and excavating the west bank underneath the bridge to establish an underpass for pedestrian access north and south of Homestead Road.

*Crossing #5*

This site is located on Bolin Creek at a SSDIP crossing and is presently located within the SFHA (~ 600 ft wide) and stream buffer, is contained within a floodway (~ 400 ft), and experiences a 100-year flood discharge of approximately 2,790 cfs. PBS&J recommends the implementation of an arched wooden bridge with guardrails that will connect the existing SS easement paralleling the east and west stream banks in such a way that will not hinder access to the SSDIP and its two associated manholes.

*Crossing #7*

This site is located on Bolin Creek and is presently located within the SFHA (~ 170 ft wide) and stream buffer, is contained within a floodway (~ 20 ft), and experiences a 100-year flood discharge of approximately 3,000 cfs. Fallen trees along stream banks and significant debris in channel at meander indicate possible beaver activity. An existing SS easement parallels the east bank. Given the wide channel, PBS&J recommends the implementation of an arched wooden bridge with guardrails.

*Crossing #8*

This site is located at the confluence of Bolin Creek and a tributary near a SSDIP crossing. This site is presently located within the SFHA (~ 240 ft wide) and stream buffer, is contained within a floodway (~ 90 ft), and experiences a 100-year flood discharge of approximately 3,600 cfs. A three-foot wide wooden footbridge currently provides access from the playground (west bank) to the existing SS easement on the east side of Bolin Creek. PBS&J recommends the implementation of a low-flow, curbed concrete bridge over the tributary immediately downstream of the SSDIP crossing and an arched wooden bridge with guardrails over Bolin Creek in vicinity of the existing footbridge to provide access from the playground.

*Crossing #9*

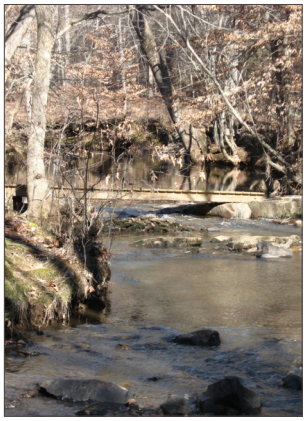
This site is located on Bolin Creek at a SSDIP crossing. This site is presently located within the SFHA (~ 140 ft wide) and stream buffer, is contained within a floodway (~ 110 ft), and experiences a 100-year flood discharge of approximately 3,600 cfs. One SS easement parallels the east bank, while another is perpendicular to the west bank. PBS&J recommends the implementation of an arched wooden bridge with guardrails over or adjacent to the SSDIP crossing.

*Crossing #10*

This site is located on Bolin Creek and is presently located within the SFHA (~ 100 ft wide) and stream buffer, is contained within a floodway (~ 45 ft), and experiences a 100-year flood discharge of approximately 3,800 cfs. A playground and pavilion exists in the floodplain on the west side of the creek. An existing SS easement parallels the east bank. PBS&J recommends the implementation of an arched wooden bridge with guardrails where the channel is most narrow immediately below the meander.

*Crossing #11*

This site is located on Bolin Creek at a SSDIP crossing. This site is presently located within the SFHA (~ 55 ft wide) and stream buffer, contained within a floodway (~ 45 ft) and experiences a 100-year flood discharge of approximately 4,100 cfs. A three-foot wide wooden footbridge provides access between the playground and walking trail on the west to the existing SS easement on the east side of the creek. PBS&J recommends replacing the existing footbridge with an arched wooden bridge with guardrails.



*Crossing #13*

This site is located on Bolin Creek in between an upstream SSDIP crossing and triple box culvert at Estes Drive Extension. This site is presently located within the SFHA (~ 200 ft wide) and stream buffer, is contained within a floodway (~ 40 ft), and experiences a 100-year flood discharge of approximately 4,400 cfs. A SS easement exists along the west side of the creek and connects to another SS easement at the DIP crossing. At this crossing, both easements veer away from the creek towards Estes Drive Extension. PBS&J recommends the option developed by Greenways Inc. to implement an elevated greenway trail that extends across the top of the culvert in perpendicular fashion. The structural integrity of the culvert should not suffer since the combination of a proposed retaining wall, asphalt path and guardrail should be comparable in weight to the weight of the excavated soil overburden.

## Conclusions & Recommendations

As is evident from the data presented in this preliminary evaluation, the potential bridge crossing locations will have to be studied in detail after final locations are determined in order to assess the impacts, if any, on the base flood elevation. While it is possible at this point to state that a curbed low water crossing will likely have less impact than an arched wooden structure with railings (depending on the depth of flow at the crossing), a definitive assessment will require the preparation of a hydraulic model and that is beyond the scope of this evaluation.

Given that there are numerous proposed crossing locations along Bolin Creek and that many of these will need to be arched bridges with railings, it should be noted that it will be very difficult to achieve a no-rise condition under these circumstances. This will likely mean that, at minimum, a LOMR (Letter of Map Revision, issued after construction is complete) will be necessary to gain approval for any increases in the base flood elevation throughout this project. It is not anticipated that these increases will be greater than one foot at any point, so a CLOMR (Conditional Letter of Map Revision, issued prior to construction and followed by a LOMR after construction) will not likely be necessary.

# Chapter 3: Opportunities & Constraints

*Chapter Outline:*
*A. Overview*
*B. Constraints*
*C. Opportunities*
*D. Overall Opportunities & Constraints Map*
*E. Existing Conditions Maps*

## A. Overview

Opportunities and constraints were mapped both in the field and in-house using GIS mapping. The consultants generated base maps with data provided by the Town of Carrboro and the State of North Carolina. The project corridor is broken down into five sections for further analysis in this chapter. The sections are divided by the project study area as follows:

1. Estes Drive Extension to Carolina North Forest Boundary
2. Carolina North Forest (southern portion)
3. Carolina North Forest (northern portion)
4. Carolina North Forest Boundary to Winmore Neighborhood
5. Lake Hogan Farm to Jones Creek
6. Jones Creek to Ballentine Property

The specific purpose of this chapter is to define the opportunities and constraints found along the corridor, which will inform the proposed Bolin Creek Greenway.

## B. Constraints

While opportunities are numerous, constraints must be considered as part of a thorough examination. Constraints affect trail implementation, constructability and costs. General cost constraints include:

### Topographic/Natural Landforms

Significant topographic features are found along the entire trail corridor creating constraints and increasing costs for trail development. Examples of these types of sites are:

1. Steep Terrain
2. Creek and Tributary Crossings
3. Wetlands and Ponds

### Private Property

Many of the tracts of land along the corridor are privately owned; however, a vast majority of the land owners have permitted access to their property for public recreational use. Regardless of this understanding, negotiations will need to occur between the private land owner and the Town of Carrboro to secure an easement for the proposed trail.

### Use Conflict

Use along the creek corridor can vary. Overlapping areas of hiking and jogging, mountain biking, commuting, picnicking, children playing, dog activity, and other adjacent private property use can create feelings of ownership along the corridor, thereby setting the stage for a conflict of interest.

### Grey Infrastructure

Despite the significant amount of natural undeveloped land along the study area, manmade infrastructure forms physical barriers for trail development. Grey infrastructure along the corridor includes:

1. Existing Roadways – (Homestead Rd., Estes Dr., Turtleback Crossing
2. Existing Active Railroads – (Norfolk Southern)
3. Hydro-Utility Lines (sewer and water)
4. Drainage Structures (culverts and pipes)
5. Electrical Utility Lines (electrical, telephone and cable)

## C. Opportunities

Bolin Creek is already recognized as a valuable environmental resource to Carrboro citizens. General opportunity categories for trail development along Bolin and Jones Creek corridors include:

### Existing Trails and Utility Easements

Stretches of cleared corridor, utilized by the Orange County Water and Sewer Authority (OWASA), are found along the study area throughout different locations adjacent to the creek. These cleared areas lend themselves toward trail feasibility due to their ease of constructability. In addition, miles of foot trails exist throughout the corridor, presenting alternate routes for future greenway alignment.

### Access for the Community

Connections to surrounding use in Carrboro provide a means for future users to safely, easily, and environmentally access the greenway and the Bolin Creek. The Bolin Creek corridor has the potential to connect 4 public schools, up to 7 surrounding neighborhoods, two parks, open space within Carolina North Forest, and other bicycle facilities within town.

### Environmental Mitigation

A large part of the Bolin Creek trail corridor is run down by human use and in need of vegetative restoration, erosion control, stream bank restoration and invasive species removal. Establishment of the greenway can help to mitigate some of these problems and permit a safe interaction between user and nature, potentially beautifying the corridor for future generations.

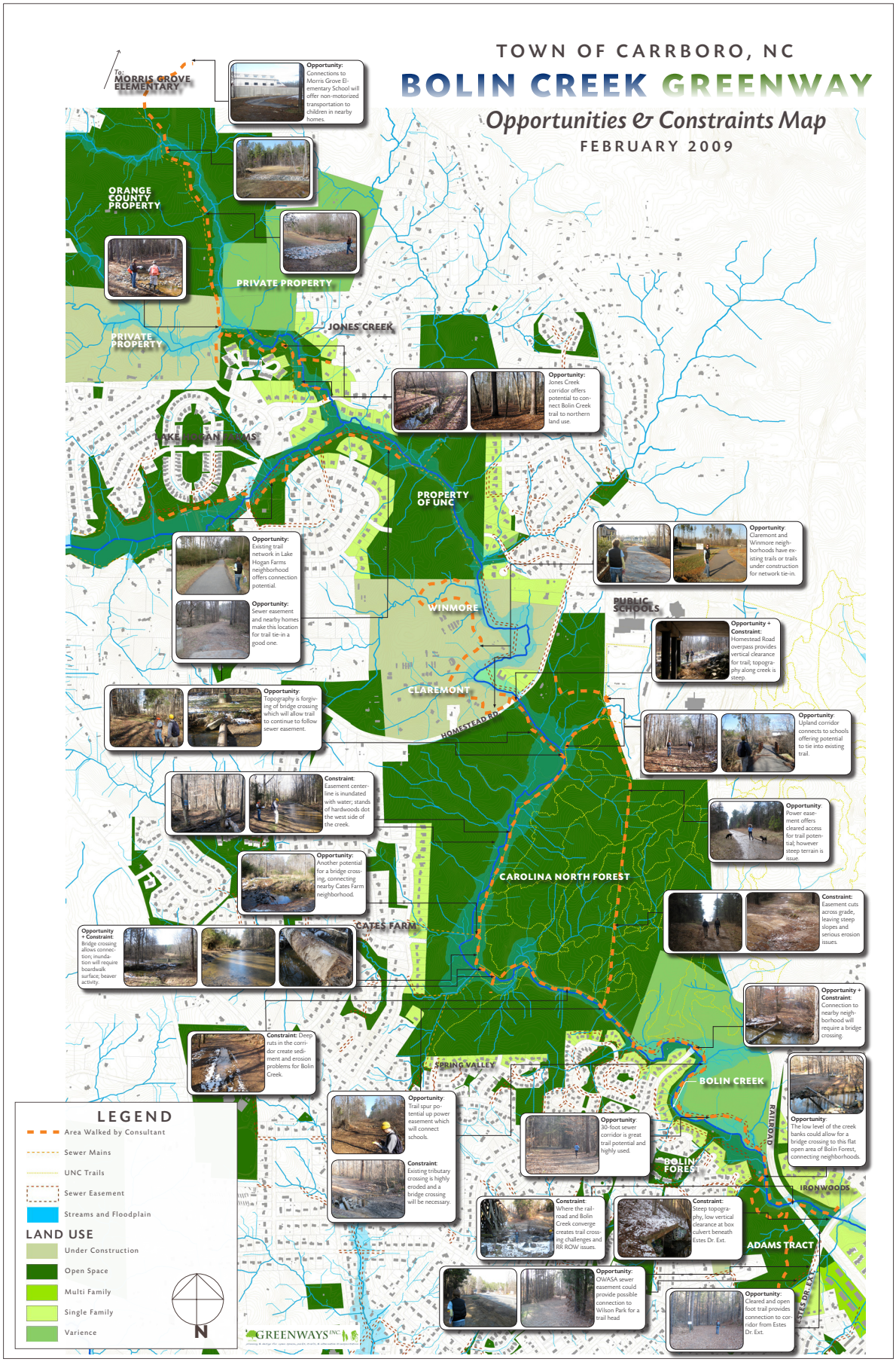
### Education and Community

Carrboro's sense of community can be further enhanced with the establishment of a trail, encouraging residents to walk or bicycle throughout the town. The proposed trail has the potential to enhance town pride and create a sense of ownership among its residents. Programming opportunities for the proposed greenway are limitless, from environmental and interpretive education, athletic events, and parades to trail maintenance days among local nature clubs. By providing a paved trail that all user groups can access safely, the greenway could become a catalyst for community connection and involvement.

## D. Existing Conditions Maps

Maps beginning on page 27 contain opportunities and constraints symbols as well as corresponding images for reference. Opportunities are noted with blue numbers, constraints with red numbers, and areas that are both an opportunity *and* a constraint are noted with a grey number. The maps also show Bolin and Jones Creek, its floodway and floodplain, associated tributaries, land use, major roadways and railroads, mapped trails, utility corridors and rights-of-way, parcel lines, and finally the orange dotted line illustrates the main areas the consultant teams walked in the field.

## Overall Opportunities and Constraints Map



## Existing Conditions: Estes Drive Extension to Carolina North Forest Boundary

1 **Constraint**: The finished grade of Estes Drive extension is approximately 25 feet above Bolin Creek. Steep 3:1 slopes from the roadway to the creek will make both an at-grade crossing or a trail underpass a cost, safety and permit constraint.

2 **Opportunity & Constraint**: Box culvert roof beneath Estes Dr. could lend itself to a benched trail condition with a hand rail; however, some tree removal, permitting and construction costs will be the exchange.

3 **Opportunity**: Sewer easement along Estes Dr. extension provides a cleared, open corridor ideal for trail conditions.

4 **Opportunity**: This unofficial parking area for the Adams Tract trails is highly eroded from vehicular use; trail enhancement could clean up this area's erosion issues.

5 **Opportunity**: Sewer easement has the potential to connect Wilson Park and use along Estes Dr. extension via the proposed Bolin Creek trail.

6 **Opportunity**: Wilson Park's existing facilities, which include ball fields, picnic areas, tennis courts, tot lots, and parking/restrooms are ideal for trail head conditions for the proposed trail.

7 **Opportunity**: Rocky shoals of southern Bolin Creek are ideal low water bridge crossings, which are a low impact solution for crossing conditions.

8 **Constraint**: The Norfolk Southern railroad crosses Bolin Creek at the southern portion of the corridor which presents a right-of-way constraint.

9 **Constraint**: Steep topography and rocky creek conditions limit trail development on the south side of Bolin Creek.

10 **Opportunity**: Easement on north side of Bolin Creek is much more accessible and will require minimal disturbance for trail preparation.

11 **Constraint**: Manholes along the corridor that are in the center of the trail will need to be accomodated. Trail surface must stay at least 10 feet away from all sewer manholes.

12 **Opportunity**: Ladder bridge that extends to Bolin Forest HOA playground is feasible condition for bridge crossing. A bridge would provide access to nearby residents. Large boulder and low stream banks provide opportunity for a low water bridge.

13 **Opportunity & Constraint**: First major tributary crossing will need a raised surface such as a boardwalk or low bridge which will require a permit and upfront costs. Opportunity exists to mitigate signs of erosion and provide a safe facility to accomodate users.

14 **Opportunity & Constraint**: Exposed run-down pipes at the second major tributary crossing will need improvement to support a paved surface trail, which will be a cost and permit constraint. Opportunity exists to improve the drainage facility as well as beautify the crossing.







CAROLINA NORTH FOREST
BOLIN CREEK
To: CHAPEL HILL
BOLIN FOREST
ADAMS TRACT
WILSON PARK
RAILROAD
ESTES DR. EXT.
LEGEND
Area Walked by Consultant
Sewer Mains
UNC Trails
Sewer Easement
Streams and Floodplain
LAND USE
Under Construction
Open Space
Multi Family
Single Family
Varience
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1
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## Existing Conditions: Estes Drive Extension to Carolina North Forest Boundary

15 **Opportunity**: Signs of overuse have severely eroded the creek corridor; however, providing a paved, delineated trail surface to users offers an environmental opportunity to limit trail braiding and discontinue erosion.

16 **Opportunity & Constraint** An existing foot trail connects Bolin Creek Drive to the creek, and space will permit a trail on the south side for a short distance. Private property constraints and steep topography will make trail alignment a challenge both fiscally and environmentally.

17 **Opportunity & Constraint**: At the third major tributary crossing, the soil has been almost entirely washed away creating the need for a bridge condition which will be a cost constraint. Efforts to improve this area with a crossing will beautify the corridor, improve water quality by preventing more sediment to enter the stream at this location, and provide a safe crossing for all user groups.

18 **Opportunity & Constraint**: This easement connects up to Pathway Drive, a major roadway in Bolin Forest and Cates Farm neighborhoods. Although conditions would permit a possibile small-scale trailhead, topography is a constraint and a larger bridge would need to span the creek.

19 **Constraint**: Another tributary crossing along the corridor lends itself to a larger bridge crossing. Permiting and cost constraints will limit opportunity.

20 **Opportunity & Constraint**: MLK Park and other adjacent Town-owned lands provide the opportunity for trail spurs to connect parks; however traversing private property and steep terrain from this location down to the creek is a huge constraint.

21 **Opportunity**: Existing trail head features off of Seawell School Road encourage trail use and provide opportunity for network tie-in.

22 **Constraint**: Existing rip rap that crosses corridor tributary will require a bridge to sustain foot and bicycle traffic, presenting permit and cost constraints.

23 **Opportunity & Constraint**: Across the creek on the south side is another stretch of Bolin Forest HOA property that is flat, open and appropriate for trail development. A large creek crossing and land owner consent present constraints.












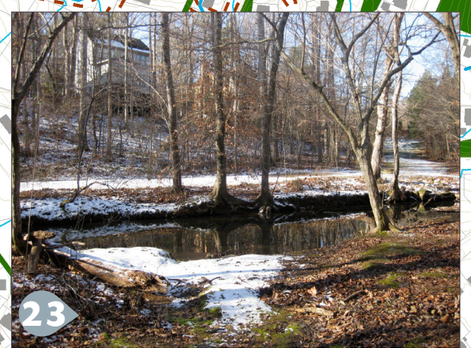


CAROLINA NORTH FOREST

MLK PARK

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BOLIN FOREST

BOLIN CREEK

SEAWELL SCHOOL RD.

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To: CHAPEL HILL

RAILROAD

ADAMS TRACT

WILSON PARK

ESTES DR. EXT.

## LEGEND

- Area Walked by Consultant
- Sewer Mains
- UNC Trails
- Sewer Easement
- Streams and Floodplain

## LAND USE

- Under Construction
- Open Space
- Multi Family
- Single Family
- Varience

N

## Existing Conditions: Carolina North Forest Boundary - Creek Corridor

24 **Opportunity**: The Carolina North Forest is an excellent opportunity for open space and recreation that supports trail development, offering an experience for all user groups including on-and off-road bicycles, children, and people with accessibility challenges.

25 **Opportunity & Constraint**: The existing power easement is a popular recreational route for mountain bikers, runners, dogwalkers and hikers and has the potential to connect to the high school, middle and elementary schools; however erosion at the base of the easement indicate overuse and poor drainage conditions which will require possible alternate trail surfacing.

26 **Opportunity**: Existing trail head feature provides access to Carolina North Forest to residents in Cates Farm; for proposed Bolin Creek trail, this is an existing access point.

27 **Opportunity & Constraint**: At Bolin Creek (at the end of the Cates Farm access trail) is the opportunity to tie into the greenway if the alignment is on the south side; however is the trail is developed on the north side of the creek, a bridge crossing will be required.

28 **Opportunity**: Visible signs of the multiple uses along the corridor are mountain bike tracks, animal tracks, and foot prints. These signs confirm the area's popularity and indicate the need for a creekside trail.

29 **Opportunity & Constraint**: Crossing potential at this location is another opportunity to connect to Cates Farm neighborhood; however a bridge crossing will be required if trail is developed on east side of creek.

30 **Constraint**: Parallel tributary along the corridor presents inundated conditions which will require raised boardwalk or alternative trail surfacing, constraining costs.

31 **Opportunity & Constraint**: Standing water, crusher run laid by an outside source, and overuse have severely degraded this portion of the corridor. Visible signs of trail furrows and trail braiding continue to widen the corridor, further impacting the usable surface. With appropriate trail surfacing and vegetative restoration, the opportunity exists to mitigate the erosion problems, improve wildlife habitat and enhance the trail user experience.

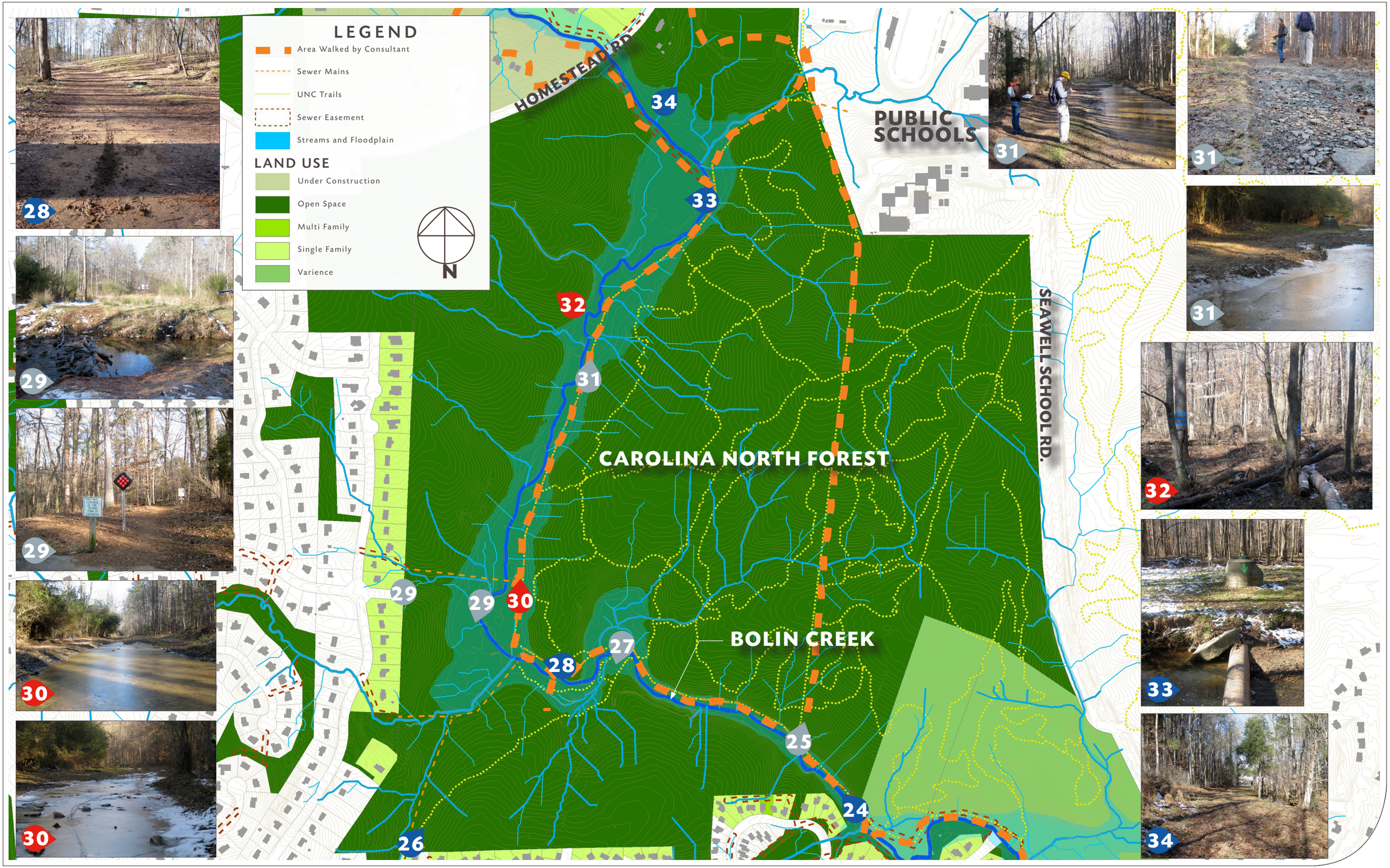
32 **Constraint**: Along the west side of Bolin Creek, stands of hardwood are present. If trail alignment is to occur in this area, tree removal will be required, presenting an environmental constraint.

33 **Opportunity**: Low water bridge opportunity exists at this location, which could tie future neighborhood development into trail.

34 **Opportunity**: Relatively flat conditions on the east side of Bolin Creek near Homestead Rd. create potential for sustainable trail development; hardwood trees dot the landscape offering a pleasant experience.







LEGEND
Area Walked by Consultant
Sewer Mains
UNC Trails
Sewer Easement
Streams and Floodplain
LAND USE
Under Construction
Open Space
Multi Family
Single Family
Varience
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HOMESTEAD RD.
PUBLIC SCHOOLS
SEAWELL SCHOOL RD.
CAROLINA NORTH FOREST
BOLIN CREEK
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## Existing Conditions: Carolina North Forest Boundary - Upland Corridor

35 **Opportunity**: Existing easement bends to the west to a kiosk and provides an upland route which connects ball fields and schools.

36 **Opportunity**: Existing pedestrian trails have been installed as well as an outdoor classroom, indicating the high use of this area. Greenway development could improve these conditions, offering an alternative transportation for children attending school at this location.

37 **Constraint**: Views down the power easement include transmission poles and straight-line conditions; compared to the creekside trail this alignment is less experiential.

38 **Opportunity**: Wider trails throughout the upland portions of the Carolina North Forest property could potentially support multi-use trail development or trail spurs from a creekside alignment option.

39 **Constraint**: Cross cut slopes, overuse, steep conditions and drainage problems have created severe erosion concerns along the power easement corridor.

40 **Constraint**: User conflict along this area could be a potential constraint if trail is developed in upland corridor. Existing mountain biking trail users may not favor this interruption.












HOMESTEAD RD.

PUBLIC SCHOOLS

SEAWELL SCHOOL RD.

CAROLINA NORTH FOREST

BOLIN CREEK

PRIVATE PROPERTY

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## LEGEND

- Area Walked by Consultant
- Sewer Mains
- UNC Trails
- Sewer Easement
- Streams and Floodplain

### LAND USE

- Under Construction
- Open Space
- Multi Family
- Single Family
- Varience

N

## Existing Conditions: Homestead Road to Jones Creek

41 **Opportunity & Constraint**: Homestead Road's roadway bridge offers approximately 8-feet of overheaad clearance, making an underpass a possibility; however permitting and cost are constraints.

42 **Constraint**: Homestead Road is a busy roadway with speed limits at 45 miles per hour and bad site lines at the creek crossing. Safe at-grade crossings proposed a challenge for trail development.

43 **Constraint**: On the north side of Homestead Road, conditions continue to challenge trail crossing. Steep topography and limited land will require grading, tree removal, and cost-impacting structures.

44 **Opportunity**: Existing trail network in Calremont and Winmore neighborhoods offer potential for trail tie-ins, offering access to the Bolin Creek Greenway for hundreds of residents in these newly developed neighborhoods.

45 **Opportunity**: At the end of the Winmore bikeway, trails begin at the UNC property creating the potential for a future northern connection to Lake Hogan Farm's existing trail network.

46 **Opportunity**: Lake Hogan Farm's trail system terminates just before UNC's property, but could eventually become a conduit for greenway users trying to access Jones Creek.

47 **Opportunity**: Existing paved trail takes users to Lake Hogan Farm clubhouse and could potentially become a trail spur for the proposed Bolin Creek Greenway.

48 **Constraint**: If Lake Hogan Farm's trail network will tie Bolin Creek greenway to Jones Creek, a bridge crossing will be necessary, presenting cost and permitting issues.

49 **Opportunity**: Trail alignment on the south side of Jones Creek is more practical from a topographical and connection standpoint.

50 **Constraint**: An at-grade trail crossing will be necessary to cross the creek and road, presenting the possibility of neighborhood resistance and cost constraints.

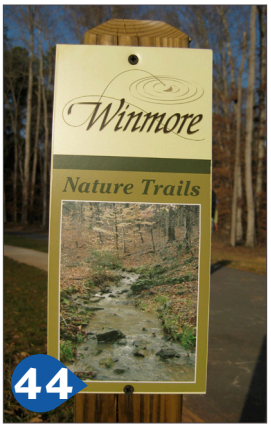
51 **Opportunity**: A foot trail spur up to the Tallyho neighborhood could provide access to trail opportunity down at Jones Creek.

52 **Opportunity & Constraint**: In order to provide access to Tallyho residents, a crossing will be necessary at this location which could present permitting and cost constraints.








LEGEND
Area Walked by Consultant
Sewer Mains
UNC Trails
Sewer Easement
Streams and Floodplain
LAND USE
Under Construction
Open Space
Multi Family
Single Family
Varience
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JONES CREEK
LAKE HOGAN FARM
PROPERTY OF UNC
WINMORE
CLAREMONT
BOLIN CREEK
HOMESTEAD RD.
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## Existing Conditions: Jones Creek

53 **Opportunity**: Open cleared conditions behind the townhomes in Lake Hogan Farm offer feasible trail conditions on the southern side of Jones Creek.

54 **Opportunity & Constraint**: Creek conditions are relatively flat and will still permit south side alignment; however steeper topography gradually overwhelms the corridor, creating conditions that will require grading and retaining walls.

55 **Constraint**: Property constraints, costly creek crossings and accessibility make this area a challenge for the Jones Creek corridor.

56 **Opportunity & Constraint**: Existing sewer easement continues north to Morris Grove Elementary School, and with proposed trail, could provide non-motorized transportation for children; however several tributary crossings will require permits and bridge crossings along the corridor.







## LEGEND

- Area Walked by Consultant
- Sewer Mains
- UNC Trails
- Sewer Easement
- Streams and Floodplain

### LAND USE

- Under Construction
- Open Space
- Multi Family
- Single Family
- Varience

N

*To:*
**MORRIS GROVE ELEMENTARY**

**ORANGE COUNTY PROPERTY**

**PRIVATE PROPERTY**

**PRIVATE PROPERTY**

**JONES CREEK**

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