



◊ North Carolina Wildlife Resources Commission ◊

Gordon Myers, Executive Director

Pittsboro Board of Commissioners July 27, 2015 Meeting Agenda Item Information

Dear Mayor Terry and Commissioners,

In December of 2012, the Board of Commissioners signed a resolution of support for the Planning Tools for Pittsboro project with a stated interest in gaining information and recommendations on how to protect natural resources in Pittsboro through land use planning and policies. We have made a lot of progress on the project, thanks to your support and that of the Town staff. We are excited to share some of this information with you today.

The Conservation Ordinance Review Committee has been meeting every other week for the past 6 months to develop recommendations for ordinance language to help protect high priority natural areas and tree canopy in the town and its extra-territorial jurisdiction. My presentation tonight will not be able to delve into all the details of these recommendations, but I hope to give you a sense of the tremendous effort this committee put forth to develop these recommendations. Catherine Deininger will be presenting more information at the August 3rd Planning Board Meeting, we hope that you will be able to attend this meeting to learn more about the committee's recommendations. It will also be useful to set-up a work session to review the full scope of the ordinance recommendations; committee members could be present to answer questions.

Items included in agenda packet:

Summary documents for the following components of the Planning Tools for Pittsboro project:

- Summary of the Natural Resource Conservation Ordinance for Pittsboro
- Regulatory Strategies to Incorporate Green Infrastructure for North Carolina
- Summary of the Biodiversity and Wildlife Habitat Assessment for Pittsboro, NC
- Summary Report of Pittsboro, NC: Land Cover Change Analysis and Urban Tree Canopy Assessment

To be handed out at meeting:

- Recommendations for Implementing a Tree Protection Ordinance in the Town of Pittsboro
- Recommendations for Implementing a Natural Resource Conservation Ordinance

Submitted by: Catherine Deininger, Biocenosis; Brooke Massa, NC Wildlife Resources Commission

Please feel free to contact me with any questions or concerns.

Thank you,

A handwritten signature in blue ink, appearing to read "Brooke Massa".

Brooke Massa
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North Carolina Wildlife Resources Commission
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Recommendations for Implementing a Natural Resource Conservation Ordinance

The Conservation Ordinance Review Committee ([CORC](#)), a community group composed of Pittsboro stakeholders were tasked with developing recommendations to implement the *Model Natural Resource Conservation Ordinance (NRCO)* that was developed by the Nicholas Institute for Environmental Policy Solutions and the NC Wildlife Resource Commission. See the *Summary of the Natural Resource Conservation Ordinance for Pittsboro* for documentation how the Recommended Natural Conservation Overlay District was determined and on what is required for development proposals within the district. Summary is available for download from the Chatham Conservation Partnership wikisite: <http://chathamconservation.wikispaces.com>.

Town of Pittsboro staff had the following two specific recommendations for implementation of the NRCO.

1. Establish a Natural Resource Board to support governance of the NRCO and the Tree Protection Ordinance. A representative from the Natural Resource Board should attend all the technical review committee meetings for new development proposals.
2. Develop a protection area table of uses modeled after the stream buffer table of uses developed for the Jordan Lake rules.
3. Make Natural Resource Conservation District voluntary with density bonuses used as incentives.

Below are specific recommendations from the CORC on optional language for implementing the NRCO. Recommendations received majority support from the committee with one dissenting vote from Philip Culpepper. Recommendations are given by section headings matching the section headings in the *Model NRCO*.

Section I: General Provisions

D. Finding of Facts

1. Natural resources such as Jordan Lake and Haw River water supply systems, forests, and plant and wildlife habitat provide valuable cultural, educational, and recreational opportunities and support local industries and public health and welfare.
2. Areas that contain a diversity of plant and animal species, or provide habitat for protected species such as the Cape Fear Shiner, can be a natural resource of local, state, national, and global significance.
3. Plants and animals play an important role in maintaining healthy ecosystems through ecological interactions such as predation, pollination, and seed dispersal. Maintaining healthy natural resources mitigates air pollution, improves water quality, moderates temperature, reduces drought and flooding, and sustains local timber, recreation and associated jobs and local revenue.

4. The quantity and quality of drinking water is enhanced by healthy ecosystems through mechanisms such as water absorption and filtration. These services can be degraded when impervious surfaces are placed in sensitive areas such as stream buffers, wetlands, and other significant natural resource areas.
5. Maintaining healthy and diverse natural resources is important for a robust farming, forestry, and horticulture economy. These industries rely on pollinators, predators of pests, healthy soil, and other natural resources. These industries can be compromised when incompatible land uses surround them.
6. Certain types of land development can negatively impact ecosystems, natural areas, and wildlife. Properly planned development can maintain these natural resource assets by avoiding the fragmentation of key natural areas and the associated reduction of ecosystem function and services

E. Purposes and Goals

1. The purpose of the Natural Resources Overlay District is to maintain the quality of life in the Town of Pittsboro and to protect the health, safety, welfare and general well-being of the citizens of Pittsboro by conserving and connecting the highest priority waterways, forests, and habitat for terrestrial and aquatic native plants and animals in Pittsboro's jurisdiction while accommodating development and other land uses.
2. The Natural Resources Overlay District is designed to preserve and protect ecosystems while balancing the need for planned growth. This shall be accomplished by minimizing fragmentation or separation of significant natural resource areas, protecting upland habitats in addition to adjacent waterways and water sources, maintaining plant and animal habitat diversity and specifically protecting unique environmental features identified as integral parts of the designated landscape.
3. This ordinance shall establish standards and procedures for the use and development of land. The standards and procedures are designed to protect, conserve, enhance, restore, and maintain significant natural resource areas and the ecological connections between them.
4. The Natural Resources Overlay District conserves significant natural resource areas identified by Town of Pittsboro.
5. It is intended that the implementation of this ordinance accomplish the following goals:
 - a. Create an aesthetically pleasing and functional living environment by conserving remaining healthy terrestrial and aquatic habitats within our jurisdiction.
 - b. Maximize the retention of existing ***significant natural resource areas***.
 - c. Establish and maintain connectivity between significant natural resource areas by retaining corridors of land in a natural state to provide for unimpeded movement of wildlife and plant species among habitat areas.
 - d. Maintain balanced outdoor recreation opportunities such as hunting, fishing, bird watching, and other outdoor pursuits.
 - e. Create opportunities for greenways throughout the community for trails, connecting habitat, buffering streams, sustaining wildlife, and providing recreation and educational activities for residents.

- f. Ensure that land uses and development are planned and designed to be harmonious with significant natural resources areas and to reduce conflicts with working lands, wildlife conservation, and habitat management activities.
- g. Protect remaining large contiguous significant natural resource areas from activities that would alter their ecological integrity, balance, or character.
- h. Maintain the diversity of plant and wildlife species and habitat found in the community, which will benefit rare species protected under Endangered Species Act such as the Cape Fear Shiner, possibly advancing that species toward delisting and help to keep other species from requiring Endangered Species Act protections in the future.
- i. Promote multiple community benefits e.g. nutrient pollution reduction, water supply protection, flood protection, steep slope protection, priority plant and animal habitat protection, air quality, soil conservation, minimizing noise and light pollution, greater awareness to development community and others.
- j. Provides ecosystem services that can reduce cost to developers by requiring less engineered structures and reduce town costs in plan reviews and inspections as a result of less stormwater management devices.
- k. Protect and enhance scenic resources including landscapes, ridgelines, meadows, and geologic features that have special scenic character or a historic or aesthetic interest or value.

Section II. Natural Resources Conservation Overlay District Established and Official Map

A. Natural Resources Conservation District

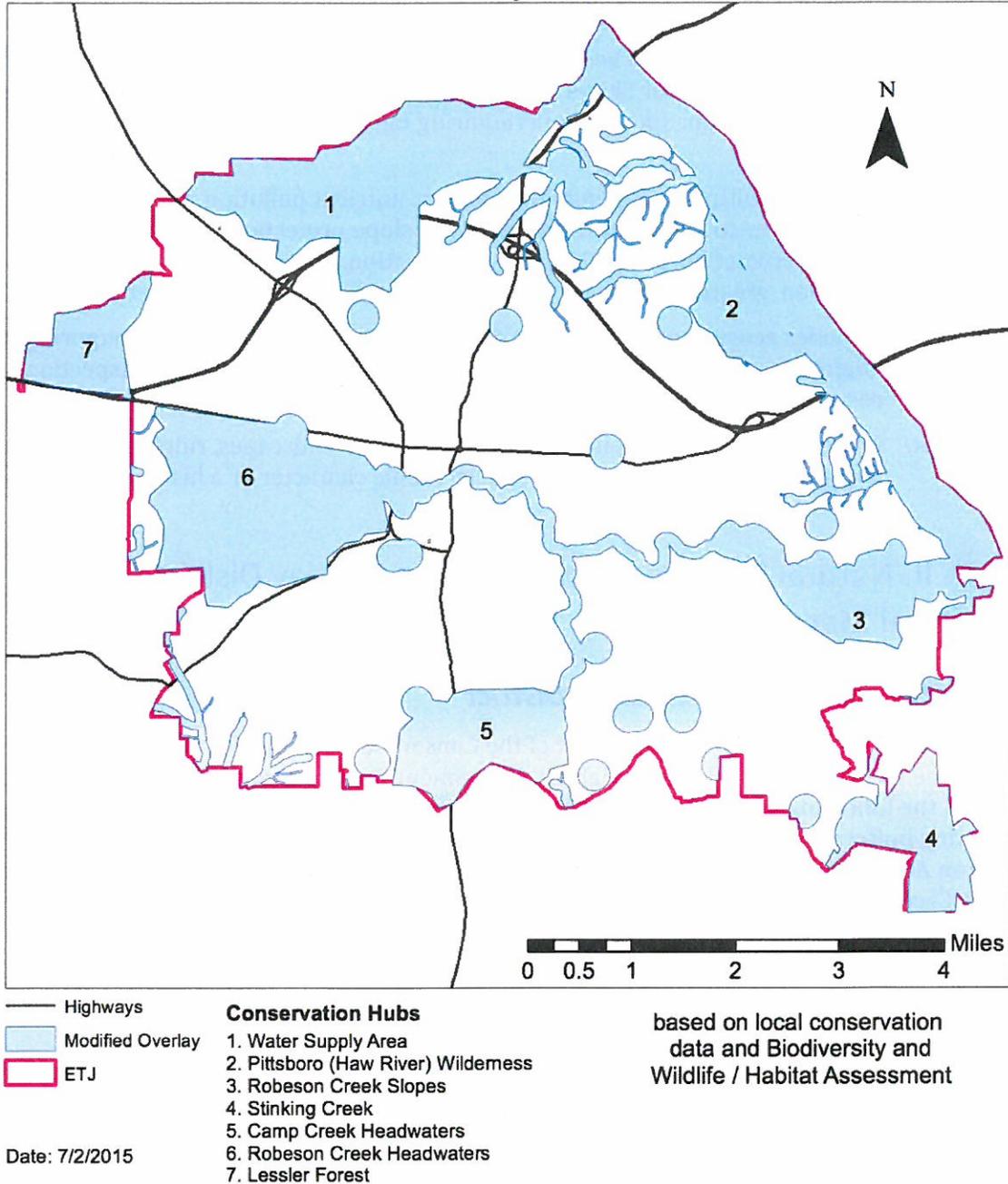
The map of the recommended NRCO District of the Conservation Ordinance Review Committee is based on the Biodiversity and Wildlife Habitat Assessment relative conservation values 5 and above, as well as, the following significant natural resource areas: isolated wetlands, rare species streams, and hunting buffers along game lands. In addition, the overlay includes a 2,000-foot Haw River Protection Area, as recommended in Pittsboro's Land Use Plan and 300 foot wildlife corridors along Robeson Creek and Camp Creek.

Seven conservation hubs were identified in the overlay district:

- 1) *Water Supply Area* that protects Brooks Creek watershed that drains to Pittsboro drinking supply above the Bynum Dam on the Haw River,
- 2) *Haw River Wilderness* the remnant of the Pittsboro Wilderness Natural Area that is not directly impacted by planned roads,
- 3) *Robeson Creek Slopes* that includes a Natural Area and highly erodible slopes,
- 4) *Stinking Creek*: includes high quality and rare Dry-Mesic Oak-Hickory Forest (Piedmont Subtype),
- 5) *Camp Creek Headwaters* that protects the headwaters of the only tributary of Robeson Creek watershed that has a 'good aquatic life' water quality rating,
- 6) *Robeson Creek Headwaters* that protects headwaters of the primary watershed in Pittsboro, which is an impaired creek, and

7) *Lessler Forest* protects a Natural Area of high rating with known occurrences for hardpan forest and the special concern species, four-toed salamander.

Recommended Conservation Overlay District



A map depicting all the conservation layers (conservation hubs, isolated wetlands, 2000 feet Haw River protection area, 300 feet Robeson Creek and Camp Creek wildlife corridors, rare species streams, and the hunting buffer as well as the Draft Conservation Overlay District is available on the Chatham Conservation Partnership wiki page for CORC under maps at chathamconservation.wikispaces.com/Conservation+Ordinance+Review+Committee.

Section III. Applicability: B. Exempt Activities

1. Match exemptions in existing town ordinance with the addition of commercial, industrial, institutional, multifamily residential, or government development less than .5 acres which would not be exempted in a other town ordinances.

Pittsboro Zoning Ordinance, Article V. Watershed Overlay District p. 82

5.5.8 Exceptions A pre-existing, deeded lot owned by an individual prior to the effective date of the provisions of this Section, regardless of whether or not a vested right has been established, may be developed for single-family residential purposes without being subject to the restrictions of this Section. However, this exemption is not applicable to multiple contiguous lots under single ownership. The recombination of existing nonconforming lots in single ownership shall be required pursuant to Article VIII, Section 2. (Nonconforming Lots) ☐

2. Also minor subdivision as define in by the Town of Pittsboro in their Subdivision Ordinance should be exempted.

Town of Pittsboro Subdivision Regulations, Section 2. Definitions

Minor Subdivision Any subdivision containing not more than five (5) lots fronting on an existing public street, not involving any new street or road, or the extension or the creation of any public improvements, and not adversely affecting the remainder of the property or adjacent property.

Section IV Standards: A. General Standards

Conduct site survey to determine if there are ***significant natural resource areas***.

1. CORC recommends that the following two options for the Town of Pittsboro to consider:
 - a. If survey determines that significant natural resources cover 50% or greater of the tract, then up to 50% of the parcel of the tract may be developed. Otherwise percentage is based on % tract that significant natural resources are found.
 - b. If survey determines significant natural resources cover 35% or greater of the tract, then 65% of the tract may be development with an additional density bonus for every additional 5% of the tract protected.
2. Add appeal to site survey go to the Board of Adjustment for questions on significant natural resources found and follow the normal appeal process for zoning. (See Pittsboro Zoning Ordinance, Section XI: Board of Adjustment)
3. Restrictions on development in area that is not being conserved
 - a. Limit to 15% to 25% impervious surface of the entire tract (percentage calculation based on total tract so includes the protected area).
 - b. Limit impervious surface to 10% in Federally listed species subwatersheds

4. Construction Performance Standards use soil erosion control program already in place through Chatham Co.

Section V: Definitions

*CORC Recommendations for how to define **protection area** and **significant natural resource areas** for use in field surveys when applying the Natural Resource Conservation Ordinance. Recommended definition for **significant natural resource areas** would replace the definition 25 in the Model NRCO.*

1. **Buffers** – protection area
2. **Protection Area** – A portion of the property designated to mitigate impacts from land uses, or transportation routes, or to protect natural areas from pollution. These areas should be maintained in existing natural vegetation and should not be cleared of natural vegetation. Protection areas can undergo prescribed burning for wildlife habitat management purposes and the understory vegetation below the tree canopy can be minimally thinned by no more than 30 percent of canopy or vegetation cover to maintain scenic views or remove invasive species.
3. **Significant natural resource areas** (*see attached maps and exhibits*): shall include those areas so designated by the Town of Pittsboro by virtue of containing rare or declining habitats or habitats that support rare species or a high diversity of species. These significant natural resource areas consist of the following natural resources and habitats and should be used in field surveys to verify the presence of natural resources:
 - a. Delineated waters falling under federal, state, Chatham County, or Town of Pittsboro jurisdiction.
 - b. Habitat of any federally endangered species.
 - c. The presence of a natural community or communities as defined by the NC Natural Heritage Program in the *Classification of the Natural Communities of North Carolina*¹ within *Natural Heritage Natural Areas* (NHNAs) identified and mapped by the NC Natural Heritage Program. NHNAs are not the same as significant natural resource areas and have their own definition. The NC Natural Heritage Program formerly called NHNAs Significant Natural Heritage Areas (SNHA) and the name is SNHA within the Natural Heritage Inventory. NHNAs within Pittsboro jurisdiction include most recent (2014) Pittsboro Wilderness, Haw River Levees and Bluffs, Robeson

¹ Shafale, M.P. 2012. *Classification of the Natural Communities of North Carolina, Fourth Approximation*. North Carolina Natural Heritage Program, Raleigh.

Creek Depression and Hardpan, Robeson Creek Slopes, and the Lessler Montmorillonite Forest.

- d. The presence of vegetation within NHNAs matching the description of vegetation for that same NHNA as documented in the county's Natural Heritage Inventory.
- e. An average seven hundred and fifty (750) foot radius upland protection area of any shape adjacent to isolated non-alluvial wetlands greater than hundred (100) square feet not connected to streams or not within conserved floodplains, starting from the edge of the water or watermark. This protection area includes a one hundred and fifty (150) foot radius protection area designated as Zone 1 and remaining six hundred and fifty (650) foot are designated as Zone 2 of symmetrical shape around the wetland water's edge. Zones are in accordance with Pittsboro's Riparian Buffer Ordinance. ² Wetlands are jurisdictional and/or non-jurisdictional waters under the Clean Water Act wetlands and are of the following types defined by the NC Natural Heritage Program in the Classification of the Natural Communities of North Carolina: Floodplain Pool Upland Seepages, Piedmont Upland Pools and Depressions.³
- f. One hundred and fifty feet on either side of perennial ("blue line") streams or rivers within *subwatersheds* (14-digit Hydrologic Unit Code), which support federally endangered or threatened aquatic species. These rare species stream protection area may be reduced to accommodate other priority habitat conservation on site, but shall not be less than 100 feet.
- g. All stream channels and drainage features in the conservation overlay district, regardless of whether or not it appears on a USGS quadrangle or Soil Survey map, shall be evaluated by a certified professional with the DWQ Surface Water Method and approved by the Town. If it is found to be intermittent, it will have a fifty (50) foot buffer on either side, measured from the top of bank. If it is found to be perennial, it will have a minimum hundred (100) foot buffer on either side, measured from the top of bank. If the feature scores between 10-18 points, it will be considered as ephemeral

² Pittsboro's Riparian Buffer Protection Ordinance, page 6.

³ Shafale, M.P. 2012. *Classification of the Natural Communities of North Carolina, Fourth Approximation*. North Carolina Natural Heritage Program, Raleigh.

- h. Ephemeral channels will have a thirty (30) foot buffer if it is shown by the land owner or developer (and approved by the Town) that the overall development design or stormwater runoff existing at the development site will be of a higher quality or preserve higher value natural habitat by preserving the ephemeral buffer than by constructing a structural BMP or otherwise disturbing the ephemeral buffer.
- i. A three hundred (300) foot wide protection area on either side of the waterway adjacent to Aquatic Natural Heritage Areas (Haw River) identified by the NC Natural Heritage Program. These protection areas may be reduced to accommodate other priority habitat conservation on site, but shall not be less than hundred (100) foot.
- j. Habitat that is sufficient as field verified by a qualified biologist to conserve species current occurrences on tracts containing documented Natural Heritage Element Occurrences tracked by the NC Natural Heritage Program.
- k. Sufficient habitat, as determined by a qualified biologist, to support state or federally listed species observed opportunistically during site visits. The term “listed” includes designation as Endangered, Threatened, or Special Concern.
- l. A three hundred and thirty (330) foot wide protection area on all sides of a colonial waterbird-nesting colony encountered or as mapped by the NC Wildlife Resources Commission. A waterbird-nesting colony is defined as an area where two or more colonial waterbirds are nesting or have nested within the past two years. Colonial waterbirds are any species of heron, egret, anhinga, ibis, and stork. The NC Wildlife Commission maps these data.⁴
- m. A two hundred (200) foot-wide protection area around rock outcrops, and mines. Rock outcrops, which are natural features, contribute to a natural community structure consistent with physical characteristics of the underlying geological unit. For the purposes of this ordinance, rock outcrops include any of the following natural communities described by the NC Natural Heritage Program in the Classification of the Natural Communities of North Carolina: High and low elevation rocky summit, High and low elevation granitic dome, Piedmont, acidic and mafic cliffs, Piedmont mafic and calcareous cliffs, Granitic flatrocks, High elevation mafic glade, Diabase glade, Ultramafic outcrop barren and Boulderfield forests.

⁴ See the NC Wildlife Commission’s Green Growth Toolbox (www.ncwildlife.org) for details on obtaining these maps.

- n. An undeveloped protection area at least three hundred (300) foot wide connecting isolated wetlands on the property.
- o. The 500-year floodplain as defined by the U.S. Federal Emergency Management Agency.
- p. Mature hardwood forest consisting of greater than 25% hardwood trees native to the region over 50-years old or greater than twenty (20) inch diameter to indicate “mature” trees (this will vary depending upon tree species and growing conditions).
- q. Unfragmented forest defined as forest blocks of any type and age with an area of forest of 75 or more acres of forest habitat. Any acreage of the unfragmented forest can occur and should be conserved on the parcel within the conservation district. The entire unfragmented forest area does not need to be contained within the parcel.
- r. Lands may be designated by Town of Pittsboro as important for hunting, wildlife viewing, and other traditional forms of wildlife-related recreation, including lands outside of NC Wildlife Resources Commission Game Lands, within 150 yards of Game Land boundaries, especially adjacent to narrow areas of the NCWRC Game Lands of where NCWRC Game Lands are less than 300 yards in width. Designated areas should be mapped.
- s. Wildlife corridor protection areas at least one hundred and fifty (150) foot ⁵ width and habitat connector protection areas between significant natural resource areas where sufficient information exists to designate these areas or these areas are part of the Biodiversity and Wildlife Habitat Assessment of the NC Department of Environment and Natural Resources Conservation Planning Tool. (Robeson Creek, Camp Creek, and Haw River Wildlife Corridors).

⁵ Green Growth Toolbox

(www.ncwildlife.org/Portals/0/Conserving/documents/GGT/Manual/GGT_manual.pdf) page 43.

10:18

~~Coconut - 2~~
~~Butter nut - 2~~
~~Lemon regular - 2~~

Recommendations for Implementing a Tree Protection Ordinance in the Town of Pittsboro

Trees are a significant part of the character of Chatham County and the Pittsboro community. Pittsboro continues to experience rapid population growth, with increasing development pressures on its natural communities. As development continues, forested areas and working lands are converted to housing and infrastructure needed to support the increased population. Within communities, impacts on trees include: street and road widening in-fill development and other improvements. A Tree Protection Ordinance allows a community to determine its own priorities for mixing population growth with sustaining viable forested areas.

The Conservation Ordinance Review Committee ([CORC](#)), a community group composed of Pittsboro stakeholders has been involved in the review of the *Developing Tree Protection Ordinances in North Carolina: A Model Tool for Local Ordinance Creation* developed by the Nicholas Institute for Environmental Policy Solutions and the NC Forest Service that will be referred to in this document as the *Tree Protection Model*. The *Tree Protection Model* suggests ordinance language to protect trees on public and private land from the direct and cumulative impacts of development and redevelopment. As such, it is most appropriate for areas that are urbanizing and/or experiencing new development. This model provides a tool to develop an ordinance that would be one piece of the needed framework for a tree management program in an urban community.

A tree management program should:

- *Create a framework for the town of Pittsboro to monitor tree removal and protect trees or areas deemed to be of value to the community,*
- *Create an income stream to help finance tree planting, tree maintenance and staff, and*
- *Help educate residents and developers about trees and the practices that affect them.*

Below are specific recommendations from the CORC on for implementing a Tree Protection Ordinance. Recommendations received majority support from the committee with one dissenting vote from Philip Culpepper.

The CORC recommends that a tree management program be developed for Pittsboro that includes the following:

1. ***Tree Protection Ordinance*** that focuses on protecting and conserving desirable trees, ***tree canopy***, and trees with significant importance in the Pittsboro community.
2. ***Street Tree and/or Landscape Ordinance*** to cover the planting, pruning, and removal of trees within the public rights-of-way and private properties. As well as containing provisions governing the maintenance or removal of private trees that pose a hazard to the public. ¹

¹ Example: Seattle Street Manual (<http://www.seattle.gov/transportation/forestry.htm>)

3. *Tree Technical Manual* that details the requirements and standards for tree protection plans and any tree lists, mapping requirements, and calculation methodologies need to support the tree ordinances.
4. *Tree Board* to review and propose revisions to the tree ordinance and technical manual and to support community education efforts on tree conservation. This commission would provide a public forum for citizens to obtain advice and voice concerns with regards to tree management.
5. *The Town of Pittsboro* applies to be designated as a Tree City. Tree City USA (TCUSA) is a program that many communities use in establishing *tree boards*. The NC Forest Service can assist communities seeking TCUSA status and *tree board* establishment. The requirements to be designated as a Tree are
 - Tree Ordinance
 - Acting Tree Board
 - Spend \$2 per capita on trees
 - Arbor Day proclamation

The remaining portion of this document outlines the provisions for each section of the *Tree Protection Model* that the CORC recommends for development of a Tree Protection Ordinance (number 1 in the above list) for Pittsboro. Section titles matching the *Tree Protection Model* are shown in **Blue**. CORC recommendations for each section are given below each section title as numbered bullets. Sections without specific CORC recommendations are simply left blank as placeholders.

Defined terms are shown in *italics* and **bold**.

Section I. General Provisions (of the Tree Protection Model)

A. Short Title

Suggested: Town of Pittsboro's Tree Protection Ordinance

B. Authority

C. Effective Date

D. Purposes and Goals

Trees provide a great number of community benefits including enhanced property values and aesthetics, inexpensive treatment and management of stormwater and air quality, wildlife habitat and urban cooling. Tree ordinances are the regulatory tool that communities use to protect tree resources.

A town with beautiful and well-maintained trees does not happen by accident. Inappropriate **development** could threaten the natural resources that make Pittsboro a

special place to live and work. The Town of Pittsboro is endowed with an abundance of natural resources including land, forests, streams, the Haw River, wildlife, and natural beauty.

The purpose of a Tree Protection Ordinance is to:

1. Implement the policies and goals contained within officially adopted plans to protect the public health, safety, and welfare of citizens.
2. Retain the small town charm and character of the Town of Pittsboro.
3. Preserve tree coverage, mature trees, and natural resource buffers.
4. Emphasize the importance of trees and vegetation as both visual and physical buffers.
5. Encourage the protection and planting of native trees.
6. Protect, facilitate, and enhance the aesthetic qualities of the Pittsboro community and built environment as a means of improving quality of life and attracting new business and residents.
7. Facilitate natural drainage patterns and infiltration of stormwater runoff.
8. Support ecosystem services provided by trees that provide shade, moderate temperature and promotes energy conservation, promote carbon dioxide absorption and oxygen production, prevent soil erosion while promoting soil stabilization and enrichment, and reduce water pollution.

E. Relationship to Other Laws, Regulations, and Ordinances

1. Tree preservation ordinances cannot interfere with the legitimate practice of forestry.

F. Interpretation

G. Severability

Section II. Applicability (of the Tree Protection Model)

A. General

This ordinance applies to all developers and/or owners of real property including the Town of Pittsboro in the town's zoning jurisdiction. Beginning with and subsequent to its effective date, the provisions of this ordinance apply to all **development** that requires a **development approval** in the Town of Pittsboro's zoning jurisdiction, unless law expressly exempts the **development**.

1. Pittsboro should coordinate tree protection plan review and approval with other land use project reviews and ensure that tree protection plans are in place and approved prior to site disturbance.

2. Clear-cutting of a site to circumvent the requirements of the Tree Protection should be prohibited. If the forestry exemption is used to remove all or substantially all of the trees that would have been protected by ordinance prior to application for **development approval** no such application shall be accepted for development of the land for a period of three years after completion of the forestry activity, or for a period of five years after completion of the forestry activity if the tree removal constituted a willful violation of this section, as determined by the Town Manager.²
3. The ordinance should clearly state that it applies to any site disturbance occurring on property owned by the Town of Pittsboro as it would with any other property.

B. Permits

No *person* shall cut, remove, or relocate any regulated trees on any public or private property within the Town of Pittsboro, unless a *Tree Protection Plan* has been approved OR the Town has issued a valid tree permit.

1. **Persons**, public or private, requesting to do any removal of trees subject to this ordinance, or any of the activities regulated by this ordinance, shall secure a permit for such activities from the Town of Pittsboro before the activities commence. For purposes of this ordinance, a **tree protection plan** approved by the Town of Pittsboro constitutes a permit.
2. The Town of Pittsboro shall have the authority to review all requests for permits and to grant or deny permits or attach reasonable conditions to the permits.
3. Individual permits will not be required for local and state department of transportation projects so long as the tree protection requirements in this ordinance are included in the project plans.

C. Exemptions

1. **Disturbance areas** of 7,000 square feet or less are exempt on single or two family residential lots.
2. Town may encourage homeowners with exemptions to voluntarily do their own mapping by providing them with instructions on mapping of individual specimen and clusters of trees.
3. Routine maintenance of existing trees outside the public right-of-way, including pruning done in a manner consistent with established arboricultural standards.
4. Eradication of exotic, non-native, and invasive or otherwise undesirable species.³

² Language take from Morrisville, NC Tree Protection Ordinance: **Limitations on Development Proposals Subsequent to Exempt Forestry Activity** (Morrisville UDO Section 5.4 Tree Protection: Applicability, p 5.5 (271))

³ The North Carolina Native Plant Society maintains an invasive exotic species list at on their website (http://www.ncwildflower.org/index.php/plant_galleries/invasives_list) that would be applicable for Pittsboro.

Emergencies

Non-Liability of the Town of Pittsboro

Section III Tree Protection Standards

Tree protection can be accomplished using requirements for protection of canopy coverage as well as requirements for preservation of individual specimen trees that are of community value.

1. Build incentives in to the ordinance that encourage increase in canopy coverage where there is a deficit in the percentage. Use disincentives to discourage the replacement of trees in lieu of the perseveration of trees.
2. Create a separate *Technical Manual* that can list specifications, tree lists, and calculation methodologies that can be updated without amending the ordinance.

A. Minimum Tree Canopy Requirements

In 2013 the 1,195 acres within the Pittsboro Town Limits had a 53% canopy coverage while the surrounding 12,525 acres within Pittsboro’s extra territorial jurisdiction (ETJ) had 78% tree coverage (excluding the town limits). Using the GIS canopy coverage by parcel layer provided by Global Ecosystem Center canopy coverage for a downtown area was calculated. The canopy coverage of this 48 acres downtown area based on Pittsboro’s Downtown Vision Map (obtained from <http://pittsboronc.gov/>) is 14%.

The following recommended minimum tree canopy coverage percentages excluding public rights-of-way:

1. 15% canopy coverage for **downtown district**
2. 30% multi-family, commercial
3. 40% institutional, *mixed use*, and other (industrial and business parks)
4. Percentages for lots zoned for single- and two-family residential:⁴

<u>Lot Size</u>	<u>Minimum Canopy Coverage</u>
< 10,000 SF (.2 ac)	20%
10,000 – 20,000 SF	30%
20,001 – 40,000 SF	40%
40,001 – 80,000 SF	50%
>80,000 SF	60%

For communities that wish to prioritize protection of habitat and prevent forest fragmentation, local government may wish to incorporate requirements that **tree canopy**

⁴ Chapel Hill minimum tree canopy coverage requirements obtained from *Examples of Tree Requirements Based on Lot Sizes* available at Montgomery County website: <http://www.conservationmontgomery.org/pdf/tree%20bill/Examples%20of%20Tree%20Requirements%20Based%20on%20Lot%20Sizes.pdf>

and tree save areas be contiguous with existing canopy or other landscape features such as floodplains and stream buffers on site as well as on surrounding properties

B. Tree Preservation Requirements

The focus of this section is on providing protection for trees and clusters of trees. Desirable tree diameter, health, species and size or groupings can be given credits against tree replacement requirements.

1. Existing **specimen trees**, located within a required project boundary buffer shall be retained. Flexible approaches such as adjustments to lot layout, placement of buildings and paved surfaces and location of utilities should be pursued in order to save rare and specimen trees, except where the removal of such trees is required to provide access to the property. No regulated tree shall be removed unless the Town Manager determines there is no reasonable way the property can be otherwise developed, improved or properly maintained, and the tree saved.
2. The area of the canopy for a dominant trees of any species retained within a **development** can be credited at 1-1/2 - 2 X the size of the **critical root zone** for that species towards the overall canopy goal of the project. (A penalty could be if the tree retained is subsequently removed from the property for any reason then the parcel or lot must have two trees of equal or greater canopy potential planted).
3. Regulated trees for the purposes of this section include **specimen trees**.
4. To the maximum extent practicable, clusters and groves of trees associated native vegetation shall be preserved and incorporated into the site design.
5. Once a tree protection plan has been approved, no regulated tree shall be removed unless the Town of Pittsboro determines that there is no reasonable way the property can be otherwise developed, improved or properly maintained, and the tree itself retained. Within a **cluster of trees**, no tree of 2" **caliper** or greater can be removed without a tree removal permit.

C. Modifications

1. The Town of Pittsboro may wish to include a procedure for allowing modifications to the tree protection standards when other legitimate local government purposes and goals may conflict with **tree canopy** protection, for instance transportation, stormwater management, or character of the community. If local government decides to provide for modifications, a process should be set out.
2. If strict compliance with the Tree Protection standards conflict with existing federal or state statutory or regulatory requirements, or when planting is required by the ordinance and the site design, topography, natural vegetation, or other special considerations exist relative to the proposed **development**, the developer

should be allowed to submit a specific alternate plan for planting to the Town for consideration.⁵

D. Incentives for Increasing Area in Single-Family Residential

Incentives for increasing the **tree canopy** protection area are designed to enhance the Town of Pittsboro's **tree canopy** in residential settings, improve overall quality of life in larger residential areas, encourage open space and wooded site protection, and discourage removal of all trees on site before and during construction.

1. Give credits toward a stormwater fee for increases in canopy coverage.
2. Credits for reduced yards, landscaping, or lot sizes. These incentives would be tied to lot sizes and setback requirements.

E. Implementation of Standards

The highest priority for all **development** and redevelopment projects shall be to maintain existing **tree canopy**. If the existing **tree canopy** is insufficient to meet the required canopy protection, planting new trees on site to reach the required percentage area is preferred. **Mitigation** by fee in lieu payment shall be used when providing canopy on-site is not practicable.

Though the retention of existing trees is preferred, not every tree can, or should, always be retained. When such trees must be removed, requirements should be in place to replace the lost functions of the removed trees. Local governments should provide for mitigation measures where it is impractical or impossible to maintain the existing trees. Mitigation measures can range from on-site tactics (e.g., replanting) and off-site tactics (e.g., the use of in-lieu fees).

1. Use **performance bonds** to assure compliance with tree replacement requirements.⁶
2. Canopy Replacement Method should cover:⁷
 - a. Number: a 1:1 requirement may be the easiest method to calculate the number of trees to be planted but does not account for removing a large tree and replacing it with a small tree.
 - b. Significant tree replacement requirements.
 - c. Species: removing a large maturing tree and replanting a small maturing tree would result in the overall loss of aesthetic and environmental and economic

⁵ City of Charlotte Tree Ordinance and Guidelines, Chapter 21 of City Code (21.121)

⁶ Pittsboro already has experience using **performance bonds** for financial security in stormwater control structures (Zoning Ordinance Article 5.5 Water Overlay District - 5.5.12)

⁷ City of Durham Unified Development Ordinance, Section 8.3.E Replacement Tree Coverage good example of replacement requirements.

benefits (e.g. cut down an oak and plant a dogwood). The acceptable species to replant should be based on the tree species list created by the municipality (see *Appendix A Defining Regulated Trees* in the *NC Guide to Developing a Tree Protection Ordinance*). While it may be desirable to require that a protected tree be replaced with the same species, some **developments** may not have suitable space for the tree when mature and payment-in-lieu may be necessary. In other cases, replacing a removed tree with the same species might not contribute to sufficient species diversity.

- d. **Minimum Size:** establishing a single size requirement for replacement trees, like 3" **caliper**, may be the easiest method but such a tree would be too large/heavy (about 650 lbs.) to handle if the ordinance impacts individual homeowners removing trees (see section on *Tree Protection and Replacement* in *NC Guide to Developing a Tree Protection Ordinance*, p 13). Requiring larger trees to replant in replacement of large trees removals (an increasing scale for replacement size) is another approach, but larger trees are substantially more expensive to purchase, move and handle, plant and support. In addition, larger trees take longer to recover from planting shock. Establishing a minimum diameter that is acceptable to be planted typically varies from 2.5-3". Some municipalities reduce the minimum size to 2" for residential removals. Other municipalities may allow larger trees to be planted to reduce the overall number of trees, however, larger trees are more difficult to establish and additional oversight and **performance bonds** may be necessary.

Section IV. Tree Protection Plans

All applications for a **development approval** should include a **tree protection plan** that complies with the standards of this ordinance. The approval of a tree protection plan shall require an enforceable restriction on property usage that runs with the land to ensure that future activities maintain the site consistent with the approved project plans.

A. Activities that require a Tree Protection Plan Permit:

1. All work impacting trees on lots designated for non-residential, multi-family residential, and **mixed use**.
2. All work impacting trees on lots designated for single, and two-family residential use where total land disturbance exceeds 5,000 square feet.

B. Tree Protection Plan Requirements

Persons proposing to impact **tree canopy** within the Town of Pittsboro zoning jurisdiction shall develop **tree protection plans**. A **Certified Arborist**, **certified forester**, or qualified Environmental Scientist with demonstrated experience in botany is required to prepare **tree protection plans**. Site information and management plan requirements for **tree protection plans** are included in the Tree Protection Model.

1. Provide documentation on requirements and standards for **tree protection plans** in a separate Technical Manual.
2. An example of an acceptable plan should be included in the Technical Manual.
3. The plan should include a map of the site with the **tree protection zones** (TPZ) identified, clusters of trees, and significant stands as well as individual trees that are regulated by the ordinance.

C. Implementation of Physical Protection Required

D. Enforcement

The **Tree Board** could inspect sites subject to this ordinance to assure that work is conforming to the approved **tree protection plan** and the provisions of this ordinance and then report back to the designated administrator who is ultimately in charge of enforcement.

Section V. Administration

A. Designation of Decision-Making Entity

Town Manager, Town Planner, or a City Arborist or hire a consulting firm. In this document the designated decision maker is referred to as the Town Manager.

B. Tree Advisory Commission

Tree Boards are a way to involve the public in tree protection efforts and use the expertise of citizens with technical backgrounds in forestry, landscape architecture, etc. to advise local governments on their programming. A **Tree Board** could assist the Town Manager in reviewing and making recommendations on permits.

Tree Board should consist of the following:

1. Citizens interested in trees as a major component of Pittsboro's physical and aesthetic environment.
2. Arborists, horticulturalists, landscape architects and designers, or others with a technical background in a related field. At least 2 members of the tree board should have such a professional background.
3. Developer.

C. Fees

D. Penalties

Section VI. Definitions

1. **Caliper:** The diameter measurement of a tree's trunk taken six (6) inches above the ground for trees less than four (4) inches caliper size, and twelve (12) inches above the ground for trees exceeding four (4) inches caliper size.
2. **Certified Arborist:** A professional tree care specialist who maintains the designation of Certified Arborist as defined and governed by the International Society of Arboriculture (ISA). For the purposes of this ordinance, a certified arborist may also refer to a professional tree care specialist who maintains the designation of consulting arborist with the American Society of Consulting Arborists (ASCA).
3. **Clusters of trees:** The tree coverage area for an existing cluster of trees shall be determined by the exterior boundary of the total root protection zones for all of the trees in the cluster. This cluster could have a minimum area of 500 square feet. The area protected and credited shall include the entire root protection zone of the tree cluster, and the plan should provide adequate tree protection measures.
4. **Critical root zone:** A circular area surrounding a tree, of which the center is the center of the tree trunk and the radius is the distance from outside of the trunk to any point 1.25 feet per inch of *diameter at breast height* (DBH). The resulting points constitute the circumference of the critical root zone. The critical root zone shall extend to a depth of five (5) feet below surface ground level. The Town of Pittsboro may expand or partially retract the critical root zone depending on the tree species and site specific situations so as to improve the chances that the trees will not be damaged during construction and to permit construction to take place.
5. **Development:** The division of a parcel of land into two or more parcels, the construction, reconstruction, conversion, structural alteration, relocation, or enlargement of any building or other structure or facility, or any grading, soil removal or relocation, excavation or landfill, or any use or change in the use of any building or other structure or land or extension of the use of the land.
6. **Development approval:** any of the following approvals by the local government regardless of the form of approval, that are for the development of land:
 - a. Any approval of an erosion and sedimentation control plan granted by a local government or the state.
 - b. Any building permit issued under Article 9 of Chapter 143 of the General Statutes.
 - c. Any approval by a county of sketch plans, preliminary *plats, plats* regarding a subdivision of land, a site specific development plan or a phased development plan, a development permit, or a building permit under Article 18 of Chapter 153A of the General Statutes.
 - d. Any approval by a city of sketch plans, preliminary *plats, plats* regarding a subdivision of land, a site specific development plan or a phased

development plan, a development permit, or a building permit under Article 19 of Chapter 160A of the General Statutes.

7. **Diameter breast height (DBH):** The diameter of a tree's trunk measured in inches at four and a half feet above ground level.
8. **Disturbance area:** The area where vegetation clearing or land manipulation takes place for the purpose of development.
9. **Downtown district:** 48 acres downtown area based on Pittsboro's Downtown Vision Map.⁸
10. **Drip zone:** A vertical line running directly underneath the tips of a tree's outermost branches.
11. **Existing vegetation:** An assemblage of native vegetation shown on the site plan. It should be retained and maintained whenever possible so as to permit such vegetation to contribute to buffer and screening requirements.
12. **Forester, registered:** An individual registered by the State of North Carolina as qualified to practice forestry by reason of their special knowledge and training in natural sciences, mathematics, silviculture, forest protection, forest mensuration, forest management, forest economics, and forest utilization.
13. **Mitigation:** A plan of measures for a proposed land use or activity submitted for authorization or variance.
14. **Mixed use:** A development that includes both residential and non-residential uses as principal uses on the same development site.
15. **Performance bond:** Local government may require that developers submit a performance bond to the Town Manager along with some form of surety, cash escrow, letter of credit, or other financial arrangement prior to the approval of the **tree protection plan** to ensure the plan is followed as required.
16. **Person:** Includes, without limitation, individuals, firms, partnerships, joint ventures, trusts, trustees, estates, corporations, associations, and any other similar entities.
17. **Plat:** A map, chart, or plan of a tract or parcel of land, which is to be or which has been subdivided.
18. **Regulated tree:** Specimen trees.
19. **Tree Board:** A commission appointed by the Town to advise on tree-related matters. For example, a tree board could write the Technical Manual provide expertise on trees, and assist the Town Manager in reviewing and making recommendations on permits.
20. **Tree canopy:** The combined area encompassing the **drip zones** of all canopy trees as evidenced by a tree survey.

⁸ Downtown Vision Map available <http://pittsboronc.gov/>

21. **Tree protection plan:** A plan identifying existing landscape elements, proposed changes, and protection measures to be used to aid in the survival of such landscape elements as defined in the ordinance
22. **Tree protection zone:** a distance equal to the designated zoning district setback or forty (40) feet from the front property line, whichever is less, or from the side lot line on a corner lot. For urban zones, the tree protection zone shall be the same as the planting strip required for the associated zoning district or as designated in a streetscape plan. This definition does not apply to single-family development.⁹
23. **Specimen Tree (Chapel Hill)**
 - a. Any healthy living pine tree that has a trunk diameter of eighteen (18) inches or more, or any other species that:
 - b. Has a trunk **diameter at breast height** (dbh) of twelve (12) inches or more; or
 - c. A trunk dbh of six (6) inches or more in the case of the North Carolina native species from a following list of genera

North Carolina Native Genera:

Aesculus (Buckeye)
 Amelanchier (Serviceberry)
 Halesia (Silverbell)
 Asimina (Pawpaw)
 Hamamelis (Witch-hazel)
 Carpinus (Hornbeam)
 Ilex (Holly)
 Cercis (Redbud)
 Juniperus (Cedar)
 Chionanthus (Fringetree)
 Ostrya (Hophornbeam)
 Cornus (Dogwood)
 Oxydendrum (Sourwood)
 Crataegus (Hawthorn)
 Sassafras (Sassafras)
 Diospyros (Persimmon)

⁹ Section 2. Definitions, City of Charlotte Tree Ordinance and Guidelines, Chapter 21 of City Code

Regulatory Strategies to Incorporate Green Infrastructure for North Carolina

The Urban & Community Forestry Program of the North Carolina Forest Service and the Nicholas Institute for Environmental Policy Solutions at Duke University

Local governments must grapple with diverse challenges including aging infrastructure, population growth, rising demand for services, and development pressures. The traditional approach to addressing these challenges has been to build more grey infrastructure, which is the traditional hardscape providing services like stormwater management, and wastewater treatment. Green infrastructure provides a cost-effective alternative that can assist local governments in providing the services needed by using natural landscape functionality, thus protecting a variety of environmental resources while increasing public health and the quality of life for residents.

Though the use of green infrastructure is not new, improved understanding of the benefits of integrating new development with existing environmental features, resources, and functions, makes green infrastructure increasingly attractive to local governments. There are a number of tools available to incorporate and encourage the use of green infrastructure in development, such as incentive programs for development and redevelopment¹ or through land use regulations, such as ordinances and codes. This brief guide presents approaches for incorporating green infrastructure through legal mechanisms and catalogues a variety of existing resources available to North Carolina communities. This short guide is not intended to be a guide on the process of planning for green infrastructure. For such guidance, local government officials, planners, developers and community members can refer to The Green Infrastructure Center's "[Evaluating and Conserving Green Infrastructure Across the Landscape: A Practitioner's Guide, North Carolina Edition](#)" and/or the North Carolina Forest Service's "[A Quick Guide to Community Planning for Green Infrastructure](#)."

Green Infrastructure

Definitions for green infrastructure vary but in the broadest of terms, green infrastructure refers to the use of soil, vegetation and other natural landscape features to manage and provide environmental services, such as water treatment for stormwater runoff, air and water quality. The definition may be extended as "a strategically planned and managed network of wilderness, parks, greenways, conservation easements, and working lands with conservation value that supports native species, maintains natural ecological



processes, sustains air and water resources, and contributes to the health and quality of life for America's communities and people."² Because green infrastructure offers many environmental benefits, local governments may benefit economically and environmentally by incorporating green infrastructure practices that encompass both of these definitions to meet their local priorities and to direct development as best meets those priorities.

¹ Credit: Center for Neighborhood Technology; <https://creativecommons.org/licenses/by-sa/2.0/legalcode>.

¹ A full review of options for incentive programs is beyond the scope of this guide. A good resource for case studies of other communities' incentive programs is the US EPA's "[Green Infrastructure Case Studies: Municipal Policies for Managing Stormwater with Green Infrastructure](#)."

² Benedict and McMahon, *Green Infrastructure*, 2006.

Regulatory Tools for Incorporating Green Infrastructure

Ordinances and codes are the regulatory mechanisms available to local governments for land use and natural resource management. Though local governments in North Carolina have no preexisting grants of power, the General Assembly has made both general grants of power to cities and counties and specific grants of power to regulate other activities under certain special circumstances. Cities and counties are generally allowed to “by ordinance define, regulate, prohibit, or abate acts, omissions, or conditions detrimental to the health, safety, or welfare of its citizens and the peace and dignity of the county; and may define and abate nuisances.”³ Other grants of authority are made to address specific issues, including the environmental impacts of development, and are found in other statutes.

Many of the resources discussed here are written as separate ordinances but could also be modified to work in a unified development ordinance⁴ framework. Some of the ordinances are written as overlay ordinances, which are used to establish additional development requirements in specific areas of a community, such as environmentally sensitive areas. The additional requirements are superimposed over, or “overlay”, the base regulations already in place.

Policy Options for Local Governments

Individual communities have different needs and motivations when incorporating green infrastructure (e.g., urban stormwater runoff control, wildlife conservation, etc.). Thus, local governments may need to revise existing ordinances or even develop and adopt new ordinances and/or overlays to address their community’s particular needs and goals. Policy options for incorporating green infrastructure include ordinances that preserve or restore pre-construction conditions on development sites, and ordinances that direct development away from sensitive areas such as wetlands, streams, and significant natural resources. The resources reviewed below are model environmental ordinances specific to North Carolina communities and/or guidelines for evaluating and revising existing codes and ordinances to integrate green infrastructure practices. These tools must be modified and adapted by each community but they serve as a good starting point for incorporating green infrastructure through regulation.

Preservation and Restoration of Pre-Construction Conditions

Green infrastructure policies can function to reduce, control, and manage stormwater runoff from development, an issue that most local governments must address, as required by state and federal regulations. As a result, effective stormwater controls are an essential element of any comprehensive program to promote green infrastructure.

Model Local Ordinances for Stormwater Regulation

Many local governments in North Carolina are already required to adopt stormwater regulatory programs due either to the urbanizing nature of the community or its location near sensitive resources (e.g., impaired waters, coastal locations). As part of these regulatory programs, DENR collaborated with the University of North Carolina (NC SU) School of Government to develop several model stormwater ordinances that local governments can look to for guidance.

- *Phase II Stormwater Model Ordinance* – This [model ordinance](#) was developed to meet requirements under the federal Clean Water Act for cities and towns that operate municipal separate storm sewer systems (MS4s) located in urbanized areas and serving a population of fewer than 100,000.⁵ The language includes performance standards that address quality, as well as the magnitude and rate of runoff.

³ NC Gen Stat § 160A-174 (2014) for cities; NC Gen Stat § 153A-121 (2014 for counties).

⁴ A unified development ordinance is a comprehensive document that combines all regulatory elements (including traditional zoning and subdivision regulations, design guidelines, building codes, floodplain, stormwater and other environmental regulations, etc.) into one document. UDOs are often more streamlined and easier for stakeholders to use and understand as all standards and definitions are in one place.

⁵ 33 U.S.C. § 1342(p).

- ***Universal Stormwater Management Program Model Ordinance*** – The Universal Stormwater Management Program is a voluntary state program intended to streamline local government stormwater regulations. This [model ordinance](#) contains alternative regulations that, if adopted, will be deemed to meet the requirements for Clean Water Act Phase II communities as well as other state stormwater regulations.
- ***Jordan Model Stormwater Ordinance for New Development*** – This [model ordinance](#) was developed for communities in the Jordan Lake watershed to comply with the Jordan Lake Nutrient Management Strategy. As such, it contains some of the most protective standards for controlling nitrogen and phosphorus discharges in stormwater runoff.

Low Impact Development: A Guidebook for North Carolina

The North Carolina Cooperative Extension published “[Low Impact Development: A Guidebook for North Carolina](#)” to provide technical guidance to local governments on incorporating the principles of low impact design (LID) to protect and conserve water resources and ecosystem services. The goals of LID are to conserve resources, minimize site impact, optimize water filtration, create areas for storage and treatment of stormwater runoff, and build the capacity for long term maintenance of installed infrastructure.⁶ The guidebook provides specific policy guidance for communities on how to review an LID stormwater management plan, procedures for communities to identify barriers to LID in their ordinances, options for adopting policies to promote LID, and information on best management practices for LID.

Direct New Development Away from Sensitive Natural Resources

Green infrastructure policy can also direct new development towards areas that will have less impact on natural resources, or to areas that already have existing infrastructure readily available. Local governments may wish to adopt ordinances that include floodplain protection⁷, stream setbacks, tree conservation areas, and even set asides for significant natural resources, such as habitat for sensitive species. Most of the stormwater ordinances mentioned previously contain some level of stream setbacks and regulate the types of activities that can occur in and along riparian buffers. The two model ordinances discussed below focus on different types of sensitive natural resources – significant natural resources (which may also include stream setbacks, depending on which resources included in the final ordinance) and tree protection. Other types of local codes that could be considered are conservation subdivision codes. A NC guide to conservation subdivisions is also reviewed below as well as a general resource on planning for greener practices in development.

- ***Model Natural Resources Overlay Conservation Ordinance*** – This [ordinance](#) addresses degradation of significant natural resources from direct and cumulative development impacts. The measures are based on the best available science and designed to be tailored for a community’s specific needs. By creating an overlay, the most sensitive natural resources can be conserved/maintained while additional community growth is accommodated.⁸
- ***Model Tree Protection Ordinance*** – The Model Tree Protection Ordinance provides communities with guidance for retaining trees. Tree protection ordinances can mitigate some of the impact of development while also ensuring community benefits, such as increased property values, stormwater runoff management, cooling, and air quality. The model ordinance sets out a framework for local governments and stakeholders to follow in deciding how to protect trees in their communities.

⁶ NC Cooperative Extension, “Low Impact Development: A Guidebook for North Carolina” at 1-3 to 1-4.

⁷ Pursuant to federal law, property owners cannot get flood insurance coverage unless the local government has adopted the federal minimums for flood plain protections 42 U.S.C. § 4002(b). Thus many communities have already adopted such regulations.

⁸ The Cape Fear Council of Government is adapting the Model Natural Resources Overlay Conservation Ordinance to the needs of North Carolina’s twenty coastal counties, which are subject to additional land use and resource management requirements under the state’s Coastal Area Management Act.

- **[Conservation Subdivision Handbook: A Guide for North Carolina Communities in the Use of Conservation Design for Land Use Planning](#)** – NCSU’s Forestry and Environmental Outreach Program and the NC Forest Service published [this handbook](#) to provide communities with subdivision guidelines that preserve open space, clustering homes to minimize development impacts. The handbook discusses the benefits of conservation subdivision regulations (also sometimes known as open space regulations) and includes model language for conservation subdivision regulations that communities can adapt to fit their needs.
- **[Green Growth Toolbox](#)** – The [Green Growth Toolbox](#) provides resources for local governments and communities seeking to preserve natural resources and protect wildlife. Along with technical assistance and training, the Toolbox includes a handbook, conservation data for communities to assess their resources, and a variety of other tools for use in the planning process. Many of the resources discussed above are discussed in more detail in the Green Growth Toolbox Handbook.

Auditing Tools for Incorporating Green Infrastructure

In addition to passing new ordinances, local governments can also incorporate green infrastructure through revising and amending existing non-environmental resource codes that are relevant to green infrastructure. Subdivision codes, street and parking standards, landscape standards, etc. should all be assessed for opportunities to better accommodate green infrastructure practices. Both EPA and the Center for Watershed Protection provide assessment tools for local governments to use in this endeavor.

EPA’s Water Quality Scorecard: Incorporating Green Infrastructure Practices at the Municipal, Neighborhood, and Site Scale

[EPA’s Water Quality Scorecard](#) provides a comprehensive guide for local governments and stakeholders to follow, whether reviewing relevant codes to revise and/or remove or to identify opportunities to incorporate greener practices. The Scorecard is designed for a variety of settings—urban, suburban, or rural/urbanizing. It addresses reviewing a local government’s zoning ordinances, subdivision codes, street standards, parking standards, setbacks, height limitations, open space plans, and comprehensive plans.

Center for Watershed Protection’s Better Site Design Guidebook and Codes & Ordinances Worksheet

The [Center for Water Protection’s Better Site Design: A Handbook for Changing Development Rules in Your Community](#) identifies twenty-two (22) principles for creating policies that result in “environmentally sensitive, economically viable, and locally appropriate development.” The principles address a wide variety of development principles including street width and length, cul-de-sac design, use of vegetated open channels, parking ratios and parking standards, open space design and management, tree conservation, and conservation incentives.



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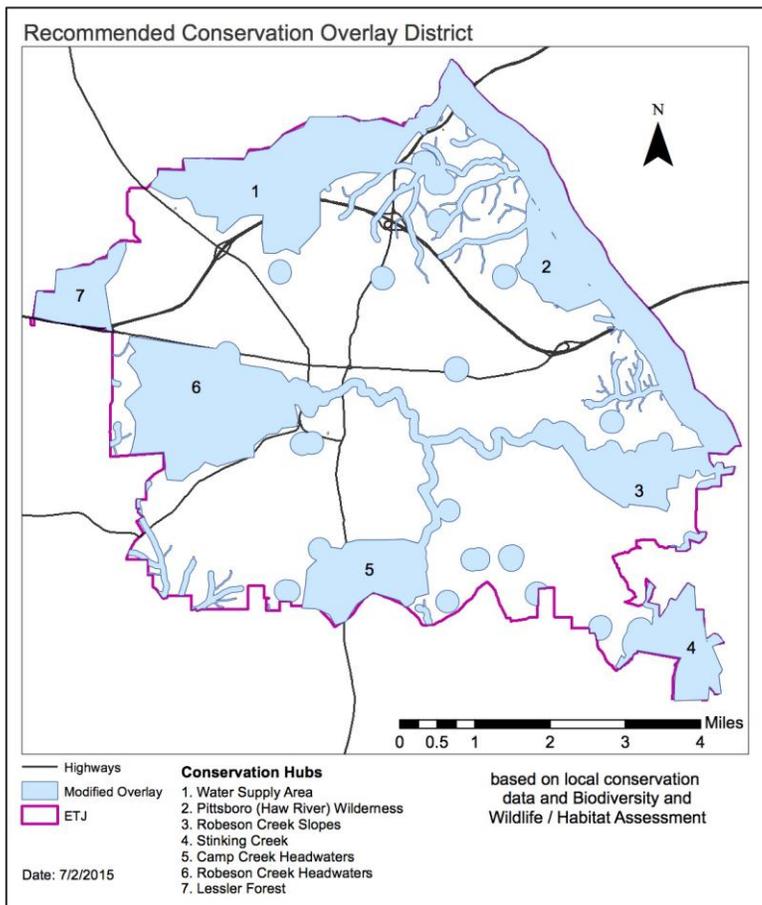
Summary of the Natural Resource Conservation Ordinance for Pittsboro

Clean water, clean air, and many native wildlife and habitats are vulnerable to improperly planned development. Unique wildlife habitats are being fragmented and are disappearing in North Carolina and the Southeast. *This ordinance is intended to encourage conservation of the most sensitive wildlife habitats such as Cape Fear Shiner habitat*, and provide for wildlife corridors between protected lands. Developers benefit from a local conservation district such as this ordinance proposes because they will be better advised and guided through the development process in areas with wetlands and other sensitive environmental features. This will lead to fewer permit delays and opposition from neighbors and the community. *The ordinance can also be adapted as an optional type of development in exchange for a density bonus or other incentive.* The language for the ordinance was developed by the N.C. Wildlife Resources Commission and the Duke University Nicholas Institute for Environmental Policy Solutions.



How is the District Determined?

The Natural Resources Conservation Overlay District (NRCO District) is designed to preserve and protect ecosystems while balancing the need for planned growth. This is accomplished by minimizing fragmentation, or separation, of significant natural resource areas, protecting upland habitats adjacent to waterways and water sources, maintaining plant and animal habitat diversity, and protecting unique environmental features identified in the landscape.



The map of the recommended NRCO District of the Conservation Ordinance Review Committee is based on the Biodiversity and Wildlife Habitat Assessment relative conservation values 5 and above, as well as, the following significant natural resource areas: isolated wetlands, rare species streams, and hunting buffers along game lands. In addition, the overlay includes a 2000 foot Haw River Protection Area, as recommended in Pittsboro's Land Use Plan and 300 foot wildlife corridors along Robeson Creek and Camp Creek. Seven conservation hubs were identified in the overlay district: 1) *Water Supply Area* that protects Brooks Creek watershed that drains to Pittsboro drinking supply above the Bynum Dam on the Haw River, 2) *Haw River Wilderness* the remnant of the Pittsboro Wilderness Natural Area that is not directly impacted by planned roads, 3) *Robeson Creek Slopes* that includes a Natural Area and highly erodible slopes, 4) *Stinking Creek*: includes high quality and rare Dry-Mesic Oak-Hickory Forest (Piedmont

Subtype), 5) *Camp Creek Headwaters* that protects the headwaters of the only tributary of Robeson Creek watershed that has a 'good aquatic life' water quality rating, 6) *Robeson Creek Headwaters* that protects headwaters of the primary watershed in Pittsboro, which is an impaired creek, and 7) *Lessler Forest* that protects a Natural Area of high rating with known occurrences for hardpan forest and the special concern species, four-toed salamander.

The following five steps were taken to draft the recommended NRCO District:

1. Conducted a Pittsboro Community Conservation Survey to rank conservation priorities,
2. Compiled natural resource data and completed a Biodiversity and Wildlife Habitat Assessment (BWHA),
3. Presented survey and BWHA results to town staff,
4. Formed an advisory committee, the Conservation Ordinance Review Committee (CORC),
5. Obtained majority consensus from CORC on a NRCO District.

A brief description for each step follows.

1. Conducted a Pittsboro Community Conservation Survey to rank conservation priorities

An online survey was conducted in June 2014 to create a framework to rank potential conservation areas within the town of Pittsboro and its extraterritorial jurisdiction (ETJ). Invitations to participate in the survey were distributed via community listservs: Chatham Conservation Partnership (CCP), Chatham Chatlist, Bynum Neighbors and Facebook pages for CCP, Town of Pittsboro, Haw River Assembly, Abundance Foundation, and Pittsboro Matters. 208 responses to the survey were collected with 52% coming from residents of Pittsboro and 60% considering Pittsboro to be their hometown. The seven natural resource goals listed ranked in the following order from most to least valuable to survey respondents: water quality, natural heritage, forestry and tree protection, wildlife habitat, farmland, culture and history, and recreation lands.

2. Compiled natural resource data and completed a Biodiversity and Wildlife Habitat Assessment

Natural resource areas that were found within Pittsboro's ETJ include:

- **Natural Heritage Program Natural Areas:** Pittsboro Wilderness, Haw River Levees and Bluffs, Robeson Creek Depression and Hardpan, Robeson Creek Slopes, and the Lessler Montmorillonite Forest.
- **Highly Erodible Slopes:** Slopes 25% and greater with highly erodible soils (with RUSLE k-factor of .49 and greater)
- **Isolated Wetlands:** located using Chatham County's high confidence wetlands layer (hydric soils, 100 year floodplain, and National Wetland Inventory) and outside of the 50 foot buffer of USGS streams and soil streams.
- **Hunting Safety Buffer:** 150-yard buffer width around boundaries of N.C. Wildlife Resources Commission game lands.
- **Rare Species Streams:** Soil streams and USGS streams that drain to Threatened and Endangered species habitat (i.e., Cape Fear Shiner).
- **BWHA Layers:** See *Summary of the Biodiversity and Wildlife Habitat Assessment for Pittsboro, NC* for a description of the BWHA results and data layers.

3. Presented survey and BWHA results to town staff

Based on results of the survey and BWHA, the town staff recommended:

- Use BWHA relative conservation values of 5 and above as a starting point to determine a NRCO District,
- Include the 2000 foot buffer on the Haw River recommended in *Pittsboro Land Use Plan*, and,

- Form a Conservation Ordinance Review Committee to develop recommendations for the town to consider on the Natural Resource Conservation Ordinance and a Tree Protection Ordinance.

4. Formed an advisory committee, Conservation Ordinance Review Committee (CORC)

Formed with representatives from the Board of Commissioners, Planning Board, Recreation and Parks Board, Chatham Co. Extension Service, a certified forester, Pittsboro Business Association, Chatham Park, and Grand Trees of Chatham. The committee met 12 times between December 2014 and June 2015.

5. Obtained majority consensus from CORC on a NRCO District

Evaluated a NRCO District based on the conservation goals. The recommended district covers less than 42% of Pittsboro's ETJ.



To download maps of each natural resource layer of the Recommended Natural Resource Conservation Overlay District for Pittsboro or to review recommendations of the CORC visit the Chatham Conservation Partnerships wikispace: <http://www.chathamconservation.wikispaces.com>.

What is required for development proposals within the District?

Persons proposing a non-exempt development project need to have a **site survey** conducted by a qualified biologist to delineate the presence of significant natural resources on the parcel. **Please Note:** If the developer is also in the process of obtaining a wetland delineation for a federal or state permit, the same biologist can conduct the site survey required in the ordinance.

If significant natural resources are determined to be on the parcel, then the ordinance requires a conservation area to be set aside (see Diagram 1):

- The Conservation Ordinance Review Committee is recommending that up to, but not exceeding, 50% of the tract must be conserved only if significant natural resources are confirmed by the site survey on 50% or more of the parcel.
- If less than 50% of the parcel is comprised of significant natural resources as confirmed by the site survey, then that proportion of significant natural resource area is conserved.
 - For example if 25% of the parcel is confirmed to contain significant natural resources then only 25% of the parcel needs to be conserved.
- An **alternative scenario** to consider would be for 35% of the tract to be conserved only if significant natural resources are confirmed by the site survey on 35% or more of the parcel. Conserved areas beyond 35% can be incentivized through the use of a density bonus.
- Natural resource management activities must be identified that will maintain the quality of the natural resources in the conservation area.
- If development impacts cannot be avoided to certain areas that contain significant natural resources, an equal area must be conserved elsewhere on the parcel.

This ordinance can also be adapted as an optional type of development in exchange for a density bonus or other incentive.

The ordinance also **limits impervious surfaces** in the parcel. The Conservation Ordinance Review Committee is recommending that impervious surface areas are limited to 15-25% over the entire tract.

What can developers do if they cannot meet the requirements of the District?

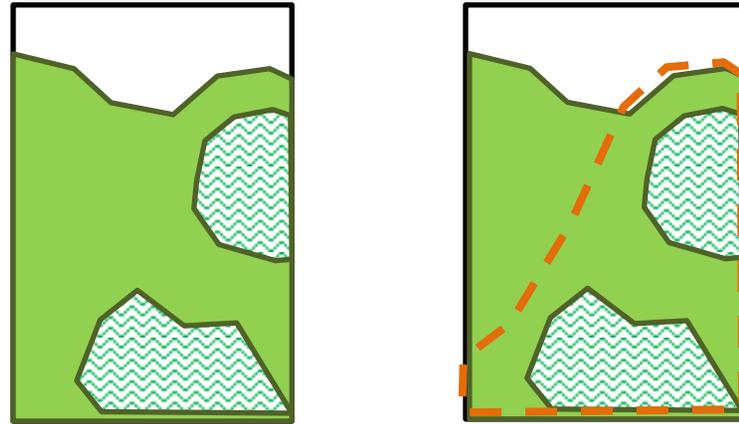
If the ordinance is optional in exchange for a density bonus or other incentive, the developers can choose not to implement a conservation development. If conservation development is required within the district, developers may request a variance from the town. The town will evaluate the merits of the variance request.

Diagram 1. A visual representation of the District conservation area requirement

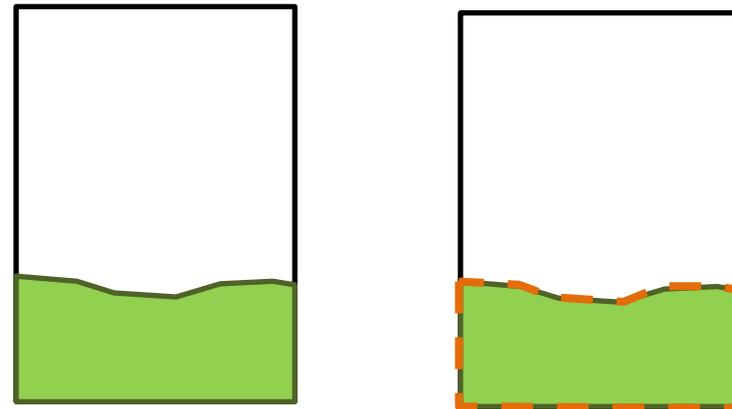
Legend

-  No 'significant natural resources' were identified by the site survey in this area.
-  Areas where Significant Natural Resources were
-  Areas where Significant Natural Resources are of the highest priority.
-  Areas where Significant Natural Resources need to be conserved

A **Maximum Conservation Scenario:** More than 50% of the parcel is identified as containing significant natural resources by the site survey. Only 50% of the parcel needs to be in conservation.



B **Other Conservation Scenarios:** Less than 50% of the parcel is identified by the site survey as containing significant natural resources; the extent of significant natural resources on the parcel needs to be conserved.



Explanation of the Scenarios

These parcels in the Natural Resources Conservation District have had the required site survey by a qualified biologist.

- A. This site survey has identified that > 50% of the parcel is comprised of 'significant natural resources'. A maximum of 50% of the parcel is required to be conserved and this area needs to include the highest priority resources.
- B. This site survey identified that only 25% of the parcel is comprised of 'significant natural resources'. Only 25% of the parcel is required to be conserved.

Summary of the Biodiversity and Wildlife Habitat Assessment for Pittsboro, NC

The Biodiversity and Wildlife Habitat Assessment (BWHA) is a method for compiling and prioritizing conservation data in order to identify essential high-quality natural resources required to maintain healthy ecosystems. The tool helps highlight areas of significant natural resources. The BWHA conducted for the Town of Pittsboro follows the methodology outlined in the *Comprehensive Conservation Plan for Chatham County, Appendix E-Methods: Conservation Ranking and Analyses* (www.chathamconservation.wikispaces.com). The Chatham BWHA is modeled after the assessment used in the N.C. Conservation Planning Tool. The primary goals of this assessment are the preservation of aquatic and terrestrial habitats, landscape function, and connectivity. The result of the assessment is a map that represents the highest priority areas for conservation of wildlife habitat and biodiversity.

Conservation Layers and Assessment Map

The BWHA is a geographic information systems (GIS) map layer that is a composite of 30 x 30 meter pixel grid comprised of 8 conservation layers categories and a impervious surface category. Each layer included has a

conservation value and has been ranked on an ordinal scale from 1 to 10 representing areas with a moderate to high

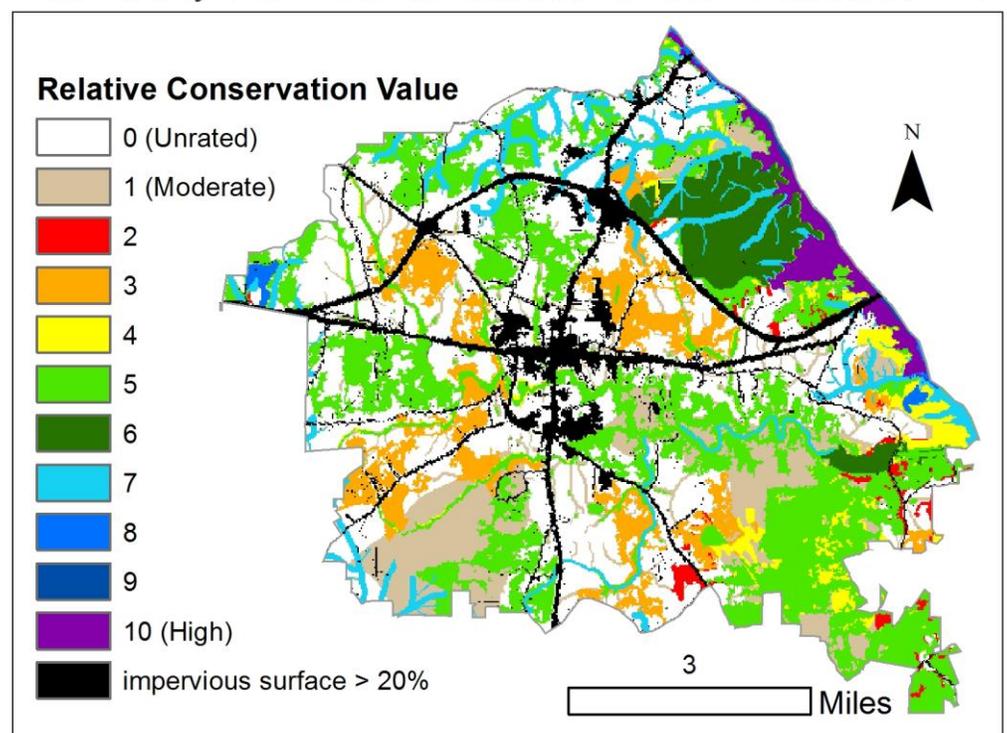
conservation value. A description of each layer and its relative

conservation value is provided in a table on the next page. The relative conservation value is based on resource rarity and distinctiveness;

resource function; and data precision, accuracy, and completeness. In addition to conservation layers, impervious surface layers were included with a ranking of (-1) to reflect negative impacts on biodiversity and wildlife habitat. Detailed

information about the data used, the conservation value ranking, and methods used for the BWHA can be found in *N.C. Conservation Planning Tool, Chapter 4: Biodiversity/Wildlife Assessment* (www.conservationtool.nc.gov).

Biodiversity and Wildlife Assessment for Pittsboro, ETJ



Date: 7/15/2015

Mapped by Biocenosis LLC for the Planning Tools for Pittsboro Project

Table 1 Ranking of Conservation Layers for BWA for Pittsboro

Category	Value	Individual Input Layers	Date	Description
Rare species and high quality communities	10	NHPNA National or State Significance	10/2014	NC Natural Heritage Program (NCHP) data Natural Heritage Areas includes terrestrial and aquatic NHAs; based on NCHP data in the NC Conservation Planning Tool (NCCPT)
	8	NHPNA Regional Significance	10/2014	
	6	NHPNA Local Significance	10/2014	
	5	EOs High Ranking	10/2014	Based on NCHP data in the NCCPT - locations of element occurrences (EOs) of rare or protected species, high quality communities, and animal assemblages; high ranking includes overlapping EOs, those with Global (G1/G2) and state ranks (S1/S2), and those considered current (and last observation less than 30 years ago) and remaining EOs ranked as other.
	4	EOs Other	Oct-14	
Guilds	10-1	Landscape Habitat Indicator (LHI) Guilds	2013	Based on NCHP's most current analysis of conservation priorities for the NC Piedmont; Guilds represent groups of indicator wildlife species that rely on unfragmented habitat and are closely associated with particular habitats.
Watersheds	7	Streams Rare Species Priority Watersheds)	1/2014	Based on NCHP data 2-digit HUCs in which federal and state-listed rare species are known to occur; USGS stream segments buffered by 200' and soil streams buffered by 50 ft. that intersect with HUCs
Streams	7/9	BioClass benthos: Excellent/Good	2012	Based on NC Department of Water Quality (DWQ) hydrography and bioclassification (benthic and fish) as of 2012; stream segments buffered by 100'
	7/9	BioClass fish: Excellent/Good	2012	
	1	Streams USGS	2007	Based on USGS blue-line streams; streams buffered by 100'
	1	Streams Soil Streams	2010	Based on digitized streams from Chatham Soil Survey maps (NRCS 2005); verified by soil scientist; streams buffered by 50'
Wetlands	5	Wetlands High Confidence	2010	Based on Union of NWI, Chatham Soils data (NRCS 2005) hydric soils and "wet spots", and flood hazard areas; depicts high likelihood for wetland habitat
	3	Wetlands Medium Confidence	2010	Based on Chatham Soils data (NRCS 2005) Riverview map unit (not included in High Confidence Wetlands); verified by soil scientist; depicts moderate likelihood for wetland habitat based on soils
Important bird areas	2	Important Bird Areas (IBAs)	2014	Based on Audubon Important Bird Areas (IBA) data to depict areas vital to birds and other biodiversity
Forest	3	Hardwood Forest Blocks 75 acres+	2011	Deciduous forests blocks defined by the National Land Cover Data (NLCD) that are 75+ acres.
	5	Hardwood Forest Blocks 500 acres+	2011	Deciduous forests blocks defined by the NLCD that are 500+ acres.
	4	Floodplain Forests	2011	Select all forest defined by the NLCD that are within the PBO_floodplain.shp
Managed Areas	4	Conservation Lands (No Buffer)	Oct-14	Based on NCHP data for Managed Areas (MAREAs) not buffered with 1/4 mile as in the CCP
Impervious surface	(-1)	Impervious surface above 20% land use/cover)	2011	Based on NLCD 2011 impervious surface data
	99(-1)	Roads	2014	Based on Chatham centerline data with addition of US15-501 expansion; roads buffered by 15 feet each side (30 feet total)
	99(-1)	Buildings	2011	Based on building footprints digitized from 2007 aerial photos for Risk Assessment by NC Dept. of Environmental Management (NCDEM)



For further information on the BWA for Pittsboro or to download a map of the assessment visit the Chatham Conservation Partnerships wikispace: <http://www.chathamconservation.wikispaces.com>

Summary Report of Pittsboro, NC: Land Cover Change Analysis and Urban Tree Canopy Assessment

Trees, and their natural environment, provide many economic, environmental, and social benefits to the people and communities around where they grow.



Introduction

As Pittsboro grows, and land use changes, it is important to guide these changes to reduce impact on the forest and the services that it provides. Land use planners can determine the impact of development options on their existing resources using the planning tools provided by this project.

Good land management decisions recognize the interdependence of healthy people, strong economies, and vibrant, intact and biologically diverse landscapes

The increasing accessibility of tools for local government planners, such as canopy assessments, provides previously unavailable information to determine the effect of a proposed landscape change. Data that describes the existing land cover and how it functions to manage air and water quality and the economic value of those services, can now be included in the costs and benefits of any planning process. This can help ensure that the priorities and values of the entire community are addressed.



- reduce energy use & costs
- increase business traffic
- increase property values & tax revenues
- reduce stormwater utility costs

ECONOMIC



- improve air & water quality
- reduce stormwater runoff
- moderate local climate
- natural habitat & linkages

ENVIRONMENT



- reduce violence
- connect to nature
- improve health & recovery
- provide privacy & reduce noise

SOCIAL

The economic, environmental, and social value of natural resources can be easy to overlook when making land-use decisions. But, just as the gray infrastructure of roads, bridges, power lines, pipelines, and sewer systems are planned, so should the supporting and surrounding **green infrastructure** of trees, water, soil and working lands for forestry and agriculture. Residents, businesses, and local governments all benefit when planners facilitate development in ways that reduces development impacts on the landscape.

The work of the natural landscape can be accurately measured and converted into an economic equivalent called an ecosystem service. **Ecosystem services** are those positive benefits nature provides

us, generally for free, that are essential for a thriving community. They include clean air and water, recreational opportunities, beautiful vistas, natural heritage sites, and stormwater remediation as well as healthy foods and places to rest the soul and recuperate.

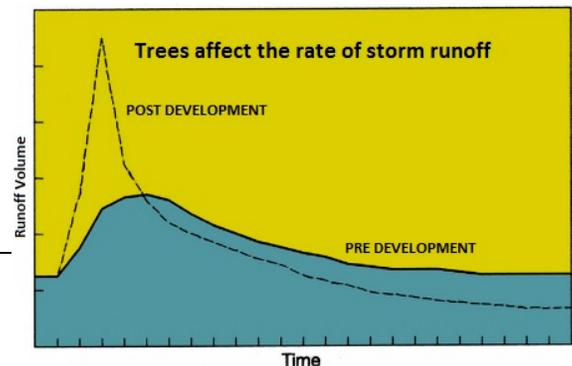
ECOSYSTEM SERVICES PROVIDED BY TREES and the NATURAL ENVIRONMENT

Air pollution: Trees and vegetation capture particulate matter and gases such as ozone, sulfur and nitrogen dioxides and carbon monoxide. Large healthy trees greater than 30 inches in diameter remove approximately 70 times more air pollution annually (3 lbs/yr) than small healthy trees less than 3 inches in diameter (0.04 lbs/yr).

Carbon storage: All plants use carbon for building cells and growing, keeping the carbon stored as long as the plant is intact. Large healthy trees greater than 30 inches in diameter sequester approximately 90 times more carbon than small healthy trees less than 3 inches in diameter yearly. Large trees also store approximately 1000 times more carbon than small trees, over their lives.

Water quality and stormwater mitigation: Trees and vegetation intercept water physically, slowing stormwater flows. This reduces flooding and allows water to infiltrate into the ground for groundwater recharge.

The Effects of Urban Trees on Air Quality, David J. Nowak, USDA Forest Service, Syracuse, NY 2002



When ecosystem services are disturbed by development, unanticipated changes can occur in the natural functions of the land. But, if land planning begins within the context of a local ecological system, development can be channeled into the most suitable areas, while environmental functions are protected, saving money and energy.

Technical Report Specifics

The technical report, *Pittsboro, NC: Land Cover Change Analysis and Urban Tree Canopy Assessment*, is a valuable reference document for the Pittsboro community and provides the following resources for planning:

- A description of the geographic information system (GIS) data sets assembled for the project
- The methodology used to convert aerial imagery into land cover types
- A description of the engineering and scientific formulas used to analyze the data
- Ecosystem services calculations
- A description of the technical analysis methods used

What is GIS? A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.

GIS allows us to view, understand, question, interpret, and visualize data in many ways to reveal relationships, patterns, and trends, in the form of maps (www.esri.com).

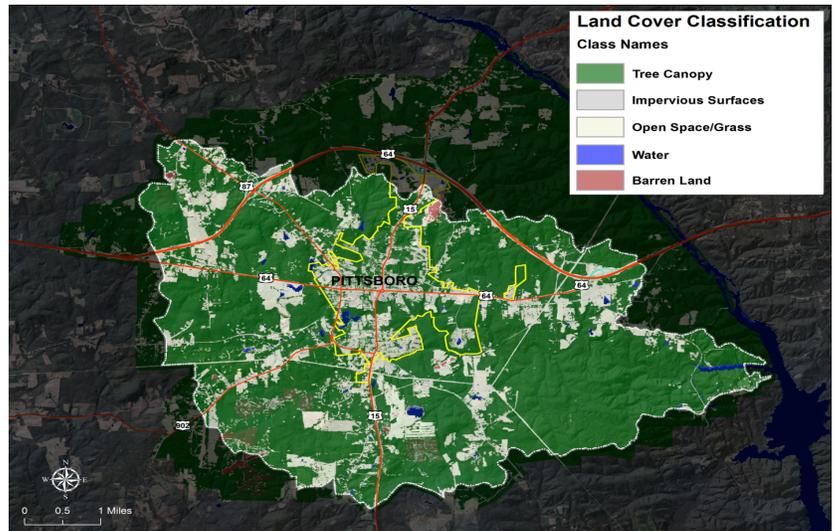
In addition to producing a written report, the ecological assessment completed by Global Ecosystem Center resulted in a GIS dataset that includes:

- Georeferenced (spatial) data extracted from satellite and aerial imagery, as well as, information describing the area's soil, water and air which is available from government agencies.

- Landsat imagery (NASA satellite) that has been classified, using the USGS methodology, to National Land Cover Data (NLCD) standards for the year 2013.
- High-resolution aerial imagery from the National Agricultural Imagery Program that has been classified at 3 meter resolution for the ETJ and 1 meter resolution inside the Town limits.
- Canopy assessment data is merged with Pittsboro's zoning data provided by the Town and Chatham County.

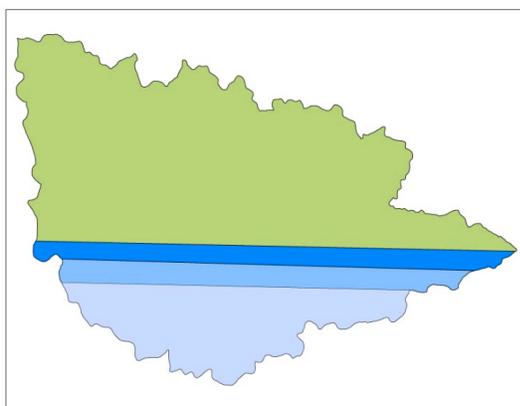
Robeson Creek Scenario

When ecological units, such as watersheds, organize the landscape the impact of development can be better seen and more effectively planned. For a local example in Pittsboro, NC, consider the Robeson Creek watershed. With development that takes into account green infrastructure of trees, water, soil and working lands for forestry and agriculture, it is possible for the Robeson Creek watershed to maintain the natural benefits of the system to clean water, and to ultimately meet the Total Maximum Daily Load (TMDL) requirements of the EPA. The ecosystem services provided by the green infrastructure reduce the required expenditures necessary for the community. Otherwise, man-made gray infrastructure must be built and maintained to provide the same services.



Watershed in 2012: An increase of 20% in impervious surface would be like adding to the Robeson Creek watershed: a 4-lane divided highway with shoulders (66' total width) 395 miles long (from Morehead City to Asheville); a 30% increase, 595 miles (from Raleigh to Orlando, FL); 40%, 790 miles (Raleigh to Portland, ME).

A scenario of the existing Robeson Creek watershed which currently only has 3% impervious surfaces was modeled to calculate 20%, 30%, and 40% changes in land cover from forest to impervious surfaces such as rooftops, roads, and parking lots. These three scenarios provide a context for considering the



	40% increase = 6,798 acres
	30% increase = 5,217 acres
	20% increase = 3,636 acres

The area of the Robeson Creek Watershed impacted if covered completely by impervious surfaces.

Development in neighboring Chapel Hill has as much as 70% impervious surface through its traditionally designed developments, with the associated access roads and other infrastructure.

impact of different degrees of change. At the present time 78% of Robeson Creek watershed that is within Pittsboro's ETJ is forested. The results of the ecosystem service analysis of the Robeson Creek scenario are given in the table on the next page. In addition to showing the decrease in annual pounds of air pollution and cubic feet of stormwater stored, the table shows the corresponding decrease in money saved by the community when forestland

is replaced with an equal area of impervious surfaces. For instance replacing 40% forestland in the watershed with rooftops, roads, and parking lots, results in only approx 63 million cubic feet of stormwater being saved which is 40 million cubic feet less than what was saved before the trees were removed. Also 40% trees removal results in an annual loss of approximately \$42 million to the community of combined stormwater storage and air pollution removal services.

Pittsboro ETJ Ecosystem Analysis Scenario for Robeson Creek Watershed

15,809 acres	Trees	Air Pollution Removal		Carbon (tons stored)		Stormwater	
	acres	Lbs/year	Value \$	Total	Per Year	Saved (ft ³)	Value @ \$3/ft ³
Pittsboro – ETJ 2012	12,054	1,171,202	3,252,285	518,698	4,038	102,936,155	\$308,808,465
Impervious 20%	8,885	863,263	2,397,175	382,319	2,976	89,442,649	\$268,327,947
Impervious 30%	7,304	709,657	1,970,632	314,290	2,447	76,632,358	\$229,897,074
Impervious 40%	5,723	556,052	1,544,088	246,262	1,917	62,799,572	\$188,398,716

*Based on the Urban Hydrology of small Watershed model (TR-55) for stormwater runoff and the Urban Forest Effects (UFORE) for air pollution and carbonsee technical report for more information.

Though a planning process that includes the goal of preserving the function of the natural system as green infrastructure it is possible to maintain the important ecosystem services that this natural system provides. Again, the technical report and ecosystem analysis data can help guide decision-makers in the Town of Pittsboro in identifying important green infrastructure resources and provides measures to evaluate the value of the services they provide the community.

American Forests estimates that trees in the nation's metropolitan areas contribute \$400 billion in stormwater retention by eliminating the need for expensive stormwater facilities.

This report is a summary, of the technical report, *Pittsboro, NC: Land Cover Change Analysis and Urban Tree Canopy Assessment*, that was completed in 2013 by Global Ecosystem Center to demonstrate how the forest provides a valuable resource for the Town of Pittsboro as part of the Planning Tools for Pittsboro Project.

The NC Forest Service Urban & Community Forestry with help from the Chatham Conservation Partnership obtained funding in 2013 through the Federal Forestry Service Redesign Program for natural resource planning in Pittsboro. Like many of the rural communities surrounding the Research Triangle Park, Pittsboro is facing intense development pressures threatening their natural resources. Planning tools such as this ecosystem analysis technical report are tailored to Pittsboro for use the town to prioritize and protect their natural resources. The planning tool development process for Pittsboro will be documented in a case study that can be used to transfer the process to other rural communities

Summary Report was written and edited by the following:

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GLOBAL ecosystem CENTER



For further information or to download a copy of this summary report or the technical report, *Pittsboro, NC: Land Cover Change Analysis and Urban Tree Canopy Assessment*, visit the Chatham Conservation Partnerships wikispace: www.chathamconservation.wikispaces.com



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