
Lower Haw River Corridor Project

Prepared for the Clean Water Management Trust
Fund
March 2008

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EXECUTIVE SUMMARY

The Lower Haw River Corridor Project addresses regional water quality concerns and demands for recreation by prioritizing land conservation along the main trunk of the Haw River between I-85/I-40 and US 15-501. This project provides information on the social and ecological landscape in order to assist landowners and conservation specialists interested in protecting the Haw's natural resources.

The Haw River's water quality is a major concern for the state of North Carolina because it provides drinking water for Chatham County, Cary, and other Triangle communities. Its headwaters begin in the Triad region and the main trunk supplies 70-90% of the flow into Jordan Reservoir (NC Division of Water Quality 1999).

Pollution threatens the water quality of this river. The North Carolina Division of Water Quality (DWQ) has proposed to designate considerable portions of the Haw's main trunk and its tributaries on the 303-d list of impaired water bodies (NC Division of Water Quality 2008 pp 3-9). Additionally, the entire watershed is nutrient sensitive because nitrogen and phosphorus levels in the water contribute to considerable algal growth within the Jordan Lake Reservoir. The North Carolina Environmental Management Commission (EMC) will decide on rules developed by the DWQ that govern total maximum daily load (TMDL) of these pollutants for the Haw River. These rules regard storm water management, riparian buffers, and other nutrient reduction approaches that local governments need to address if the rules are promulgated. Protecting and restoring riparian areas is therefore paramount for communities if they are to meet the objectives of rules to improve water quality.

Increasingly, recreationalists are discovering the beauty of the river's gentle riffles and calming stretches of flat water colonnaded by hardwood forest. This corridor will serve as a section of the Mountains to Sea Trail, an initiative spearheaded by NC State Parks and Recreation. Land-based and water-based recreation is becoming more popular to people living in these regions. As open land becomes scarce, recreationalists will turn towards public lands and publically managed river access points to meet their demands.

Furthermore, the Haw River contains nationally significant wildlife habitat monitored by state and federal agencies. Biologists from North Carolina State Natural Heritage have designated approximately 10 miles of the Haw's main trunk within the study area as supporting populations of the federal and state endangered Cape Fear Shiner as well as rare freshwater mussel species (Hall and Boyer 1992).

In light of these concerns, the Haw River Assembly and Elon University obtained support (\$97,000) from the Clean Water Management Trust Fund (CWMTF) to develop a plan for the conservation of the main trunk of the Haw River. This plan, called the Lower Haw River Corridor Project (LHRCP), focuses on the main trunk of the Haw along a 27 mile stretch from I-40/85 in Alamance County to 15-501 near Bynum, in Chatham County. It continues the Haw River Riparian Corridor Conservation Plan that covered a 20 mile stretch of the Haw River between I-40/85 and the Guilford County line (Kron et al. 2005).

This report is a tool for conservation professionals to use for project planning. It provides information on natural history, environmental conditions, as well as social conditions specific to the project's geographical area.

Environmental analysis in this report includes an interpretation of land cover from aerial photos and sampling of vegetation and river bank conditions in the field. Land cover within 500 feet of the river is

about 80% forest. The southern stretch of the study area has 90% forest cover and the northern reaches has 70%. Field collected data on riparian forest composition and riverbank erodibility provide information on current environmental conditions. Deciduous trees dominate the riparian forest canopies. Uncommon species such as mountain laurel and magnolia exist, but the invasive exotic shrub, autumn olive, is pervasive in these environments. River bank assessments measured with the Bank Erosion Hazard Index (BEHI) indicate that the majority of the banks are moderately erodible. This study provides baseline information crucial for grant seekers who wish to detect future ecological and environmental changes in the watershed.

Landowner contacts established for this project will serve to initiate on-the-ground conservation. Individuals have expressed interest in pursuing farmland conservation, allowing a recreational corridor, and establishing river and stream vegetation buffers. This report includes information on programs and agency contact information so that landowners have an overview of the options available to them. Various forms of communication have facilitated contact between Haw River landowners and conservation professionals who can serve the needs of private individuals. These relationships are necessary first steps in protecting the natural resources of this area.

Additionally, this project has compiled and organized key datasets into a GIS database. Conservation professionals need this information to seek funding and prioritize their efforts along this stretch of river. Analysis of socio-economic and environmental variables such as population growth and 303-d listings, supply important contextual information grant writers can use for projects. An analysis of land cover provides information relevant for water quality assessment, ecological restoration opportunities, and natural community preservation. A GIS-based prioritization identifies 58 high-priority properties whose characteristics related to the protection of water quality warrant special attention by the conservation community. These data are readily accessible for further use, analysis, and updates for organizations committed to protecting the water quality of the Haw River watershed.

This planning document represents a commitment several organizations have made to protect and enhance the natural resources of the Haw River. It includes an implementation strategy that synthesizes the findings from the various research efforts of the LHRCP. This strategy involves various non-profits and governmental organizations who will pursue conservation projects in this corridor. Report products equip these organizations as well as landowners with information to decide the most fruitful way to pursue options that improve not only water quality but recreation opportunities, wildlife habitat, and other conservation objectives. Efforts from fieldwork have identified landowners willing to contribute to stewardship and conservation on their property. Outcomes from this work catalyze the process of protecting the environment of this important Piedmont watershed.

Acknowledgements

The North Carolina Clean Water Management Trust Fund (CWMTF) supported this project. We thank the CWMTF staff and especially Nancy Guthrie who provided welcomed advice and expertise in developing this plan and at various junctions throughout this project.

We especially want to thank the Piedmont Triad Council of Governments (PTCOG) for developing a superb model with their Haw River Riparian Corridor Plan for our work. Paul Kron, who led efforts for PTCOG in the first Haw River plan, was instrumental in many aspects of our plan; we thank him for all of the help he provided. We would also like to thank Kristen Selikoff, GIS analyst for PTCOG, for sharing her proficiency in GIS and providing key technical tips in analyzing spatial data. We would like to acknowledge the many dedicated individuals working in local, state, and federal agencies who have taken a special interest in improving the environment of the Haw River Corridor. Melody Wiggins, City of Graham Recreation and Parks Director, Tony Laws, Burlington Recreation and Parks Director, Bryan Hagood, Alamance County Recreation and Parks Director, all have made special commitments to enhance greenspace and recreational opportunities for the public that will have immeasurable positive impacts for Haw River water quality. Phil Ross, Alamance County Soil and Water Conservation District Conservation Administrator, Rick Bailey, USDA Natural Resource Conservation Service, are committed to water quality issues in this region and we thank them for providing expert advice.

Many thanks goes to agency and non-profit officials that have helped to make the landowner meetings such a success: Kathryn Morris, Chatham County Soil and Water Conservation, Danny Ray, NC Wildlife Commission, Katie Armstrong and Susan Carl, NC State Parks, Rich Shaw, Orange County Lands Legacy Program, Lori Taft, Orange County Parks and Recreation, Tandy Jones, Triangle Land Conservancy, Elaine Chiosso, Haw River Assembly, John Ann Shearer, U.S. Fish and Wildlife Service, Michael Hermann, Ecosystem Enhancement Program, and Brian Baker and Rudy Langley, Haw River Land Stewards Program.

A special thanks goes to REI of Durham and especially for Jim Bennett for providing kayaks to perform the numerous riverbank assessments on the Haw. We would also like to give a special thanks to Matt Diehl, owner of River Landing Inn in Saxapahaw for providing space for our landowner meeting in Alamance County. Additionally we give a hearty thanks to Julie Cusatis and Bill Delano of Triangle Training Inc. for providing space for our landowner meeting in Chatham County.

We would also like to thank Dr. Greg Jennings, Michael Schaffer, and Jan Patterson of NC State's Biological and Agricultural Engineering Department for teaching us field techniques to assess bank erosion.

This project would have not been able to be completed without the support of dedicated individuals at Elon University. Dr. David Vandermast, professor of biology, led the forest floodplain data collection. Dr. Anne Cassebaum, professor of English shared her knowledge of the environmental history of the Haw River. Paul Robinette played an integral part in the stream bank assessment and land cover digitizing. We also thank student Peter Jensen for his work assisting the land cover digitizing enterprise. Additionally, we appreciate the work of Ashley Steele who entered the vegetation data. Furthermore the project thanks the dedicated staff that helped to keep the project running smoothly, especially Kim Giles for providing program support, Chuck Sparks for the mailing, and Jimmy McCall for the printing needs of the project.

Most importantly we thank all of the landowners who gave us time to talk conservation and permission to do this study on their properties.

INTRODUCTION

This is a summary report of the activities and analysis performed for the Lower Haw River Corridor Project. The geographic scope of the field work focuses on properties within 500 feet of the main trunk of the Haw River between I-85/I-40 and U.S. 15-501. A more detailed technical appendix for conservation practitioners highlights ecological findings and opportunities for conservation within the study area. The Lower Haw River Corridor Project continues efforts for conservation planning begun by the Piedmont Triad Council of Governments (PTCOG) which developed a corridor plan for the Haw River in the northern portion of Alamance County (Kron et al. 2005).

A primary purpose of this project is to provide pertinent information for parties interested in the conservation of the Haw River corridor. This report summarizes information into three main sections: context, findings, and implementation. The context section covers historic, demographic, and water quality trends for the Haw River and its watershed. The findings describe the field activities and GIS analysis the project completed. Field activities include landowner contact and an assessment of environmental aspects of the Haw River corridor. GIS analysis consists of a characterization of land cover along the Haw's main trunk as well as a prioritization scheme for conservation. Implementation outlines the next steps various actors will take in order to pursue projects along the Haw.

CONTEXT

Historical Context

From the banks of the Haw River, John Lawson, an English naturalist and surveyor, called this body of water the "flower of the Carolinas" in the early 1700's (Lawson 1967 pp 59-67 cited in Troxler and Vincent 1999 p34). In addition to its natural beauty, the Haw River served European settlers in other ways such as a source of power for grist mills and an abundant source of fish (Hall et al. 1987). Historic sites such as mills, ferries, bridges, and dams numbering at least 17 exist in the 27 mile stretch of the study area (Chilton forthcoming).

Mills to process cotton became prominent in the 1880's. Entrepreneurs from families such as the Holt's and Trollinger's made cloth in mills powered by the Haw River in the 19th and 20th centuries and produced such products as 'Alamance Plaid' (Hall et al. 1987). Small landowners and tenant farmers from the surrounding area became the labor that operated the mills during this time period. These families strived to escape the difficulties of fluctuating crop prices and pest infestations by moving to the mill towns for work.

Growth in textile mills and changes in technologies during the post World War II era had considerable environmental impacts on the Haw. The advent of synthetic dyes for the production of cloth had a deleterious effect on the water quality of the Haw River. Residents recall times when the river ran different colors in the 1970's. These substances along with other pollutants made the river less than desirable due to foul smells and fish kills.

Recent Trends

Beginning in the 1980's and 1990's a service economy less reliant on cash crops and the textile industry emerged in this area (Fenn et al. 2003). Farming continued a decline that had begun in the 1970's and forests grew in their place, especially in more isolated and rugged areas like those along the Haw in Chatham County. However, growth in residential areas is changing the landscape once again.

The nearby, highly developed Triangle and Triad regions have grown substantially in recent years. The Haw River's placement between these growing regions and proximity to major transportation

arteries will place increasing pressure on the Haw’s resources (Figure 1). Chatham is one of 15 North Carolina counties expected to experience high population growth from 2000-2020 (50,000 to 76,000) (North Carolina State Demographics 2008). The second growth forest, farmland, river towns, and rural landscapes are desirable to families who work in either the Triangle or Triad regions. Developers have begun acquiring lands for single family homes on properties abutting the Haw River throughout the stretch from I-85 to SR 15-501. Three Haw River landowners began developing properties for over 20 lots totaling 300 acres on land abutting the Haw during the summer of 2007 in the study area.

Presently, the areas around the Haw do not have a high population density. This sparseness of population makes conservation simpler since the properties tend to be larger, reducing the number of transactions necessary to preserve areas (Figure 2). Moreover, Wake County, a major user of Jordan Lake, is expected to have high rates of growth from 2000 – 2030 (600,000-1.4 million) (North Carolina State Demographics 2008).

These population increases underscore the need to preserve the Haw River corridor so that drinking water supplies stay clean and recreational opportunities become available for Triangle and Triad residents. These recent trends threaten the water quality of the Haw due to increased runoff from more impervious surface related to residential construction as well as from runoff from chemicals and fertilizers for the maintenance of lawns.

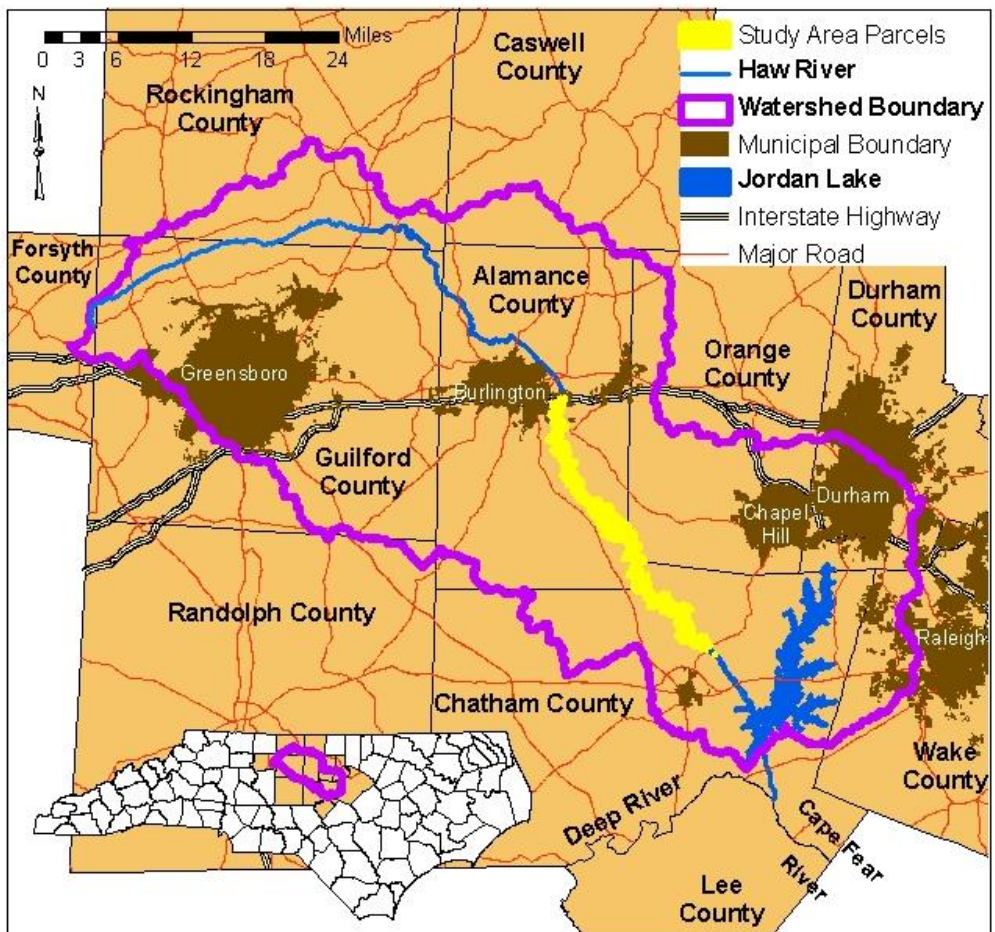


Figure 1. Haw River Watershed: 11 County Region

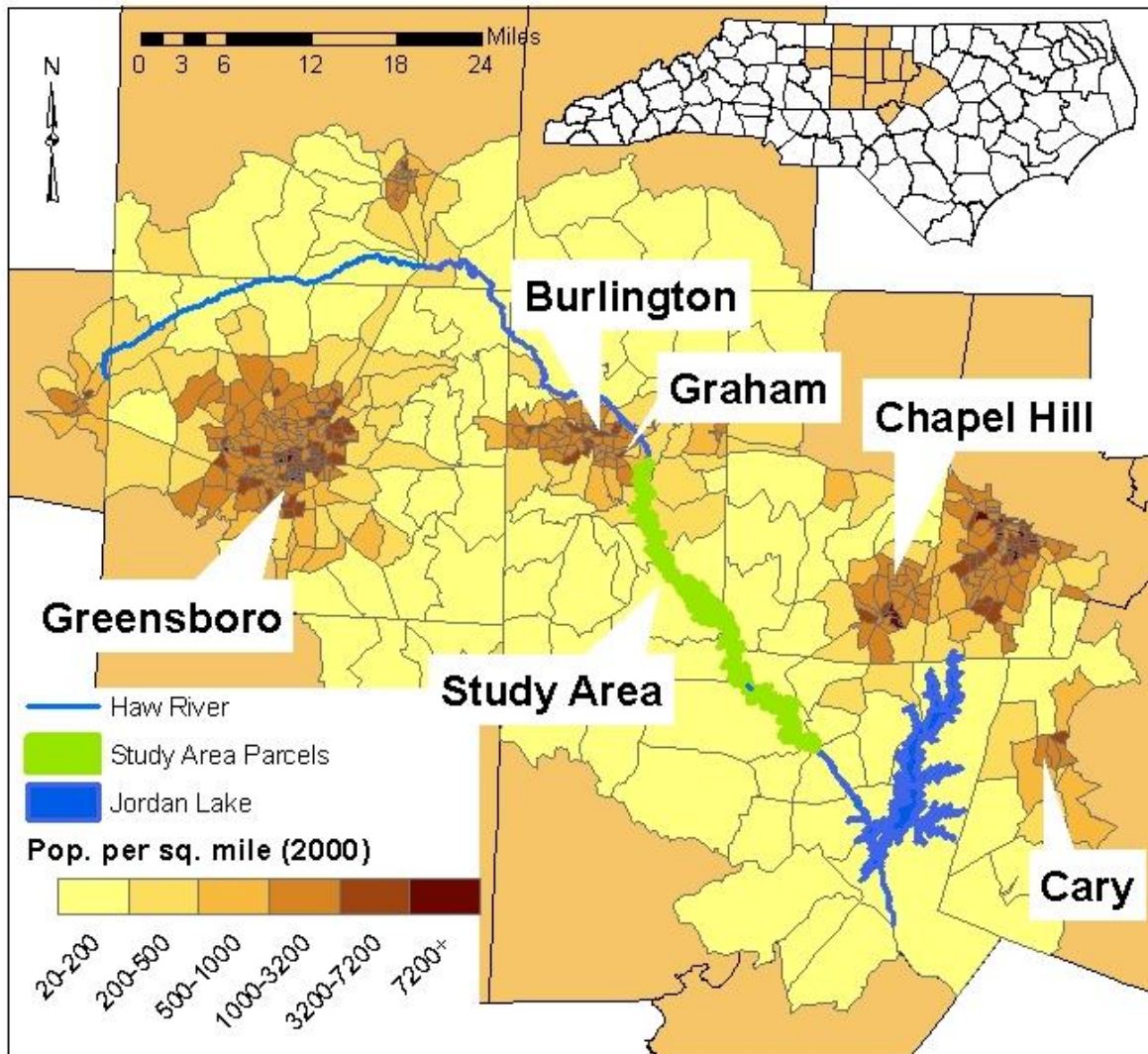


Figure 2. Census Block Group Population Density in the Haw River Watershed 2000

Water Quality

Water quality since the 1980's has been improving in the Haw River watershed according to some measures. Total suspended sediment decreased, possibly from a decrease in cropland and improved farming practices in the watershed (Spruill et al 2006). Total phosphorus also decreased since the 1980's, but nitrogen, another waterborne pollutant, did not have any significant changes over this time period (Spruill et al. 2006). Surveys of aquatic macroinvertebrates in the study area or in its tributaries have been rated 'good – fair' (DWQ 1999). However, the NC Division of Water Quality, (DWQ) has defined the Haw River watershed as nutrient sensitive due to high levels of chlorophyll-a, (a measure of algae) in the Jordan Lake reservoir. In order to satisfy state and federal regulations, the DWQ must set Total Maximum Daily Load (TMDL) levels and regulate point and non-point sources of pollution in the Haw River watershed.

Water quality: 303-d Impaired Streams

Another indicator of water quality involves listing stream and river segments on the EPA's 303-d list of impaired waters. The listed stream segments change as water quality conditions improve or degrade in these areas. Since 1998 the length of stream, river, and lake edges designated as impaired waters has decreased in the Haw River watershed from 214 miles in 1998 to 146 miles for the proposed 2008 listing. The DWQ has not listed any river segments as impaired within the study area, however, upstream portions of the main trunk are impaired as well as three tributaries feeding the main stem (Figure 3).

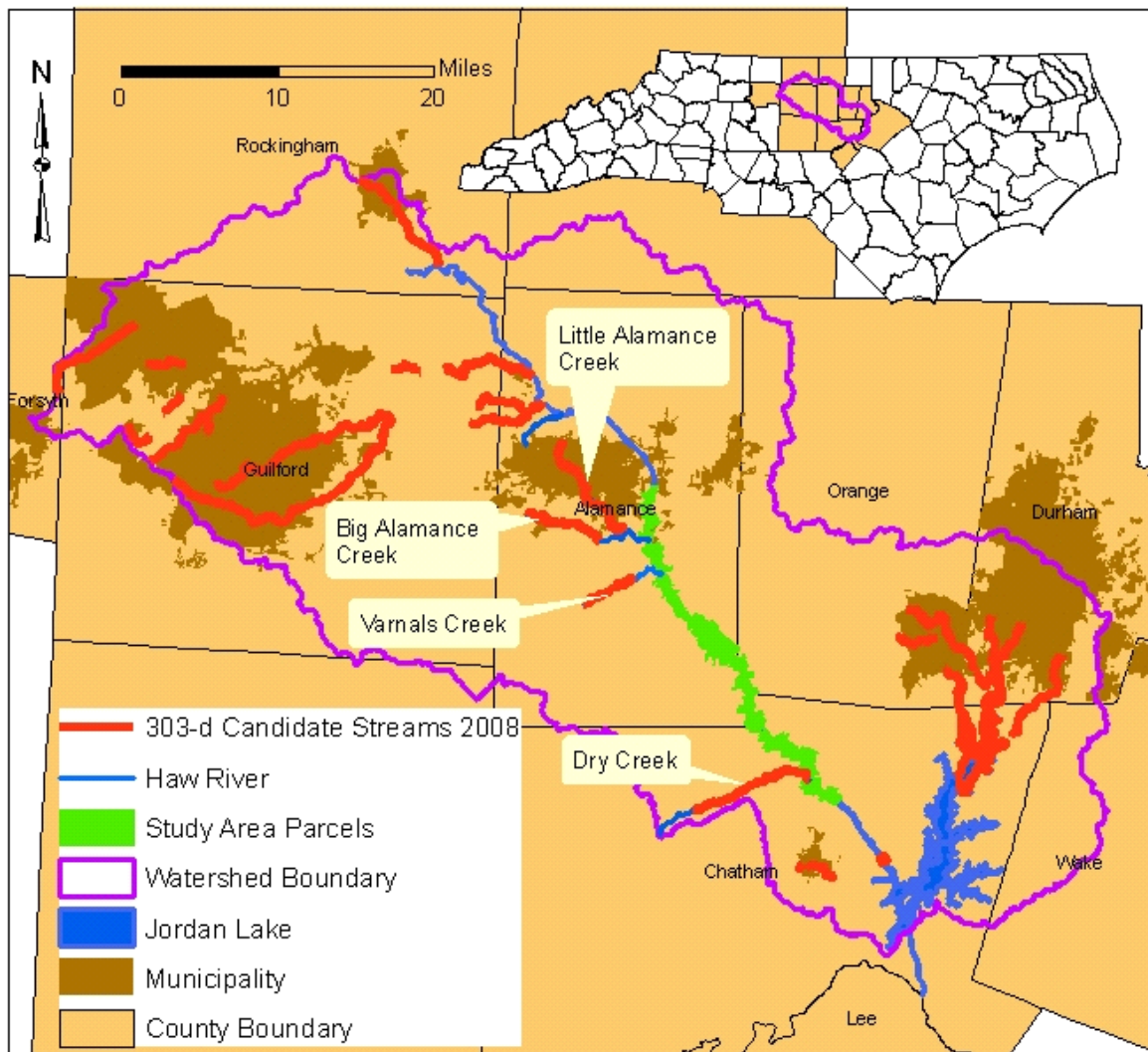


Figure 3 Stream Segments: 303-d 2008 Candidate List

FINDINGS

Land Cover Analysis by County

The type of land cover in a watershed affects how quickly water runs off the ground and into streams and rivers. Rainwater moves slower through forests relative to areas with more impervious surfaces such as roads and buildings. Watersheds with more impervious surface will have more flash floods, soil erosion, and pollution because rainwater rushes into channels more quickly rather than percolating through vegetation and soil (Tollan 2002) . The land cover composition in the Haw River watershed, therefore, is an important component contributing to its water quality.

Methods

This study relied on digital aerial photographs available on the Alamance and Chatham county websites (Alamance County 2007, Chatham County 2007). Color orthophotos from 2005 were used for the Alamance and Orange county sections; 2002 black and white aerials were used for the Chatham County section. A 500 foot buffer from the Haw River's edge served as the boundary for the data interpretation effort. Students and technicians from Elon's Center for Environmental Studies digitized these data in ArcMap (ESRI 2006). The following land cover classes were defined: forest, open land, shrub, impervious, water (Table 1).

Table 1 . Land Cover Descriptions

Cover Type	Description
forest	area of mature trees with canopies apparent in the image, includes patches with trees that have a canopy width of ≥ 10 m, pine plantations, deciduous forest, mixed pine and deciduous forest.
open	area whose predominant cover does not have a preponderance of trees or shrubs, the main feature appears herbaceous plants or bare ground, includes lawns, pasture, hayfield, forest clearings, cropfields. The majority land use in this category appears to be pasture or hayfield
shrubland	area whose main cover vegetation is small canopied trees, shrubs, overgrown fields
impervious	linear and geometric structures appearing to be building and roads
water	streams, ponds, rivers

Results

The majority of the area within 500 feet of the Haw consists of floodplain forests with some areas of short, rocky bluffs. Chatham County has the highest proportion of forest cover while Orange and Alamance counties have less forest cover (Table 2). Alamance had the highest proportion of impervious surface due to the presence of Saxapahaw and Swepsonville, two towns that developed around textile mills in the 19th and 20th centuries. This county also had a relatively high proportion of open cover due to a greater extent of pastures, hayfields, and residential lawns (Table 2).

Table 2. Land Cover Analysis by County

	Entire Study Area		Alamance County		Orange County		Chatham County	
	acres	percent	acres	percent	acres	percent	acre	percent
forest	2848	78.7%	1495	72.6%	157	73.8%	1196	89.0%
open	488	13.5%	382	18.6%	38	17.7%	68	5.1%
shrub	205	5.7%	126	6.1%	17	8.2%	62	4.6%
impervious	32	0.9%	29	1.4%	1	0.3%	2	0.2%
water	44	1.2%	27	1.3%	0	0.1%	16	1.2%

Discussion

The higher proportion of forest cover in the area immediately adjacent to the Haw River indicates the influence of a floodplain which prohibits many residential land uses. The necessity to drain perennial wet areas and the possibility of catastrophic floods complicates farming practices and likely

contribute to a lack of pasture or hay in floodplains. The decline in row crop, beef cattle, and dairy farming has also contributed to the higher proportion of forest cover along the Haw. These land cover characteristics are rapidly changing, especially in Chatham County. Riverside observations indicate that landowners have cleared extensive areas of forest totaling at least 50-100 acres within the 500 foot buffer.

The significant changes in the forest cover are likely to increase runoff and potentially increase sediment discharge into the Haw River. Determining past conditions establishes a baseline with which to compare present and future land cover that is affecting water quality in the Haw River basin. The 2002 interpretation in Chatham County and the 2005 interpretation in Alamance and Orange counties will serve as benchmarks for change detection along this waterway.

Land Cover: Haw River Corridor



Figure 4. Study Area Land Cover Detail

Landowner Interest /Conservation Options

Analysis of parcel data from August of 2007 determined that there were 380 landowners within 500 feet from the Haw River between US 15-501 to I-85/I-40. Of the 380 landowners, 8 were governmental entities 19 were listed as corporations, and 353 were individuals or family trusts. Alamance County had the most landowners, 277, followed by 81 in Chatham and 22 in Orange counties (Table 3). [The properties were in 582 parcels; Eighty-five percent of the 111 multi-parcel landowners had contiguous ownership.]

This study initiated contacts with 372 private landowners in two different ways. A letter introduced the project and sought permission to assess vegetation and riverbank conditions on landowner property and asked if they landowners wanted more information on various conservation programs. The mailing included a post card that they could send back to the project. Landowners indicated their interest in learning more about conservation programs by circling 1 - 4 choices (land, soil, farmland, forests) or checking boxes for more information about the Haw River Trail (Appendix). Additionally, we phoned 170 landowners in order to gain permission to do forest inventories and riverbank assessments as well as to determine interest in conservation programs.

We grouped the number of private landowners into 4 different categories according to their interest in the study or conservation. Landowners totaling 63 were interested in allowing the team access for forest inventory or riverbank assessment (Table 3). The 16 landowners indicating interest in learning more about conservation programs also allowed access for study. Additionally those individuals interested in knowing more information about hosting a trail were also interested in some sort of conservation and in allowing access for our forest inventory or riverbank assessment (Table 3). The landowners interested in learning more about conservation were distributed throughout the study area: 3% of the acreage in Alamance County, 10% in Orange, and 16% in Chatham counties (Table 3).

Table 3 Project Interest. Categories: not participating—not contacted or not interested; study—allowed vegetation survey or riverbank assessment; conservation—interested in learning more about land, soil, forest, or farmland conservation; Trail—interested in knowing more about hosting a trail on their property

Project Interest	Landowner Number	Parcel Count	Alamance Acreage	Orange Acreage	Chatham Acreage	Total Acreage
Not Participating	285	436	10399	479	2411	13289
Study	63	93	1457	85	766	2308
Conservation	16	18	272	38	389	699
Trail	10	10	163	27	248	439
Government	8	25	966	2	121	1090

Landowner Meetings

A third way the project contacted landowners involved holding meetings. These meetings happened in the fall of 2007 and winter of 2008 in order to discuss findings from the vegetation survey and riverbank assessment studies. The October meeting involved presentations from two local non-profits as well as local, state, and federal government officials. A second meeting involved the Haw River Land Stewards Program which creates a means by which Haw River landowners can learn about different options for conservation on their property. This program is also a vehicle for keeping conservation professionals informed of decisions landowners make regarding the sale of their property.

This approach was particularly effective in obtaining information on the familial and other ties that exist among the Haw River landowners. Individuals the project has not been able to contact may be more willing to open a dialog with conservation professionals if they have worked with friends and family members. Moreover, landowner meetings allow individuals who have not met their neighbors to do so. The development of these relationships is important to river conservation because it helps to create a bond to a place and a community. These ties encourage a collective understanding of the importance of stewardship and conservation on the Haw River. Landowners begin to learn the significance that their land use decisions have for the public.

In addition to group meetings, we met with 15 landowners individually in order to talk with them about their current floodplain management and future plans for their property. Field observations revealed a variety of goals as well as past and current uses of these areas. Access to the river was important to the majority of the landowners. Mowed paths into the floodplain that could accommodate a four wheel drive truck were common. Vegetation management differed considerably. Approximately half of the 15 landowners had a park-like setting without shrubs and tall weeds under the tree canopy so that they could better see and enjoy the river. Others only had trails for walking or canoe access. Still others had pasture or hayfields near the river.

Some of these landowners recognized that invasive exotic species were a difficult problem to manage. Species such as autumn olive (*Eleagnus umbellata*) and tree of heaven (*Allianthus altissima*) were two common species landowners tried to manage in the floodplain. Individuals used methods such as cutting, cutting and treating with herbicide, and manually prying the smaller trees with special equipment. Those with especially extensive cover of these species asked if there were resources and expertise available to assist them in reducing or removing these species from their properties so that native plant species could thrive there instead. Various state agencies provide advice and technical assistance to landowners outlined in (Table 4).

Some of the farmers' concerns included issues related to river bank erosion. One landowner noted that fences his father established 40-50 years ago have washed into the river due to extensive erosion. Another landowner, who recently purchased property on the Haw River, has left a vegetated area between a hay field and the river, but has noticed that some of the trees in that strip have washed into the river. Cost-share programs available through the USDA may be able to assist farmers in addressing some challenges related to erosion (Table 4).

Table 4 Conservation Programs Available to Landowners
Farmland/ USDA Programs

Program Name	Purpose	Applicant Eligibility	Land Eligibility	Cost Share
CRP	protect soil, water, wildlife	individuals and groups	cropland	yes
CRP General	conservation practices to benefit large areas	individuals and groups	cropland	yes
CREP	improve water quality and wildlife habitat	individuals and groups	cropland	yes
CSP	rewards conservation stewardship	individuals	cropland	yes
EQIP	address natural resource concerns on ag. land	livestock and agricultural producers	agricultural	yes
GRP	conserve grassland	landowners with ≤ 10 acres of grassland	grassland	yes
WHIP	improve habitat	individuals, groups, governments	wildlife habitat	yes
WRP	protect wetlands	individuals and groups	wetlands	yes
NC Ag Cost Share Program	improve water quality	landowner or tenant	crop or pasture	yes

Contact: USDA offices **Alamance** (336-513-5505) **Orange** (919 644 1079) **Chatham** (919 542 2244)
 More detailed descriptions: <http://www.nc.nrcs.usda.gov/programs/>

Stewardship

Program Name	Purpose	Applicant Eligibility	Land Eligibility	Cost Share
NC Forest Stewardship Program (FSP)	landowner education, develop forest plan	private landowner (non industrial)	forestland > 10 acres	possible
CCAP* (USDA)	improve soil/water conservation	private, non-farm landowner	target watersheds	possible
Haw River Assembly (HRA)	landowner education	private landowner	Haw River watershed	
EEP (DENR)	stream restoration	private landowner	target watersheds	yes
Partners for wildlife (USFWS)	US Fish and Wildlife program for threatened & endangered species	private landowner	target species	yes

Contact: FSP: (336 562-5066) CCAP (Chatham only 542 2244) HRA (919 542 5790) EEP (919 715 5458) USFWS (919 856 4520)

Conservation

Vehicle Name	Purpose	Applicant Eligibility	Benefits
Easements	water quality, habitat, recreation, farmland, other	private landowner	tax deduction or reimbursement, retain ownership
Land Donation	water quality, habitat, recreation, other	private landowner	tax deduction
Land Sale	water quality, habitat, recreation, other	private landowner	reimbursement (possible tax deduction)

Contacts: **Alamance:** Haw River Land Stewards Program Brian Baker (229-2229); Piedmont Land Conservancy Greg Messinger (336 691-0088) **Chatham and Orange:** Triangle Land Conservancy Tandy Jones (919 833-3662) **Orange:** Orange County Lands Legacy Program Rich Shaw (245-2591)

Prioritization of Landowner Properties

We established a method to identify properties that have a more significant role in protecting the water quality of the Haw River by ranking different attributes associated with conservation. We treated contiguous parcels under one owner as a single property for this GIS-based analysis. The seven variables included for this prioritization scheme represent features of a property that are of conservation concern. Five of these factors reflect a property’s connectivity to the Haw River. The more links (such as river frontage or floodplain area) a property had to the river, the higher the priority score (Table 5). An additional variable added an element of habitat conservation by integrating acreage designated by North Carolina’s Natural Heritage Inventory into the analysis. Contiguity for both habitat conservation and recreation is also important; a variable for adjacency to protected lands captures this component.

Table 5 Property Prioritization Scheme

Variable	Range	Points
300 Foot Buffer: Percentage of property within 300 feet of river	0-49%	0
	50-74%	1
	75-89%	2
	90-100%	3
Floodplain: Percentage of property within 100-year floodplain	0-49%	0
	50-74%	1
	75-89%	2
	90-100%	3
River Frontage: Number of feet fronting river	0-650	0
	650-1299	1
	1300-2799	2
	2800-5000	3
	5000 +	4
Stream Length: Number of feet of stream within property	0-650	0
	650-1299	1
	1300-2799	2
	2800-5000	3
	5000 +	4
Stream Number: Number of streams within property	1-7: one point per stream	
Natural Heritage Inventory: Acreage of designated inventory area within property	0	0
	0.01 - 5 acres	1
	5 acres +	2
Adjacency to Protected Lands		1

In total, 58 properties received a ‘high priority’ rating based on the prioritization scheme (Table6). Conservation practitioners may use the results of this analysis to focus landowner relationship-building on key properties in this corridor. This information coupled with landowner receptivity to conservation will provide a first step for organizations to develop projects that will ensure or improve water quality for the Haw and help to achieve landowner objectives.

Table 6 Summary of Properties Receiving Prioritization Scores

Ranking	Points	Number of Properties
High Priority	7-15	58
Medium Priority	4-6	94
Low Priority	1-3	160
Not a Priority	0	124

Environmental Assessment

We assessed environmental conditions of the Haw River Corridor by determining river bank erodibility and measuring riparian forest. Both of these activities provide information for restoration targeted at improving water quality. Highly erodible banks may benefit from remedial measures to stabilize the banks, such as establishing vegetation. Understanding the current forest makeup provides a benchmark from which to compare restoration along the Haw or in its watershed.

River Bank Assessment

The study measured erodibility by calculating the Bank Erosion Hazard Index (BEHI) at 87 sites between SR 54 and 15-501 (Figure 5). BEHI takes into account features such as bank height, root depth, bank angle, and surface protection. Calculations determined index values ranging from low to high on the BEHI scale. The majority (66%) was in the moderate range for this measurement; approximately equal proportions of the remaining sites were in the low (18%) and high (16%) categories. Multiple factors contribute to BEHI scores including past and present land cover changes, the presence of dams, and underlying geology. The complex nature of the relationship between these attributes and river bank condition warrants additional study which researchers based out of Elon will address. This exercise is a preliminary step in documenting the condition of the Haw River. The knowledge base generated from BEHI scores lays the groundwork for further investigations into estimations of sediment discharge into the Haw and the impact of watershed level changes on bank erosion.

Vegetation Inventory

Determining the composition of vegetation in the Haw River Corridor is important because of the special characteristics of the forests and the functions they provide. Riparian forests not only decrease sedimentation due to stream bank erosion, these systems also take up nutrients and play an important role in flood control. We followed protocols set forth for the Carolina Vegetation Survey (CVS) which uses a flexible protocol of 10x10 meter units (Peet et al. 1998). The CVS has a central database located at UNC Chapel Hill; it is part of a larger effort documenting the vegetation communities of the Carolinas. Data collected for this project will be submitted to this statewide database. Teams completed 34 CVS plots on 15 properties. Approximately half (19) were located in three areas the NC State Natural Heritage Program (SNHA) has designated significant on the county level (Figure 5). The northernmost SNHAs were Cedar Cliff Bottomlands and Saxapahaw Sloughs and Slopes; Rock Rest Mafic Islands and Shore was the southernmost SHNA (Figure 5).

Vegetation Inventory Results

The overstory trees tended to be yellow poplar (*Liriodendron tulipifera*) and sweetgum (*Liquidambar styraciflua*) with sycamore (*Platanus occidentalis*) and bitternut hickory (*Carya cordiformis*). River birch (*Betula nigra*) was an occasional overstory tree in the Cedar Cliff Bottomlands area. Box elder (*Acer nigrum*) was also a common canopy species. Common species in the seedling and sapling layers included southern sugar maple (*Acer barbatum*) and ironwood (*Ostrya virginiana*). The Rock Rest Mafic Islands and shore supported the highest number of uncommon woody species. Small trees and shrubs along this stretch of river included Magnolia (*Magnolia tripetala*), mountain laurel (*Kalmia latifolia*), and wild azalea (*Rhododendron nudum*); common hop-tree (*Ptelea trifoliata*) was found near one of the plots. Additionally, cane, (*Arundinaria gigantea*) was present in one plot in this area. There was also a stand of mountain laurel in the Saxapahaw Sloughs and Slopes area.

Many landowners recognized the presence of invasive exotic species on their properties. Some have begun removing species such as autumn olive (*Elaeagnus umbellata*) and tree of heaven (*Ailanthus*

altissima) due to their aggressive spread along the river. Autumn olive existed in 62% of the plots. Tree of heaven existed in 18% of the plots.

Assessing the current conditions in these forests provides a baseline from which to assess changes in the vegetation. Alterations in forest composition, such as from high levels of invasive exotic cover, may affect the long-term integrity and sustainability of these communities and diminish the functions they furnish for the watershed. Continuing research based at Elon will address questions related to invasive exotic spread in the Haw River floodplain.



Figure 5. Environmental Assessment Overview

IMPLEMENTATION

Goals

Conservation goals include ensuring water quality, preserving habitat, and increasing public access along the Haw River. North Carolina Parks and Recreation envisions that the Mountains to Sea Trail will run along parts of the Haw with a spur connecting it to public land surrounding Jordan Lake. Additional objectives include sustaining water quality as well as improving access for water-based recreation.

Approaches and priorities

Donations and purchases of land and easements from willing landowners coupled with the use of existing public land will be the primary vehicles for achieving this goal. One approach involves connecting parcels that are already under some sort of protection in order to create contiguous conservation areas. Other priorities include gaining access for recreational purposes and conserving lands designated by the NC Natural Heritage program. The prioritization process of the Lower Haw River Corridor Project uses these concerns and includes variables associated with water quality in order to guide conservation efforts.

Involved parties

Different conservation organizations have begun implementing projects in the northern and southern reaches of the study area. Land Trusts such as the Piedmont Land Conservancy in Alamance County and Triangle Land Conservancy (TLC) in Orange and Chatham counties have been partnering with governmental entities to preserve lands in the Haw River corridor. Initiatives such as the Lands Legacy Program in Orange County and the Haw River Land Stewards Program in Alamance County are also conserving land along the Haw. Additionally, the Haw River Assembly is an active promoter of land conservation in this corridor.

General steps

Organizations will initiate contact with the owners of high priority properties that have expressed interest in conservation programs. An alternative approach is to contact interested landowners with lower priority properties. Field visits have found that landowners often know neighbors or are related to others owning land on the river. These receptive landowners can provide contact information and a trusting reference to facilitate conversations with other landowners. Conservation professionals can have their efforts snowball into significant projects even on properties that are not as high a priority for water quality protection, wildlife habitat, or other conservation goals. The conservation of several parcels together may sum to a high priority stretch of river. Therefore, opening dialog with interested parties is a crucial first step for many segments of the river.

The technical appendix has information on property priorities and landowner interest for 21 sections within the study area.

A combination of public and private organizations has begun conservation efforts along the main trunk of the Haw River. There are, however, different approaches organizations at the northern end of the study area take from those working at the southern end. Local governmental entities are more active at

the northern end while NC State Parks are active at the southern end. The organizations at the northern reaches are working downstream and the organizations at the southern end are working upstream in order to create contiguous protected areas.

Northern Reaches

In the northern reaches near I-85/40, innovative measures by Graham, Burlington, Swepsonville, and Alamance County governments and parks and recreation departments enhance public greenspace and protect water quality by utilizing existing public land. Improved public access will garner political support to continue building upon a conservation corridor along the Haw River. Success generates interest and fosters environmental stewardship of the river in areas such as Glencoe Mill Village, Town and Country Park, and on Swepsonville parkland. This work has expanded to include the establishment of trail easements on private land

Private property predominates along the Haw River, therefore, organizations that work with private landowners are very important. The Haw River Land Stewards Program focuses on private landowners having property touching the river. Meetings and other means of contact help to develop relationships that are crucial for protecting private lands. This program serves as a conduit for information and conservation opportunities. Landowners benefit by learning about the different options for conservation they can pursue; in return they inform the program of their plans to sell or subdivide their property. The line of communication this program creates will allow conservation professionals to more efficiently identify projects and achieve goals for the Haw River Corridor's protection. Moreover, the Piedmont Land Conservancy has been working with private landowners along the Haw River with one pending project for river corridor protection.

Southern Reaches

The Haw River corridor in Chatham and Orange counties is one of the priority corridors for the Triangle Land Conservancy. Past accomplishments by TLC in this corridor have included establishing conservation easements in the floodplains of three adjoining properties in an ecologically sensitive area of the corridor. They employ various conservation tools based upon the desires of the landowners they contact. Since the Lower Haw River Corridor Project began, TLC has worked in the study area with NC State Parks and Recreation to acquire two parcels near 15-501, additionally they are in negotiations for a third tract of land near Chicken Bridge in Chatham County.

Discussion

The products of this report help to make the efforts of conservation professionals more effective by providing relevant information on various social and environmental aspects of the Haw River corridor. Contextual data and analyses will aid in the framing of grant applications to pursue funding for conservation projects. Data on environmental conditions provide benchmarks to which to compare future states in this watershed. Additionally, activities in the field and in communities have helped to initiate relationships between interested landowners and conservation organizations so that landowners can achieve the goals they have for their land.

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Appendix

Watersheds

The Haw River Basin composes a large proportion of Upper Cape Fear watershed. It lies in portions of eleven Piedmont counties (Figure 1). Its headwaters begin in northeast Forsyth County and the main trunk conjoins with the Deep River to form the Cape Fear on the Lee and Chatham county boundaries. The US Geological Survey (USGS) and North Carolina Division of Water Quality (DWQ) define the watershed and sub-basins in a nested fashion by assigning Hydrological Unit (HU) codes. Higher number units in an HU code indicate smaller sub-basins. The study area's properties are within 4 sub-basins: 03030002030 03030002040 03030002050 03030002060 with 11 unit HU codes (Figure A1).

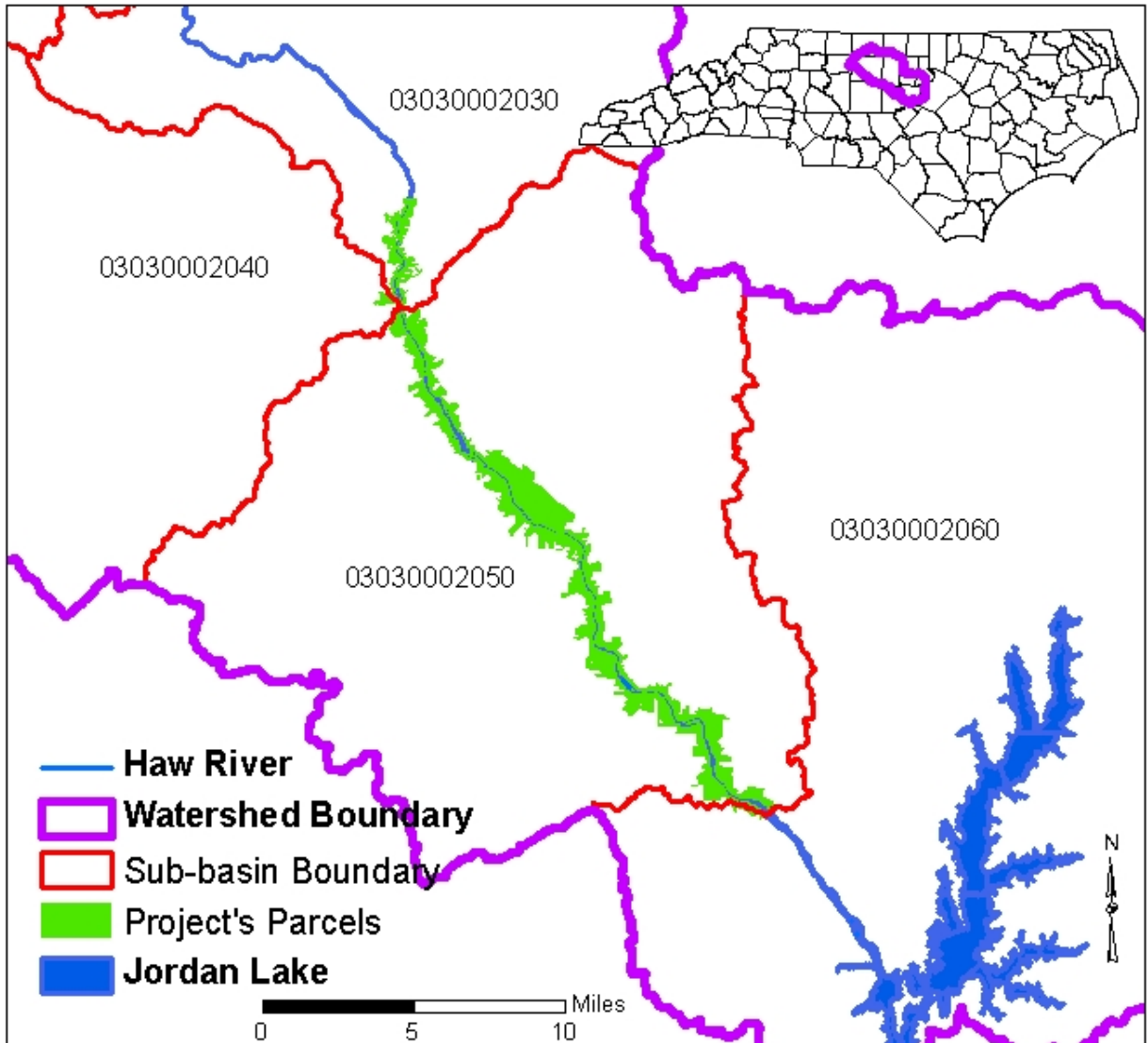


Figure A 1 Sub-watershed Boundaries

Sub-watersheds are further subdivided into small sub-watershed boundaries, each having a 14 digit HU code. The study area's property boundaries are within 13 of these smaller watersheds (Figure A 3).

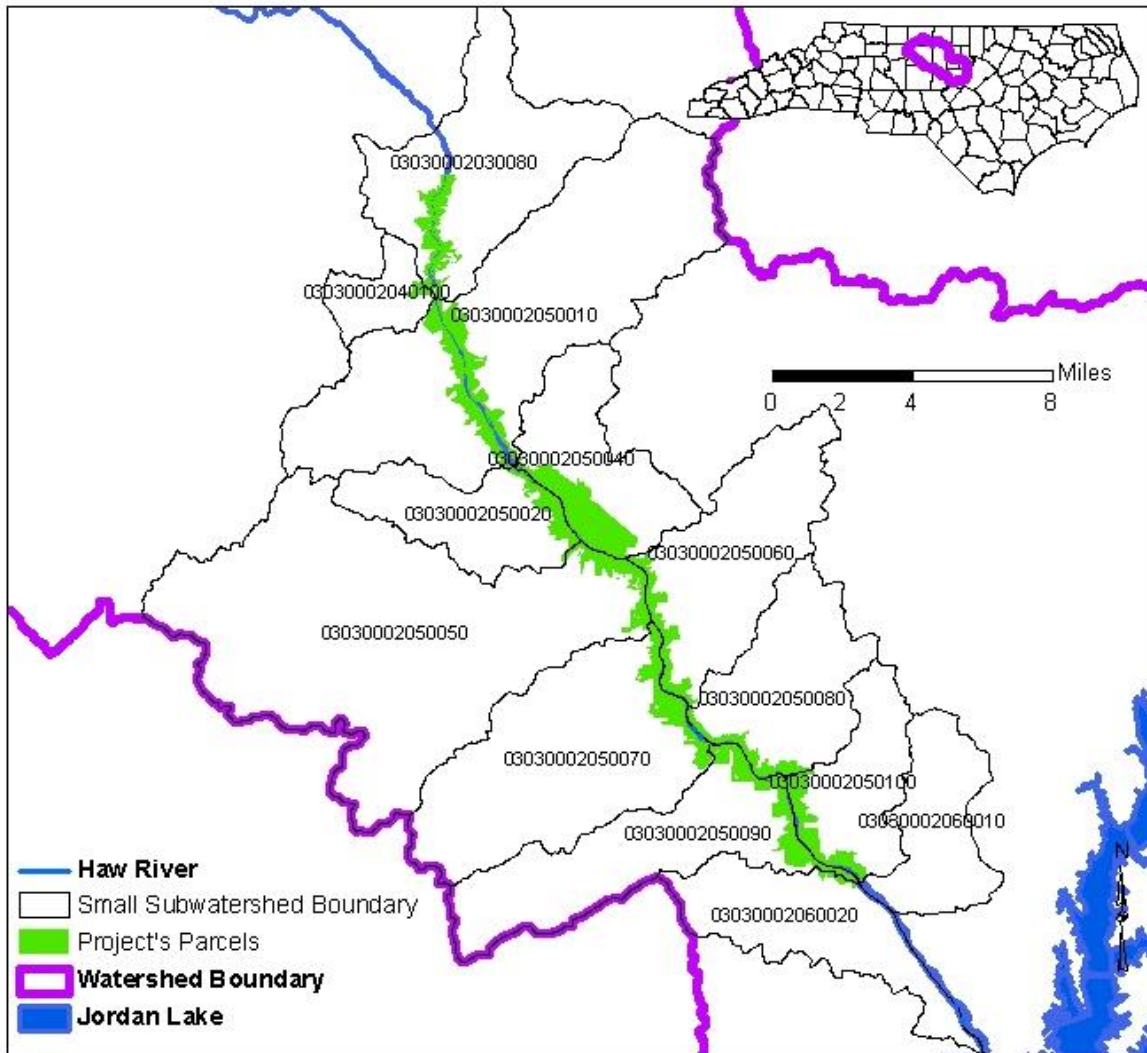


Figure A 3 Small Sub-watershed Boundaries

We would like to know whether you are interested in helping us with our cataloging of the vegetation along the Haw by allowing us to identify plants near the river on your property, please check the box and fill in the appropriate spaces

I am willing to be contacted about this project

Please let us know the best way we can contact you:

Phone number: _____

Best time to call: _____

ELON UNIVERSITY 

**Haw River Project
David Welch
2625 Campus Box
Elon University
Elon, NC 27244**

We would also like to know whether you might be interested in obtaining more information about conservation on your land.

I would be interested in learning more about grants and tax incentive programs for my property related to the conservation of:
(please circle 1 or more of the following 4 choices)

Land Soil Farmland Forests

I would be interested in learning more about hosting the Haw River Trail on my property

I am interested in receiving the Haw River Trail's e-newsletter about conservation and recreation efforts on the Haw River.

ELON UNIVERSITY 

Figure A 4 Example of Postcard Sent to Landowners

Table A 1 Additional Contact Information for Conservation Professionals

Contact Information for Conservation Professionals

Organization	Contact Name	Phone	email	
Alamance County USDA	Phil Ross, Rick Bailey	336 513 5505	phil.ross@alamance-nc.com	agriculture
Chatham County USDA	Michael Sturdevant	919 542 2244		agriculture
Orange County USDA	Brent Bogue	919 644 1079	brent.bogue@co.orange.nc.us	agriculture
Stewardship Contacts				
NC Wildlife Commission	Daniel Ray	336 562 5066	danielray@embarqmail.com	forest
Chatham County USDA	Kathryn Morris	919 542 2244	Kathryn.morris@nc.usda.gov	water
	Elaine Chiosso, Cynthia Crossen			stream pollution
Haw River Assembly	Catherine Deininger	919 542 5790	info@hawriver.org	prev.
DENR Ecosystem Enhancement Program	Michael Herman, Deborah Amoral	919 715 5458	michael.herman@ncmail.net	stream
US Fish and Wildlife	John Ann Shearer	919 856 4520	JohnAnn_Shearer@fws.gov	wildlife
Clean Water Management Trust Fund	Nancy Guthrie	919 387 8070	nancy.guthrie@ncmail.net	water
Land Conservation Contacts				
Triangle Land Conservancy (Chatham and Orange counties)	Tandy Jones	919 833 3662	tandy@tlc-nc.org	land conservation
Piedmont Land Conservancy (Alamance County)	Greg Messinger	336 691 0088	gmessinger@piedmontland.org	land conservation
Haw River Land Stewards Program	Brian Baker	336 229 2229	brian.baker@alamance-nc.com	land conservation
Orange County Recreation	Lori Taft	919 245 2660	ltaft@co.orange.nc.us	recreation (trails)
Orange County Lands Legacy	Rich Shaw	919 245 2591	rshaw@co.orange.nc.us katie.armstrong@ncmail.net	land conservation
NC Parks and Rec	Susan Carl, Katie Armstrong	919 733 4181	Susan.Carl@ncmail.net	land conservation

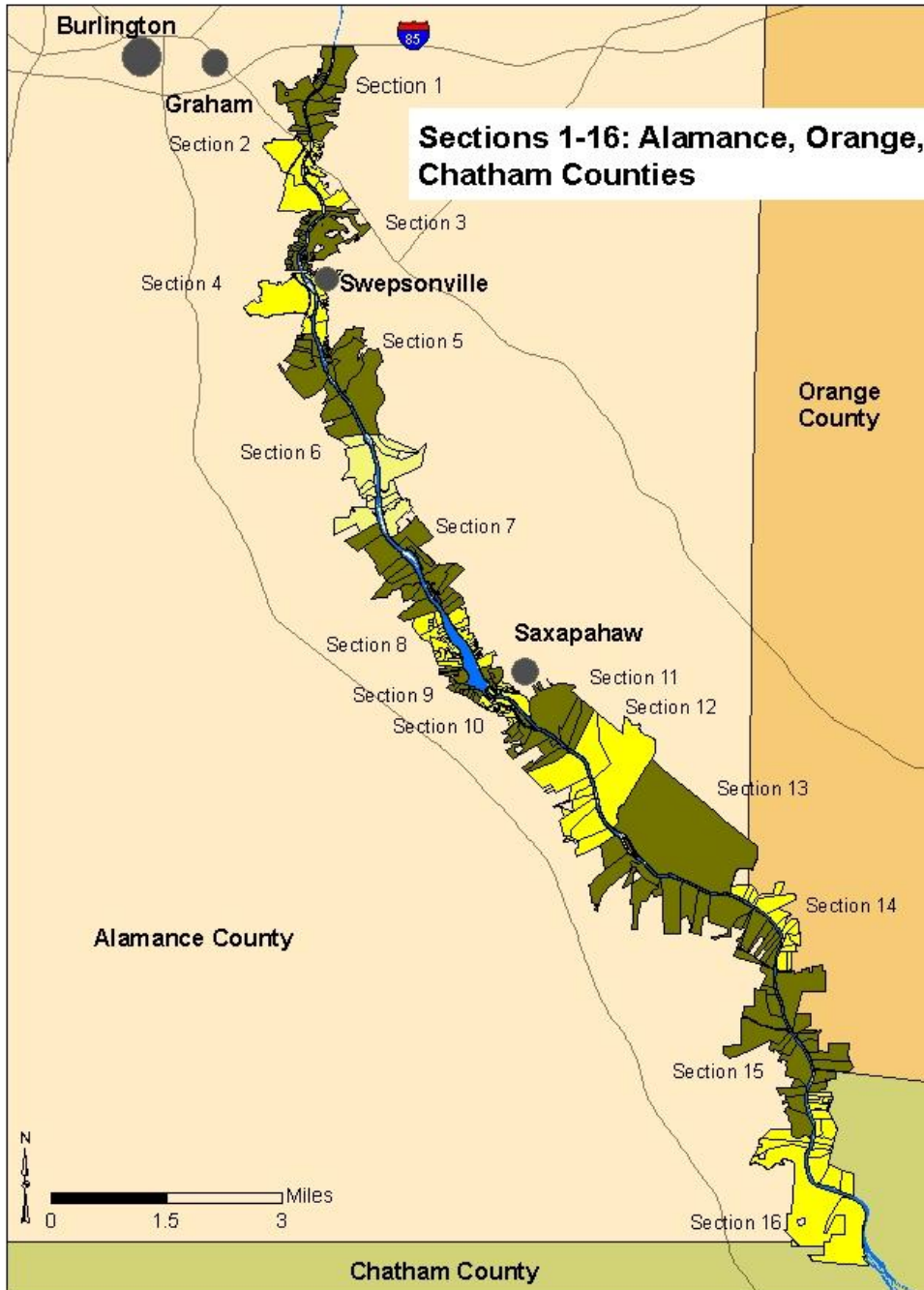


Figure A4 Sections 1-16

Sections 1-16 are the northern reaches of the study area. Piedmont Land Conservancy, Haw River Land Stewards Program, and parks and recreation departments from Graham, Alamance County, Burlington, and Swepsonville are active in conservation along this stretch of river.

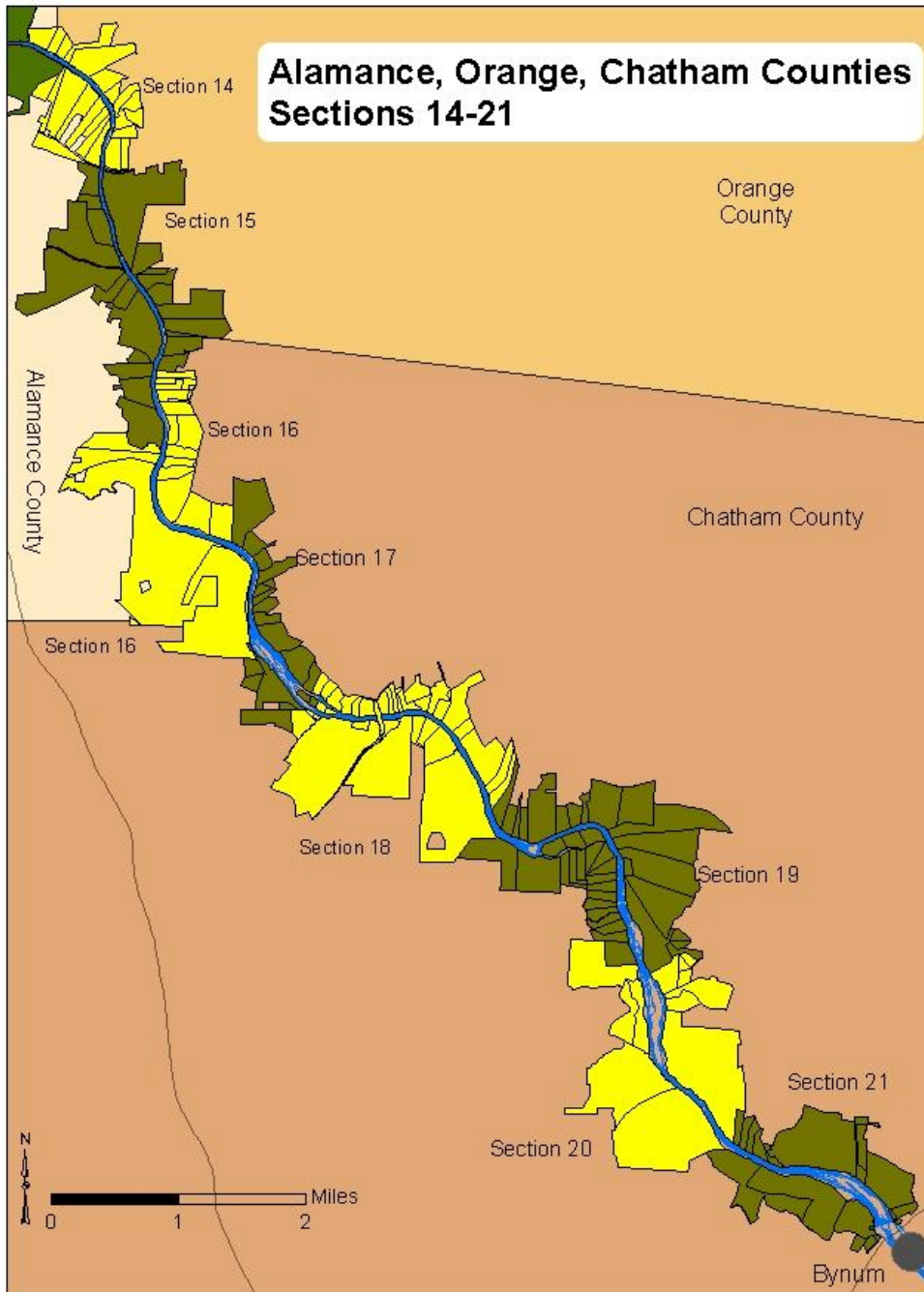


Figure A5 Sections 14-21

This sections constitute the souther reaches of the study area. Triangle Land Conservancy and Haw River Assembly are actively working to preserve lands in this stretch of river.

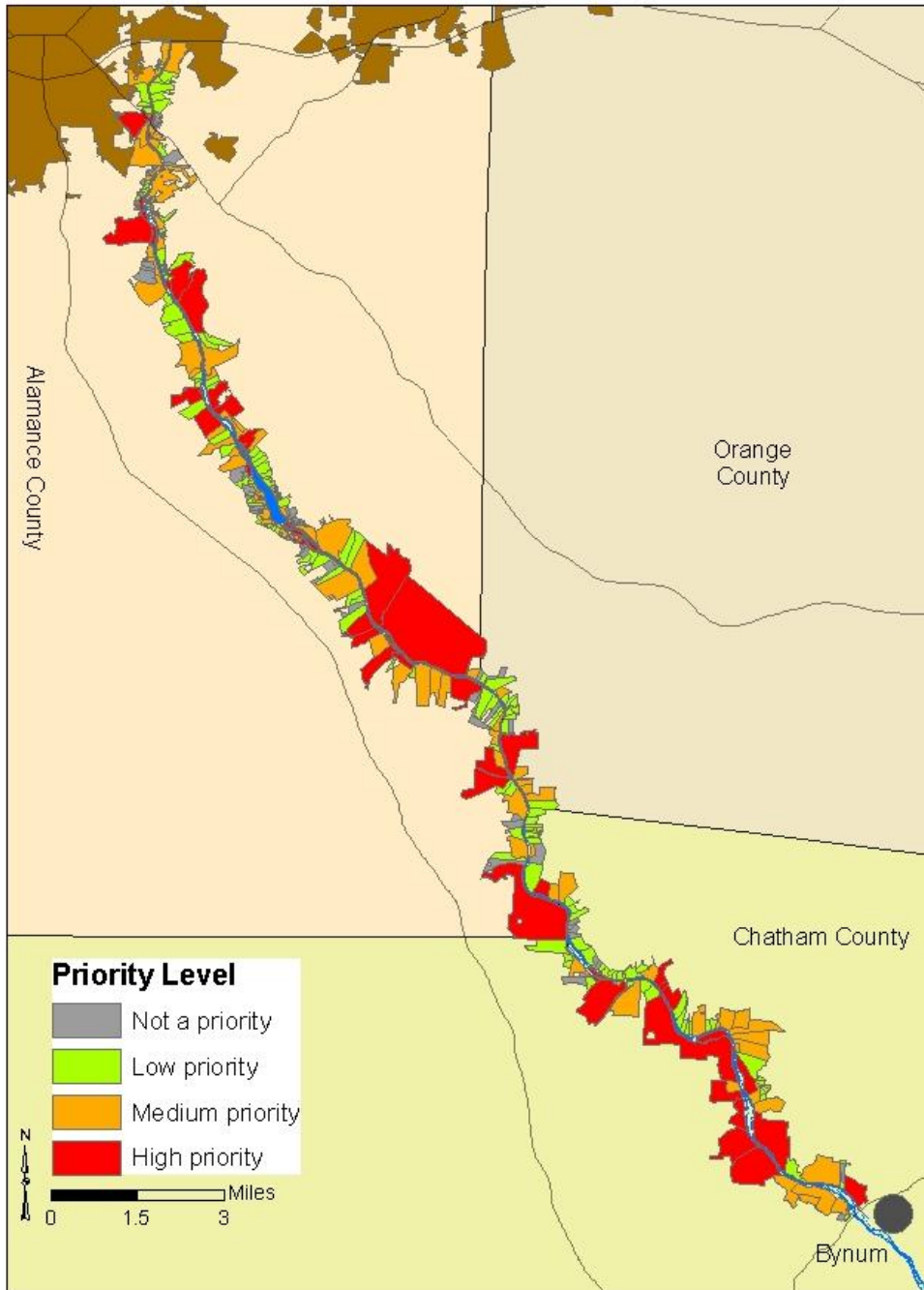


Figure A6 Property Prioritization Results

The Prioritization process ranked properties based on conservation-related attributes. Water-quality attributes included river frontage, stream length, stream count, area within the 100 year floodplain and area within 300 feet of the river. Species habitat attributes included the acreage of NC Natural Heritage Designation. An additional variable for connectivity places a higher priority for properties adjacent to protected lands. Protected lands include conservation easements, NC State Parks, the Cities of Graham, and Burlington, and Alamance County.