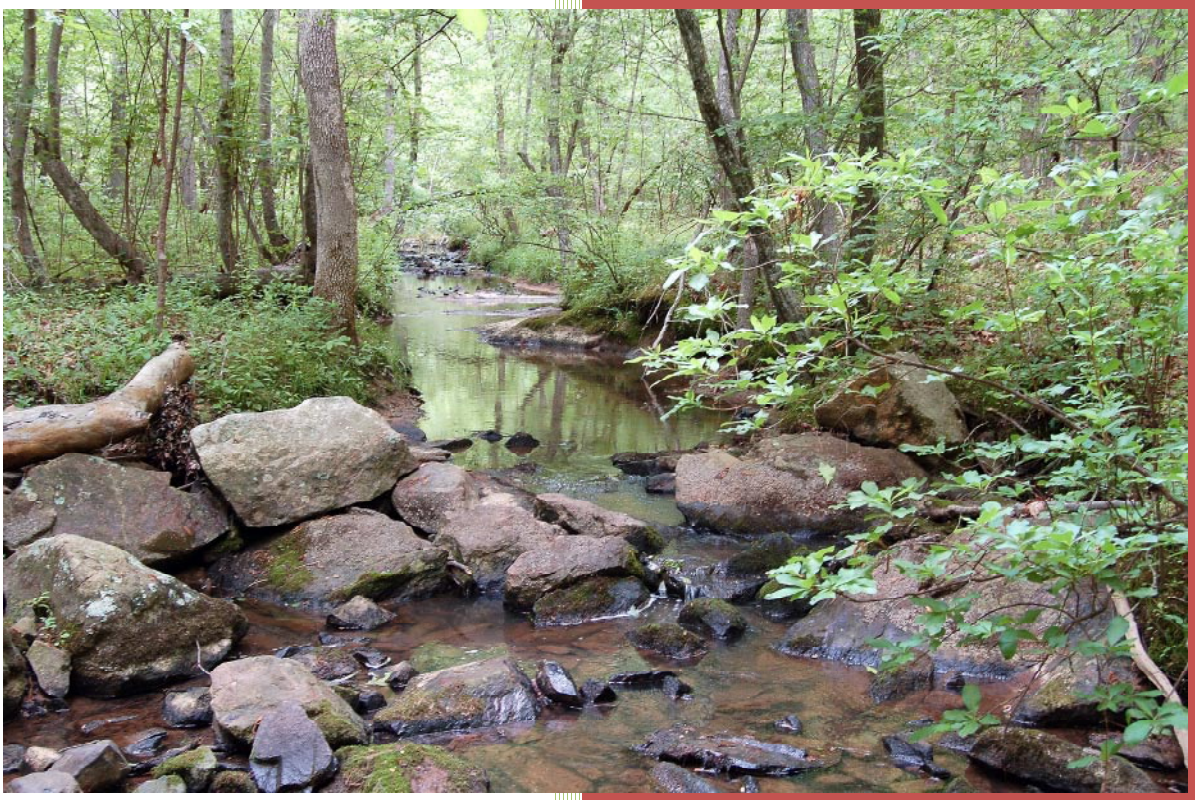
Little Alamance, Travis, & Tickle Creek Watersheds Report & Project Atlas:

An Ecosystem Enhancement Program Funded Local Watershed Plan Phase III



Prepared by:

Piedmont Triad Council of Governments

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PIEDMONT TRIAD COUNCIL OF GOVERNMENTS

Ecosystem Enhancement PROGRAM

Little Alamance, Travis, & Tickle Creek Watersheds Restoration Plan

Prepared For & Funded By:
The North Carolina Ecosystem Enhancement Program

Prepared By:
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Introduction

The Little Alamance, Travis & Tickle Creek Watershed (LATT) occupies 52 square miles in western Alamance County and eastern Guilford County, NC, just north of the US I-40 highway. Little Alamance Creek (LA) is considered an impaired waterbody by the NC Division of Water Quality (DWQ). NC DWQ monitoring indicated the waters of Little Alamance Creek violate the Clean Water Act for impaired biological integrity; an analysis conducted in 2000 determined that the stressor was urban stormwater runoff. Travis and Tickle Creeks (TT) are listed as impaired for biological integrity in the 2008 Draft 303(d) list of impaired waters for having "Fair" bioclassifications, meaning that the watersheds did not possess the ecology they should, according to NC DWQ standards (NC DENR, 2005; NC DENR, 2006).

The watersheds have two predominant land uses, rural and urban. Alamance County is historically an agrarian community, with Burlington and Graham providing an industrial center focused on textiles. Recently, the urban areas of Burlington and Graham have expanded, and contributed low-density impervious coverage to the watersheds. The current urban area occupies 57% of the land in the LATT watersheds.

The NC Ecosystem Enhancement Program (EEP) Local Watershed Plan (LWP) process was used to develop a plan to remedy these water quality issues. The LWP is designed to assess watershed conditions and identify opportunities to improve and protect watershed functions. This process also helps address EEP's institutional need to mitigate impacts to streams and wetlands in the Haw River Basin from NC Department of Transportation (NCDOT) projects and other development-related impacts. Originally, the TT watershed was included in the LWP due to field-observed opportunities to restore impacted streams and wetlands along with the subwatershed's proximity to the ecologically- and socially-valued Haw River. The impaired status of the Travis & Tickle Creeks now makes such attentions a necessity.

The PTCOG partnered with EEP and conducted a LWP Phase I assessment of the water quality impacts and watershed needs in all LATT watersheds in 2006. Six goals for the project were identified during this phase by the project's stakeholder group. These six goals are:

1) **Increase local government awareness of the impacts of urban growth on water resources –** through a review and analysis of current local watershed policies and ordinances, ascertain what is already being done to manage urban water impacts, and work with these governments to improve their understanding of the environmental, social, and economic benefits of stormwater management.

2) **Strengthen watershed protection standards –** through watershed policy review, identify weaknesses in current watershed management approaches and work with current planning and administrative staffs to improve water quality protections within their jurisdictions for sustainable watershed management.

3) **Improve water quality through stormwater management –** identify projects and programs that may aide urban jurisdictions in their management of stormwater and restore impaired waters (i.e., Little Alamance, Tickle, and Travis Creeks) to supporting status.

4) **Identify and rank parcels for retrofits, stream repair, preservation, and/or conservation –** through a combination of GIS analysis and field work, objectively locate and prioritize projects within both watersheds that most efficiently and effectively restore supporting habitat conditions to both watersheds and facilitate stewardship.

5) **Assess aquatic health to identify stressors that are the most likely causes of poor biological conditions –** NC DWQ assessments of both watersheds will help identify pollution sources, allowing for strategic project and policy approaches for quick and effective mitigation (NC DWQ, 2008).

6) **Meet requirements of outside funding sources for implementation of projects –** identify potential federal, state, and private funding sources for further watershed evaluation and/or project implementation, and have a working knowledge of what their criteria are for project proposals (PTCOG, 2007).

EEP approved funding for the PTCOG to execute a LATT LWP Phase II/III watershed assessment in Winter 2007; work began in Spring 2007. The Phase II *Little Alamance, Travis, & Tickle Creek Watersheds Assessment* collects the DWQ monitoring data and the PTCOG field assessments data, and uses it to determine the subwatersheds within the LATT watersheds that contribute most to the current status of impairment in all three streams (PTCOG 2008). The fundamental product of the Phase II planning process is the guidance on where possible restoration efforts may most effectively serve the watersheds.

This Phase III report directs stakeholders on restoration and conservation priorities for the LATT. It is a companion piece to the *LATT Watershed Assessment*, providing stakeholders a list of project and policy measures they can invest in to remediate water quality in the LATT streams, and then apply to ensure the long-term care of the watershed. It comprehensively addresses all Goals identified in the Phase I planning process.

There is a need to approach watershed restoration with both projects and policies. Projects address obvious impacts to current watershed health, such as eroding streambanks. Policy changes provide a more long-term strategy for sustainable watershed stewardship. In the LATT watersheds, where the major impact to water quality impairment appears to be stormwater, this is especially important. Projects can attenuate stormwater impacts, but to definitively solve stormwater degradation, communities must create ordinances that specifically focus on minimizing stormwater impacts upon watershed streams and citizens. Solutions to the LATT watersheds' current impairment can be found in the following *Policy Recommendations* and *Project Atlas* chapters, but success will only be found through a combination of both approaches. Restoration efforts throughout NC – including a number of EEP planning efforts – provide evidence of the efficacy of this two-pronged approach.

Management Strategies

Following 24 months of watershed characterization, analysis, assessment, and planning by the LATT watersheds Stakeholders, the LATT Technical Team (PTCOG, EEP, & NC DWQ) recommends the following 10 detailed policy and management strategies for implementation by local, regional, and state-level watershed stakeholders of the non-profit, public, and private sectors.

LATT Watershed Management Strategies

Watershed Restoration Projects

1. Stormwater Retrofits
2. Stream Repair Projects
3. Riparian Buffer Restoration
4. Improved Stream Maintenance

Strategies to Prevent Future Degradation

5. Improved Site Design
6. Rural Lands Protection
7. Restriction of Chemical Applications
8. Improved Enforcement of Existing Rules

Strategies to Increase Watershed Stewardship

9. Watershed Outreach & Education
10. Stream & Watershed Monitoring

The recommendations here are based upon the level of effort needed to improve water quality conditions; the needs the watershed (i.e. flood prevention); implementation feasibility; and community benefit. The recommendations are informed from the fieldwork, watershed analysis, NC DWQ monitoring data, and discussions held amongst the Stakeholders Committee and the Technical Team. These recommendations are directly informed by comments from all invested parties in the watershed planning process. Each recommendation section outlines data findings, specific recommendations, and potential drawbacks or obstacles.

Watershed Restoration Strategies

The three impaired LATT creeks are unable to support sufficient levels of aquatic life according to established NC DWQ standards. Four of these ten recommended management strategies are meant to directly restore degraded watershed functions. The LATT stakeholders and technical team refer here to these four approaches (stormwater retrofits, riparian buffer restoration, stream repair, and improved stream maintenance projects) as "watershed restoration." Examining the LATT watersheds as a network of smaller stream watersheds uniform in land use, slope, and hydrology (aka subwatersheds), project stakeholders prioritized the densest areas of development in the LATT watersheds for field assessments and conducted two stages of fieldwork in April, May, and October 2007 (Subwatersheds LA 2, LA 3, LA 6, LA 7, LA12, & LA 13; TT 2, TT 4, TT 6, TT 7, TT 8, TT 9, TT 10, TT 11, TT 12, & TT 15). The subwatershed delineation methodology is described in detail in the *LATT Watershed Assessment*.

The field assessments were composed of streamwalk assessments of over 34 stream miles (42%) of the LATT creeks and tributaries, and a week of windshield-based upland assessments of the watershed to identify potential agricultural impacts to water quality. Table 1 summarizes the number of potential watershed restoration opportunities in each subwatershed. The 246 watershed restoration projects identified through LATT

field work were prioritized for restoring water quality and aquatic habitat conditions in degraded stream reached (Figures 1 & 2). General conclusions for from LATT fieldwork include:

- The needs and density of watershed restoration projects differ in the two watersheds. The LA watershed is significantly more urbanized than the TT watershed, and requires greater investment in attenuating stormwater impacts upon watershed health. LA priority projects identified in this plan include 24 buffer restoration projects, 48 stream repair needs, and 19 stormwater retrofit opportunities. In contrast, priority projects identified by this plan in the TT watershed include 17 buffer restoration projects, 23 stream repair needs, and 6 stormwater retrofit opportunities.

Projects within 100 yards of each other were clustered to better address multiple watershed functions and health needs simultaneously. Implementing clustered projects is expected to have the greatest benefit to hydrology, water quality, and aquatic habitat, and has been a successful strategy in other EEP watershed restoration efforts. It effectively reduces the number of LATT watersheds project sites from 246 to 110.

There are many opportunities to implement highly-visible restoration, repair, and retrofit projects that inherently provide educational benefits. PTCOG can coordinate such projects through its *Stormwater SMART* program (www.stormwatersmart.org), designed to improve watershed education and stormwater management. SMART has an established presence in all of the LATT communities, and a rapport with the administrative and utility staffs on stormwater education and outreach needs, except Guilford County, which relies upon the City of Greensboro for stormwater education and outreach.

- Overall, buffer restoration, stream repair, and stormwater retrofit projects can improve the LATT watersheds health, particularly their hydrology and soil stability. However, this protection is limited and illustrates the need for comprehensive, sustainable watershed management.

Completed LATT Field Work 4/30 – 5/16/2008			
Subwatershed	**Stream Miles Covered**	**Total Stream Miles**	**Potential Projects**
LA2	2.1	3.1	32
LA3	1.3	2.5	18
LA5	0.7	1.7	6
LA6	1.7	2.9	7
LA7	2.2	3.0	16
LA10 –partial	0.9	3.2	4
LA12	2.3	6.3	35
LA13	7.1	1.0	38
Little Alamance Totals	**18.3**	**23.8**	**156**
Percentage of Streams Walked	**77%**		
TT4	4.9	10.4	23
TT6	4.6	17.1	23
TT7	2.4	12.0	20
TT8	1.5	9.1	3
TT11	2.4	8.3	21
Totals	**15.8**	**56.9**	**90**
Percentage of Streams Walked	**28%**		

Table 1: Potential Restoration Projects Identified Through LATT Fieldwork

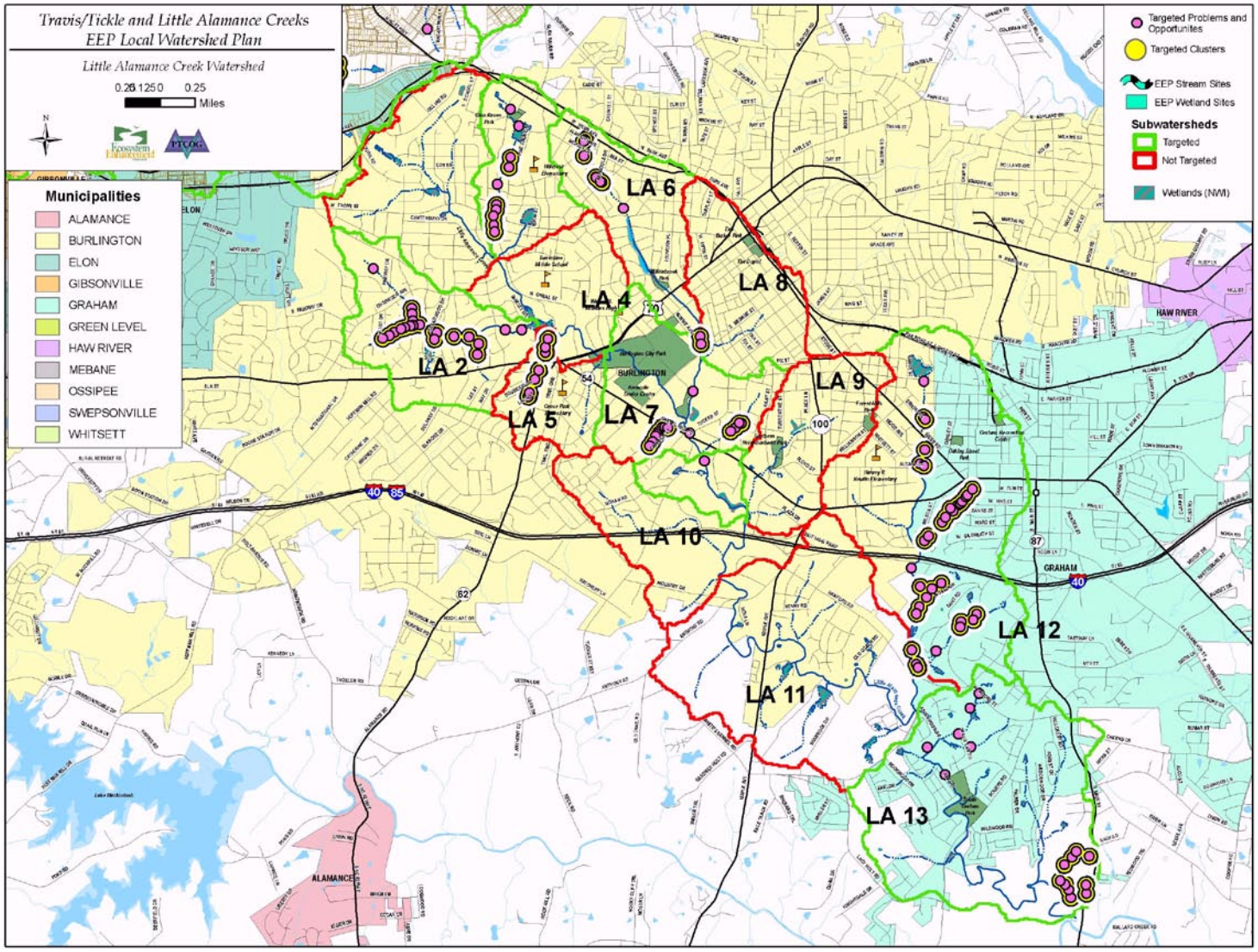


Figure 1: Little Alamance Field Data & Project Opportunities

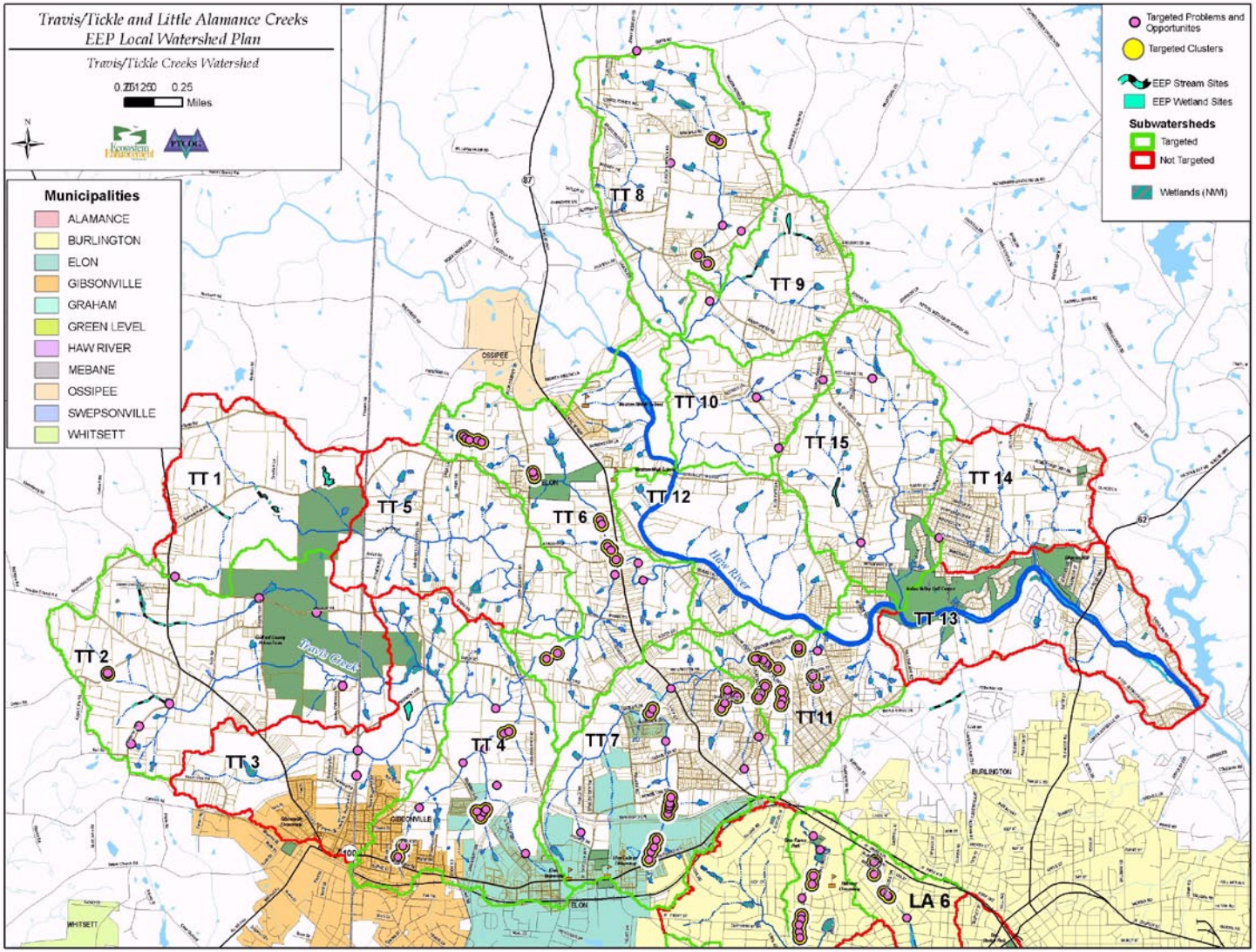


Figure 2: Travis & Tickle Creek Watershed Field Data & Project Opportunities

Recommendation 1: Stormwater Retrofit Projects

The Problem

As the LA watershed has urbanized, both the volume and rate of stormwater runoff have increased, resulting in stream instability, in-stream erosion, and increased pollution that contribute to the impairment of LA and its tributaries. Stormwater best management practices (BMPs) such as wetlands, rain gardens, or grass swales installed within the stream corridor or upland areas can capture and treat stormwater runoff before it reaches the streams (Hunt, 2005). Although the watersheds' Cities and Guilford County currently require BMPs for most new development, most of the development in LA watershed predates the regulations. Retrofitting existing sites is an expensive, but often necessary way to correct existing impacts. This will be even more of a pressing issue when these communities have to reduce their nutrient contributions in the Jordan Lake Reservoir watershed to comply with NC DWQ's proposed nutrient loading targets for this larger watershed. Stormwater utility fees are common to all LATT urban centers, but communities will need to invest the time to develop sustainable financing for this role and its responsibilities, especially as they grow under the proposed Jordan Lake Rules. Further funding is likely needed to fulfill compliance and truly invest in sustainable stormwater management. Though there is public funding to currently support such projects, it will become more difficult to procure following passage of any state legislation governing municipal responsibilities for restricting nutrient productions. In anticipation of this reality, it would be wise to raise stormwater utilities now to have a funding pool that can adequately address these concerns in the future.

TT is also experiencing stormwater impacts to its water quality from roads and smaller developed communities, and they are a significant factor to habitat degradation. Alamance County currently does not require stormwater BMPs for new developments, and this places all waters – including the Haw River – at risk from future developments. Future impacts of development upon water quality could be avoided easily, but with no zoning and little land use regulation in Alamance County, there is no guarantee that this will happen. The resulting development impacts will prove costly, particularly if communities must retrofit their developments under DWQ's Jordan Lake nutrient management strategy ("Rules").

Findings

- Fieldwork identified 29 sites with a high potential for retrofit in the watersheds
- 9 of the retrofit opportunities are in urban subwatershed LA 13.
- 3 projects are either on public land or on the land of a reportedly willing landowner.

Recommended management strategy

Construct the identified stormwater retrofits, beginning with those most densely positioned relative to each other. Overall, the 29 identified retrofits can be described as follows:

- Retrofit public sites as demonstration projects;
- Outreach to churches to maintain and enhance sheet flow off parking lots;
- Consult with the City of Burlington in regard to investing in a Stormwater Specialist and the services they can provide communities;
- Consult with the City of High Point on the staff and resource needs for the effective enforcement of stormwater features and retrofit projects (City of High Point, 2007);
- Emphasize investments and efforts in the urbanized and heavily-impaired subwatershed LA13.
- Anticipate stormwater retrofit and maintenance investments that will be required under NPDES Phase II and the Jordan Lake Rules, and attempt to meet these needs through grant funding and increases in the stormwater utility surcharges;
- Avoid, or minimize, impacts to existing forests and wetlands as filter areas;
- Address commercial areas' on-site stormwater needs through retrofitting highly impervious sites with stormwater and pollution source control measures, more commonly known as Best Management Practices;
    - Consult with the NC State University (NCSU) Cooperative Extension Water Quality Group (http://www.bae.ncsu.edu/programs/extension/wqg/) – a nationally-recognized leader in stormwater BMP design and construction;
- Encourage planting of native trees and shrubs, particularly within 30-ft. riparian corridors;
- Use stream buffers and rain gardens in older neighborhoods;
- Convert existing dry ponds to improved stormwater treatment devices such as wet ponds or stormwater wetlands;
- Identify and inventory stormwater BMP opportunities for large commercial, industrial, public, and residential areas not visited in this planning process; and
- Treat larger drainage areas on County and City-owned lands.

Recommendation 2: Riparian Buffer Restoration

The Problem

LATT creeks are recognized by the State of North Carolina as "impaired" because of their respective inabilities to support aquatic life. LA is listed by DWQ as having "Poor" bioclassification, while TT has a "Fair" listing. Stakeholders may conclude that LA is more severely degraded than the TT watershed streams due to stormwater impacts. There is broad, scientifically-based consensus that contiguous, intact riparian areas are essential for the healthy functioning of streams (McNaught, et al., 2003). In the LATT waters, streambank root systems provided by riparian buffers may be the only line of defense for preventing further stream channel erosion and sedimentation. Furthermore, buffering zones provide the service of filtering debris and toxic chemicals from surface flow before it reaches catchment waters. Streambanks in the LA watershed that are completely armored not only see increased risks of flash flooding and poor surface water filtration, but also have more degraded aquatic habitat due to more intense stormflow velocity downstream.

Most of the jurisdictions included in this watershed assessment have restrictions regarding development within floodplain and water supply watersheds. However, the rules apply to new development only, and because the LATT waters are not water supplies, many of these rules have no authority to improve water quality conditions in the LATT watersheds. The result is that many riparian areas in the LATT watershed are impacted, thus further reducing the benefits buffers provide. The highly-degraded streambanks and beds in downtown Burlington bear witness to the impacts a lack of buffers can cause. Requiring little investment, buffers in the TT watershed will effectively mitigate agricultural impacts upon water quality. The City of Burlington Parks & Recreation Department has initiated a pilot project that maintains a 15-ft. buffer along LA in the Burlington City Park, located in the City's core. This project will yield significant gains through a simple change in management of these grounds, and could easily be replicated throughout the watersheds. Without such actions, though, streambanks in these communities and downstream of them will continue to worsen, further aggravating the conditions which led to the current impaired status of these watersheds.

<u>Findings</u>

- Though evenly distributed in general, subwatersheds LA7 and LA13 have the greatest number buffer restoration or enhancement needs, with 8 and 7, respectively. Both of these watersheds are located in central urban areas, downstream of developed headwaters (LA6, LA8, LA12);
- 10 recommended projects are either on public land or on land owned by a reportedly willing landowner;
- Many buffer restoration opportunities are contiguous within the same stream corridor, and repair opportunities were nearly uniform throughout the LATT watersheds; and

- Stream reaches with riparian buffers are more resistant to channel erosion than are streams with no buffers, and roots may be the only protection for stream banks in most areas.

Recommended management strategy

- Prioritize projects on public lands (in some cases, changing management practices or simple plantings may suffice);
- Contact landowners on lands intersecting high priority buffer restoration opportunities;
- Write and enforce an ordinance prohibiting disturbance of areas within at least 30 feet of streams (NC DFR, 1990);
- Reference and consult with the City of Greensboro and/or the City of High Point about their successful riparian buffer network, especially implementation and maintenance (City of Greensboro, 2008; City of High Point, 2007);
- Conduct annual stream walks and/or review aerial photography in the watersheds. Stream walks will help identify new restoration opportunities and strengthen enforcement of the riparian buffer protection regulations (see Recommendations 5 & 8). The long-term goal should be to have no buffer restoration needs in the watershed;
- Partner with NC EEP to restore high priority buffer sites in LATT watersheds that meet their project requirements; and
- Partner with local stakeholders – notably the Alamance County Soil & Water Conservation District (ACSWCD) and the Haw River Trail advocates – on priority buffer projects in the LATT watersheds;
- Monitor water quality regularly downstream of all targeted buffer sites to note any changes in conditions due to efforts.

Recommendation 3: Stream Repair Projects

The Problem

The LATT are recognized as impaired by NC DWQ because of their respective inabilities to support aquatic life. Both monitoring and fieldwork confirm that the threats facing LA are different than those affecting the TT creeks. A significant area of the LA watershed (33%) is impervious to water, and this has led high volumes of surface water flow that cause severe streambank erosion and streambed scouring. At these levels, the CWP has found that impervious surfaces can be directly tied to "non-supporting" streams and creeks (Capiella & Brown, 2001). The conditions observed from field assessments in the LA watershed support this conclusion.

The central area of the LA watershed in downtown Burlington appears to suffer the most degradation from stormwater impacts, with highly eroded stream banks and poor riparian buffer habitat. The Willowbrook Creek subwatershed of the LA watershed also has pollution impacts from surrounding inputs; the source(s) of high nitrogen, phosphorous, and metals levels here are currently unknown and require further attention. Many streams in the LA watershed are incised and unable to access the 100-year floodplains, many of which are built upon, leading to further downstream impacts. Many stream banks are physically unstable. Although repairing these areas is not sufficient, on its own, to bring recovery to water quality and aquatic habitat, it is an important element of watershed restoration in LA. If unaddressed, further erosion could have significant sediment impacts in these streams.

TT watershed suffers from streambank erosion and streambed scouring as well, but this appears to largely be the result of poorly maintained riparian corridors. Restoration of corridors along the creeks and their tributaries will have a profound impact upon water quality improvements, though it will not fully remediate the waters of the TT watershed. Livestock exclusion must be increased to limit livestock impacts upon the streambank infrastructure, riparian corridor vegetation, and nutrient and bacteria levels within the water column. Furthermore, the Basin Creek tributary needs improved erosion control practices and riparian corridor restoration, or risk violating additional NC DWQ standards, such as acceptable fecal coliform bacteria levels.

<u>Findings</u>

- 27 of the 71 stream repair opportunities lie in urban subwatersheds LA 12 and LA 15;
- Many potential projects do not meet NC EEP's minimum mitigation criteria. However, the water quality impacts are significant and should be addressed as soon as possible to prevent them from enlarging;

- 3 projects are either on public land or on land owned by a willing land owner;
- The greatest reductions in sediment will come from protection of riparian buffers and improved stormwater management, and all repair efforts must be coupled to improved buffer maintenance for long-term improvements (Recommendation 2) (Cappiella, 2001; McNaught, et al., 2003); and
- All LATT streams will be unstable until site designs, agricultural practices, and buffer management, and stormwater management practices improve.

<u>Recommended management strategy</u>

- Contact landowners on lands intersecting high priority stream repair to investigate feasibility for repair;
- NC EEP needs to investigate stream repair opportunities that meet their mitigation thresholds for restoration;
- Work with local public, private, and non-profit organizations in partnerships to create projects, write grants, and specifically address the conservation and stormwater needs of these watersheds, recognizing that mutual investment benefits all communities;
- Work with landowners already maintaining ideal buffer networks on their properties, and involve them in direct education efforts for buffer restoration;
- Form partnerships to address the restoration needs of select high priority stream repair opportunities, focusing first on projects on public land or with willing landowners to educate the greater public on the benefits of restoration projects;
- Work with agricultural landowners to seek partnership opportunities for livestock exclusion fencing and/or riparian corridor maintenance. Decreased field applications of agrochemicals also may increase dissolved oxygen concentrations and lower algal presence in the waters (See Recommendation 7); and
- Explore avenues to broaden the activities and criteria that NC EEP uses to credit restoring urban aquatic environments to improve efficiency of watershed restoration efforts.

Recommendation 4: Improved Stream Maintenance

Problem

Logjams and trash were found throughout the LATT watersheds. These accumulations of debris compromise the structural needs of the stream, altering natural flow patterns and velocities. Often, these deposits act as dams, creating eddies and exacerbating already-eroding streambanks and beds. These dams also slow downstream flow, altering tertiary stream structures (i.e. rocks, logs, bends in the stream), and lowering dissolved oxygen levels, further degrading aquatic habitat. This is compounded by the failure of sanitary or stormwater pipes, which were seen throughout the watersheds, though infrequently. Such leaky systems will contribute to eutrophication of catchment waters and the destruction of aquatic ecology and need to be maintained by regular inspection. All jurisdictions worked closely with the LATT Technical team to address any leaks found through field assessments.

Accumulations of trash and fallen trees can also pose a significant public concern. The intense stormwater flows of the LA watershed may carry toxic substance containers into the waters themselves, potentially endangering those in direct contact with the water. The public concern also involves the aesthetic value of clean waterways, and the devaluation accumulation of trash and timber has upon communities. It is in the interest of all community members to remove these health hazards from the LATT waters.

This area of the Haw River watershed is a potential blueway and ecotourism site that stands to gain economically by displaying cleaner waters. Enabling public utilities and law enforcement agencies in their abilities to improve this situation, and prevent its persistence in the LATT watersheds, is a key component of water quality improvements.

<u>Findings</u>

- 7 trash dumping sites;
- 30 sanitary sewer or stormwater system failures;
- 15 logjams; and
- 17 sites in need of landowner education & outreach activities.

Recommended Management Strategies

- Determine a combination of program, policy, and project solutions to the current weaknesses in the communities' abilities to maintain sewer utilities and large-scale refuse collection by jurisdictional administrative staff;
- Increase and enforce penalties for illegal dumping into LATT waters at a jurisdictional level. These penalties will be most effective of uniformly applied;
- Municipalities should work with the PTCOG's Stormwater SMART program on stormwater education, including proper disposal of yard waste, household hazardous waste, and other items found in LATT creeks and tributaries; and
- Work with PTCOG's Stormwater SMART program to improve communities' individual public education programs to make landowners aware of watershed stewardship and ecologically-friendly land use.

Strategies to Prevent Future Degradation

Although the waters of the LATT watersheds are currently impaired for biological integrity, the greatest threats to water quality and aquatic habitat may lie in the future. Currently, greater than 87% of the LATT watersheds' 52 square-mile watershed is covered by rural, forested, or agricultural land. However, when examined as separate hydrologic units, LA watershed has significantly more impervious surface (33%) than the TT watershed (22%). Build-out scenarios for these watersheds – particularly the rural TT watershed – are difficult due to the lack of zoning regulation in Alamance County. Nor have Transportation Analysis Zone (TAZ) analyses yet been conducted to estimate the impacts expanding and improving the current transportation infrastructure will have upon impervious surface coverage and stormwater impacts in the LATT watersheds. The 2008 listing of both Travis and Tickle Creeks as impaired for bioclassification makes this potential development even more of a concern.

What is currently known is the development potential of the urban areas in these watersheds. Not only are these communities reinvesting in their local economies, but these three watersheds are located on US I-40, equidistant from the quickly-growing Triangle and Triad regions of NC. NC has one of the fastest growth rates of any state in the country, and much of it is expected to occur in these two regions. Current land use, stormwater and buffer regulations appear to be inadequate to protect basic watershed functions in the face of such dramatic future changes in land use.

The watersheds will become more impervious to stormwater infiltration as they urbanize. The current level of effectively impervious cover (rooftops, roads, parking lots, and driveways) of all three watersheds is 22%. According to the CWP, that means that the watersheds – particularly the TT watersheds – are on the brink of becoming "non-supporting" streams requiring intensive restoration, as opposed to "impacted" streams that can still be rehabilitated through more passive management. If that level increases, stream runoff will increase and cause further damage to the already-stressed stream channels. This is especially relevant in the LA watershed's already highly urbanized communities that are likely nodes of future bedroom community development.

In an effort to combat harmful levels of nutrient inputs to the Jordan Lake Reservoir, NC DWQ has proposed a nutrient management strategy based on the Lake's Total Maximum Daily Load (TMDL) assessment for the entire Lake watershed, including all LATT communities. The strategy proposes rules designed to solve the eutrophic conditions at the Jordan Lake Reservoir. Specific components of the Rules address the need to reduce non-point source (NPS) pollution and stormwater flow, as they are common sources of concentrated nutrient flow. The proposed Jordan Lake Rules will require stormwater management above and beyond the current federal National Pollution Discharge Elimination System (NPDES) Phase II rules, and will require an unprecedented investment from these communities to improve watershed conditions. While the proposed Rules' implementation will likely prove costly to LATT watershed communities, the current impaired conditions of both the LA and TT waters demonstrate the need to reduce stormwater impacts on local waters.

The following recommendations are crucial to protecting the water quality and habitat functions of the LATT watersheds from future degradation. It is recommended that public and non-profit partners in the LATT watersheds utilize these strategies to prevent future degradation of watershed health and function:

Recommendation 5: Improved Site Design
Recommendation 6: Rural Lands Protection
Recommendation 7: Restriction of Chemical Applications
Recommendation 8: Improved Enforcement of Existing Rules

As the cities, counties, and other watershed partners implement these recommended approaches, the number and severity of impacts on the watershed from new development will likely decrease, resulting in better water quality and a cleaner living environment for future watershed residents. A number of neighboring communities in different watersheds are currently facing similar concerns, and are addressing them in customized and sustainable ways; collaboration across watersheds is encouraged. These pro-active steps may help minimize potential future costs to local governments to comply with the proposed Jordan Lake Rules, while also encouraging sustainable community growth.

Recommendation 5: Improved Site Design

Problem

The LATT soils are variable in terms of erodibility, which is typical of the Triad region's geology. Some soils are mostly composed of clay, do not percolate well, and highly erodible. Others are loamy, porous, and resistant to erosion. In the urbanized LA watershed, erodibility is a greater concern due to stresses from stormwater impacts. Soil character is less of an issue as more damaging surface water flows erode soils indiscriminately, and soil type matters little when confronting stressful hydrologic conditions. In fact, hydrologic impacts pose the greatest management challenge in the LA watershed, and a significant impact upon the TT watershed. The best way to restore a degraded stream while allowing new development is to strategically design structural and landscape uses so their water quality impacts are minimized and/or mitigated. Known as Low Impact Development (LID), this strategy manages stormwater on development sites so that post-development stormwater peak flow and total volume are ideally attenuated to the pre-development conditions.

The NCSU Cooperative Extension Service's Water Quality Group is developing a comprehensive BMP handbook for North Carolina that is scheduled to be published in December 2008. This document will be the foremost resource for stakeholders in the LATT watersheds, and should be used a guiding document in implementing this restoration plan. Until then, direct contact with the Water Quality Group is recommended. The Low Impact Development Center, Inc., in Maryland is also a well-respected and successful organization that provides consultation and reference services for communities interested in promoting LID in their communities. They are a non-profit organization with numerous projects throughout the United States, and a number of free resources at their website (http://www.lowimpactdevelopment.org/publications.htm). To observe a more local approach to LID, the City of High Point offers a number of incentives to developers and landowners to encourage sustainable development with minimal environmental impact (City of High Point, 2007).

Findings

LATT jurisdictions currently use few strategies to improve site design or provide incentives to encourage development ingenuity. The Cities of Graham and Elon have passed resolutions minimizing development impacts upon water quality and/or prioritizing community safety (i.e. flash flood risk). These positive steps do not address enforcement or provide specific parameters to developers or planning staffs on how to improve development impacts. The Town of Gibsonville has a slope ordinance that prohibits development on >2:1 slopes, but does not guide developers on how to minimize water quality impacts (i.e. avoid erosive and/or hydric soils). The City of Burlington and both Alamance and Guilford Counties restrict development within water supply watersheds. However, the LATT watersheds do not encompass any water supplies, and there are few regulations protecting these watersheds. Some of the Planning staffs within the watershed informally engage developers regarding site designs and LID principles. These discussions would benefit from a more structured framework. Currently, there are no comprehensive LID, site design, or stormwater mitigation ordinances in official use within the LATT watersheds

Recommended Management Strategy

The LID approach to stormwater management attempts to mimic a site's natural, or pre-development, hydrology to the greatest extent possible through runoff minimization, rainwater capture, landscaping, infiltration, and conveyance. LID goals are challenging to meet, and most easily implemented and successful on low-density residential sites like those sites in the TT watershed. There are retrofit opportunities that provide simpler solutions such as bioretention cells and rain gardens. Many LID principles can be effectively integrated into site design for stormwater runoff minimization. The LID approach may allow developers to save money by minimizing earth movement and foundation costs.

All municipalities within the LATT watersheds qualify as NPDES Phase II communities. Therefore, they are mandated to invest in improved stormwater control and nutrient loading reductions. The LATT catchments also fall under the purview of the NC DWQ proposed rules to reduce and limit nutrient inputs to Jordan Lake Reservoir watershed. Engaging in stormwater mitigation and management now may decrease required investments in these efforts following the adoption of these Rules. Pro-active promotion and use of LID standards will benefit all LATT communities economically, environmentally, and politically.

It is strongly recommended that all LATT jurisdictions revise their existing stormwater management policies for new development to meet a hydrologic performance standard such as LID. LATT jurisdictions are also encouraged to retrofit sites for LID through incentive programs. This could be accomplished by temporary or permanent tax credits for LID sites and/or open space promotion, recognizing this property investment as a community service for all watershed residents. The City of High Point has found success with such measures (City of High Point, 2007). Where LID is not practical, LATT stakeholders are encouraged to consider other rule changes to closely mimic the LID standard using the following guidelines and strategies:

- Determine a combination of incentives and regulations for each jurisdiction that will most effectively and feasibly entice communities to invest in LID practices;
- Determine a strategy for each site that offsets the impacts from its impervious surfaces through stormwater Best Management Practices (BMPs), especially on institutional and commercial properties;
- Determine minimal site standards, including a slope ordinance that restricts land uses from slopes >15%; a soils ordinance that minimizes land uses on erosive soils; prohibit development within the 100-year floodplain; and limits development within the 500-year floodplain;
- Minimize the loss of existing forest cover, especially within the 500-year floodplain, either through an ordinance or an incentive program that credits developers with minimizing their environmental footprints;
- Encourage restoring landscapes with native grasses and vegetation or, at the least, maintaining existing vegetation in the mowed right-of-way at a greater height; Increase incentives to preserve existing trees/forested areas on developing sites;
- Encourage, or require, the use of conservation subdivisions that promote open space, walkability, and natural features such as older trees and greenways. Require that open space be maintained in natural condition;

- Encourage the use of bioretention with underdrain systems in landscaped areas of parking lots for stormwater treatment;
- Create stronger protections for small (less than one acre) wetland areas adjacent to intermittent streams that currently escape protection (these are not on the USGS or SCS maps). Do not allow stormwater management facilities within the wetland or its buffer;
- Anticipate the Jordan Lake Rules restrictions on nutrient inputs (phosphorous and nitrogen) in the headwater watersheds and attempt to adhere to them now, and;
- Consult with the City of High Point on their approaches to offering a package of incentives and regulations that foster sustainable LID within their community and the numerous watersheds it occupies.

Recommendation 6: Rural Lands Protection

Problem

The LATT watersheds are highly diverse in their land uses. The LA watershed is highly urbanized and composed almost entirely of the Cities of Burlington and Graham. The larger TT watershed includes dense land uses in its southern region, but consists primarily of rural, agricultural land parcels. This duality in land use is complemented by a duality in land use regulation. The municipalities manage land use development within their jurisdictions; Alamance County has relatively few land use regulations. This makes predictions of future development expansion(s) and their water quality impact difficult.

The NC agricultural cost-share program is very effective in Alamance County. There are also a number of Voluntary Agricultural Districts (VADs) within the County, which seek to protect agricultural lands from development by using federal funding to compensate landowners who voluntarily preserve and manage their parcels as agricultural lands. In addition, the efforts of the ACSWCD to preserve agricultural lands from future development have been remarkably successful. These factors may help slow urban expansion and its water quality impacts, but only temporarily.

One Natural Heritage Inventory (NHI) site has been sited in eastern Guilford County, but no other lands of ecological value have yet been recognized within the LATT watershed. There is a large amount of Alamance County land within the LATT watersheds that is still prone to unregulated development in the future. While Jordan Lake Rules will legislate restrictions on nutrient inputs to these waters, increased land use regulation will allow administrative and planning staffs to better predict potential social and environmental impacts to their communities and manage land use in accordance with community values.

The Haw River corridor passes directly through the TT watersheds, and is recognized as a conservation priority and potential economic investment by a number of stakeholders. The PTCOG developed *The Haw River Riparian Corridor Conservation Plan* in 2005 for the largely rural northern Haw River, and it is still a valued document in these processes. Open space parcels identified in the Plan have been targeted for preservation and potential blueway use, and have identified as a priority area by stakeholders in this restoration planning process. Haw River corridor parcels are featured repeatedly in the LATT Project Atlas (see Section 2) (PTCOG, 2005).

<u>Recommended Management Strategy</u>

Development in Alamance County has been restricted by conservation and preservation of agricultural lands through local implementation of state and federal cost-share programs. The effectiveness of these programs in protecting water quality in Alamance County should not be underestimated. Efforts should be made to increase local support for them,

particularly by stakeholders that prioritize the County's agricultural history and character. Preservation of the Haw River is already recognized as a priority by state and local stakeholders. *The Haw River Riparian Corridor Conservation Plan* should be referred to as a guiding document. Preservation efforts could lead to increased regional revenue from increased ecotourism. In anticipation of the Jordan Lake Rules' impacts upon rural land uses and water quality impacts, coordination of water quality planning with rural lands preservation efforts could help minimize long-term costs of all stakeholders:

- Strive for a continuous riparian corridor network that restores water quality and restricts nutrient input to catchments while also conserving agrarian land use. Buffers are known to be more effective if maintained as a cohesive BMP;
- Bolster the ACSWCD through increased local and state funding. Local stakeholders should recognize the need for agricultural preservation to all communities within the LATT watersheds. All six jurisdictions need to invest time and money in discussing regulations and/or incentives that will better retain the rural character of Alamance County and best restore supportive water quality conditions downstream; and
- Rely upon *The Haw River Riparian Corridor Conservation Plan* as a guidance document for water quality conservation priorities. Invest in the Haw River Trail – which seeks to preserve a greenway along the Haw River, as detailed in the *Haw River Corridor Restoration Plan* (http://hawrivertrail.org/) – as a lead agency in this effort.

Recommendation 7: Restriction of Chemical Applications

Problem

The LATT waters are impaired for biological integrity. Much of the degrading impacts to water quality and ecological habitat arise from stormwater flows due to urbanization. More recent impairments within the rural TT watershed indicate other land use impacts resulting from chemical application. Substances such as those found in some pesticides and herbicides can accumulate in wildlife and provide potentially harmful toxins upon exposure. These chemicals (e.g. RoundUp) are also frequently used heavily in stream buffers in residential areas, degrading the vegetative cover in these corridors and exposing the soil to stormwater. The cumulative impacts will include heightened erosion of the streambank, increased NPS pollution loading into the streams, and loss of private property to erosion.

Fertilizers – namely nitrogen and phosphorous – can overwhelm waters with nutrients, allowing opportunistic species such as algae the chance to overrun local ecosystems. The oxygen-depleted, eutrophic waters of the TT watershed indicate that this is happening. If not regulated, over-application of either pesticides or fertilizers can have negative long-term effects upon ecosystems that may take years to remedy. Over-application of fertilizers is likely to be a significant factor in causing the current nutrient impairment of the Jordan Lake Reservoir.

Currently, Guilford County and the Cities of Burlington and Elon have standards for chemical application to public lands. Extending this regulation to private properties, especially golf courses, is essential if meaningful reductions in chemical inputs to the watersheds are to be obtained. If managed by local governments, the LATT jurisdictions can gradually ease into more restrained uses of chemicals upon grounds. Jordan Lake Rules, soon to be issued to a greater than 1,000 sq. mi. watershed that includes the LATT catchments, will be imposing standards for nutrient inputs to headwaters. Reducing fertilizer applications will aid in reaching the reduction goals of these jurisdictions.

The use of native vegetation throughout the community would make this an easier goal to achieve. Under drought conditions, such as those observed in 2007-2008 NC, the use of native vegetation can reduce landscaping and grounds maintenance costs, as they often grow robustly under natural weather conditions and in native soils with minimal investments in chemical purchasing and application. Furthermore, the use of native vegetation in riparian buffers filters pollutants and offers a low-cost solution to preventing them from joining catchment waters. Native plants also complement any efforts to emphasize local culture and heritage within the LATT watersheds as Haw River communities.

Recommended Management Strategies

- Using the NC Division of Soil and Water Conservation and the NC State University Extension Service as consultants, conduct workshops and enhance outreach efforts on proper application of herbicide, fungicide, and fertilizer to both public and private lands within the LATT watersheds so that they reduce environmental risk while also serving their respective functions;
- If it is found that a chemical is only effective at application levels that provide environmental risk (as in the case of most fungicides), prohibit the use of those chemicals, and enforce this new restriction through policing;
- Prohibit the denuding of streambanks by chemical or physical disruption (see the *City of High Point Development Ordinance*, 2007);
- Anticipate the Jordan Lake Rules' standards for nutrient inputs and phase in local ordinances so communities can seamlessly ease into more restrictive regulations regarding nutrient applications;
- Promote the use of native vegetation buffers throughout the LATT watersheds to decrease the needs for pesticides, fertilizers, and water (http://www.hawriver.org/library/publications/Native%20Plant%20br.pdf);
- Use municipal and county public lands (i.e. parks) as pilot projects to educate the public on the efficacy and benefit of reducing chemical application and using native plants in landscaping; and
- Promote the Audubon Cooperative Sanctuary Program for Golf Courses to minimize recreational impacts upon water quality. Coordinate these efforts with a public education campaign.

Recommendation 8: Improved Enforcement of Current Regulations

Problem

Currently, the four LATT communities have NPDES Phase II rules governing erosion control, stormwater management, floodplain protection, and riparian buffer protection. While there are federal and state regulations regarding the use and management of wetlands, lakes, and rivers, they are general and broadly applied to variable landscapes (i.e. the US Clean Water Act). Local ordinances and regulations, on the other hand, are written and enforced by local officials with intimate knowledge of their watersheds and the needs of the environment and public within them. There are opportunities for strengthening existing local regulations (see Recommendations 1, 4, & 5). In addition, greater emphasis on the enforcement of these ordinances could enhance efforts to protect watershed function. Fieldwork revealed multiple failures to enforce ordinances that led to impacts currently degrading the watersheds.

Findings

Local ordinances and state regulations prohibit illegal discharges, surfacing wastewater from septic systems, sewer overflows, and dumping of trash. Fieldwork identified instances of poorly functioning erosion and sediment controls, trash dumping, and impacted buffers on new and existing development.

- 29 instances of failing stormwater and sanitary sewer infrastructure
- 41 needs for riparian buffer enhancement and/or restoration
- 7 sites of trash dumping into the stream corridor

Recommended Management Strategies

Specific recommendations are listed, by program area, below:

Erosion and Sediment Control

- All cities within these watersheds fall under NPDES Phase II stormwater regulations, which require construction site runoff control. NC DWQ's Stormwater Program administers these regulations. However, due to the amount of construction activity in the State and its limited number of staff, the Program is unable to inspect all construction sites over 1 acre. A Sediment & Erosion Control Officer should either complete inspections at the watershed scale to ensure the NPDES permit reports are being implemented as required or provide incentives to the LATT governments to complete these inspections;
- Sediment and erosion control are required for all construction projects, including post-construction controls, but more sediment and erosion control officers are needed to ensure compliance with these regulations;
- Work with the PTCOG's Stormwater SMART program to educate landowners and key private sector institutions over the long-term about stormwater, and the savings that can be gained through immediate compliance; and
- Contractor, engineering, and erosion control regulator training should be provided.

Impacted Buffers

- Conduct regular stream assessments of LATT streams and tributaries to identify impacts to the streams and riparian buffers. This will require additional staff or public participation, which has been successful elsewhere in NC (http://www.muddywaterwatch.org/). Since riparian buffers are the most effective - and one of the least costly - stormwater management tool, it makes sense that buffers should receive the same level of oversight as do other stormwater management controls.

Stormwater Management

Fieldwork assessments regularly encountered stormwater BMPs failing their designed purposes.

- Increase the abilities of local staff to inspect new construction and to conduct annual inspections of the existing BMPs either through programmatic or personnel expansions. This could be accomplished by employing a watershed-scale Sediment & Erosion Control Officer;
- Consider strengthening As-Built certification requirements to place more responsibility on the design professional and/or installation specialist (see Recommendation 5); and
- The number of projects requiring BMP's has increased dramatically and the number will continue to increase in the future. Review staff levels annually for adequacy.

Trash Dumping

Enforcing littering regulations is challenging in low-visibility areas like stream corridors.

- Include citizens in efforts to monitor or clean up LATT waters;
- Advertise a citizen hotline to facilitate enforcement. Homeowner education is a vital part of this approach (see Recommendations 9 & 10); and
- Alamance County has a household hazardous waste collection program, but only collects waste once annually. Holding this household hazardous waste collection day more than once a year could greatly benefit the public, both immediately and in regard to long-term watershed stewardship.

Sewer and Wastewater Discharges

Create a task force with other stakeholders such as NC Division of Environmental Health to explore opportunities to improve the monitoring and enforcement mechanisms to prevent:

- Failures of wastewater lines within the stream corridor; and
- Failures of stormwater BMPs and systems.

Watershed Stewardship

This plan recommends several strategies for restoring basic watershed functions and preventing future degradation. However, it is clear that restoration and protection will not be possible without increased stewardship of all LATT watersheds. This requires several approaches of differing intensities, respecting the differing natures of each watershed's land use and impairment.

At the most basic level, the general level of watershed awareness must be raised. Improving education on watershed stewardship – especially stormwater – could yield huge results in behavioral changes (i.e. improved buffer maintenance). Citizens cannot be expected to protect or preserve a watershed if they do not know their role(s) within a watershed. However, only actions lead people to change habits or actively protect waters. Direct interaction with the streams of the LATT watersheds leads to a sense of ownership amongst the populace. Citizens need to directly invest in their surroundings and environment to feel a loss of value upon its impairment. Direct experience of the public with a stream or river – particularly one that is impaired – is the most powerful education tool at stakeholders' disposals.

The following section recommends two approaches for improving stewardship in the LATT watersheds:

Recommendation #9: Watershed Outreach and Education
Recommendation #10: Water Quality Monitoring

The stewardship strategies recommended herein will require additional resources of time and effort. As these watersheds urbanize, hydrologic impacts, erosion, and pollution inputs will worsen. A wide range of stakeholders are needed to ensure programs are implemented, rules are enforced, and water quality goals are met. The LATT watersheds encompass most of three cities (Burlington, Graham, & Elon), part of another (Gibsonville), and lands of two counties (Alamance & Guilford). All of these cities are NPDES Phase II stormwater communities, and Guilford County is invested in stormwater responsibilities on behalf of its Phase II communities. Five of six of these communities rely upon the PTCOG's Stormwater SMART education and outreach program to address stormwater concerns; Guilford County has its own Stormwater education program. Currently, stormwater education for all of these communities is focused upon secondary school students, which led to the construction of an educational wetland that serves the greater City of Graham. However, there is a need and demand to extend stormwater education services to the greater public, particularly those groups that commonly have a direct impact upon water quality (landscapers, developers, gardeners, etc.). Presumably, all of the Phase II communities are complying with their other stormwater requirements through their planning staffs. Only Burlington and Guilford County have a stormwater specialist on staff to handle these issues full time.

Another compelling reason for increasing the levels of monitoring and stewardship in the LATT watersheds is to comply with the proposed Jordan Lake Rules. NC DWQ is developing a set of Rules addressing nutrient inputs within the Lake's watershed, which is nutrient sensitive and impaired. The proposed Rules require Haw River communities to

reduce nutrient (nitrogen and phosphorous) loads to the Lake by 8% from their 1997 – 2001 baseline levels. New development will face increasing pressures to reduce impacts upon water quality (see Recommendation 5), and communities in the Jordan Lake watershed will be forced to find ways to reduce existing nutrient loads (see Recommendations 1- 4), perhaps including retrofits to existing developments. Communities will also need to show the effectiveness of management strategies, and monitoring and stewardship practices like those recommended. With proper documentation, all investments in nutrient reduction will be accounted for by NC DWQ when considering jurisdictions' efforts to achieve proposed nutrient reduction targets. Implementation of such practices both anticipates the Rules' cost and minimizes external regulations over local land uses. Successful compliance with the rules will require action at a number of scales and from all community sectors.

Recommendation 9: Watershed Outreach & Education

Problem

Fieldwork in April and May 2007 revealed a number of inputs to the LATT waters that could be amended through landowner education and outreach programs. Most of these findings resulted directly from streamwalks. Given the high levels of impervious surface in the LA watershed, the influence on watershed conditions by development impacts must be addressed in any stormwater education curricula or outreach programs. The Center for Watershed Protection has established recommended actions to redress stormwater impacts, and specific strategies have been detailed by various NC agencies, including EEP, ACS&WCD, and NCSU Cooperative Extension Service (Scheuler & Holland, 2000).

Findings

- *Trash Dumping* — Some homes and businesses located along stream buffers store or dispose of mostly yard waste in the riparian buffer and stream. Water quality data indicates that this sometimes includes hazardous materials.
- *Active streambank armoring* – Numerous residents have paved or bricked streambanks in their yards to increase water flow and clarity. There is a need to educate these citizens that healthy streams are ones that change their direction and appearance often and have vegetated banks.

- *Riparian zone maintenance* – Most residential, commercial, and industrial landowners maintain mowed grass and thinned vegetation down to the streambank. In some instances this practice was directly encouraging eutrophication of ponds on the same landowner's property. Efforts to end this practice, and encourage plantings at a watershed-scale extent could mitigate significant stormwater flow and have enormous benefits to water quality. This need is more urgent with the impending Jordan Lake Rules, as the lack of buffers may be a large reason why waters have high nutrient levels.

Recommended Management Strategy

- Contact all noted streamside landowners with mailings and/or direct outreach about proper maintenance and benefits of riparian buffers and the regulations governing (and penalties for noncompliance with) littering;
- Write and enforce an ordinance prohibiting disturbance of areas within at least 30 feet of streams (NC DFR, 1990);
- Educate all landowners in LATT with riparian lands (especially those within the 100-year floodplain) about proper maintenance of buffer zones and their benefits;

- Restore buffers and clean streams at public schools, parks, and/or public libraries and other public spaces. Involve teachers and other staff who may be able to champion these projects;
- Work with the PTCOG's *Stormwater SMART* program, RC&D, ACS&WCD, and the HRT advocates to initiate and maintain education and outreach programs, including procuring funding;
- Conduct outreach presentations and discussions with target groups, including small auto repair and sales shops, existing gas stations, landscapers, maintenance crews, and restaurants; and
- Find funding for communities to develop watershed-scale education and incentive programs to improve stewardship, perhaps through Elon University and/or Alamance County Community College.

Recommendation 10: Stream and Watershed Monitoring

Problem

The LATT waters are impaired because of their respective inabilities to support aquatic life. The two watersheds are extremely different in terms of land use and current regulations, but they are inextricably linked by proximity and their larger roles as tributaries to the Haw River and the Upper Cape Fear River. What are the causes of their impairments, and how do we know to correctly respond to any changes in water quality?

The Draft 2008 *303(d) List of Impaired Streams* lists the Little Alamance, and the Travis & Tickle Creeks Poor and Fair, respectively, based on aquatic life habitat. The two TT watershed streams were not listed as impaired until 2008. However, land use in this part of Alamance County has not changed that dramatically in the last decade. Is the TT watershed beginning to degrade to the same degree as the LA watershed from increased road networks? Are there other land uses that are causing this? Will an improved buffer network address these needs?

Currently, the LATT streams and tributaries are not monitored for water quality by any local entities, though Meritech does monitor the Haw River on behalf of the permitted dischargers in the Upper Cape Fear River basin. NC DWQ has conducted chemical, biological, and habitat assessments among 20 sites shown in Figures 3 and 4 of this plan. However, due to the infrequency of NC DWQ's monitoring schedule, this data does not necessarily reflect the true water quality conditions of the LATT watersheds and is not a sustainable monitoring strategy. It also provides another layer between watershed citizens connecting their actions with impacts upon watershed health. Such a connection could be remedied by programs such as Adopt-A-Stream or procuring funds to post stream crossing signs throughout the watersheds.

LA aquatic habitat has continued to degrade over time, and exhibits a troubling rise in nutrient levels in recent records. Furthermore, high ammonia and metals levels were recorded at Willowbrook Creek under base flow conditions. NC DWQ has attempted to identify the source(s) of this pollution, but has not yet met success. These sensitive waters are important for controlling stormwater flow and water quality. All streams are currently impaired, despite the fact that their headwaters are relatively undeveloped. Most LATT headwaters have not been developed, except the highly-degraded unnamed tributary (UT) subwatershed LA 2 in Graham. None of these headwaters areas have any permanent protections to retain them as open space or agricultural lands. If developed, the impacts upon these headwaters and their downstream communities could be severe.

<u>Findings</u>

- Poor riparian buffer management, livestock impacts, and a lack of stormwater BMPs offsetting increasing levels of impervious surface likely create severe sediment impacts in the TT watershed;
- Good aquatic life exists in the relatively undeveloped and vacant subwatershed TT 15, providing potential water quality reference conditions for comparison with other subbasins in the LATT planning area. This subwatershed served this purpose

for the NC DWQ's *Evaluation of Water Quality, Habitat, and Stream Biology in the Little Alamance, Tickle, and Travis Creek Watersheds*;

- Stream reaches with riparian buffers are more resistant to channel erosion than are streams with no buffers, and roots may be the only protection for stream banks in most areas;
- 29 stormwater and sewer system fixtures had malfunctioned;
- 7 sites of illegal trash dumping;
- Subwatershed LA 11 had very high levels of ammonia, turbidity, aluminum, iron, and zinc;
- The LA watershed has high levels of streambank erosion and streambed scouring due to the impervious surfaces of surrounding urban communities;
- Watershed stewardship is poor, indicating an apparent lack of knowledge about water quality benefits and proper land management by residents;
- Regulations regarding watershed protection are weak and generally only apply to water supply watersheds and not well-enforced (see all other Recommendations); and
- Poor water quality persists in areas downstream of the densely-developed urban areas.

<u>Recommended short-term monitoring objectives</u>

- Work with NC DWQ to identify the source(s) of impairment in LA 11 and work with the appropriate party(s) to remedy it;
- NC DWQ, the governments, and/or a civic group such as an Adopt-A-Stream group need to monitor ambient water quality conditions and note changes in water quality following BMP implementation; and
- Permanently protect headwater regions by restricting all development there to LID.

<u>Recommended long-term monitoring programs</u>

- Establish annual stream walks to gage the progression of in-stream erosion;
- Establish a long-term flow gage in LATT waters;
- Develop an effective long-term monitoring program by actively involving citizens through an Adopt-a-Stream program, especially in the more densely-populated LA watershed; and
- Monitor flow and nutrient loading, as it pertains to Jordan Lake headwaters, especially at How River confluence points.

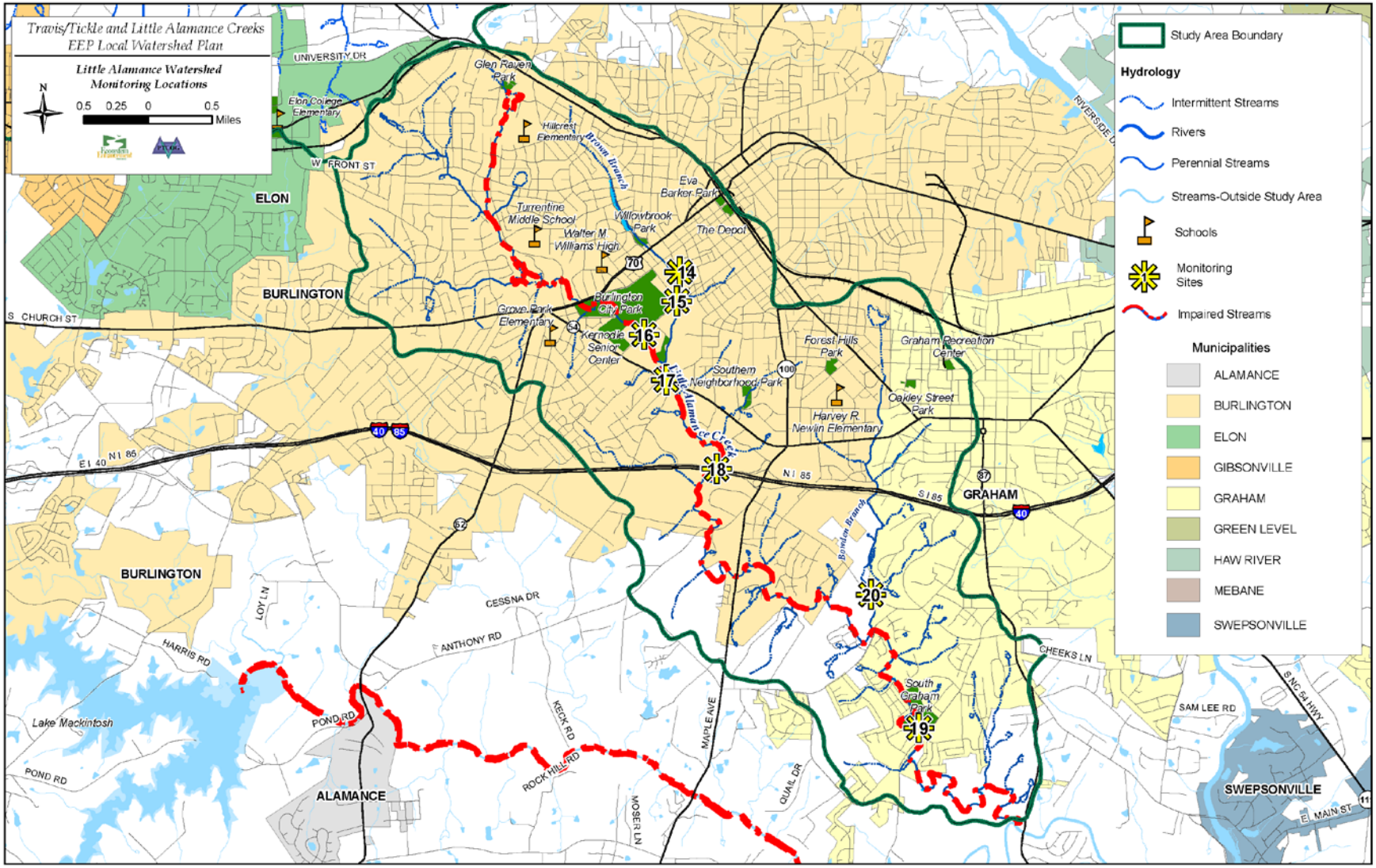


Figure 3: LA DWQ Monitoring Sites

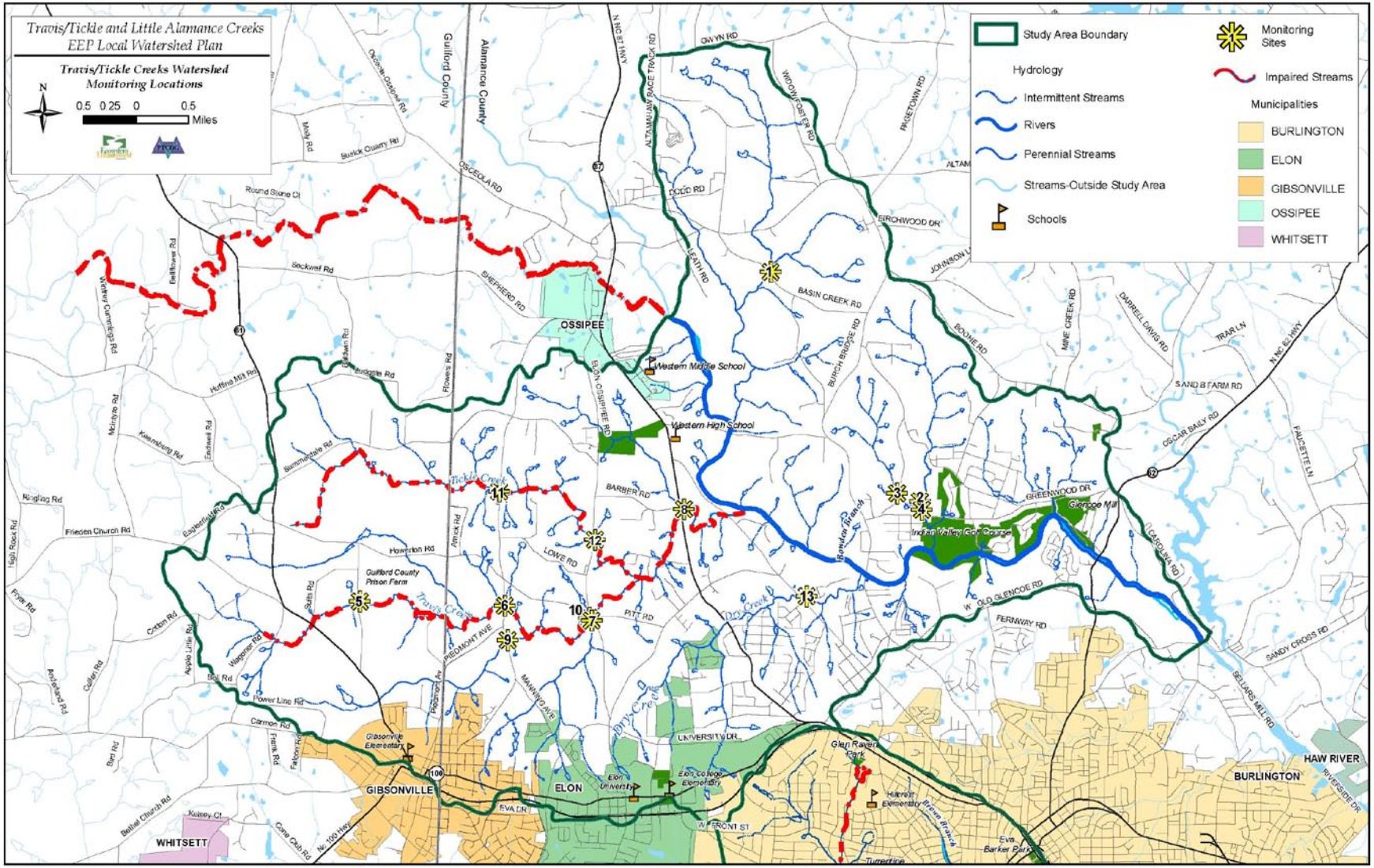


Figure 4: TT DWQ Monitoring Site

This LATT Project Atlas is a synthesis of all analyses done over the course of this 24-month restoration planning effort. It is mostly based upon the values assigned parcels through the Conservation and Stressor Assessments (detailed below). The parcel values produced by these assessments allowed the PTCOG to filter out projects so that only the highest Conservation or Stressor Values were selected for further analysis. Project ranking is also a product of a subjective valuation: project feasibility, project size, and the current land use were all considered when arranging these projects into a ranked list. Comments and advice from EEP, DWQ, and EcoLogic Associates guided our preliminary site selections: if a particular parcel or project was of value to these groups, it was included in the final Project Atlas. This selection process was opened to all stakeholders to ensure any projects important to local constituents were included, but there was no feedback.

Large projects on vacant or public lands, owned by a landowner interested in working with stakeholders were given a higher ranking than comparable types of projects. It was assumed that these projects are more likely to be implemented and serve the watershed's restoration needs. The projects are arranged such that the first one is considered the most important to restoration needs within the LATT watershed. However, it must be noted that there may be restoration projects not included in this Atlas that could arise, and these opportunities should be seized upon to improve water quality conditions within the watershed. The LATT waters are all impaired, and appear to be degrading further; any efforts to staunch this trend are welcome, and all stakeholders are encouraged to seek out willing partners for projects.

Initial Parcel Assessment & Ranking System

The PTOCG developed and refined a point system to assess the watersheds' 19,020 parcels and to assign a priority level to each parcel within the study area. The prioritization approach is detailed explicitly in the *LATT Watershed Assessment*. Assessment criteria were established using GIS data describing existing conditions throughout the study corridor as well as site specific data collected by PTCOG in the field. Using the precedents established for such analysis in the *Little Lick Creek Local Watershed Plan*, attributes were selected and intersected with each parcel and given a one-point value to allow accumulation into a ranking system (UNRBA, 2006; PTCOG, 2008). Points were awarded to each parcel or cluster of adjacent parcels owned by the same person or entity based on the criteria and factors summarized in Table 2. The total possible points awarded for Conservation Value is 24, though the highest Conservation Value attained was 18.

Point System for Initial Parcel Conservation Assessment and Ranking		
Criteria	**Factors**	**Points**
Impervious surface:	< 5%	1 point
	< 10%	1 point
	< 20%	1 point
Wetlands Presence:	NWI Listing	1 point
	Hydric Soils	1 point
Floodplain Protection:	Within 100-yr floodplain	1 point
	Buffer >50 ft.	1 point
	>100 ft	1 point
	>330 ft.	1 point
Land Characters:	Acreage > 50	1 point
	> 20	1 point
	> 10	1 point
	"Highly Erodible" Soils	1 point
	Slope >15%	1 point
	Forest Cover >50%	1 point
Land Use:	BMP site	1 point
	<0.25mi of BMP	1 point
	VAD	1 point
	<0.25mi of VAD	1 point
	EEP site	1 point
	<0.25mi of EEP	1 point
	Haw River parcel	1 point
	<0.25mi of Haw River parcel	1 point
Water Quality:	<0.5mi of noted DWQ "Good" site	1 point

Table 2: LATT Conservation Assessment parcel attributes and their respective values. *NWI*: National Wetlands Inventory recorded wetland; *BMP*: Best Management Practice site noted to improve stormwater conditions; *VAD*: Voluntary Agricultural District, a parcel that's landowners have voluntarily entered into an agreement with the ACS&WCD to manage their lands for conservation purposes and receive compensation for doing so; *EEP*: Ecosystem Enhancement Program, which has engaged the landowner at one level or another to conserve and/or restore their lands for improved water quality conditions.

Using the point system summarized above, PTCOG identified and prioritized parcels, giving them a Conservation Value. This approach was complemented by a similar analysis of the potential stress a parcel and its land use pose to watershed health and water quality, which is outlined in Table 3. The total possible Stressor Value

Point System for Initial Parcel Stressor Assessment and Ranking		
Criteria	**Factors**	**Points**
Impervious surface:	> 5%	1 point
	> 10%	1 point
	> 20%	1 point
Wetlands Presence:	NWI Listing	1 point
	Hydric Soils	1 point
Floodplain Protection:	Within 100-yr floodplain	1 point
	1st-order streams	1 point
	Buffer <50 ft.	1 point
	<100 ft	1 point
	<330 ft.	1 point
Land Characters:	"Highly Erodible" Soils	1 point
	Slope >15%	1 point
	Forest Cover <50%	1 point
Land Use:	BMP site	1 point
	<0.25mi of BMP	1 point
	EEP site	1 point
	<0.25mi of EEP	1 point
Water Quality:	<0.5mi of noted DWQ "Poor" site	1 point

for this analysis was 18, the highest achieved Stressor Value was 11.

The parcels outlined in this Atlas were identified as priority needs through this GIS-based parcel analysis. The points that each earned are named in a field for each potential project. Values that are exceptionally high or low amongst the parcels are highlighted in a bold red font. In general, the parcels identified here reflect <.01% of all 19020 distinct parcels in the LATT watersheds. Such a selective approach likely omitted some priorities identified by EEP or the field work that was an integral part of this project. The PTCOG attempted to remedy this, including restoration and conservation parcels that were commonly discussed at meetings, and ensuring that all active EEP projects in the watersheds were included amongst the projects. The LATT Stakeholders' input was continuously requested and included at all times in the planning process to ensure their reflection in the Project Atlas. This was particularly notable during stream assessments, discussions at meetings, and the open-forum comment period upon this Project Atlas.

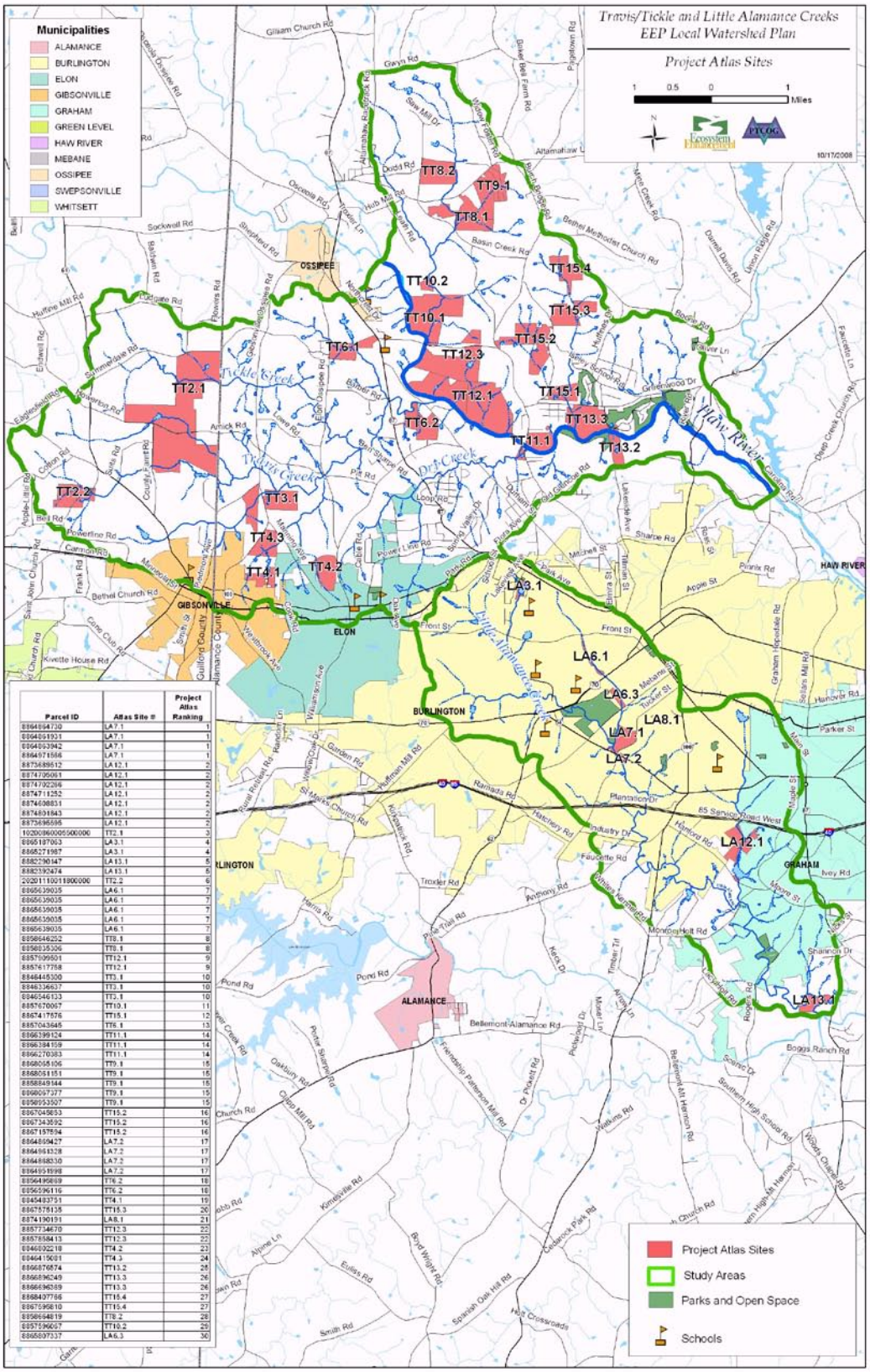
The following list of 31 priority projects is ranked according to the potential value they could provide to restoration of the Little Alamance and/or Travis & Tickle Creek watersheds if implemented (Figure 5). The projects are named according to their subwatershed and order of appearance (i.e. LA 7.1 is the first site found within the Little Alamance subwatershed 7, and parcel "a" is one of multiple parcels detailed in the project). More detailed information regarding

parcel ownership is retained by the governing jurisdictions within the LATT watersheds.

During the course of the planning process, EEP began to act on priorities that were emerging. One of these projects, in Burlington's City Park, was selected by the program as a pilot project to restore over 2,000 feet of unstable streambanks, re-establish riparian vegetation, and install several stormwater BMPs on publicly owned land. Several other sites listed in this atlas of projects have owners who have been contacted by EEP. Two of these owners are already enrolled in the Program. The projects remain in this report, however because there is opportunity on the adjacent properties that would help improve these projects.

It is necessary to address issues of data quality in these projects. The first is that of the wetlands listed in the Project Atlas. The PTCOG does not have the capabilities of distinguishing between natural wetlands, agricultural ponds, or bioretention cells. The National Wetlands Inventory (NWI) maintains records of these features, but also does not distinguish amongst these different features; this data is the best available for watershed planning purposes. Users of this document are cautioned against the assumption that "wetlands" listed in a project are features that are natural and/or hydrologically valuable.

Furthermore, it is apparent that the percentages of forested cover and impervious surface do not always sum to 100% of the parcel, and often exceed this. Forested cover and impervious surface are not complementary and this must not be assumed. For example, a parcel that has heavy tree cover may not be representative of the impervious surface under the tree canopy, which could mostly be paved if the trees have are old. The data was initially collected by the US Geological Survey as two distinct layers in the NLCD, and then the PTCOG edited for local use within the watershed.



Parcel ID	Atlas Site #	Project Atlas Ranking
8864894730	LA7.1	1
8864891931	LA7.1	1
8864893942	LA7.1	1
8864971586	LA7.1	1
8873689512	LA12.1	2
8874705081	LA12.1	2
8874702286	LA12.1	2
8874711252	LA12.1	2
8874698831	LA12.1	2
8874691843	LA12.1	2
8875696586	LA12.1	2
10200960005500000	TT2.1	3
8865187063	LA3.1	4
8865271987	LA3.1	4
8882290147	LA13.1	5
8882392474	LA13.1	5
20201110019900000	TT2.2	6
8865639035	LA6.1	7
8865639035	LA6.1	7
8865639035	LA6.1	7
8865639035	LA6.1	7
8865639035	LA6.1	7
8858646252	TT8.1	8
8858635306	TT8.1	8
8857609501	TT12.1	9
8857617758	TT12.1	9
8848445300	TT3.1	10
8846336637	TT3.1	10
8846546133	TT3.1	10
8857670067	TT10.1	11
8867417676	TT15.1	12
8857043645	TT6.1	13
8866399124	TT11.1	14
8866384159	TT11.1	14
8866270383	TT11.1	14
8868055106	TT9.1	15
8868051151	TT9.1	15
8858849144	TT9.1	15
8866057377	TT9.1	15
8866053507	TT9.1	15
8867045853	TT15.2	16
8867343592	TT15.2	16
8867157594	TT15.2	16
8864869427	LA7.2	17
8864861378	LA7.2	17
8864868830	LA7.2	17
8864951998	LA7.2	17
8856495869	TT6.2	18
8856596116	TT6.2	18
8845483751	TT4.1	19
8857576135	TT15.3	20
8874190191	LA8.1	21
8857734670	TT12.3	22
8857858413	TT12.3	22
8846022218	TT4.2	23
8846415091	TT4.3	24
8866876574	TT13.2	25
8866896249	TT13.3	26
8866896389	TT13.3	26
8868497786	TT15.4	27
8867596810	TT15.4	27
8858694819	TT8.2	28
8857596057	TT10.2	29
8865697337	LA6.3	30

Figure 5: LATT Project Atlas Parcels

Little Alamance 7.1

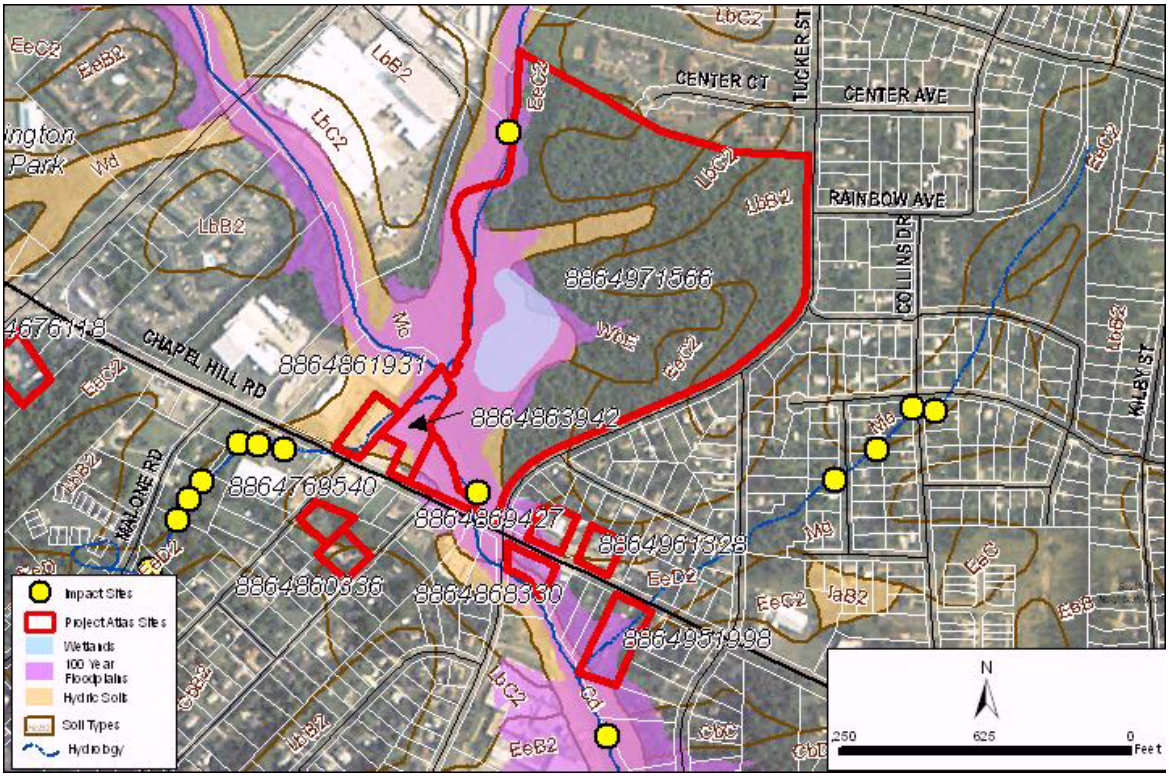
Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 15; 13; 9; 6
Stressor Value: 7; 8; **10**; **10**
Site Location: City of Burlington, Little Alamance watershed (LA)
Acreage: 42.91 acres; 1.42 acres; 0.85 acres; 0.79 acres
Land Use: Vacant; Office; Office; Office
Percentage of Parcel Forested: **96%**; 34%; 22%;
Percentage of Effective Impervious Surface: 21%; 6%; 11%; 10%
Percentage of Parcel in 100 year floodplain: 24%; 25%; 34%; 0%
Percentage of Parcel in 500 year floodplain: 26% (11.16 acres); **84%** (1.19 acres); **98%** (0.83 acres); **85%** (0.79 acres)
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 4,228 ft
- Intermittent Streams: 486 ft
- Pond/Lake: 2.67 acres

Recommended Practice: Preservation, Stream Restoration, Wetland Preservation, Log Jam Removal

Recommended Size of Practice: 13.97 ac floodplain preservation
2.67 ac wetland
4,714 linear stream feet of stream restoration

Pros	Cons
• Undeveloped land • Well-forested • Surrounded by highly impervious land • In need of BMP implementation • 2.5-acre National Wetlands Inventory (NWI) riverine wetland • Potential urban stormwater control	• High development pressure • Zoned for multi-family land use • Little Alamance highly impaired here • Failing streambank • Loss would add significant impervious surface to area



The development of this large urban, open space parcel could be enormously damaging to water quality and stormwater control in downtown Burlington. All efforts need to be made to preserve this parcel as open space, and prevent impervious surfaces from covering these 43 acres. The parcel currently serves the surrounding commercial, industrial, and residential areas as a (natural) stormwater control feature, mitigating intense polluted surfaces flows by filtration with well-forested riparian buffers and a 2.5-acre wetland. If this parcel is developed as a multifamily structure – for which it is zoned - the impervious surface will have an enormous contribution to stormwater flow and non-point source (NPS) pollution, and downstream water quality will further degrade. There is a need not only to use this parcel as a site to offset on-site stormwater, but that of the surrounding urban subwatershed. There should be concerted effort to both restore the streambanks on this parcel and preserve it as an urban open space; it is in the interest of general public welfare. Its central location also allows restoration efforts on it to serve as an ideal education and pilot project opportunity, and possibly serve as a public space like a park.

1) Little Alamance 12.1

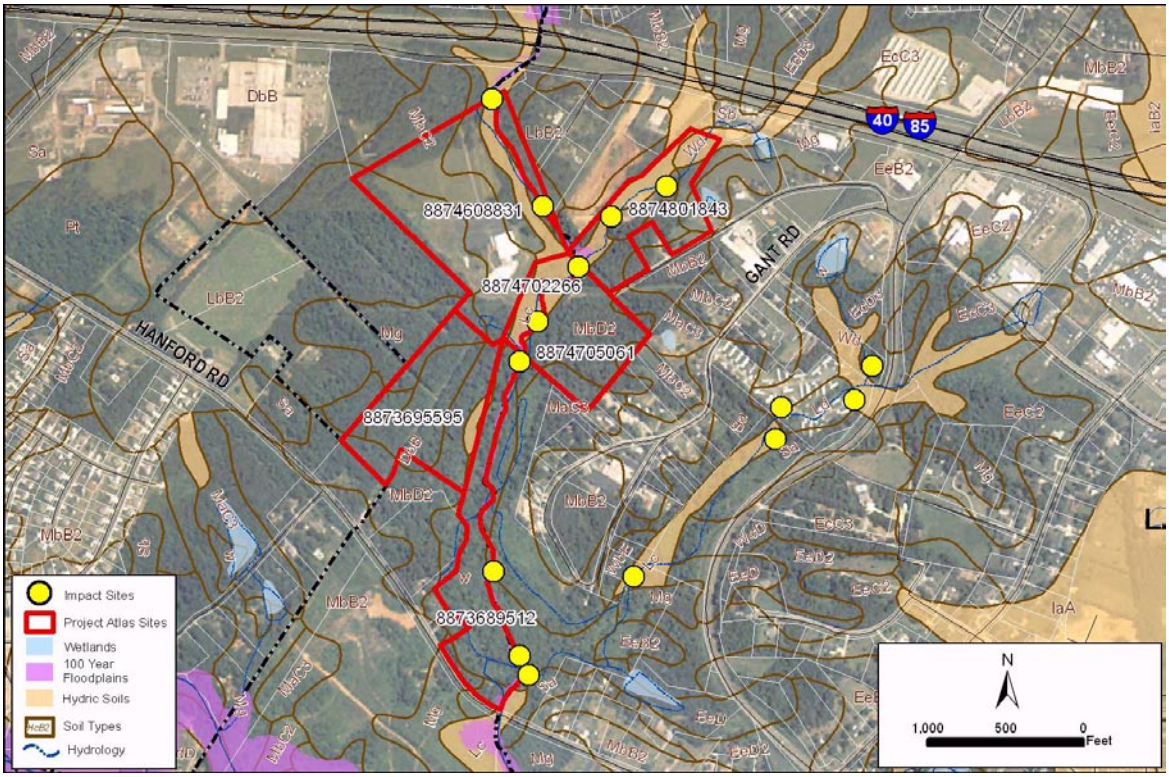
Significant Site Features & Results of Initial Parcel Ranking:
Stressor Value: 8; **9**; 8; 6; **9**; 8; 7
Site Location: Cities of Burlington & Graham, LA
Acreage: 11.41 acres; 9.72 acres; 2.5 acres; 1.69 acres; 22.97 acres; 10.15 acres; 14.49 acres
Land Use: Vacant; Single Family; Institutional; Single Family; Institutional; Single Family; Vacant
Percentage of Parcel Forested: **96%**; **100%**; **84%**; **100%**; 40%; 60%; **100%**
Percentage of Effective Impervious Surface: **0%**; **0%**; **0.6%**; **0%**; 23%; 8%; **0%**
Percentage of Parcel in 100 year floodplain: 1%; 7%; 8%; 0%; 2%;0%; 0%
Percentage of Parcel in 500 year floodplain: 2% (0.46 acres); 14% (0.35 acres); 0%; 12% (1.37 acres); 0%; 0%
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 928 ft.; 532ft.; 0 ft.; 709ft.
- Intermittent Streams: 119.89 ft.; 211.77 ft.; 0 ft.; 15.71 ft.
- Pond/Lake: N/A

Recommended Practice: Streambank Restoration, Log Jam Removal, Landowner Education

Recommended Size of Practice: **2.18 ac floodplain preservation**
2,516 linear stream feet of streambank restoration

Pros	Cons
• Well forested • In urban area • In need of BMP implementation • Surrounded by BMP needs • On public and vacant parcels • Potential to serve as pilot project	• In urban area • Eroded and incised channel • Expensive project



This project was noted in the field assessments as one of the worst cases of bank erosion in both the LA and TT watersheds. The unnamed tributary (UT) of LA here, at the border between the Cities of Burlington and Graham, has banks higher than 10 feet in some places, and appears to be eroding more with time as stormwater flows continue to drastically - and artificially - alter the stream morphology along this entire tributary. The potential advantages of doing a project at this site are both the obvious need for restoration and the current public and vacant land uses of the immediate parcels. The landowners and the City of Graham have the opportunity to improve their watershed stewardship and serve their respective constituents with a project here, as well as improve the quality of life for downstream residents. The public ownership of the land, proximity to a public amenity (a swimming pool), and location between both significant urban centers also makes any potential project here an ideal opportunity for public outreach and education regarding watershed stewardship. Care would need to be taken to preserve the well-maintained riparian buffers in any projects at this site.

There is a need to involve upstream landowners who are intentionally armoring their banks with bricks and sandbags to prevent erosion. This behavior only amplifies flash flooding and downstream impacts, and leads to these parcel owners' loss of property.

The proximity of this UT to the confluence of LA with the Haw River makes the need for action even higher. While current conditions persist, both Cities could use this stream as an example of the damages that stormwater can have on streams and ecosystems. The three landowners should be contacted immediately, and work should be as soon as possible, with maximum media coverage that will aid in watershed stewardship amongst all citizens.

2) Travis & Tickle 2.1

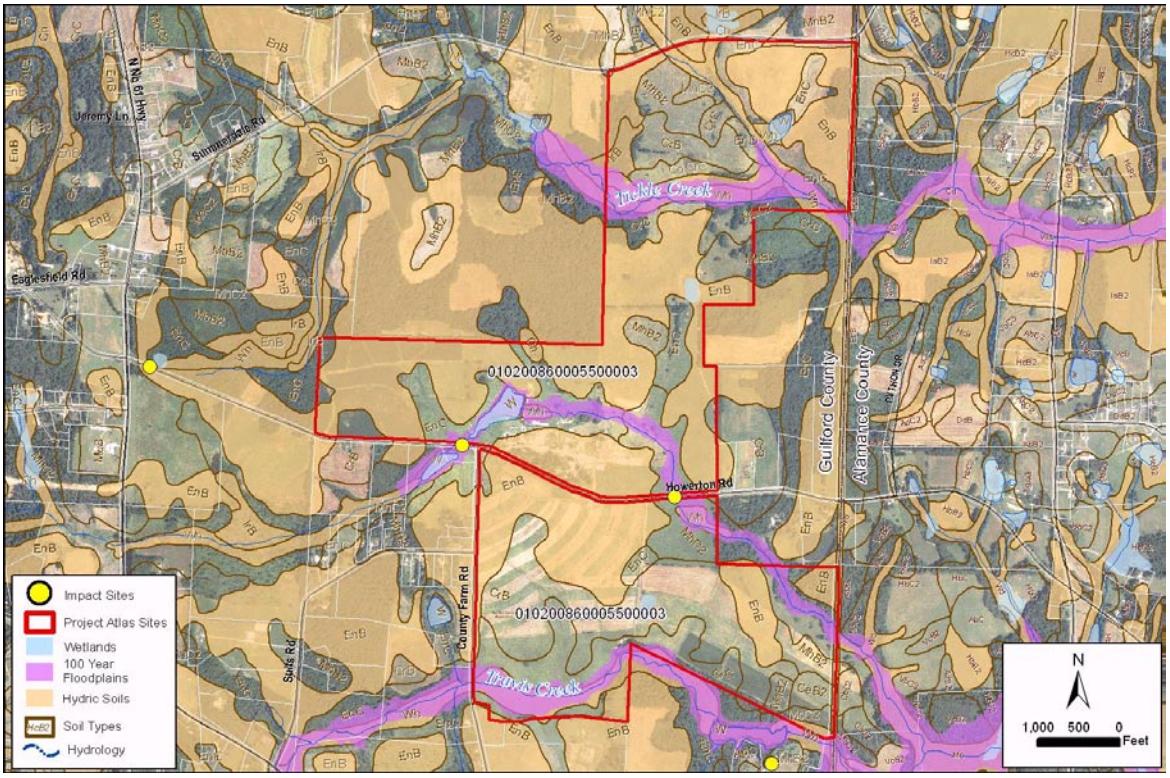
Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 17
Site Location: Guilford County, Travis & Tickle Creek watersheds (TT)
Acreage: 613.40 acres
Land Use: Agriculture
Percentage of Parcel Forested: 8%
Percentage of Effective Impervious Surface: 26%
Percentage of Parcel in 100 year floodplain: 11%
Percentage of Parcel in 500 year floodplain: 11% (67.47 acres)
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 10,945 ft
- Intermittent Streams: 2,000.41 ft
- Pond/Lake: 7.22 acres

Recommended Practice: Buffer Restoration, Wetland Restoration, Livestock Exclusion, Landowner Education

Recommended Size of Practice: 67.47 ac floodplain preservation
7.22 ac wetland
12,945 linear stream feet of streambank restoration

Pros	Cons
• Undeveloped land • In Travis and Tickle Creeks headwaters • Large parcel – 613 acres • 7.5 acres of 4 NWI non-riverine wetlands • In need of BMP implementation • Implementation could be low-cost	• Cleared of forest cover • Small riparian buffers • Institutional zone limits certain management approaches • Needs livestock exclusion • Travis Creek likelyimpaired on property • Loss would add significant impervious surface to area



The Guilford County Prison Farm potentially offers the simplest opportunity restore supporting water quality conditions to any creeks in the LATT watersheds. Upon entering the 613-acre parcel, Travis Creek is not in violation of any NC DWQ water quality standards. Nitrogen levels are elevated here, and this appears to be a direct result of a lack of riparian buffers and livestock exclusion on the parcel. These problems can be easily solved, especially with the assistance of NC's cost-share programs for agricultural lands, but there has been a lack of landowner support thus far. It is recommended that efforts be made through both Guilford County S&WCD and NC State University's (NCSU) Cooperative Extension to extend outreach and educational efforts with the stewards of this public land, and foster a relationship that may lead to restoration and preservation of the wetlands and streams in this headwater parcel.

3) Little Alamance 3.1

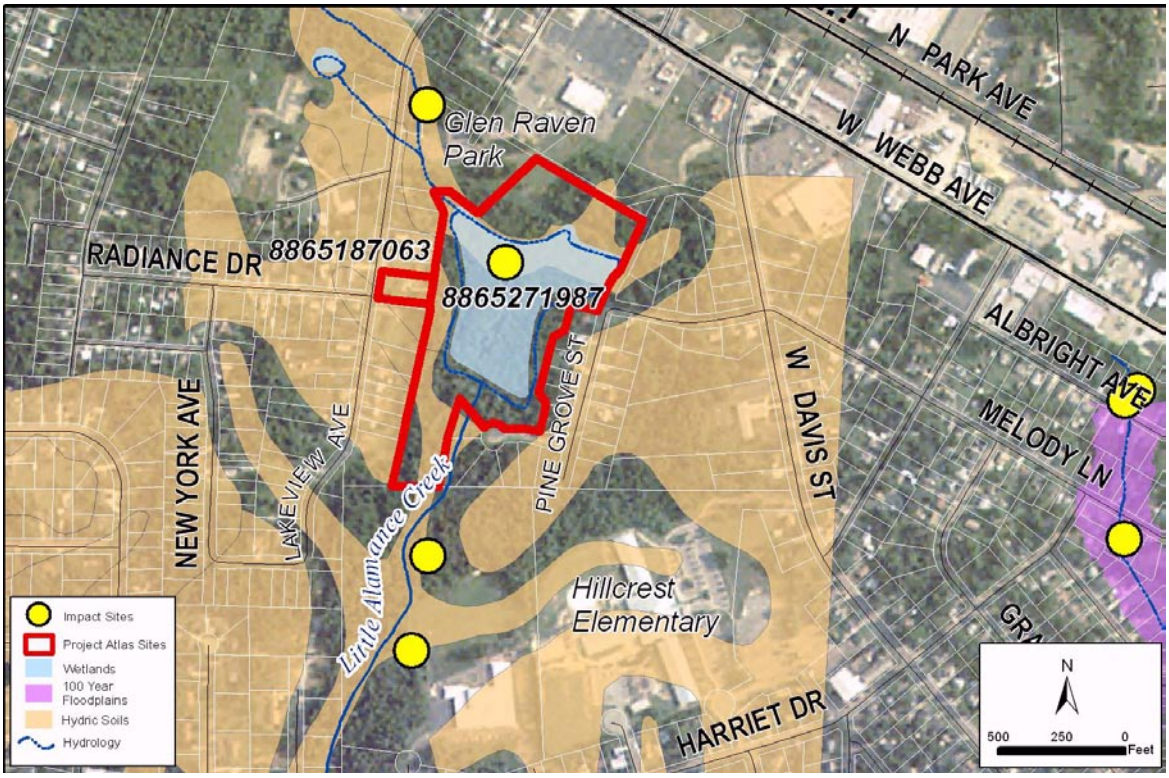
Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 14; 6
Stressor Value: 7; **10**
Site Location: City of Burlington, LA
Acreage: 14.60 acres; 0.521 acres
Land Use: Residential (Single Family); Single Family
Percentage of Parcel Forested: **96%**; 10%
Percentage of Effective Impervious Surface: 11.61%; 3%
Percentage of Parcel in 100 year floodplain: 0%; 0 %
Percentage of Parcel in 500 year floodplain: 0%; 0%
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 414 ft
- Intermittent Streams: 382 ft
- Wetlands: 5.72 acres

Recommended Practice: Streambank Enhancement & Wetland Preservation

Recommended Size of Practice: 14.60 acres: **5.72 wetland acres**
796 linear stream feet of streambank enhancement

Pros	Cons
• Headwaters of Little Alamance Creek • Adjacent to public park • Adjacent and upstream of elementary school, which has streambank restoration needs • 6-acre NWI non-riverine wetland (bottomland alluvial mixed forest) in need of preservation • Small stream restoration project needed at head of property • Can assist Burlington in fulfilling Phase II NPDES requirements	• Privately owned • Zoned for single-family residence • Surrounded by commercial and residential properties • Degraded headcut leading into property



This mid-sized and undeveloped property is in the headwaters of LA watershed and is immediately downstream of the UT's origins in northern Burlington. A 6-acre NWI-listed wetland lies centrally on the property, which is in the midst of a highly residential area. This wetland is the remnant of a former pond that has filled with sediment. Development pressure on the 14.60 acres is estimated to be high. US Army Corps of Engineers 404 permitting and wetland mitigation would be required in the event of development. The property is currently undeveloped and is forested, providing a neighborhood amenity and water quality control for the sensitive headwaters of the urbanized watershed. The wetland on this property is protecting downstream residents – including the Hillcrest Elementary School, Burlington Board of Education, and Burlington Christian Academy – from stormwater impacts.

This parcel is located next to three institutional parcels, including two schools, and could potentially serve as a public amenity and utility as a recreational and environmental feature. Furthermore, Hillcrest Elementary School has streambank restoration needs, which could be met as a large project if coupled with this preservation project. It also has the potential for educational and community benefit that can aid the City of Burlington in complying with their Phase II NPDES requirements for stormwater education by filtering nutrients from stormwater from the surrounding suburban areas. The downstream UT that flows through the school property is eroded, and could complement any conservation or restoration efforts on this tract. If developed, it is estimated that downstream impacts will dramatically increase. Maximum efforts should be made to preserve this wetland and surrounding natural area in this otherwise urbanized landscape.

4) Little Alamance 13.1

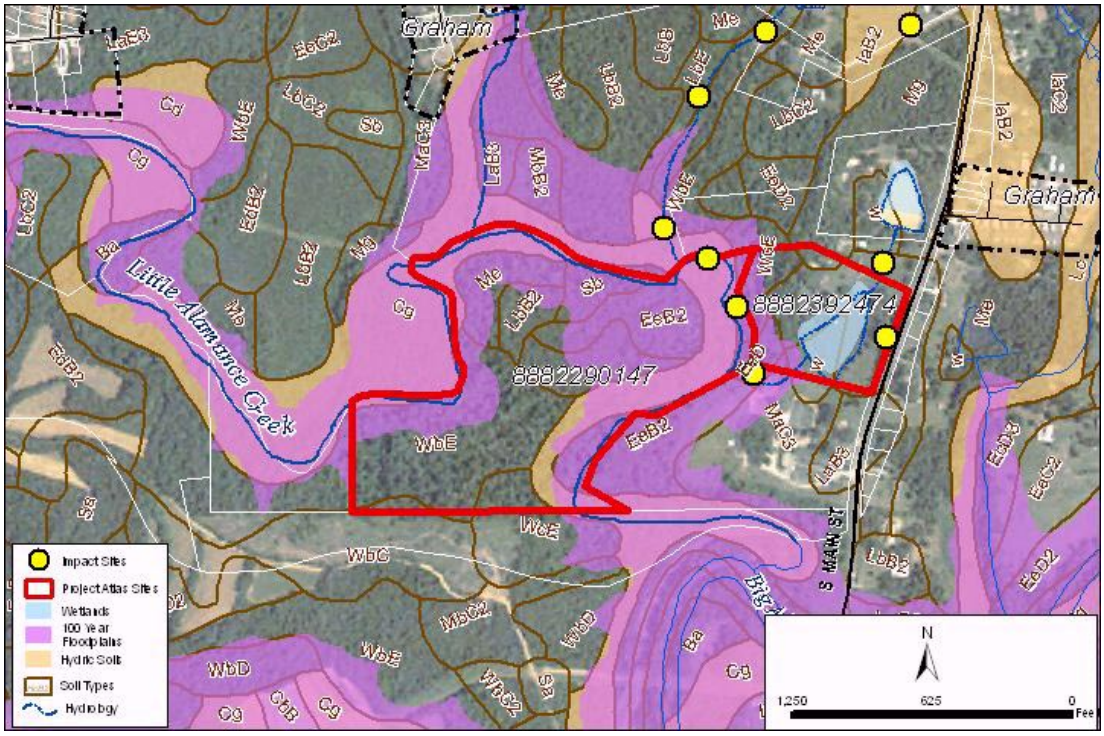
Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 13; 12
Site Location: Alamance County, LA
Acreage: 33.69 acres; 8.15 acres
Land Use: Vacant; Residential (Single Family)
Percentage of Parcel Forested: **100%**; 60%
Percentage of Effective Impervious Surface: **0%**; 6%
Percentage of Parcel in 100 year floodplain: 63%; 19%
Percentage of Parcel in 500 year floodplain: 68% (22.91 acres); 21% (1.71 acres)
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 12,123ft.; 0 ft
- Intermittent Streams: 121ft.; 668 ft.
- Pond/Lake: 1.67 acres

Recommended Practice: Stream Enhancement, Landowner Education; Stormwater Retrofit, Wetland Restoration

Recommended Size of Practice: 24.62 ac floodplain preservation
1.67 ac wetland
12,913 linear stream feet of streambank enhancement

Pros	Cons
• Almost entirely forested • 1.5-acre NWI non-riverine wetland (Ross) • Immediately upstream of Haw River confluence • Immediately downstream of public golf course • Low development pressure	• Log jam and trash accumulation • Stormwater retrofit needs • Upstream impacts • Problems will compound with time • Steep slopes • Highly erodible soils



These two parcels in the southern extent of the LA watershed must be addressed as part of a coordinated landowner education and stream enhancement effort on the UT and the LA Creek before it meets the Haw River. Accumulation of trash, logs, and stormwater flow will only grow with time if upstream landowners do not address their bank stabilization and refuse disposal responsibilities. This is especially significant on one property, approximately half of which lies in the 100-year floodplain. If upstream stormwater impacts continue to grow due to failing infrastructure and a lack of riparian buffers, flooding may overcome the historic floodplain and impact the Foust property. These two parcels are part of a strategic need to mitigate non-point source (NPS) flow into the Haw River. Developing watershed protection measures in this UT catchment may also serve Graham in its Phase II NPDES needs as they can mitigate upland stormwater impacts. Though zoned as "Single Family," both parcels appear to be unused currently. Maintaining a low-impact land use here is necessary for continued watershed stewardship. It is recommended that immediate contact with the landowners be made, so that both the landowners and the watershed may benefit from riparian easements or open space preservation management.

5) Travis & Tickle 2.2

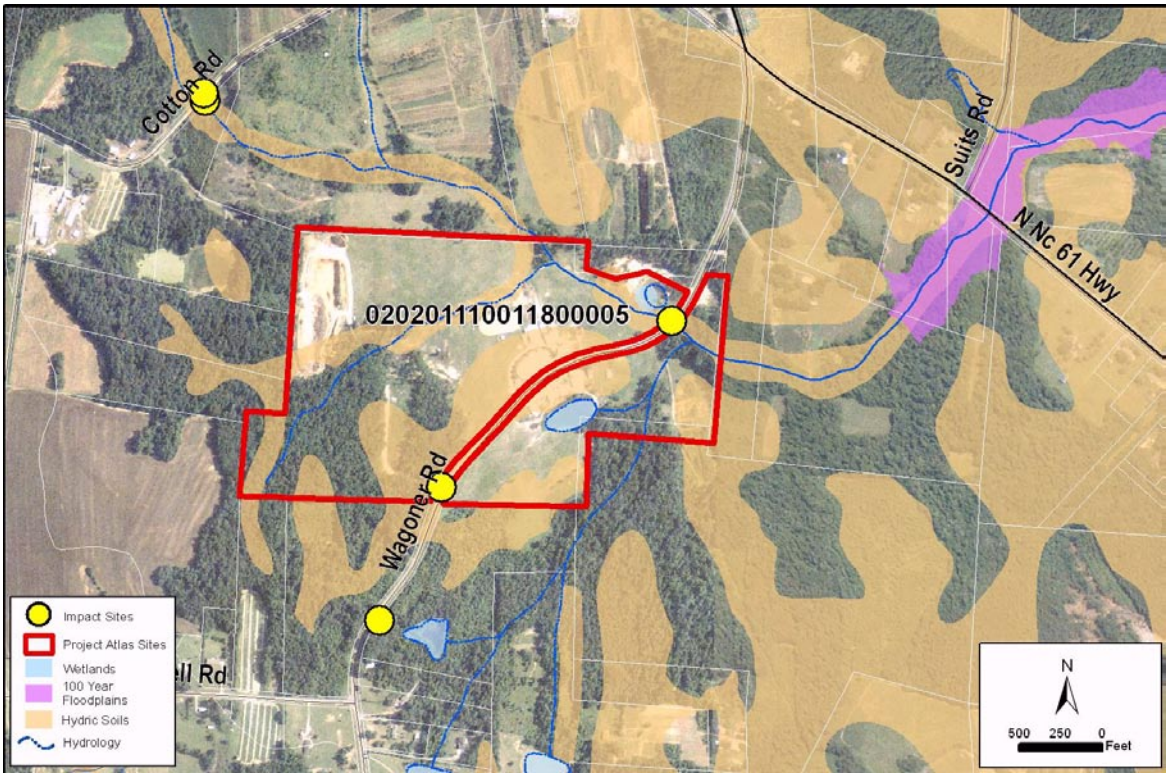
Significant Site Features & Results of Initial Parcel Ranking:
Total Points Received in Initial Ranking: 15
Site Location: Guilford County, TT
Acreage: 80.61 acres
Land Use: Agricultural
Percentage of Parcel Forested: 24%
Percentage of Effective Impervious Surface: **0%**
Percentage of Parcel in 100 year floodplain: N/A
Percentage of Parcel in 500 year floodplain: N/A
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 1,290 ft
- Intermittent Streams: 3,614 ft
- Pond/Lake: 1.25 acres

Recommended Practice: Stream Enhancement, Riparian Buffer Enhancement

Recommended Size of Practice: **4,904 linear stream feet of streambank conservation**
1.25 ac wetland preservation

Pros	Cons
• Travis Creek headwaters • Well-forested • Potential for a highly-effective, low-cost project in riparian enhancement • Landowner education opportunity • Agricultural preservation opportunity • Downstream from wetland restoration opportunity	• Denuded riparian zone likely producing large amounts of sediment and nutrients • Steep slopes • No local land use regulation



Similar to the larger Prison Farm parcel, this is a site where simple buffer restoration and landowner education could have a dramatic and valuable impact. Located in the headwaters of the Travis Creek watershed, this parcel is a likely contributor of sediment and nutrients to Travis Creek. Investment in restoring healthy conditions here could be a significant aid in restoring Travis Creek to supportive status. The land does not appear to have any permanent or temporary agricultural preservation to protect it from development. It is in the interest of all Travis Creek watershed residents to protect this sensitive and important tributary to the Creek. Guilford County S&WCD should be contacted, and partnerships with EEP should be explored to restore stream conditions here.

6) Little Alamance 6.1

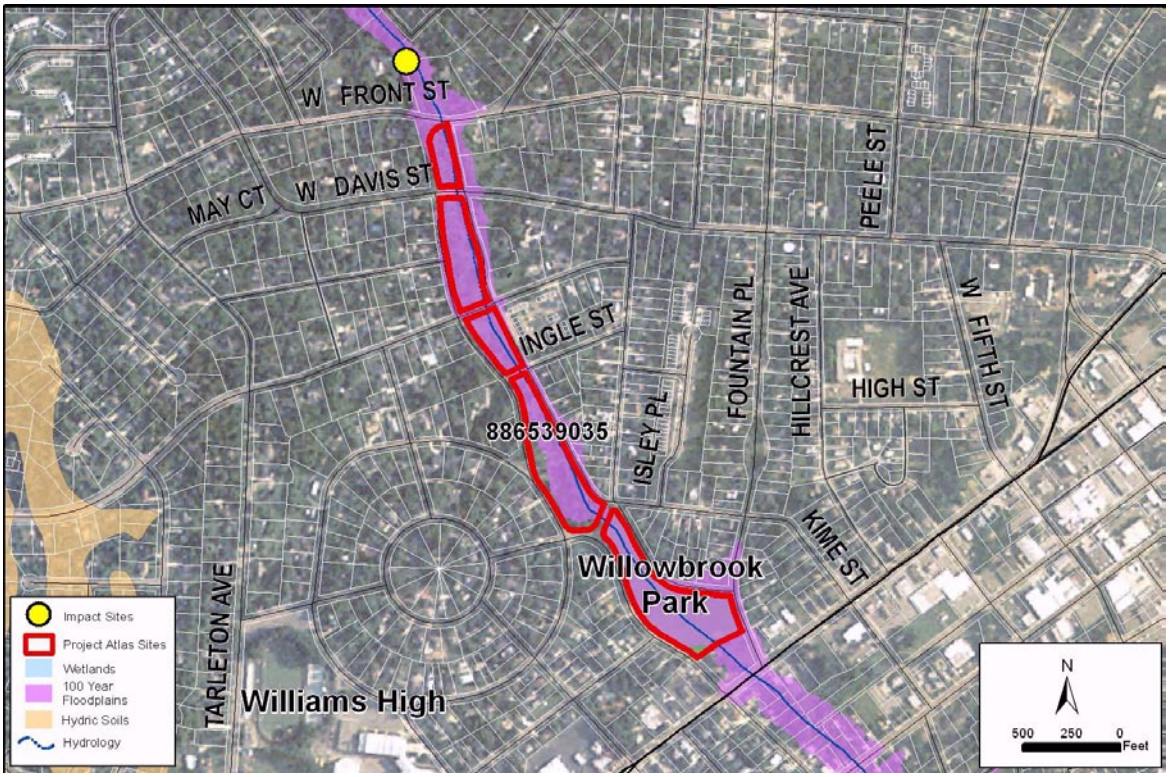
Significant Site Features & Results of Initial Parcel Ranking:
Total Points Received in Initial Ranking: 8
Site Location: City of Burlington, LA
Acreage: 15.27 acres
Land Use: Open Space/Recreational
Percentage of Parcel Forested: **0%**
Percentage of Effective Impervious Surface: 11%
Percentage of Parcel in 100 year floodplain: 0%
Percentage of Parcel in 500 year floodplain: 0%
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 2,303 ft
- Intermittent Streams: 2,100 ft
- Pond/Lake: N/A

Recommended Practice: Stream Restoration, Buffer Restoration, Landowner Education

Recommended Size of Practice: 4,406 linear stream feet of streambank conservation

Pros	Cons
• Little Alamance Creek headwaters subwatershed • Public park • Residential area • Large riparian buffer • Stable soils	• Lack of interest from local stakeholders • Lack of buffers • Highly visible area • No current tree cover • Small parcels



These four parcels owned by the City of Burlington are an ideal project to conduct for the benefit of the LA watershed's health. The public ownership of the parcels and the visibility of the project could serve as a powerful tool in educating the public the value of stream restoration and riparian buffers. Currently, these parcels are intensively managed such that only tiny riparian buffers exist and are residence to multiple invasive species, and the stream is highly channelized. The large stretch of stream that would be addressed by such a project will have a large benefit to the hydrologic and hydric health of the watershed. Unfortunately, the surrounding stakeholders are currently non-supportive to changes in the maintenance of the buffers, which are almost non-existent at this site, and are adamantly opposed to the stream restoration efforts of other stakeholders to improve conditions there.

Improved landowner education and dialogue between stakeholders and local residents is absolutely necessary for this project to succeed. Restoration of this site will not only improve the water quality conditions, it will serve as a recreational and outreach tool in improving citizen stewardship. The high potential value of this project argues strongly in favor of making the investments in staff and time to improve awareness and stewardship by local residents concerning this potential project.

7) Travis & Tickle 8.1

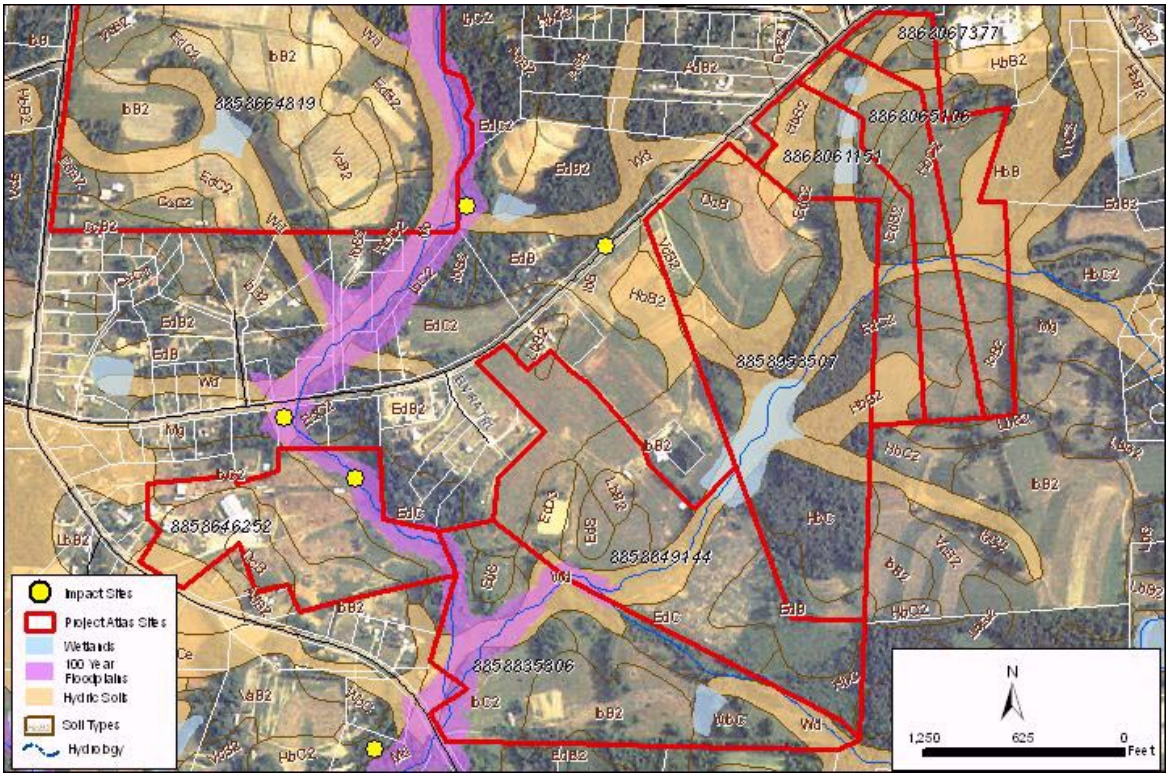
Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 15; 14
Site Location: Alamance County, TT
Acreage: 28.60 acres; 46.73 acres
Land Use: Agriculture; Agriculture
Percentage of Parcel Forested: 60%; 26%
Percentage of Effective Impervious Surface: 28%; 12%
Percentage of Parcel in 100 year floodplain: 13% (3.72 acres); 17% (7.94 acres)
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 1,001 ft.; 2,019 ft.
- Intermittent Streams: 0 ft.; 1,704ft.
- Pond/Lake: 0 acres; 0.97 acres

Recommended Practice: Stream Restoration, Buffer Restoration, Wetland Enhancement, Landowner Education

Recommended Size of Practice: 11.66 ac floodplain preservation
0.97 ac wetland
4,724 linear stream feet of streambank restoration

Pros	Cons
• In Haw River headwaters • Potential EEP project sites • 1-acre NWI non-riverine wetland • In need of BMP implementation • Large benefit if addressed • Potential to serve as pilot projects	• Basin Creek impacted here • Needs sediment control • Most land cleared of forest cover • Highly impervious • Livestock accessing streams



It is critical to the health of Basin Creek to restore the streams that flow through these two parcels. A NC DWQ monitoring site is immediately downstream of these properties, and it recorded the worst water quality in the TT watershed, violating standards for turbidity. Nutrient, sediment, and fecal coliform bacteria levels were all noted to be at levels of concern, and in need of immediate actions. Most of this pollution may be attributed to the use of the smaller parcel as a stockyard, with small buffers and no vegetative growth on upland slopes. Consequently, every storm event flushes soil, fecal matter, and associated nutrients into Basin Creek, degrading waters at that location and downstream.

ACS&WCD has worked with this landowner in the past to add fencing to the site, but further efforts are needed to restore supportive waters to Basin Creek. Over 3,700 feet of stream on the larger property need fencing to prevent cattle access, improve channel conditions, and establish healthy riparian vegetation. Those streams at the stockyard need repair to degraded stream banks. An EEP project may serve these needs. Much of the other parcel's land is cleared, but working with the landowners to protect their wetland and streams will have benefits downstream, as well as offering the landowners the opportunity to preserve their parcels as agricultural land. EEP has contacted these property owners, and should coordinate their efforts with ACS&WCD to ensure maximum benefit to the landowners.

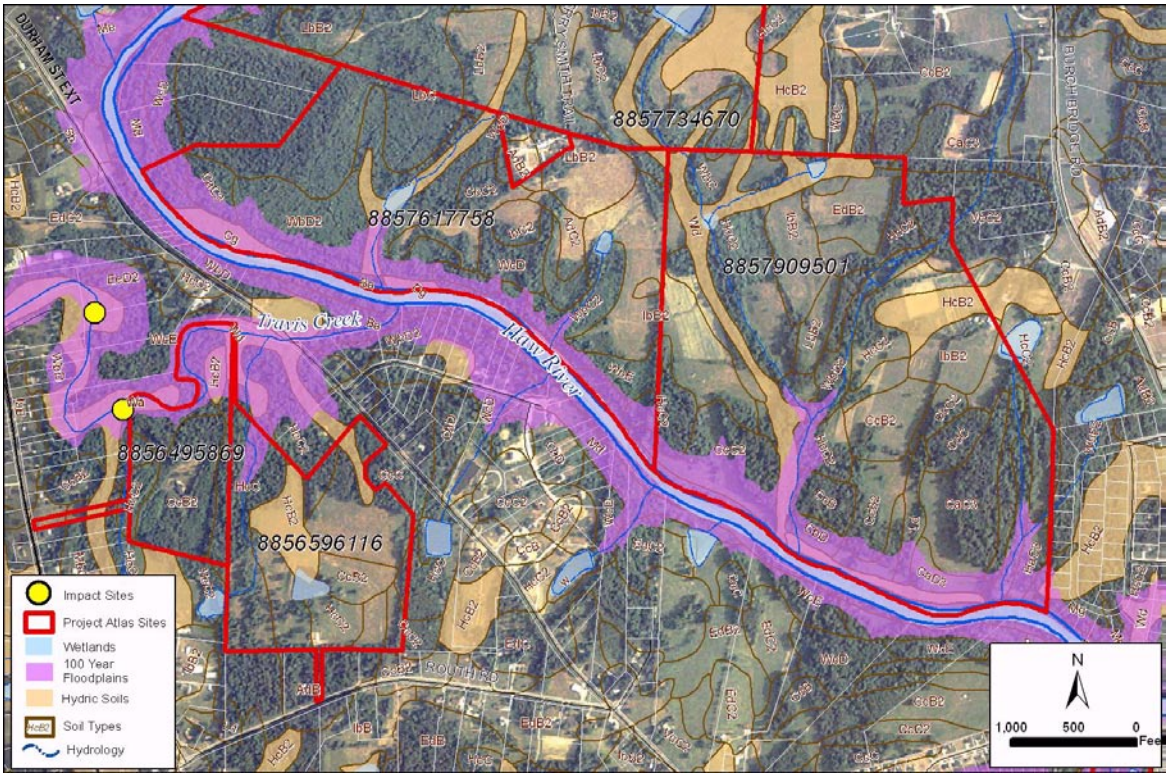
8) Travis & Tickle 12.1

Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 18 & 18
Site Location: Alamance County, TT
Acreage: 209.17 acres; 134.94 acres
Land Use: Agriculture; Agriculture
Percentage of Parcel Forested: 49%; 72%
Percentage of Effective Impervious Surface: **0%**; 7%
Percentage of Parcel in 100 year floodplain: 15%; 21%
Percentage of Parcel in 500 year floodplain: 22% (46.02 acres); 26% (35.08 acres)
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 3,066 ft.; 3,366 ft.
- Intermittent Streams: 8,815 ft.; 2,455 ft.
- Pond/Lake: 2.03 acres; 3.26 acres

Recommended Practice: Preservation
Recommended Size of Practice: 344.11 acres: 8.11 ac floodplain preservation
5.29 ac wetland
17,703 linear stream feet of streambank enhancement

Pros	Cons
• Haw River corridor parcels • Well forested • Large riparian buffer • Four small NWI non-riverine wetlands totaling ~2 acres • Conserved under Voluntary Agriculture District (VAD) • Landowners already working with EEP, ACS&WCD, & PLC	• Steep slopes • Highly erodible soils • No local land use regulation



These two large parcels in rural Alamance County are already the beneficiaries of working with EEP, the Piedmont Land Conservancy (PLC), Haw River Trail (HRT), and ACS&WCD and the National Resources & Conservation Service (NRCS) towards riparian conservation and agricultural preservation that will protect a total of 10,000 linear stream feet. The landowners and farm operators have worked with EEP to preserve the downstream parcel of these two. Efforts should be made to protect these lands as open space and critical riparian areas, especially within the Haw River riparian corridor: these parcels are just upstream from the Haw River confluence, and likely play a pivotal role in providing relatively clean water to this major artery. The UTs that flow through them include five that are filtered by upstream ponds and wetlands prior to discharging into the Haw River. The parcels were historically managed under VAD, and plans are for the entire property (both tracts) to be placed in a permanent farmland preservation easement through the USDA's Farm and Ranchland Protection Program (FRPP). AWCSD, NRCS, and PLC successfully protected the eastern tract through a federal granting process. An application for the remaining western tract is in progress.

9) Travis & Tickle 3.1

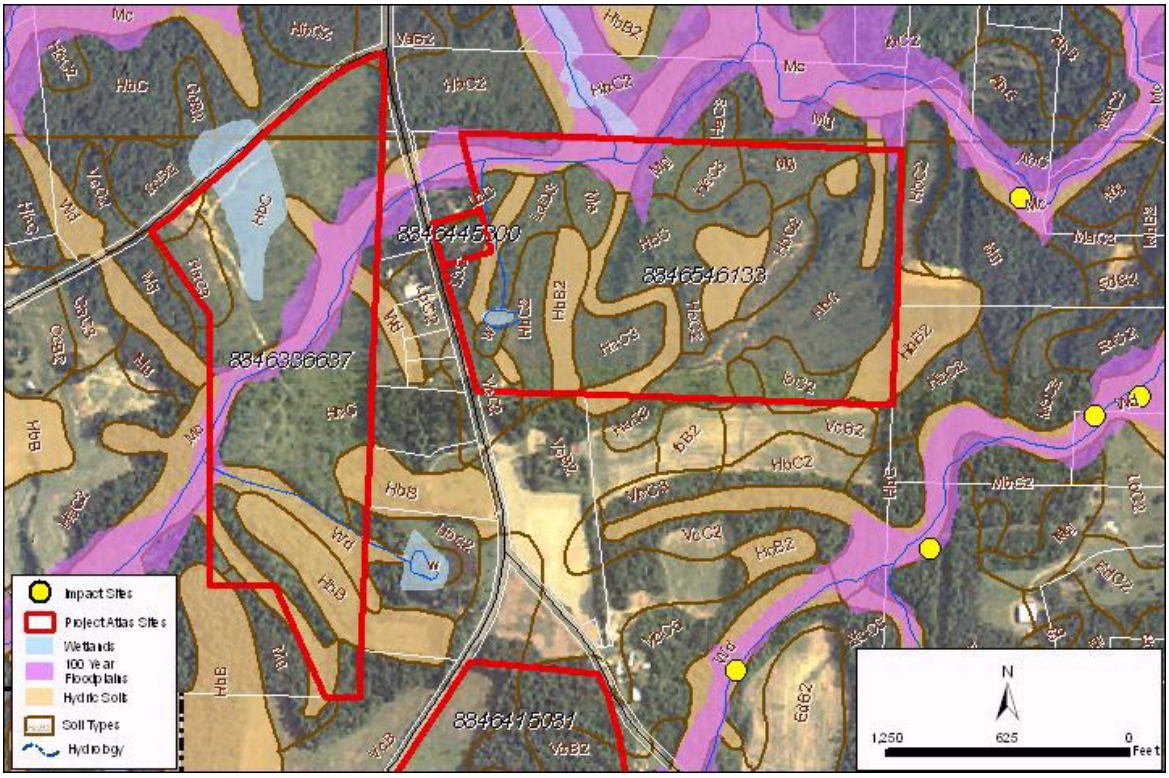
Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 16; **18**; 10
Site Location: Alamance County, TT
Acreage: 67.79 acres; 54.87 acres; 1.34 acres
Land Use: Vacant; Single Family; Single Family
Percentage of Parcel Forested: 12%; 50%; 0%
Percentage of Effective Impervious Surface: **0%**; **0%**; **0%**
Percentage of Parcel in 100 year floodplain: 8%; 17%; 0%
Percentage of Parcel in 500 year floodplain: 9% (6 acres); 18% (10 acres); 0%
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 1,623 ft
- Intermittent Streams: 908 ft
- Wetland Acres: 3.98 acres

Recommended Practice: Wetland Restoration & Streambank Enhancement/Conservation

Recommended Size of Practice: 12.76 acres:
8.78 ac floodplain preservation
3.98 ac wetland
2,530 linear stream feet of streambank enhancement

Pros	Cons
• 4-acre NWI non-riverine wetland • Perennial stream with 330-ft buffer • Immediately downstream of UT headwaters • Immediately upstream of Travis Creek confluence	• Development pressure due to proximity to Elon & Gibsonville • No current local land use regulation • Heavily logged for softwood timber • Steep slope, highly-erodible soils



Two of four large vacant or single-family priority properties that lie just outside the northern perimeter of the Gibsonville and Elon town limits in Alamance County, these parcels offer an opportunity to preserve green space outside of the urban centers in the LATT watersheds. These properties are within a mile of each other, and are separated only by one intervening non-priority parcel. The larger property is bordered by Gibsonville-Ossipee Road to the East and Piedmont Avenue to the North, both of which are significant thoroughfares for urban and rural residents of the area; the smaller parcel is bordered to its West by Gibsonville-Ossipee Road. The potential for subdivision and development is high. The northern end of the smaller parcel is cleared of trees for dirt access roads immediately off Piedmont Avenue; the upland areas on the other parcel are cleared. There are opportunities to conserve aquatic and riparian habitat, restore wetland habitat, improve water quality, mitigate stormwater flow from the road, and strategically link a parcel conservation projects upstream of Travis Creek and its confluence with the Haw River. If developed for multiple residences, it is important to do so in accordance with LID principles, preserving as much of the hydrologic and hydric functions of these parcels as possible.

10) Travis & Tickle 10.1

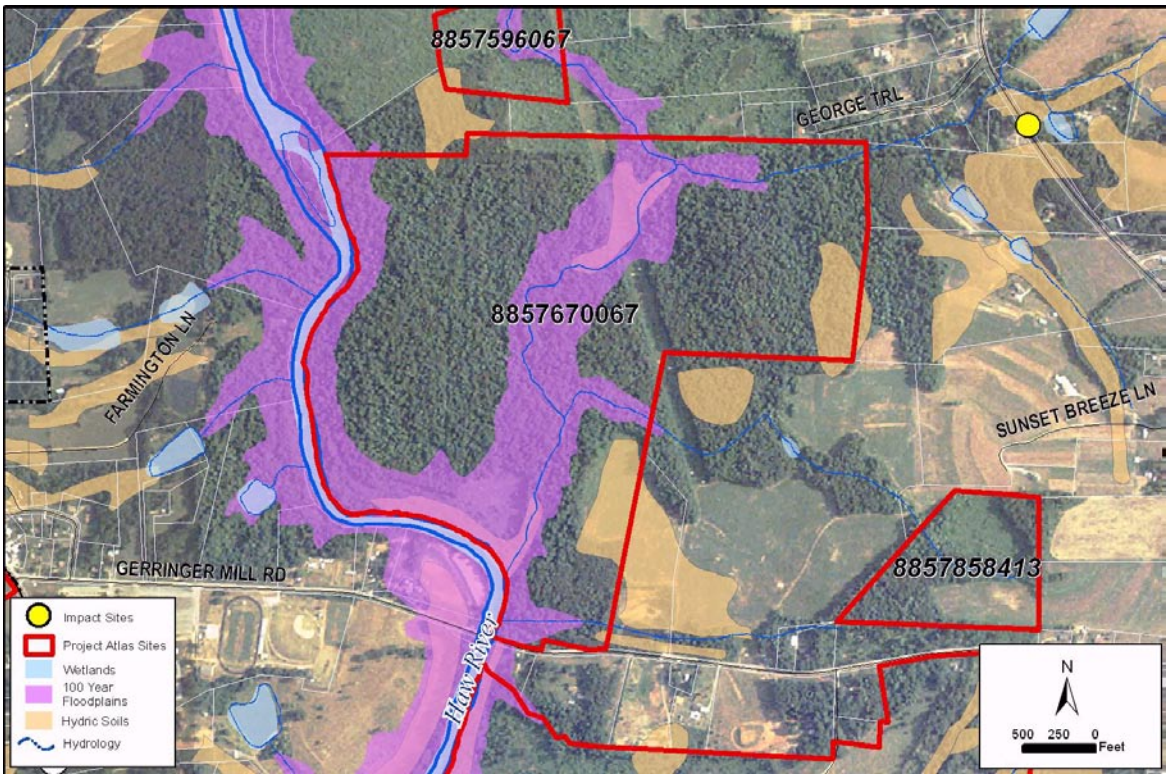
Significant Site Features & Results of Initial Parcel Ranking:
Total Points Received in Initial Ranking: 17
Site Location: Alamance County, TT
Acreage: 199.78 acres
Land Use: Vacant
Percentage of Parcel Forested: **86%**
Percentage of Effective Impervious Surface: **0%**
Percentage of Parcel in 100 year floodplain: 17%
Percentage of Parcel in 500 year floodplain: 17% (40 acres)
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 15,310 ft
- Intermittent Streams: 4,007 ft
- Pond/Lake: N/A

Recommended Practice: Preservation

Recommended Size of Practice: 199.78 acres: **40 ac floodplain preservation**
19,317 linear stream feet of streambank conservation

Pros	Cons
• Haw River corridor parcel • Well-forested • Large riparian buffer • Would serve 2 perennial streams • Adjacent to vacant lands • In close proximity to many other Project Atlas sites	• No local land use regulation • Steep slopes • High development pressure



This 200-acre parcel is an ideal preservation candidate for the LATT watershed. In fact, its appeal was already noted in *The Haw River Riparian Corridor Conservation Plan* (PTCOG, 2005). An open space only interrupted by a utility easement, this parcel is currently vacant. As such, it serves as a valuable amenity to the adjacent Haw River, giving River users a large green space to enjoy and filtering any surface water flow before it reaches the waters. It also hosts a significant perennial tributary that should be considered a priority when discussing the current health of the Haw River. The close proximity of this parcel to others named in this Project Atlas enhances the potential for connectivity amongst open spaces and agricultural parcels, enhancing the ecological value of all of this property. The enormous amount of linear stream feet that could be protected through preservation of this parcel should be of interest to the HRT, PLC, EEP, ACS&WCD, and any others interested in greenway or blueway development on the Haw River. For further details, including information on initial landowner contact regarding this parcel, please refer to *The Haw River Riparian Corridor Conservation Plan* (PTCOG, 2005).

11) Travis & Tickle 15.1

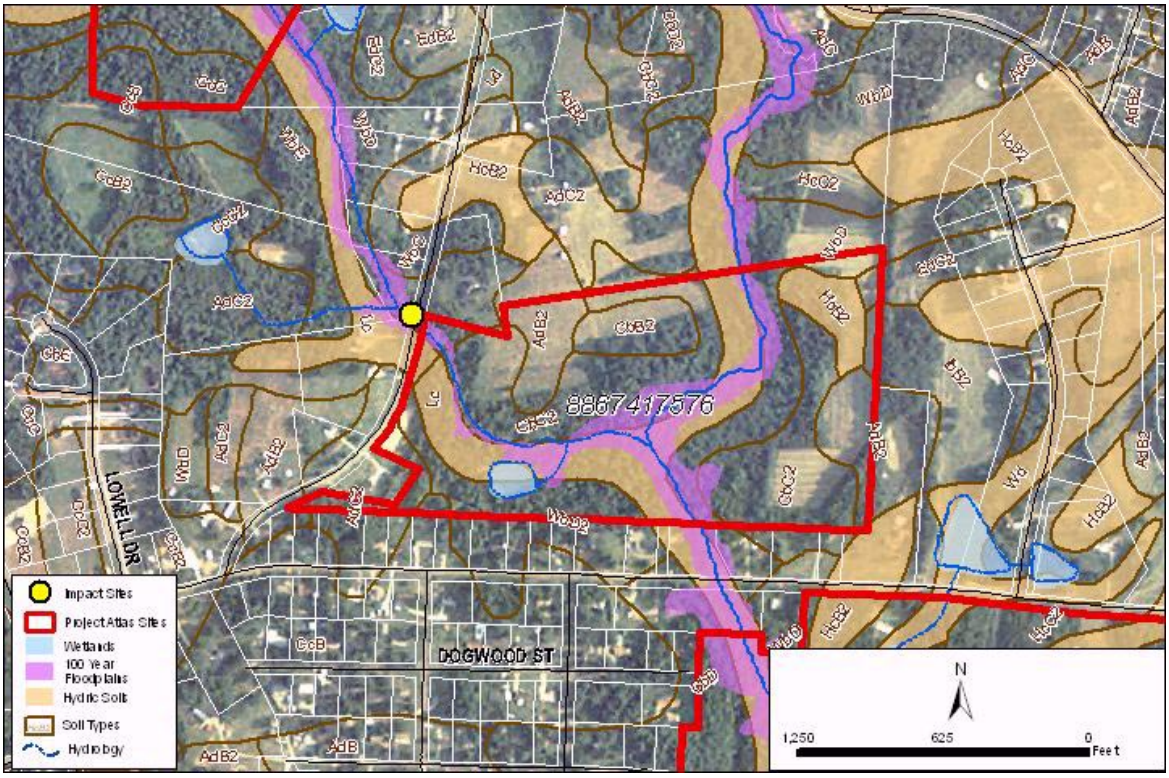
Significant Site Features & Results of Initial Parcel Ranking:
Conservation: 17
Site Location: Alamance County, TT
Acreage: 47.73 acres
Land Use: Agriculture
Percentage of Parcel Forested: 64%
Percentage of Effective Impervious Surface: 13%
Percentage of Parcel in 100 year floodplain: 15%
Percentage of Parcel in 500 year floodplain: 15% (7.16 acres)
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 1,531 ft
- Intermittent Streams: 1,549 ft
- Pond/Lake: 0.56 acres

Recommended Practice: Preservation

Recommended Size of Practice: 47.73 acres: **7.16 ac floodplain preservation**
0.56 ac wetland
3,080 linear stream feet of streambank conservation

Pros	Cons
• EEP Project site • Well forested • Mostly undeveloped • 0.5-acre NWI riverine wetland • Large riparian buffer • VAD parcels • Upstream of Haw River • Potential to influence neighbors	• No local land use regulation • High development pressure • Highly erosive soils • Steep slopes • Reluctance to permanently conserve the parcel



This is a potential EEP project that would have great benefit to the Haw River. Strategically located upstream of the Haw River and another high-priority project parcel, conserving this land is an important component of the conservation strategy for all of rural Alamance County. It is the site of NC DWQ's reference monitoring site, a habitat known for its sensitive species and relatively high quality waters. Its proximity to other, largely vacant properties could serve as a powerful example that leads to similar practices on these properties, much as the VAD that presides over the parcel is common in the area. This is especially important in this region of the TT watershed, as this parcel is adjacent to a center of residential development and possible expansion. The BMP noted here is actually one that calls for further preservation on the parcel across the street. Its position at a busy rural intersection only heightens the development pressures on this parcel and in the area. EEP has contacted the owner who is not currently interested in preserving the parcel. The decision between subdivision of parcels for development or the preservation of parcels for agricultural and environmental purposes will loom larger in the future, and is the underlying reason for the high priority status of many of the large rural parcels in this Project Atlas.

12) Travis & Tickle 6.1

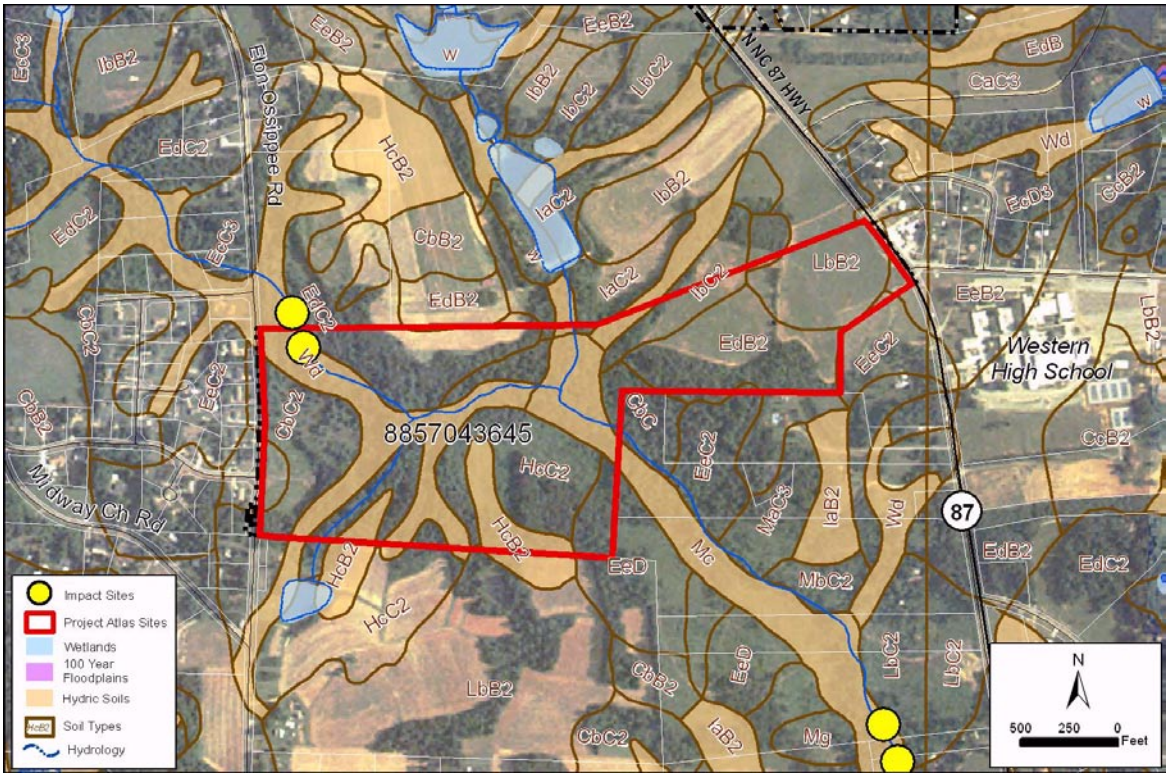
Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 16
Site Location: Town of Elon, TT
Acreage: 67.31 acres
Land Use: Open Space/Recreation
Percentage of Parcel Forested: 67%
Percentage of Effective Impervious Surface: **0%**
Percentage of Parcel in 100 year floodplain: 0%
Percentage of Parcel in 500 year floodplain: 0%
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 2,376 ft
- Intermittent Streams: 810 ft
- Pond/Lake: 0 acres

Recommended Practice: Stream Enhancement, Preservation

Recommended Size of Practice: **3,186 linear stream feet of streambank enhancement**

Pros	Cons
• Well forested • Public land • Across the street from a high school → Potential environmental education site • Site of 2 confluences • Downstream of 2 NWI non-riverine wetlands • In need of BMP implementation • Large benefit if addressed • Potential to serve as pilot project	• Located between two busy roads • Land management concerns • Headcut has moved through the northern UT of the parcel



The Town of Elon owns this satellite parcel about 2 miles north of the regular Town limits. It is passively managed, and is mainly used by poachers who hunt deer there. It is also a stream enhancement site, due to a headcut on a property just upstream just upstream of the northern UT. These impacts are likely due to the residential development just upstream that lack the necessary stormwater BMPs. The Town's parcel effectively mitigates the stormwater impacts of the neighboring residents by providing a large (67 acres), forested, pervious area with a naturally flowing stream. It is also important to note that two wetlands immediately upstream of this parcel aid in these mitigation services to the community.

The value of this parcel is high, but it could be increased if it can be minimally developed as a greenway and an educational site. This will benefit both the adjacent high school and the community. The Town of Elon is interested in preserving it as a minimally-managed area that serves the public, but they are not currently interested in managing the site themselves. A relationship between the Town and PLC and/or the HRT could solve this dilemma, to the community's educational and hydrological benefit.

13) Travis & Tickle 11.1

Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 18; 18; 11
Site Location: Alamance County, TT
Acreage: 52.62; 10.24; 1.28 acres
Land Use: Vacant; Residential (Single Family); Residential (Single Family)
Percentage of Parcel Forested: 71%; **82%**; 2%
Percentage of Effective Impervious Surface: **7%**; 18%; 18%
Percentage of Parcel in 100 year floodplain: 45%; 87%; 0%
Percentage of Parcel in 500 year floodplain: 55% (28.94 acres); **92%** (9.42 acres); 0%
Site Characteristics Receiving Initial Ranking Points:

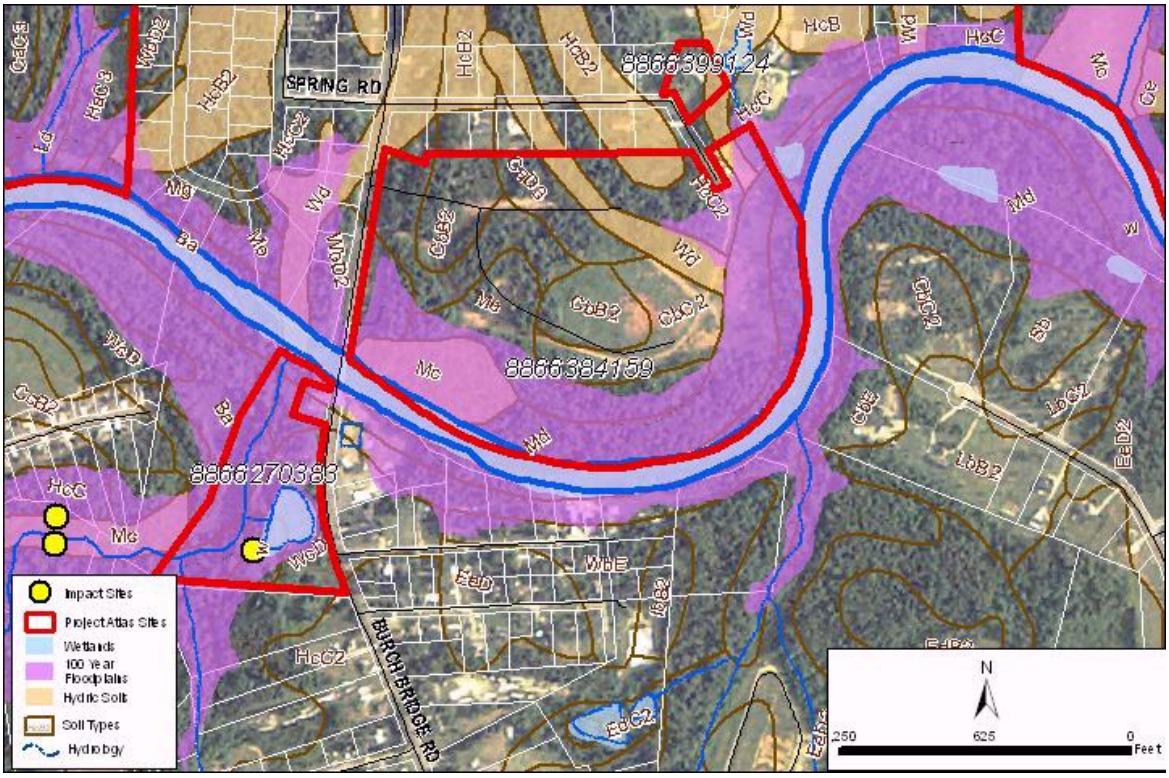
- Perennial stream: 3,988 ft
- Intermittent Streams: 500 ft
- Wetlands: 2.29 acres

Recommended Practice: Landowner Education, Streambank Enhancement, Stormwater Retrofit

Recommended Size of Practice: 38.36 acres: **38.36 ac floodplain preservation**
2.29 ac wetland
4,487 linear stream feet of streambank enhancement

Pros	Cons

• Adjacent to Haw River
• Adjacent to open space
• 330-ft. riparian buffers on Beacon property
• Near to EEP project, where current restoration efforts are taking place
• Presence of small NWI riverine wetland on Clark property
• Smaller properties downstream of two small headwater wetlands on an adjacent industrial property
• Restoration of immediate tributary to Haw River
• Landowner education could have large dividends
	• Within 100-yr. floodplain
	• Beacon property zoned as "Vacant", but appears to be cleared of interior vegetation, though buffers remain
	• Clark property has a number of needs
	  • Failing stormwater pipes
	  • Failing incised streambanks
	  • Landowner mowing down to bank
	  • Cleared of forest cover



These three properties totaling 64 acres are along the Haw River, and just downstream of large preserved riparian agricultural lands. This site holds both preservation and restoration opportunities that will benefit the Haw River and Tickle Creek watersheds. They are steep-sloped properties that have a UT running along them that originates in two small wetlands on an adjacent land that is zoned for industrial use. Furthermore, the largest property has 2,822 ft. directly along the Haw River. This landowner maintains a 330-ft. buffer without compensation, though its interior is still used. Preserving these lands to protect the Haw River and mitigate overland flow from uphill residential properties is the priority, but, according the HRT, the landowner is not interested in preserving this parcel as open space.

Across the Haw River, the 10.24 acres of riparian land may be able to serve a similar mitigation purpose, but it is in need of restoration first. A number of issues plague this parcel. Upstream impacts from poor maintenance of streams and wetland are having dramatic degrading impacts upon the riparian zone on this property. This impact is augmented by the presence of stormwater pipes discharging directly into the UT on this property, and the landowners' maintenance of the land by mowing to the streamside, and disposing of refuse in the stream. Incised and slumping banks were found all along this stream. Furthermore, the location of this property almost entirely within the 100-year foodplain not only put its residents at risk, but also threatens the greater water quality, if these impacts continue and contribute to stormflow. The impact upon the Haw River directly downstream is unknown. If restored, this whole stretch of the Haw River will directly benefit from reduced NPS pollution impacts.

14) Travis & Tickle 9.1

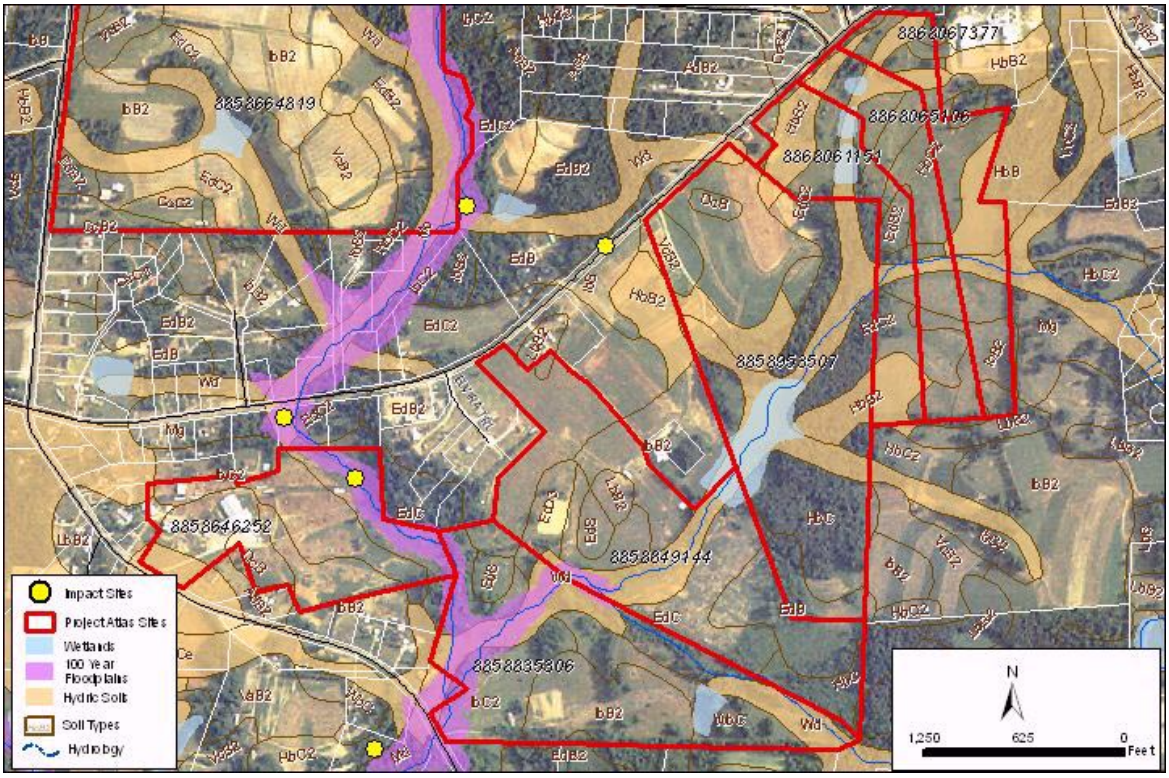
Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 16, 16, 14, 13, & 13
Stressor Value: **10**; **9**; 7; 6; 6
Site Location: Alamance County, TT
Acreage: 49.73 acres; 62.25 acres; 18.14 acres; 18.08 acres; 18.68 acres
Land Use: Agriculture; Agriculture; Agriculture; Agriculture; Agriculture
Percentage of Parcel Forested: 16%; 50%; 12%; 1%; 5%
Percentage of Effective Impervious Surface: **0%; 0%; 0.5%; 0%; 0%**
Percentage of Parcel in 100 year floodplain: 3%; 6%; N/A; N/A; N/A
Percentage of Parcel in 500 year floodplain: 2% (1.5 acres);6% (4 acres); N/A; N/A; N/A
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: N/A
- Intermittent Streams: 1,450 ft.; 1,540.25 ft.; 301ft.; 238 ft.; 384 ft.
- Pond/Lake: 4.04 acres; 0.69 acres; 0.35 acres; 0 acres

Recommended Practice: Buffer Enhancement, Wetland Enhancement, Preservation, Landowner Education

Recommended Size of Practice:
1 ac floodplain preservation
5.08 ac wetland
3,913 linear stream feet of streambank enhancement

Pros	Cons
• In Haw River headwaters (Basin Creek) • VAD Land • Potential EEP project sites • ~7 acres of 4 NWI riverine wetlands • Large parcels – 613 acres total • In need of agricultural BMP implementation • Potential to serve as pilot projects • Educational opportunity	• Most land cleared of forest cover • Needs sediment control • Loss would add significant impervious surface to area • Basin Creek impacted in this area • Permanent protection?



These five parcels are agricultural lands in the Basin Creek subwatershed of the Haw River. They are cleared for agricultural purposes, but abide by the regulations of the Alamance County VAD. The presence of wetlands on these lands makes them hydrologically valuable – especially the 5-acre wetland lying on the two largest parcels. The three smaller parcels, adjacent to Clover Garden Elementary School, have impacted hydric soils and riparian buffers. Because of the school's proximity, restoration of wetlands could be offer education opportunity.

These parcels lie on a tributary to Basin Creek, which is the most degraded stream in the TT watershed. The loss of the wetlands and healthy streams on these parcels will further stress downstream waters. Though development pressure of the area is not great, the growth of single-family residences in this part of the County could change that. Preserving these lands as agriculture and open space, however, both preserves a healthy tributary with valued overland flow control wetlands and serves as an example to neighboring landowners on the benefits of such actions.

15) Travis & Tickle 15.2

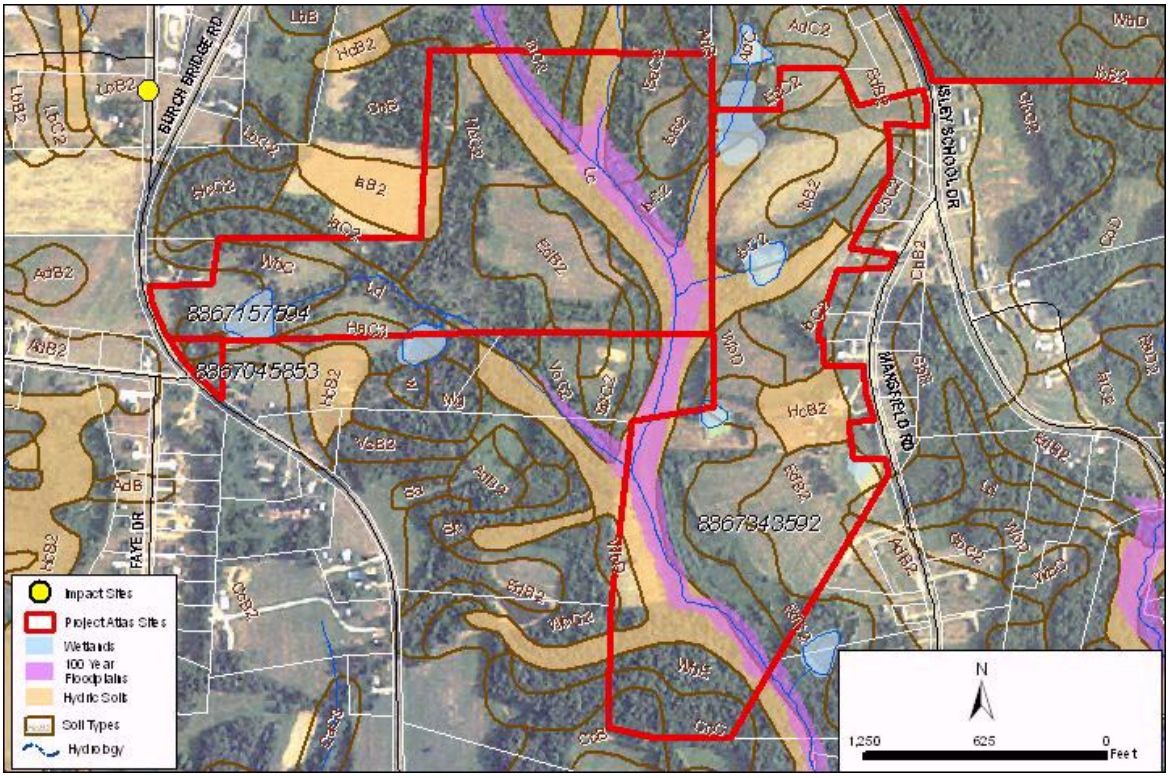
Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 17; 18; 10
Site Location: Alamance County, TT
Acreage: 76.91 acres; 70.43 acres; 1.62 acres
Land Use: Agriculture; Residential (Single Family); Single Family
Percentage of Parcel Forested: **84%**; 26%; 0%
Percentage of Effective Impervious Surface: 20%; 31%; 1%
Percentage of Parcel in 100 year floodplain: 10%; 7%; 0%
Percentage of Parcel in 500 year floodplain: 10% (7.7 acres); 7% (4.9 acres); 0%
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 0 ft.; 0 ft.
- Intermittent Streams: 4,505 ft; 2,260 ft.
- Pond/Lake: 1.85 acres; 3.92 acres

Recommended Practice: Preservation

Recommended Size of Practice: 76.91 acres: **4.93 ac floodplain preservation**
5.77 ac wetland
6,765 linear stream feet of streambank conservation

Pros	Cons
• Adjacent to Haw River corridor • Well forested • Large riparian buffer • Four small NWI non-riverine wetlands totaling ~4 acres • Conserved under VAD • Landowners already working with EEP	• Steep slopes • Highly erodible soils • No local land use regulation



These two large parcels in rural Alamance County are already the beneficiaries of working with EEP. The eastern property is a potential wetland and stream protection site, while the family owning the western parcel has worked with EEP to preserve another agricultural parcel. Efforts should be made to protect these critical riparian areas: these parcels are just upstream from the Haw River confluence, and likely play a pivotal role in providing relatively clean water to this major artery. While they are currently under VAD management, it is unknown if they are being protected on a more permanent basis. ACS&WCD, EEP, and the HRT should be consulted regarding these parcels. If steps are not taken, the development pressures on these parcels may be too high to protect it in the future, and Alamance County will lose both its water quality and its agricultural heritage.

16) Little Alamance 7.2

Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 10; 4; 3; 7
Stressor Value: – **9; 10; 10; 10**
Site Location: City of Burlington, LA
Acreage: 1.39 acres; 0.57 acres; 0.57 acres; 0.54 acres
Land Use: Office; Office; Office; Office
Percentage of Parcel Forested: 46%; 26%; **0.5%**; **4%**
Percentage of Effective Impervious Surface: 32%; **64%**; **75%**; **54%**
Percentage of Parcel in 100 year floodplain: **68%**; N/A; 32%; **100%**
Percentage of Parcel in 500 year floodplain: **72%** (1.00 acre); N/A; 50% (0.29 acres); **100%** (0.54 acres)
Site Characteristics Receiving Initial Ranking Points:

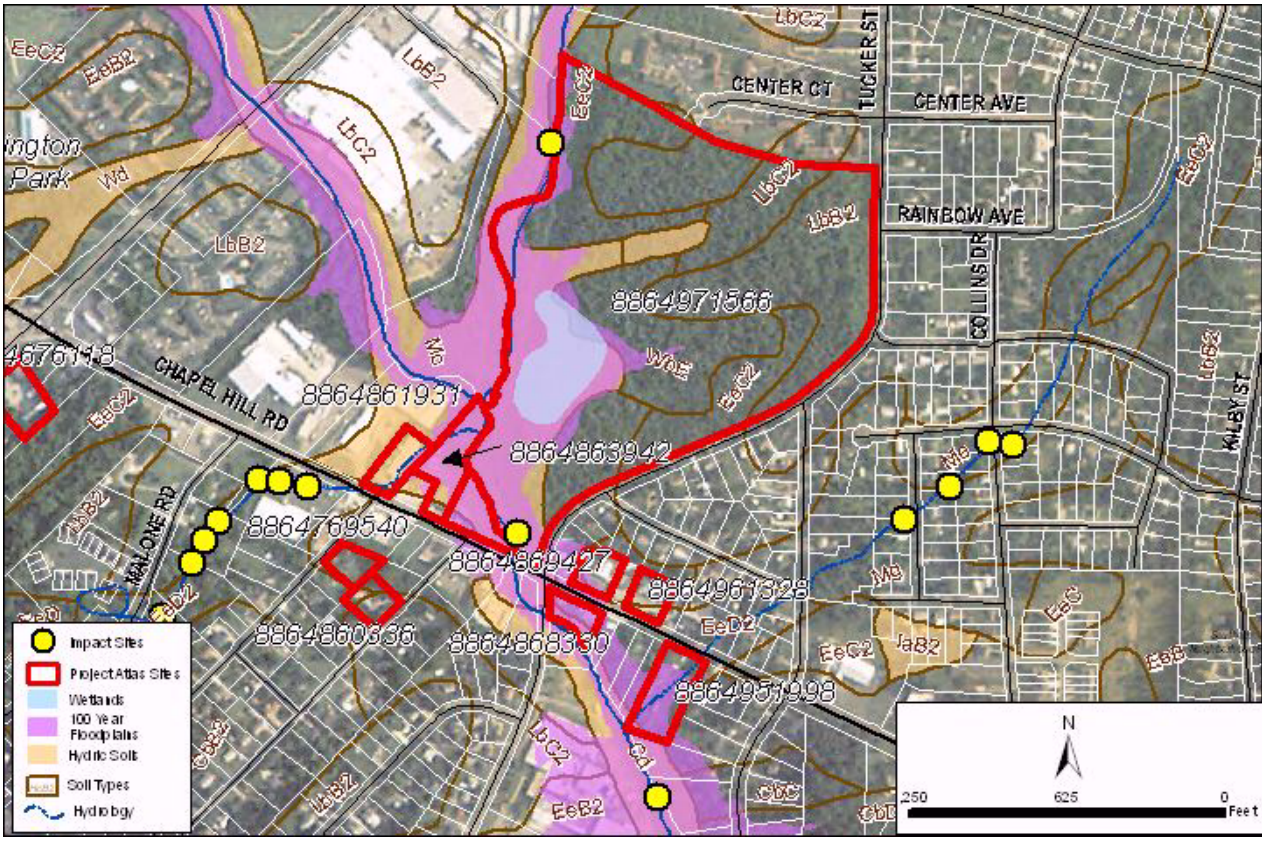
- Perennial stream: N/A
- Intermittent Streams: 1,310 ft; N/A; N/A; N/A
- Pond/Lake: N/A

Recommended Practice: Preservation, Landowner Education, Buffer Restoration, Stormwater Retrofit

Recommended Size of Practice: 1.83 ac floodplain preservation
1,310 linear stream feet of streambank restoration

Pros	Cons

• Office Parcels:
  • In need of stormwater controls
  • Downstream of noted BMPs
  • Good potential restoration pilot project(s)
• Open Space Parcel:
  • Undeveloped land
  • Well-forested
  • Surrounded by highly impervious land
  • In need of BMP implementation
  • Stormwater control
	• Office Parcels:
	  • Highly impervious
	  • No riparian buffers
	  • No stormwater controls
	  • Within the 100-yr. floodplain
	  • Upstream (US) & Downstream (DS) impaired streams
	  • Small parcels
	  • Busy thoroughfare
	• Foy Parcel:
	  • Within the 100-yr. floodplain
	  • Zoned for Office space
	  • Very high development pressure
	  • Small parcel that cannot mitigate all uphill stormwater flow
	  • Near industrial zone



The Chapel Hill Road area of Burlington is a highly developed commercial zone with very little pervious surface. Anecdotal evidence suggests that this extent of Little Alamance Creek experiences some of the most dramatic stormwater flooding events of the entire watershed, and has created some of the most incised streams in both watersheds. Conservation of the few relatively open spaces in this area – such as this large parcel – could have great benefit to area residents. Not only would conservation and restoration of riparian areas serve a stormwater mitigation purpose, but it may also offset the upstream impacts from poor stream buffer management. Concurrent implementation of stormwater BMPs that can address the impacts of these small impervious office parcels will be necessary to improve local riparian conditions.

Any conservation here must be complemented by landowner education efforts on these unbuffered upstream parcels. Indeed, the educational benefit of restoration in such a densely populated area could have a domino effect with regard to stormwater management. Some of the best parcels for these pilot projects – such as rain gardens offsetting impervious roofs and parking lots – are the three office lots upstream of the larger open space parcel. These parcels are almost entirely paved, have no tree cover, and absolutely no buffers if they have streams within their borders. Furthermore, one parcel is entirely within the 100-year floodplain, putting it at the mercy of future flooding events in LA. These parcels are upstream and downstream of multiple stream restoration sites, and it is noted in the field assessments that this stretch of LA is generally degraded; any and all restoration efforts here are needed. Given the potential benefit of actions in this area, immediate action and cooperation with landowners and the City of Burlington's Planning and Stormwater Departments is recommended in conjunction with an aggressive education campaign centered on promoting riparian buffers and stormwater management in residential and commercial districts, promoting innovative designs such as green rooftops.

17) Travis & Tickle 6.2

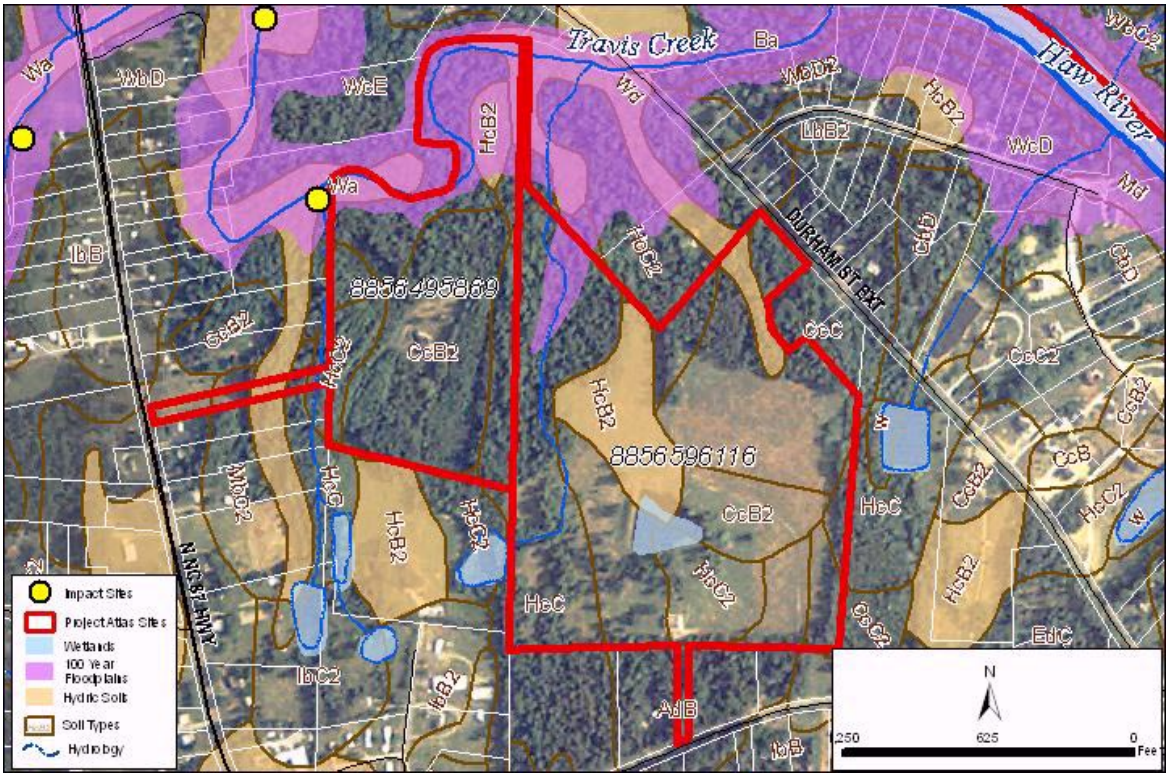
Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 17 & 17
Site Location: Alamance County, TT
Acreage: 54 acres; 21 acres
Land Use: Residential (Single Family); Vacant
Percentage of Parcel Forested: 54%; 40%
Percentage of Effective Impervious Surface: 15%; 11%
Percentage of Parcel in 100 year floodplain: 24%; 4%
Percentage of Parcel in 500 year floodplain: 28% (15.12 acres); 9% (1.89 acres)
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 1,441 ft.; 25 ft.
- Intermittent Streams: 226 ft.; 1,690 ft.
- Pond/Lake: 0 acres; 1.07 acres

Recommended Practice: Preservation, Buffer Enhancement, Wetland Enhancement

Recommended Size of Practice: 17.01 ac floodplain preservation
1.07 ac wetland
3,382 linear stream feet of streambank enhancement

Pros	Cons
• Undeveloped land in a residential area • 1-acre non-riverine NWI wetland • Downstream of log jam • Downstream of another 1-acre wetland • Forested buffers • Stable soils • Occupy almost entire Haw River tributary • Possibly needs buffer enhancement • Stream composes property boundary (Reagan)	• High development pressure • Zoned for single-family land use • Upland areas completely cleared • No current land protection



These parcels offer an opportunity to mitigate stormflow into the Haw River from surrounding development, and to ensure lands are used sustainably in the northern reaches of Burlington. The larger property offers significant stormwater management opportunities, with a wide forested buffer surrounding its tributary stream, and a 1-acre wetland downhill from the road. The tributary flowing through it is also the effluent of another, off-property 1-acre wetland that also serves as a stormwater control feature.

The smaller, western property, on the other hand, has two of four property boundaries defined by forested and buffered streams. Aerial photographs and field data support provide evidence that these landowners are conscious of this, but it will be beneficial if they have a greater incentive to persist with such sustainable land management. It is also necessary to contact these owners to get their cooperation in removing the log jam that is partially on their property. While both of these properties could potentially be subdivided and sold for denser development, they are currently maintained as a single family residences with a large amount of land cleared. Communicating with the landowners is necessary to ensure the preservation and/or LID of these strategic parcels.

18) Travis & Tickle 4.1

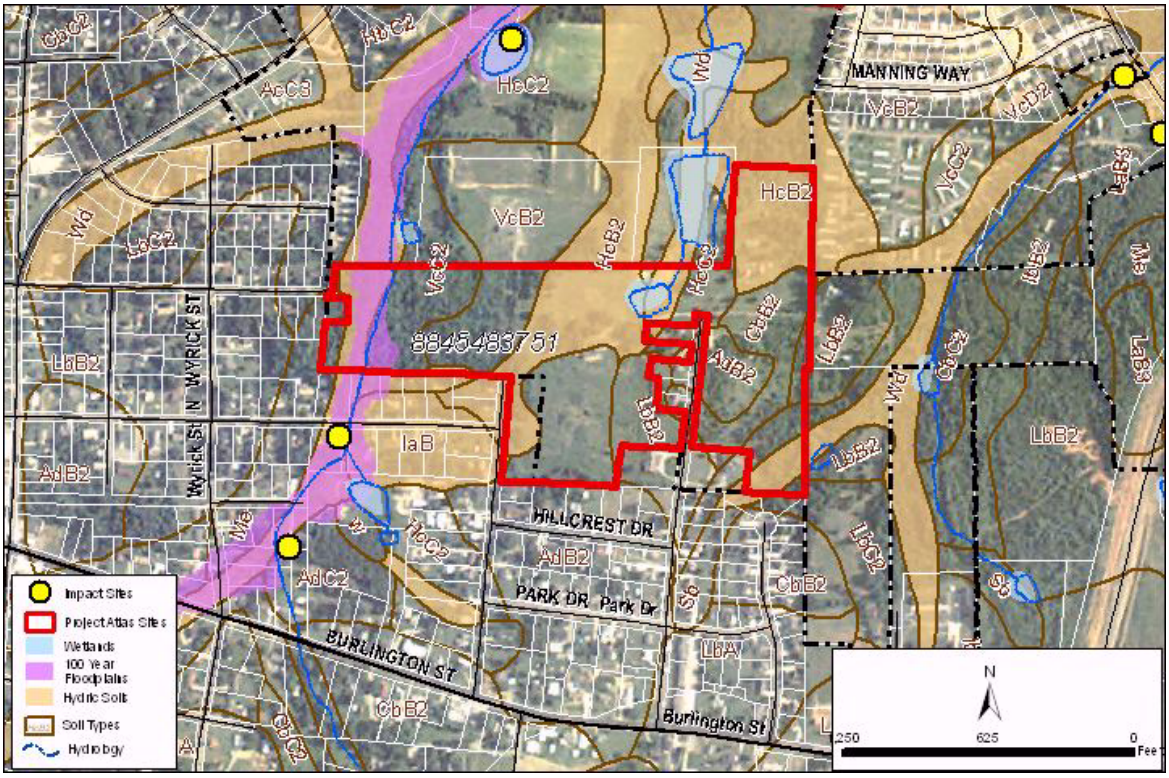
Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 14
Site Location: Alamance County, TT
Acreage: 36.06 acres
Land Use: Residential (Single Family)
Percentage of Parcel Forested: 48%
Percentage of Effective Impervious Surface: 12%
Percentage of Parcel in 100 year floodplain: 5%
Percentage of Parcel in 500 year floodplain: 5% (1.80 acres)
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 0 ft
- Intermittent Streams: 590 ft
- Pond/Lake: 0.47 acres

Recommended Practice: Preservation, Buffer Enhancement, Wetland Enhancement

Recommended Size of Practice: 1.80 ac floodplain preservation
0.47 ac wetland
590 linear stream feet of streambank enhancement

Pros	Cons
• Undeveloped land in a residential area • Upstream of NWI wetland • 0.5-acre NWI non-riverine wetland • Mostly forested • In headwaters of Travis Creek • Needs small buffer enhancement • Could serve as a pilot project in a residential area	• High development pressure • Zoned for single-family land use • Large land with small stream frontage and wetland acreage



Located just outside the Gibsonville's town limits and this parcel is currently undeveloped. The pressure to develop this land is high, though, and, if that happens, the watershed will lose a site that most certainly is critical to mitigating stormflow and upstream aquatic impacts in the Travis Creek headwaters. Though the quantifiable features here are small, they are critical. The wetland network that originates on this parcel is necessary for managing NPS pollution upstream of this site.

Enhancement of the buffer here may also serve as a good example to upstream landowners who are clearing their land down to the streamside. Downstream conditions are good, and much of that can be attributed to the non-developed status of the Patton parcel. Immediate steps should be taken to enhance the buffers, wetlands, and open space on this property. It is necessary for the protection of downstream areas, and the benefit of the surrounding residences.

19) Travis & Tickle 15.3

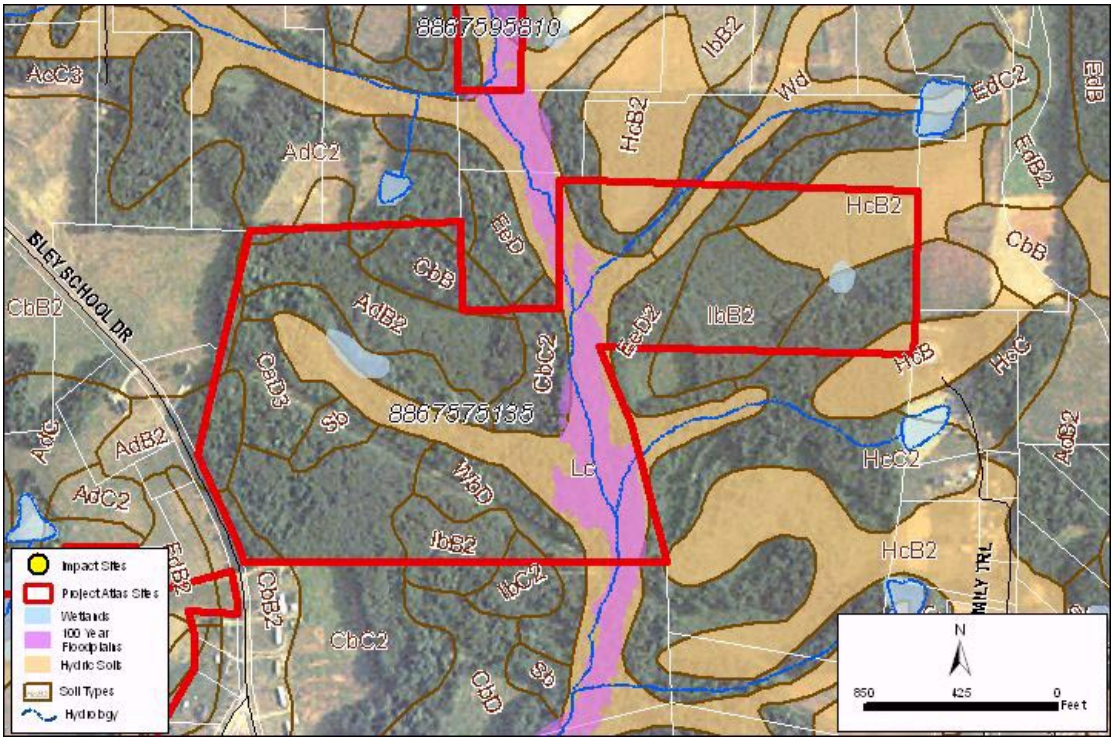
Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 18
Site Location: Alamance County, TT
Acreage: 81.76 acres
Land Use: Agriculture
Percentage of Parcel Forested: **98%**
Percentage of Effective Impervious Surface: **8%**
Percentage of Parcel in 100 year floodplain: N/A
Percentage of Parcel in 500 year floodplain: N/A
Site Characteristics Receiving Initial Ranking Points:

- Perennial Streams: 0 ft
- Intermittent Streams: 2,621 ft
- Pond/Lake: 1.01 acres

Recommended Practice: Preservation

Recommended Size of Practice: 81.76 acres: **1.01 ac wetland**
2,621 linear stream feet of streambank conservation

Pros	Cons
• Almost entirely forested • VAD parcel • 2 NWI non-riverine wetlands totaling 1-acre • Within DWQ reference subwatershed • Low development pressure	• Highly erodible soils • Steep slopes • Critical land that protects a DWQ-rated "Good" site



This is an outstanding preservation opportunity. This parcel occupies two confluence points on Basin Creek in subwatershed TT 15. Many of these UTs are downstream of small wetlands; this property has two small wetlands itself. Much of the land – though used for agriculture – is forested. It is reasonable to estimate that this parcel plays a significant role in protecting the "Good" DWQ reference monitoring site. The parcel currently lies in an Alamance County VAD, but measures need to be taken to ensure the permanent preservation of this critical piece of land in the TT watershed. Coordination with the ACS&WCD and immediate contact with the landowner is recommended.

20) Little Alamance 8.1

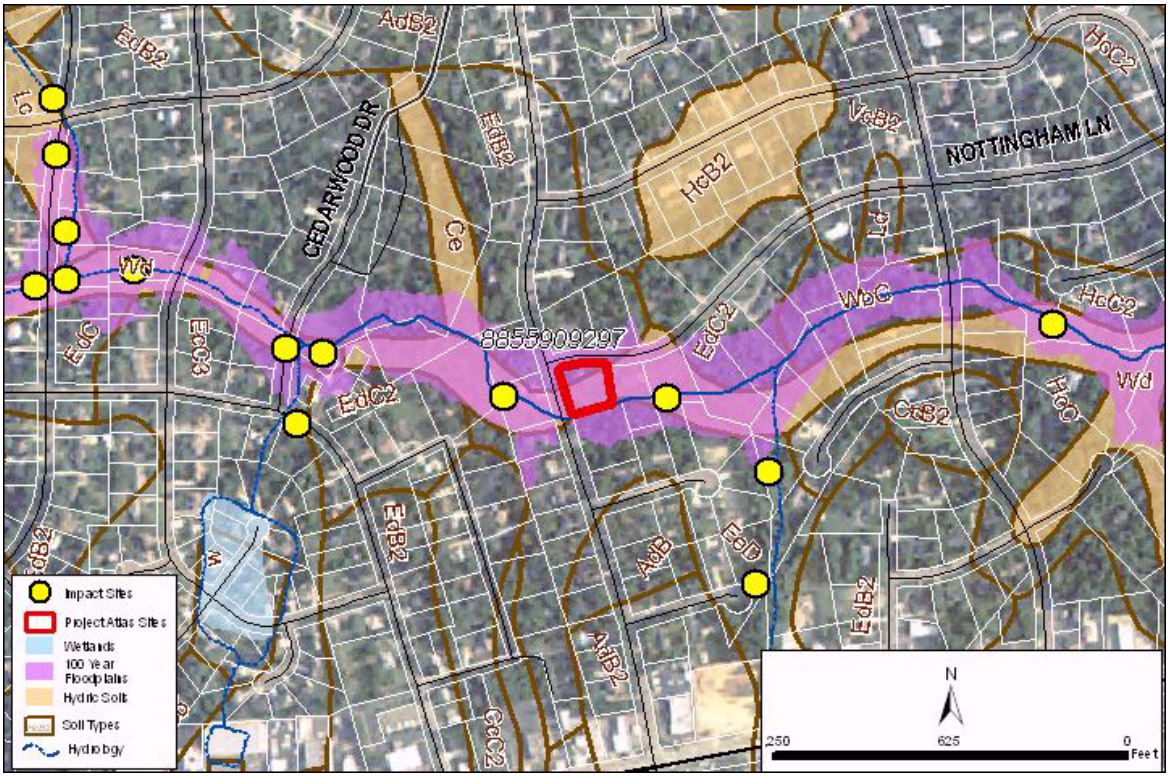
Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 7
Site Location: City of Burlington, LA
Acreage: 0.59 acres
Land Use: Residential (Single Family)
Percentage of Parcel Forested: **92%**
Percentage of Impervious Surface: 28%
Percentage of Parcel in 100 year floodplain: **100%**
Percentage of Parcel in 500 year floodplain: **100%** (0.59 acres)
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 150 feet
- Intermittent Streams: N/A
- Pond/Lake: 0 acres

Recommended Practice: Streambank Restoration, Buffer Restoration, Stormwater Retrofit, Landowner Education

Recommended Size of Practice: 0.59 acres

Pros	Cons
• Well forested • In urban area • In need of BMP implementation • Surrounded by BMP needs • Potential to serve as pilot project	• Completely within 100-yr. floodplain • In urban area • Concrete channel • Impervious surface



This urban parcel is one of many in downtown Burlington that requires measures to offset its contributions to the stormwater impacts upon Little Alamance Creek. Highly impervious, with an armored stream channel, there is little to indicate that anything about the Creek at this property is natural. The City of Burlington will be required to address the lack of buffers along all undeveloped properties under the NC DWQ Jordan Lake Rules, but will be aided if it can restore or enhance buffers within its highly-impervious urban core. There is also a need to restore more natural riparian morphology to the streambanks and bed that more directly serves the needs of the LA watershed. This is apparent from the armored channel at this location and failing stormwater devices up- and downstream of this parcel. A targeted approach will have a temporary benefit to this area of Little Alamance Creek, but a more systematic approach to restoring healthy waters is needed for sustainable stewardship and restoration to take place. This requires policy and/or programmatic solutions by the City of Burlington.

21) Travis & Tickle 12.3

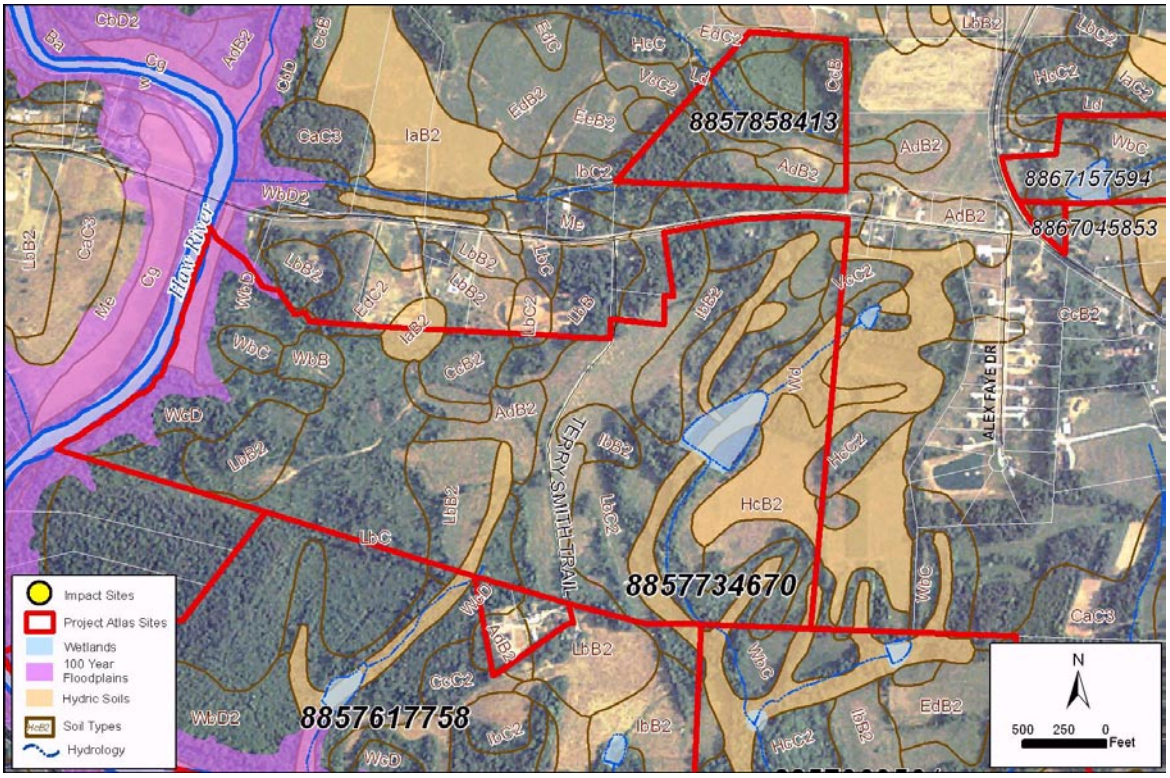
Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 18 & 14
Site Location: Alamance County, TT
Acreage: 161.38 acres; 21.20 acres
Land Use: Agriculture; Agriculture
Percentage of Parcel Forested: 60%; 71%
Percentage of Effective Impervious Surface: **8%**; **0%**
Percentage of Parcel in 100 year floodplain: 5%; 0%
Percentage of Parcel in 500 year floodplain: 7% (11.30 acres); 0%
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 468 ft
- Intermittent Streams: 1,810 ft.; 778 ft.
- Pond/Lake: 3.23 acres; 0 acres

Recommended Practice: Preservation

Recommended Size of Practice: 182.58 acres: 11.30 ac floodplain preservation
3.23 ac wetland
3,055 linear stream feet of streambank conservation

Pros	Cons
• Haw River corridor parcel • Well forested • 3-acre NWI non-riverine wetland • Large riparian buffer • VAD parcels • Stable soils (small parcel)	• No local land use regulation • Permanent conservation?



These two parcels are in rural Alamance County within the Haw River corridor. Both have been placed under the management of a VAD, but it is unknown if there is more permanent conservation management of these parcels. Efforts should be made to protect these lands as open space and critical riparian areas. Residential developments just upstream of this parcel indicate increasing pressures to subdivide and develop these parcels. The UT that flows through the larger parcel includes a 3-acre wetland that could have a significant role in managing stormflow and NPS. ACS&WCD and the HRT should be consulted regarding these parcels. If steps are not taken, the development pressures on these parcels may be too high to protect it in the future, and Alamance County will suffer both the loss of good water quality and its agricultural heritage.

22) Travis & Tickle 4.2

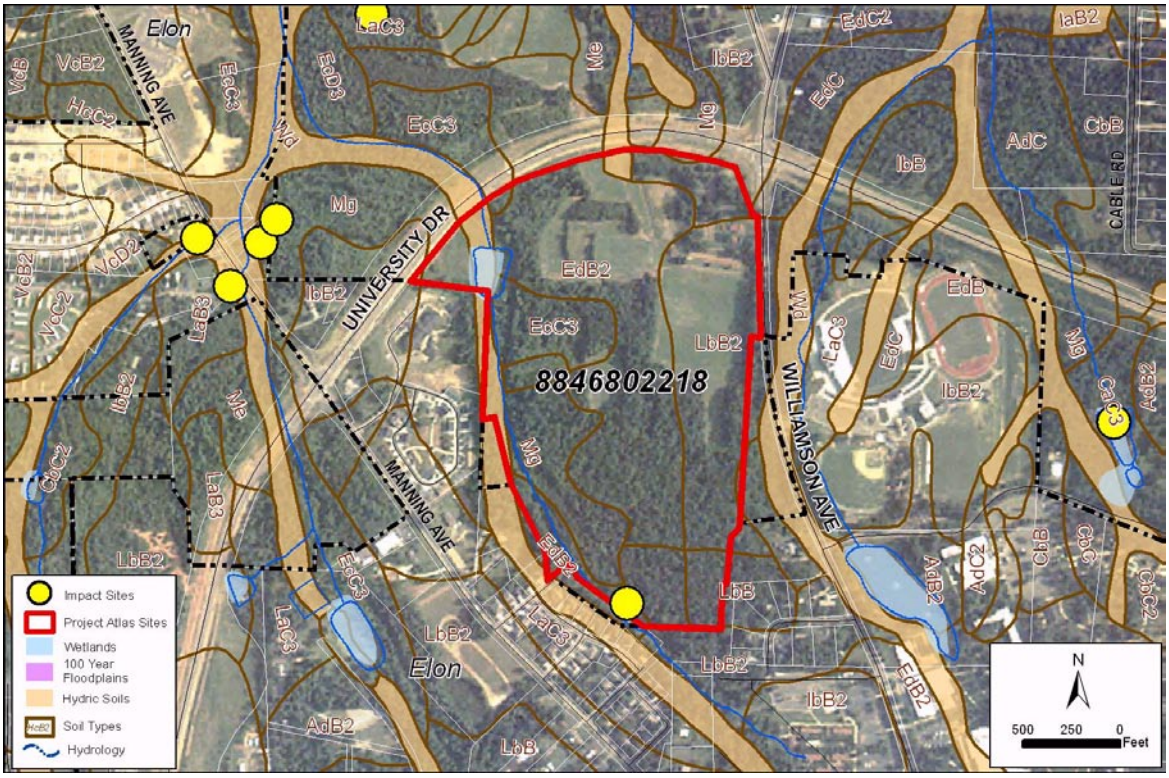
Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 15
Site Location: Alamance County, TT
Acreage: 68.88 acres
Land Use: Residential (Single Family)
Percentage of Parcel Forested: 65%
Percentage of Effective Impervious Surface: 18%
Percentage of Parcel in 100 year floodplain: 0%
Percentage of Parcel in 500 year floodplain: 0%
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 0 ft
- Intermittent Streams: 1,965 ft
- Pond/Lake: 0.83 acres

Recommended Practice: Preservation, Landowner Education, Streambank Enhancement

Recommended Size of Practice: 0.83 ac wetland
1,965 linear stream feet of streambank enhancement

Pros	Cons
• Mostly forested • High potential for landowner education • Undeveloped land • Presence of small wetland	• Noted bank enhancement needed • Steep slopes • Zoned for residential development • High development pressure



This parcel lies on an UT of the Travis Creek subwatershed. It has been undeveloped, though some areas have been cleared. The field assessment noted that the landowner should be contacted, as the left bank of the UT was being mowed down to the water's edge. The ease of remedying this impact, and the undeveloped nature of the land, make this a parcel that should be readily pursued. The parcel mitigates of the upstream stormflow, filtering the water and slowing its flow through dense forest cover and small wetland. The location of this parcel just outside Elon's town limits, and its current land use zone as "Single Family" make the need for landowner communication and preservation actions urgent. If developed, this site could also serve as an ideally central location for a pilot LID-designed residential community.

23) Travis & Tickle 4.3

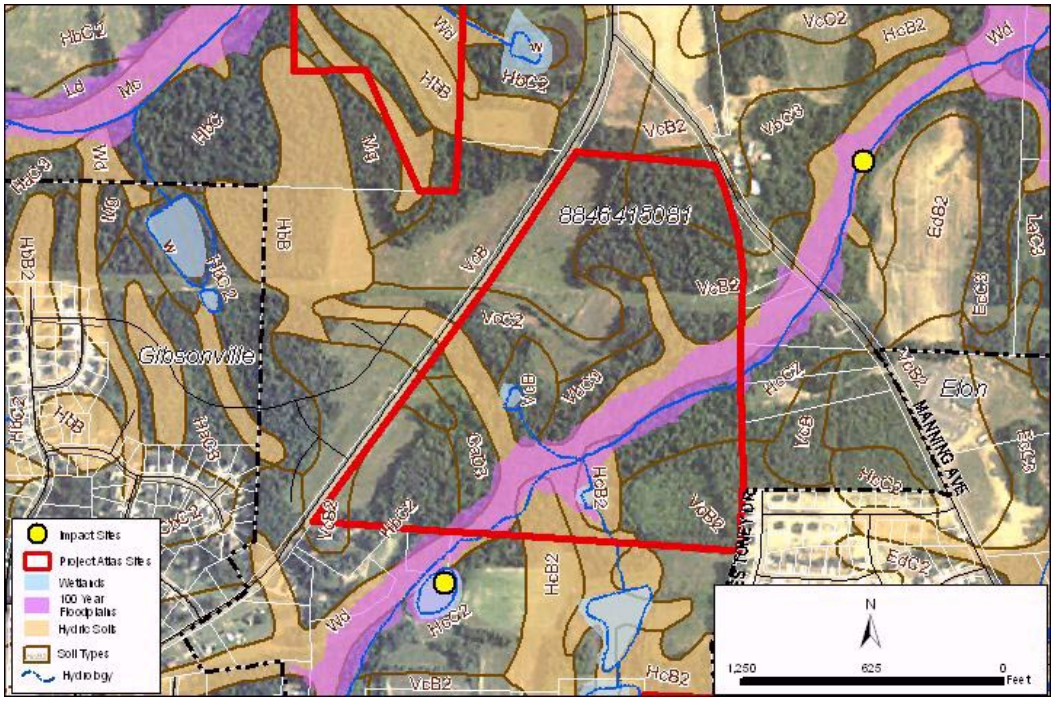
Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 18
Site Location: Alamance County, TT
Acreage: 59.31 acres
Land Use: Residential (Single Family)
Percentage of Parcel Forested: **75%**
Percentage of Effective Impervious Surface: 21%
Percentage of Parcel in 100 year floodplain: 14%
Percentage of Parcel in 500 year floodplain: 14%
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 659 ft
- Intermittent Streams: 1,382 ft
- Pond/Lake: 0.36 acres

Recommended Practice: Preservation, Buffer Enhancement

Recommended Size of Practice: 59.31 acres: **8.07 ac floodplain preservation**
0.36 ac wetland
2,041 linear stream feet streambank enhancement

Pros	Cons
• Well-forested • Large riparian buffer • Two small NWI riverine wetlands • Could serve as a stable conduit between two buffer/streambank enhancement projects • Excellent neighboring potential projects	• Steep slopes • High development pressure • No local land use regulation



This property is located on the perimeter of the Town of Elon in Alamance County, and is one of four large, undeveloped properties that could compose an excellent preservation and/or conservation project in the area. It is mostly forested, and serves as the confluence point of three wetland effluent flows. The parcel is also between two sites where buffer and streambank enhancement are needed. In both cases, watershed stewardship appeared to be evident, but the banks were failing all the same. If it could serve as a stable stream conduit between these two sites, it could enhance the recovery of the stream. This parcel is also immediately upstream of the confluence with Travis Creek, and should be recognized as having added value for this reason. Immediate steps to preserve this land are recommended, as the development pressure in this otherwise residential and commercial land use setting is estimated to be high. If developed, these hydric and hydrologic functions need to be preserved through LID planning and design.

24) Travis & Tickle 13.2

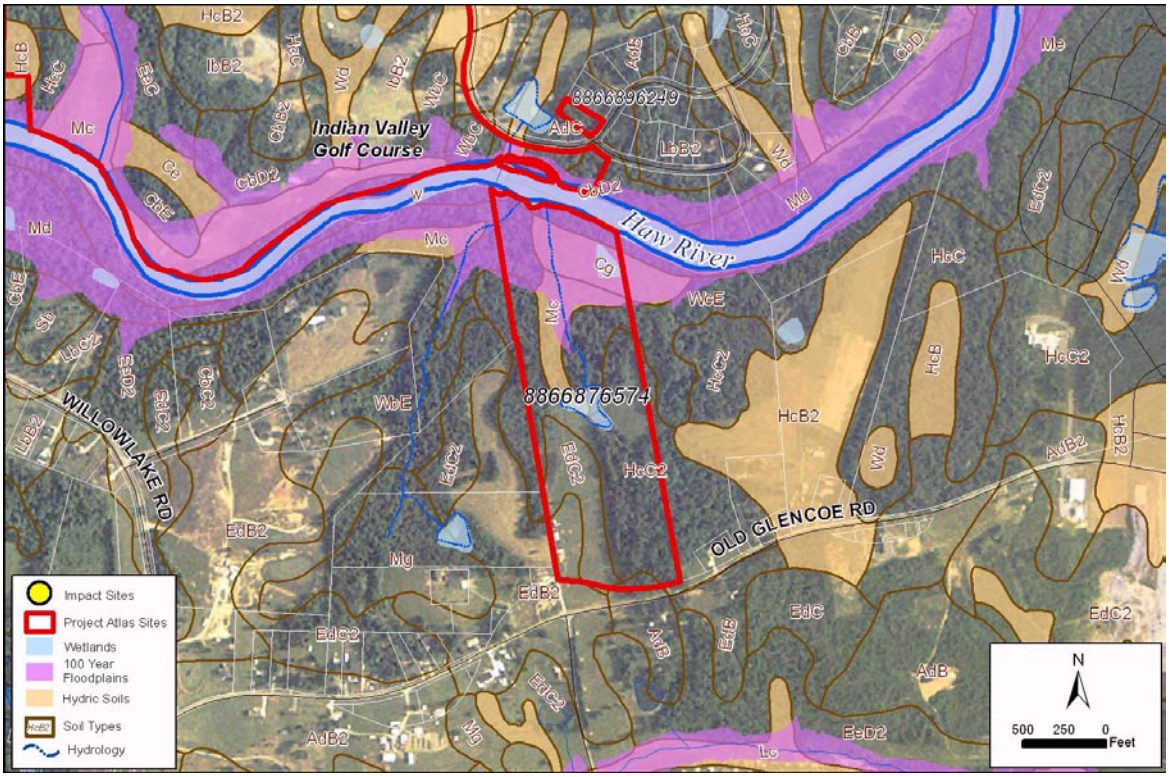
Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 18
Site Location: Alamance County, TT
Acreage: 38.02 acres
Land Use: Agriculture (General Farm/Present Use)
Percentage of Parcel Forested: 70%
Percentage of Effective Impervious Surface: 16%
Percentage of Parcel in 100 year floodplain: 26%
Percentage of Parcel in 500 year floodplain: 28% (10.65 acres)
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 98 ft
- Intermittent Streams: 1,371 ft
- Pond/Lake: 1.53 acres

Recommended Practice: Preservation, Buffer Enhancement, Wetland Enhancement

Recommended Size of Practice: 10.65 ac floodplain preservation
1.53 ac wetland
1,468 linear stream feet of streambank enhancement

Pros	Cons
• Undeveloped land • Surrounded by open or vacant parcels • Haw River Corridor parcel • 1-acre NWI non-riverine wetland • Forested buffers • Stable soils • Mostly undeveloped	• High development pressure • Zoned for single-family land use • Upland areas partly cleared • No current land protection • Threat to Haw River if developed



There is an argument to preserve and/or restore every parcel in the Haw River corridor. The river has the potential to be an environmental and economic centerpiece for the region, particularly now that the Haw River State Park is proceeding. This parcel, however, offers the opportunity to preserve a 1.5-acre wetland and almost 1,500 linear stream feet on relatively untouched land just north of Burlington. The waters on this parcel are just downstream from the larger property, and flow directly into the Haw River. The conservation of this parcel may offer residents and landowners on the south shore of the Haw River an example of the benefits of watershed stewardship, and how sustainability can benefit neighbors as well as the landowner. As Burlington extends northward beyond its current city limits, the pressures to develop such parcels will increase, and efforts should be made to retain these open spaces now, for the benefit of all.

25) Travis & Tickle 13.3

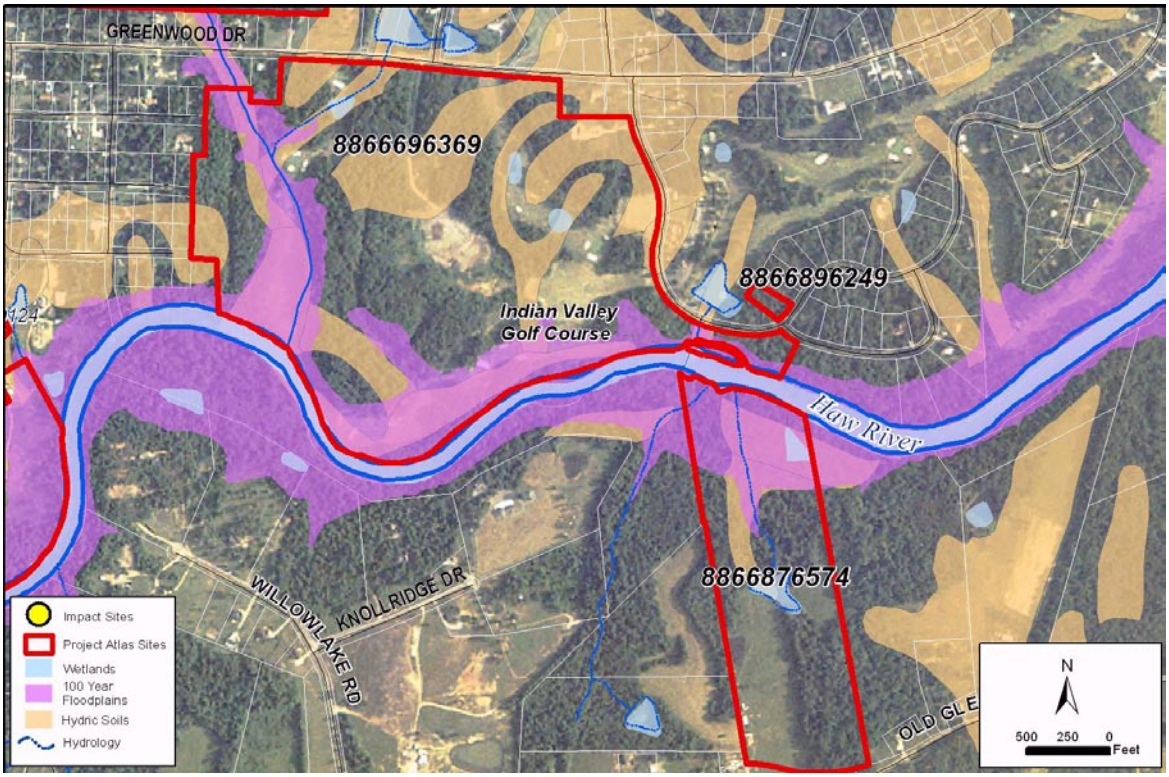
Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: **19**; 12
Site Location: City of Burlington, TT
Acreage: 120.35 acres; 1.65 acres
Land Use: Open/Recreational; Single Family
Percentage of Parcel Forested: 42%; **100%**
Percentage of Effective Impervious Surface: 28%; **100%**
Percentage of Parcel in 100 year floodplain: 27%; 0%
Percentage of Parcel in 500 year floodplain: 36% (42.89 acres); 0%
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: **5,512 ft**
- Intermittent Streams: **1,227 ft**
- Pond/Lake: 1.02 acres

Recommended Practice: Buffer Enhancement; Landowner Education; Preservation

Recommended Size of Practice: 13.75 acres: **42.89 ac floodplain preservation**
1.02 ac wetland
6,739 linear stream feet of streambank conservation

Pros	Cons
• Haw River corridor parcel • Publicly-owned property • Well forested • Large riparian buffer • Strategic plan for parcel already exists • Stable soils	• No local land use regulation • On land used as a golf course • No interest on this property thus far • Part of a mixed use residential community



The golf course on this site is a parcel that was already identified in the *Haw River Corridor Restoration Plan* as a priority site for simple land management solutions that could have a profound impact upon water quality in the Haw River and in the perennial stream that flows through this significant part of the course. It will be necessary to communicate with the maintenance crews for the course regarding their applications of pesticides and fertilizers to minimize chemical inputs to the waters. It will also benefit the course to improve its riparian buffer zone along the Haw River. Not only will this improve the ecological habitat in this steeply-sloped region of the River's corridor, but it will also staunch flooding that is a persistent problem on this part of the course. Given that the golf course is owned by the City of Burlington, communications with the land managers should be easier than in the cases of privately-owned courses. Actions here could also serve to compliment the preservation and recreation efforts the City of Burlington is putting forth on the other shore of the Haw River.

26) Travis & Tickle 15.4

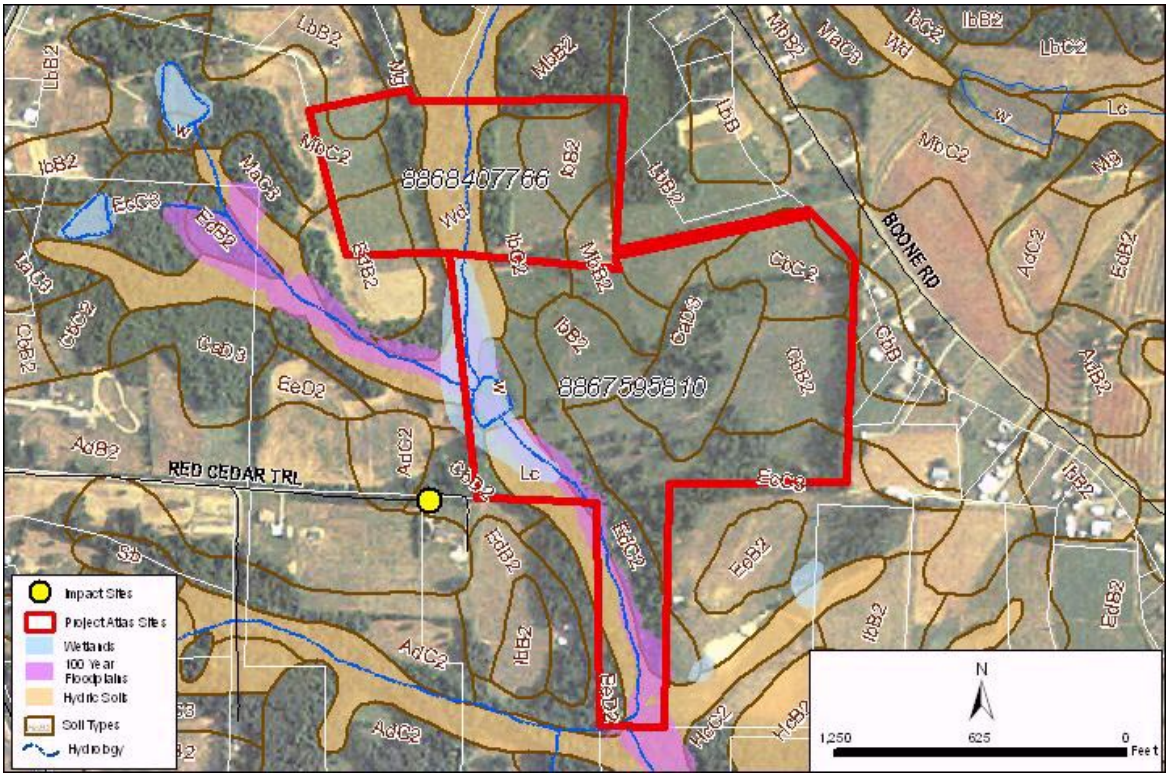
Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 11 & 13
Site Location: Alamance County, TT
Acreage: 20.47 acres; 47.33 acres
Land Use: Agriculture; Agriculture
Percentage of Parcel Forested: 42%; 34%
Percentage of Effective Impervious Surface: **0%**; **0%**
Percentage of Parcel in 100 year floodplain: N/A; 10%
Percentage of Parcel in 500 year floodplain: N/A; 10% (2.05 acres)
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 0 ft.; 0 ft.
- Intermittent Streams: 0 ft.; 2,115 ft.
- Pond/Lake: 0 acres; 3.54 acres

Recommended Practice: Preservation

Recommended Size of Practice: 67.80 acres:
2.05 ac floodplain preservation
3.54 ac wetland
2,115 linear stream feet of streambank conservation

Pros	Cons
• In NC DWQ's reference subwatershed • Occupies Haw River tributary headwaters • >3-acre NWI riverine wetland • Noted watershed stewardship in area • VAD parcel (Danieley) • Site of potential EEP project	• Erosive soils • Proximity to busy road • Permanent protection?



These parcels are prospective EEP preservation sites. Currently enrolled in the ACS&WCD VAD program, these well-forested sites have historically been agriculturally-managed with a conservation ethic. Their position in the headwaters of Haw River tributaries makes this a crucial management approach, and it is necessary to ensure that the landowners see this management as an economically sustainable option. Though in a remote, rural area of the TT watershed, these parcels are located along the heavily-used Boone Road, and could be appealing to developers. EEP has purchased a 2000-foot riparian and 2-acre wetland easements on the larger parcel from the landowners, and is in discussion with the smaller parcel's owners to do the same there. These landowners are also developing a cost-share program focusing on agricultural amenities with the ACS&WCD.

27) Travis & Tickle 8.2

Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 17
Site Location: Alamance County, TT
Acreage: 91.02 acres
Land Use: Agriculture
Percentage of Parcel Forested: 35%
Percentage of Effective Impervious Surface: 22%
Percentage of Parcel in 100 year floodplain: 7%
Percentage of Parcel in 500 year floodplain: 7%
Site Characteristics Receiving Initial Ranking Points:

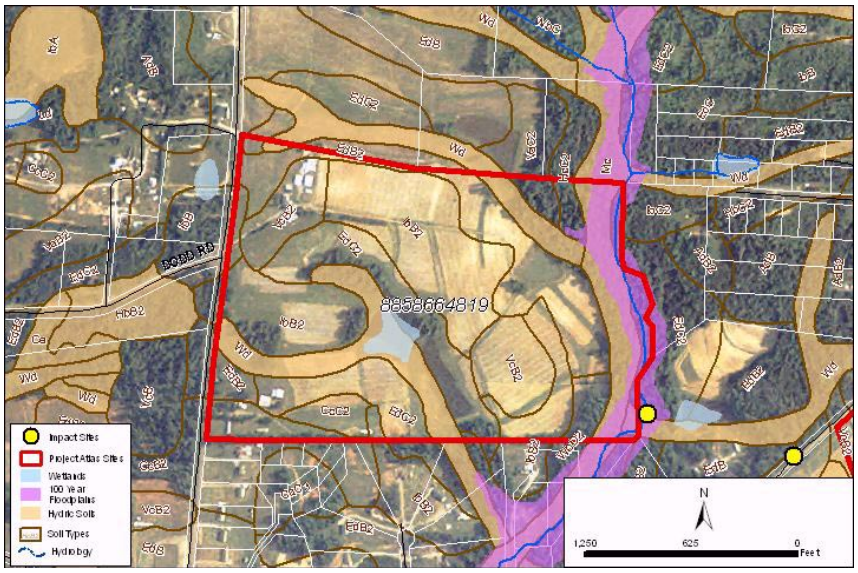
- Perennial stream: 1282 ft
- Intermittent Streams: 0 ft
- Pond/Lake: 1.31 acres

Recommended Practice: Preservation

Recommended Size of Practice: 6.37 acres:

6.37 ac floodplain preservation
1.31 ac wetland
1,282 linear stream feet of streambank conservation

Pros	Cons
• Headwaters parcel • VAD parcel • Riparian buffer conserved • 1-acre NWI non-riverine wetland • Well-maintained Basin Creek parcel	• Erodible soils • Steep slopes • Potential risk if not further protected



This parcel is an excellent agricultural and riparian preservation opportunity in the northeastern TT watershed, on Basin Creek. Upstream of the stockyards that are the likely primary source of degradation on Basin Creek, this parcel is well maintained, as dictated by the VAD that overlays it, with large riparian buffers and conservation tillage. It is unknown if the parcel is further protected under more permanent agricultural preservation programs. If developed, the downstream degradation is expected to grow with time and increasing impervious surface coverage. Coordination with ACS&WCD and immediate landowner contact is recommended.

28) Travis & Tickle 10.2

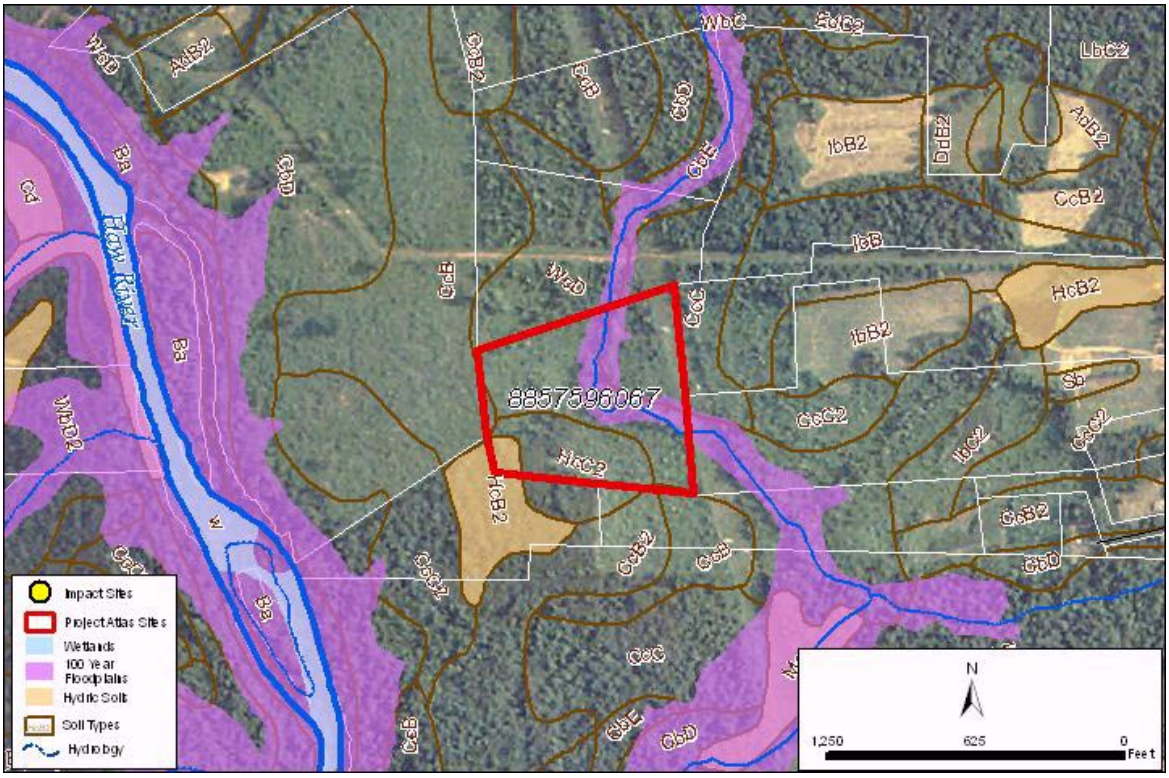
Significant Site Features & Results of Initial Parcel Ranking:
Conservation Value: 12
Site Location: Alamance County, TT
Acreage: 13.75 acres
Land Use: Vacant
Percentage of Parcel Forested: **100**%
Percentage of Effective Impervious Surface: **0%**
Percentage of Parcel in 100 year floodplain: 19%
Percentage of Parcel in 500 year floodplain: 19% (2.61 acres)
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 869 ft
- Intermittent Streams: 0 ft
- Pond/Lake: N/A

Recommended Practice: Preservation

Recommended Size of Practice: 13.75 acres: **2.61 ac floodplain preservation**
869 linear stream feet of streambank conservation

Pros	Cons
• Haw River corridor parcel • Completely forested • Large riparian buffer • Adjacent to vacant lands • Stable soils	• No local land use regulation • Small parcel



This parcel should be a cog for coordinated conservation efforts in the northern region of the TT watershed. A small, passively-managed parcel with a pristine riparian corridor and stable soils, this will be a good pilot project towards the conservation of all of the larger vacant parcels adjacent to it. It is notable that this parcel is downstream of the stockyards contributing large amounts of sediment and nutrients to Basin Creek. It is reasonable to estimate that conservation of this parcel and others is essential to help mitigate major upstream impacts and improve stream ecology. ACS&WCD and the HRT should be consulted regarding the preservation of this and surrounding parcels as open space. If assessed for development potential, it is advised that LID be explored here, protecting the Haw River and permitting this and the surrounding parcels to continue their watershed functions, filtering and controlling surface water flows.

29) Little Alamance 6.3

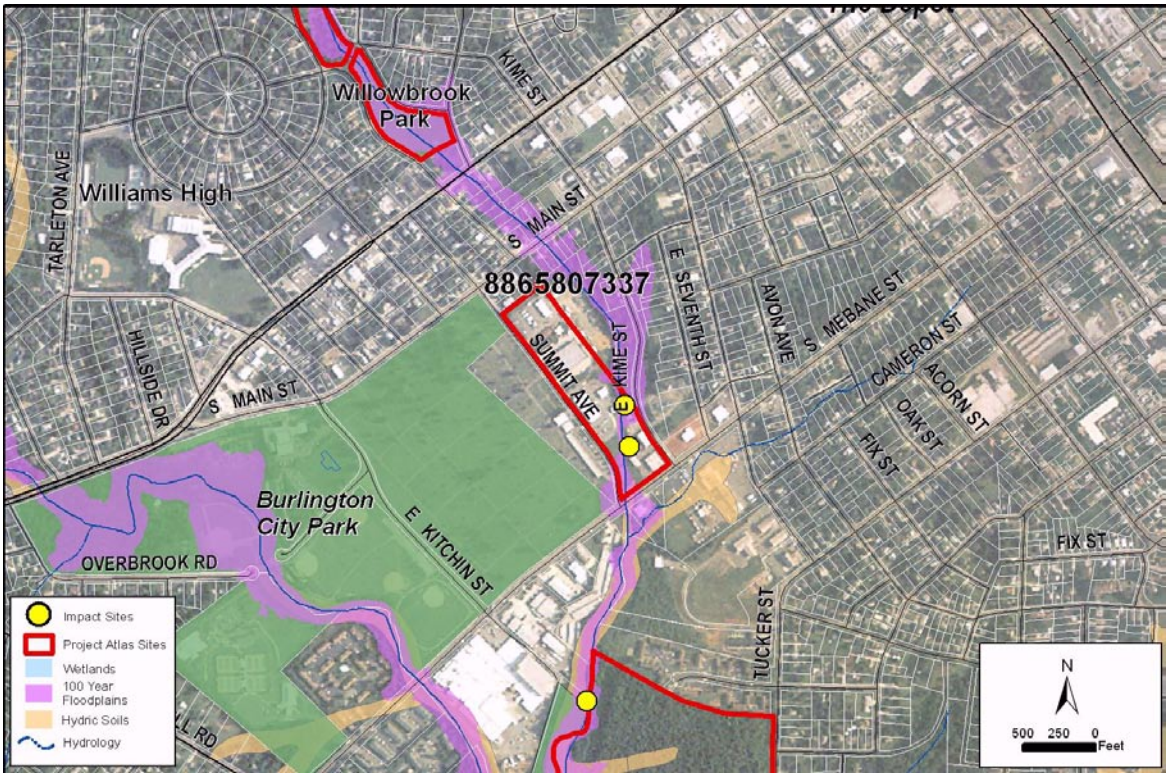
Significant Site Features & Results of Initial Parcel Ranking:
Stressor Value: **10**
Site Location: City of Burlington, LA
Acreage: 11.75 acres
Land Use: Industrial
Percentage of Parcel Forested: **0%**
Percentage of Effective Impervious Surface: **92%**
Percentage of Parcel in 100 year floodplain: 13%
Percentage of Parcel in 500 year floodplain: 15% (1.72 acres)
Site Characteristics Receiving Initial Ranking Points:

- Perennial stream: 761 ft
- Intermittent Streams: 0 ft
- Pond/Lake: N/A

Recommended Practice: Landowner Education; Stream Restoration; Buffer Restoration

Recommended Size of Practice: 13.75 acres: **1.72 ac floodplain preservation**
761 linear stream feet of streambank conservation

Pros	Cons
• Publicly-owned property • Centrally-located in Burlington • On Willowbrook Creek • Simple restoration strategy	• On industrial property • Possibly a site of pollution • Conflict of land use • No local land use regulation



This parcel is a publicly-owned parcel in central Burlington. It is currently used as an industrial site, and is thought to be a potential contributor to the pollution of Willowbrook Creek. It is poorly maintained, with non-existent buffers and highly-impervious areas within its parcel boundaries. The close proximity of this parcel to the well-managed City Park is striking, and needs to be remedied. Buffer and stream restoration at this centrally-located site would serve as an excellent education and outreach opportunity for the surrounding residents, and could signal a clear management change by the City in regard to its approaches to watershed stewardship and stormwater control. This site is upstream of other impacted areas, and the highly channelized and armored state of the stream at this stretch could be a factor in this larger hydrologic degradation.

Summary

This Phase III Restoration Plan and Project Atlas serves as a guiding document for LATT watershed stakeholders to restore their waters to a standard at which they can support the ecology they would under a natural setting. This will require restoration of multiple areas within the streams, and demands improvements in stormwater management within the watersheds' urban areas. In LA, uncontrolled stormwater is the current source of water quality degradation, and from field analyses, appears to still be the most significant impairment source to both environmental and public health. TT requires an aggressive approach at improving riparian buffer networking in rural Alamance and Guilford Counties, as well as enabling landowners to minimize land use impacts upon water quality through federal and state rural lands protection programs. This Project Atlas offers specific projects and guidance on how to approach watershed restoration with maximum efficacy and efficiency. The Jordan Lake Rules will require investments in stormwater attenuation that go beyond the National Pollution Discharge Elimination System Phase II requirements, potentially including retrofitting existing development with stormwater BMPs that will better mitigate the impacts of development upon water quality.

The recent development trends within the LATT watershed are unsustainable for the health and safety of both ecological and human communities. As Burlington, Graham, and Elon continue to grow, the increasing levels of impervious surface will continue to exacerbate the degradations due to stormwater within the watershed, and will increase water pollution levels, flash flooding, and streambank instability. There are ways in which these communities can grow with their unique identities, but without these negative results. The restoration goals identified by the LATT stakeholders as the purpose behind these planning efforts provide a framework of values within which to work, and the Project Atlas and Policy Recommendations provide tools on how to create a sustainable future for the watersheds' ecological and human communities. Within this framework of guiding principles and specific tools on how to remediate watershed health and function are opportunities for watershed governments to use these planning efforts as a springboard to more aggressive watershed stewardship and sustainable community development:

1) **Increase local government awareness of the impacts of urban growth on water resources –** This planning process and these documents give governments the awareness and tools to address the environmental, social, and economic benefits of stormwater management. Leveraging these resources towards improved watershed stewardship is the purpose of the last 2 years' efforts, and will hopefully be reflected by a greater awareness of watershed stewardship by elected officials in the near future.

2) **Strengthen watershed protection standards –** This document details ways in which jurisdictions can enhance their watershed protections through ordinances, rules, and programs. NC DWQ's recent impairment listing of the Travis and Tickle Creeks displays the urgent need for more stringent measures protecting natural resources in these watersheds. The Jordan Lake Rules – regardless of their specific content – will also require these communities to invest in better watershed stewardship, particularly with regard to nutrient reductions. Taking these steps now will save significant funds in retrofitting and remediation projects in the future.

3) **Improve water quality through stormwater management –** This Project Atlas details

projects within the urban cores that can mitigate stormwater impacts to the LATT waters. These projects, in combination with stronger legislative protections of watershed health, are designed to effectively and efficiently restore the impaired waters of these watersheds.

4) **Identify and rank parcels for retrofits, stream repair, preservation, and/or conservation –** The Project Atlas gives LATT watershed stakeholders explicit rationale for project prioritization, and arranges them in order of efficacy at improving watershed function and health.

5) **Assess aquatic health to identify stressors that are the most likely causes of poor biological conditions –** NC DWQ assessments of both watersheds identified stormwater impacts and a universal lack of effective riparian buffers as the main sources of water quality impairments in Little Alamance, and Travis and Tickle Creeks, respectively. NC DWQ also identified Willowbrook Creek (aka Brown Branch) as being polluted by ammonia and several metal species that are continually contributing to watershed degradation. Basin Creek is also notably degraded for ammonia and fecal coliform bacteria inputs.

6) **Meet requirements of outside funding sources for implementation of projects –** Watershed restoration projects – including "innovative stormwater projects" – are currently funded by grants from the US EPA, NC DWQ, NC DWR, NC Clean Water Management Trust Fund, Z. Smith Reynolds Foundation, and the Golden Leaf Foundation. The PTCOG, EEP, PLC, HRT, ACS&WCD, GCS&WCD, and the Piedmont Conservation Council are all resources that should be used for grant writing and project development needs, and partnerships are encouraged and needed to ensure project funding.

By using these guiding principles strategically, LATT communities have the opportunity to invest in themselves, creating not only an ideal environmental situation, but also ideal communities that are tailored to citizens' values. The LATT waters are impaired, but these planning documents are tools that can allow these six jurisdictions to lead the way for improved watershed stewardship in North Carolina's Piedmont.

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Appendix A

The Center for Watershed Protection (CWP) has conducted multiple studies throughout the United States, but chiefly, on the impacts impervious surfaces have upon water quality and stream habitat health. Many of these projects have been focused in the Chesapeake Bay watershed, where human land use is estimated to be a significant factor in the eutrophication of the Bay waters and non-supportive status. Through a comparison of USGS National Land Cover Dataset (NLCD) impervious surfaces measurements to the heath of water features at the same locations, the CWP was able to make conclusions about the relationships between impervious surfaces and stream health (Figure 6). As seen in this figure, the relationship between impervious surface and stream health is direct. The CWP has established three thresholds of stream health from this relationship and the field data they collected.

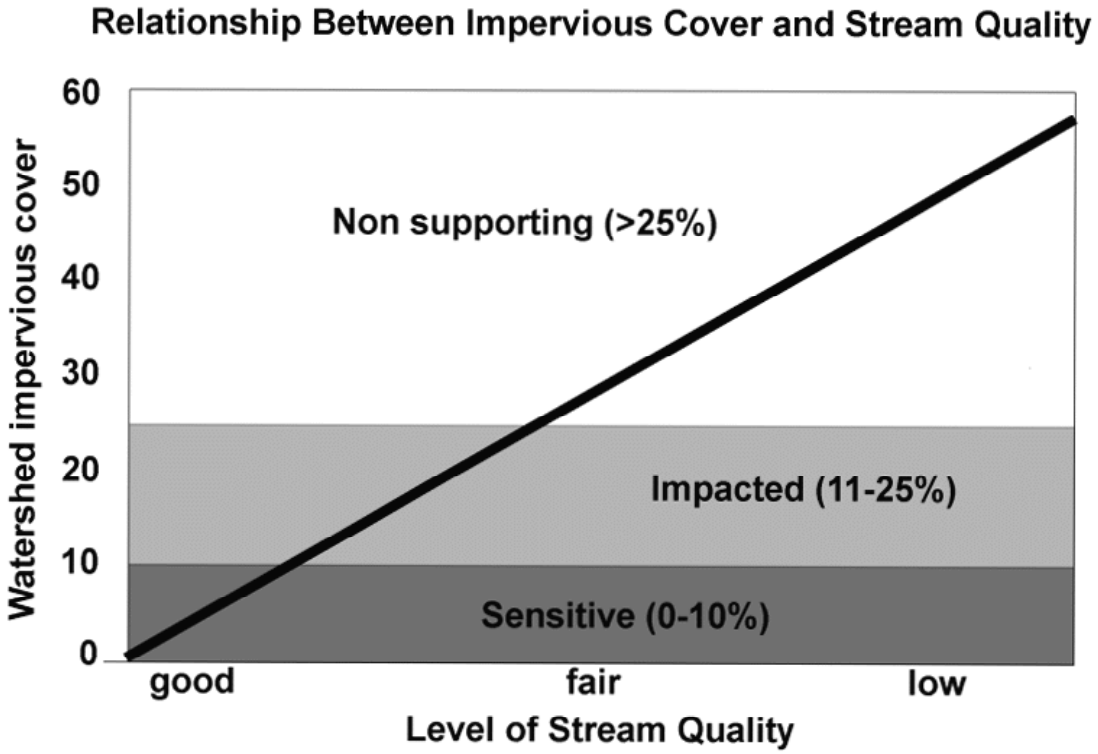

Figure 6: CWP Analysis of the Relationship Between Impervious Surfaces and Stream Health (CWP, 2001).

These data were used in the Stressor Assessment that the PTCOG conducted, as well as in defining the term "effectively impervious" when determining the impervious surface coverage within the LATT watersheds. The NLCD impervious surface data is available at a 9,700 square foot resolution, presented as 30x30 meter pixels. Using this knowledge, the recorded impervious surface percentage of that area was used to obtain the total area of impervious surface for each 9,700 square foot frame (i.e. 50% impervious surface of a pixel equals 4,350 square feet of impervious surface). This total impervious surface area was divided by the total watershed area to determine the impervious surface percentage of the whole watershed. Given that subwatersheds and catchments with >25% impervious surface coverage cause a stream to be non-supportive of the

ecology they should host, the PTCOG concluded that LA watershed is currently non-supporting, and TT watershed is currently "impacted."