Lower Abbotts Creek Watershed Restoration Plan

PIEDMONT TRIAD COUNCIL OF GOVERNMENTS

June 2011

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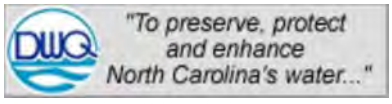

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Section 1: Introduction

The Lower Abbotts Creek Watershed occupies 76 square miles between Lake Thom-A-Lex and High Rock Lake in central Davidson County, NC (Fig. 1). NC Division of Water Quality (DWQ) monitoring indicates the Creek's waters are impaired for chlorophyll-*a,* turbidity, and ecological/biological integrity, based upon samplings of fish and benthic organisms. It also violates the NC action level for copper. The Abbotts Creek Arm of High Rock Lake, included in this assessment, is impaired for failing to meet water quality standards for turbidity, pH, and chlorophyll-*a* (NC DENR 2010). The sources of these impairments are non-point, and have been attributed largely to stormwater runoff from the City of Lexington (NC DENR 2008).

Lower Abbotts Creek watershed contains four significant tributaries, Leonard's Creek, Pounder's Fork, Rich Fork Creek, and Lake Thom-A-Lex. Lake Thom-a-Lex is essentially an impoundment of Upper Abbotts Creek, and separates the Upper and Lower Creeks from each other. It is assumed that the impoundment retains most of the water quality pollutants in the Lake, which is supported by water quality data. The watershed is mostly rural, with 91% of its land identified as non-urban. However, the land uses vary from the largely agricultural use in the headwaters and eastern bank of Abbotts Creek to the recreational and low-density residential developments adjacent to High Rock Lake. The watershed also has a long history of intense industrial use, including being one of the largest furniture producing centers in the world at one time and experiencing the large Duracell mercury spill in the 1990s (US EPA 2009). There is significant through-traffic in this watershed, with US Interstates 85 and 85 Business transecting it. The state routes NC-8, NC-47, and NC-64 also bring significant traffic through this watershed.

Urban areas comprise only 9% of the watershed: the City of Lexington occupies Subwatershed 4 (Fig. 1). This urban area is the only one within the watershed, and has a 15% impervious cover for this developed area. The total amount of impervious cover in this watershed is <5%. The Center for Watershed Protection (CWP) has determined that all waters with <5% impervious cover are capable of achieving pristine stream habitat conditions, though the concentration of impervious cover makes full recovery of these tributaries more doubtful (Schueler & Holland 2000). Furthermore, the *Lower Abbotts Creek Watershed Assessment* determined that the main source of pollution to Lower Abbotts Creek is Rich Fork Creek's stormwater runoff from High Point and Thomasville. That watershed has a 35% impervious coverage and is in need of significant and immediate restoration and remediation investments. It is now clear that it is in the best interests of Lower Abbotts Creek stakeholders to directly or indirectly support these efforts, namely through the implementation of the *Rich Fork Creek Watershed Restoration Plan* that was completed in 2010 (PTCOG 2009).

The Piedmont Triad Council of Governments (PTCOG) Environmental Planning staff has partnered with of Davidson County and the City of Lexington to assess the present water quality impacts and watershed restoration needs of Lower Abbotts Creek. The initial step in the watershed restoration planning process for Lower Abbotts Creek was a comprehensive characterization and assessment of current watershed conditions. This included a land use impacts assessment, an assessment of water quality data collected at six locations in and around the watershed, local policy assessments using the Center for Watershed Protection's Codes & Ordinance Worksheet and the US Environmental Protection Agency's (EPA's) Water Quality Scorecard, and data collected from field assessments of streambanks and ecology. All of these characterizations and analyses can be found in the *Lower Abbotts Creek Watershed Assessment* (PTCOG, 2011b). The conclusions found in this document are the basis and guiding principles for this Restoration Plan. An Executive Summary can be found in Appendix A, and all details can be found at www.abbottscreekwater.org.

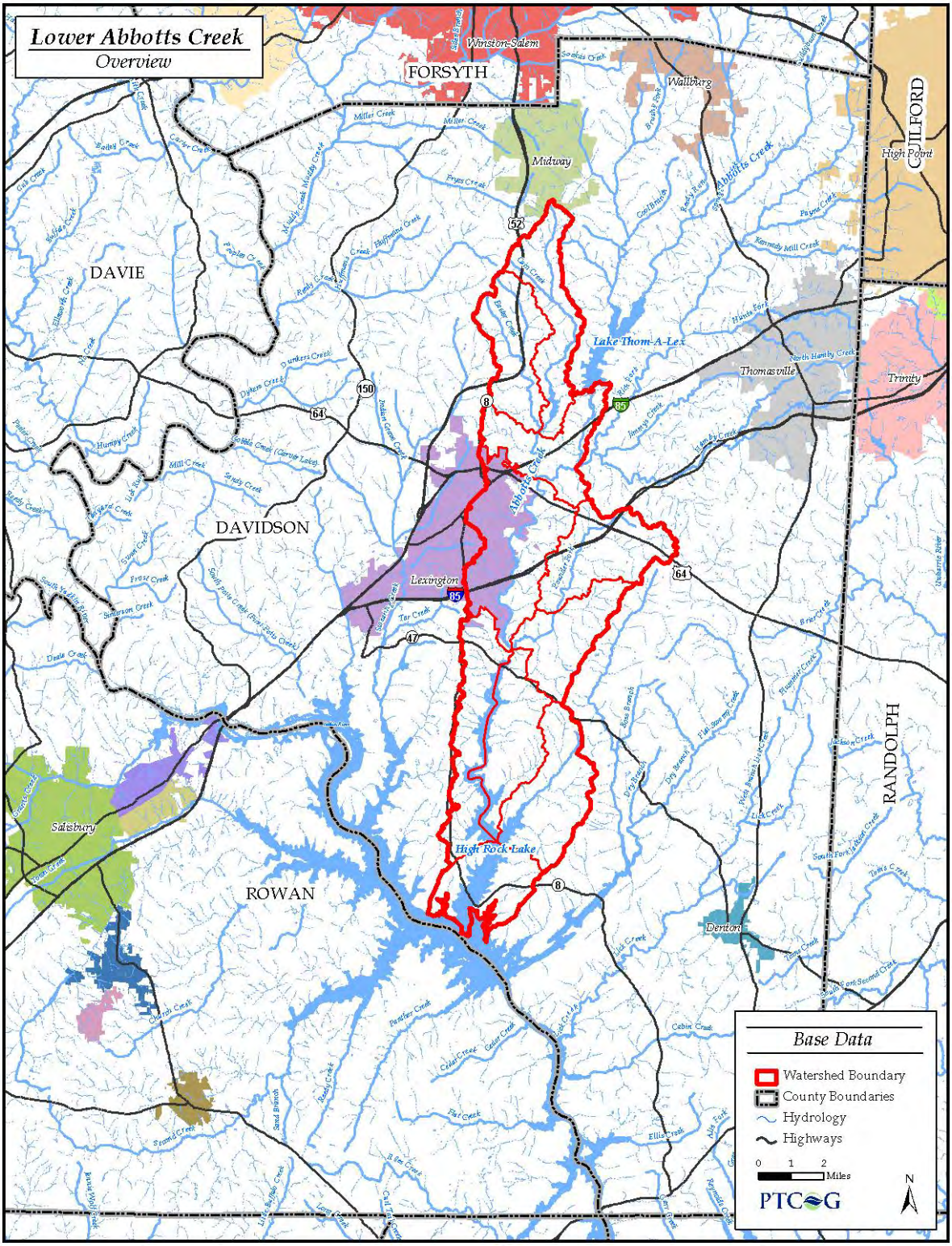


Figure 1 Lower Abbotts Creek Watershed

The Lower Abbotts Creek watershed requires a multi-pronged approach to adequately and sustainably remedy its current impaired status. Without meaningful changes to local codes, ordinances, and behaviors that preside over a watershed, projects such as stream restoration or stormwater retrofits will not suffice, especially in Lower Abbotts Creek, where many small impacts spread throughout the watershed are a significant source of pollution. Lower Abbotts Creek is listed by the NC DWQ as being polluted for chlorophyll-*a,* turbidity, copper, and ecological/biological integrity, based upon samplings of fish and benthic organisms (NC DWQ 2010). The presence of high levels of copper appears to be a relic from when Lake Thom-a-Lex was treated with copper sulfate to suppress algal growth. That lake is now treated with solar-powered aerators and the City of Lexington, monitoring the Creek immediately downstream of the lake for copper levels finds no significant levels of copper in Lower Abbotts Creek (PTCOG 2011b).

The flushes of sediment causing the Creek's turbidity pollution are mostly due to the presence of sand mining and the lack of stormwater management or stewardship in the Rich Fork Creek watershed, Lower Abbotts Creek's main tributary. Similarly, the impacts to ecological habitat appear to be largely due to high stormwater flows originating in the urbanized headwaters of Rich Fork Creek in High Point and Thomasville. Rich Fork Creek's volume can fluctuate between a 2 cubic feet per second (cfs) base flow to over 20,000 cfs during storm events. Undoubtedly the City of Lexington and the development around I-85 are adding to this stormwater burden, but the impervious cover in the Lower Abbotts Creek watershed only occupies 9% of the watershed, and is almost completely localized to one subwatershed (PTCOG 2010).

The high chlorophyll-a levels are also caused upstream, as the water quality record shows a high correlation between the nutrient and fecal coliform levels upstream in Hamby and Rich Fork Creeks with high levels found in Lower Abbotts Creek and the Abbotts Creek Arm of High Rock Lake. High levels of nutrients were also found in rural areas of the Lower Abbotts Creek watershed, and are likely due to residential and agricultural sources, but the main non-point source of pollution appears to be originating in Thomasville and is likely associated with its failing wastewater infrastructure (PTCOG 2011b; Smith 2010).

Lower Abbotts Creek is a tributary to High Rock Lake, which is listed as violating water quality standards for turbidity, chlorophyll-*a*, and pH (NC DWQ 2010). NC DWQ is conducting a Total Maximum Daily Load (TMDL) assessment of the Lake's water quality to determine the sources of nutrient pollution compromising its use as a recreational resource and ecological habitat. Please visit http://portal.ncdenr.org/web/wq/ps/mtu/specialstudies#high_rock_lake for detailed information. Rich Fork Creek has extremely high rates of erosion, and Yadkin-Pee Dee River Basin Association (YPDRBA) water quality data indicates that this tributary is contributing significantly higher levels of total nitrogen, total phosphorous, fecal coli form bacteria, total suspended solids, and turbidity levels that are directly degrading downstream water quality, including that of High Rock Lake.

Restoration of the Lower Abbotts Creek watershed needs to be approached with both projects and policies. Projects address obvious impacts to current watershed health, such as eroding streambanks. They are also highly visible opportunities to increase public awareness and understanding of watershed needs. Policy changes provide a more long-term strategy for sustainable watershed stewardship and concretely address non-point source pollution through enforceable programs. In the Lower Abbotts Creek watershed, where the major impacts to water quality appear to be pollution from an upstream tributary and a lack of local policies to address watershed problems, this is especially important. Projects can

attenuate stormwater impacts and improve streams, but to definitively address watershed remediation, communities must create ordinances that specifically focus on protecting the watershed and its citizens, as well as recognizing the other economic and social priorities of these communities. This *Restoration Plan* features 25 projects and 10 management recommendations that can all improve Lower Abbotts Creek watershed health and function as well as the quality of life for all those living here.


High Rock Lake, Nov 2010

The purpose of this restoration plan is to coordinate watershed needs identified in the *Lower Abbotts Creek Watershed Assessment* with the feasibility to create new projects or programs. Fortunately, over the past two years, citizen involvement and local government interest in watershed improvements has markedly risen. An Implementation Timeline featured in this Plan coordinates a series of steps in management policies and project investments that will most effectively and efficiently restore watershed functions and health City of Lexington and Davidson County. This Timeline is the most important feature of the *Restoration Plan* to improve quality of life and environmental health in the watershed. The Policy Recommendations and the Project Atlas priorities detail the goals and actions outlined in the Timeline and follow in Sections 3 and 4, respectively. They are guidance tools, relevant to the year 2011 and intended for adaptation as the jurisdictions it impacts grow and develop.

Section 2: Implementation Timeline

Lower Abbotts Creek Implementation Timeline

	Phase 1 (2012-2017)	*Phase 2 (2018-2023)*	*Phase 3 (2024-2033)*	*Phase 4 (2033 -2042)*
	5 projects + RFC	5 projects + RFC	5 projects + RFC (Thru 2030)	5 projects + RFC
	year 5	***year 10***	***year 20***	***year 30***
Copper				
Reduce Sediment and Nutrients in to High Rock Lake				
Rich Fork Creek				
Stormwater in Lexington				
Policy Recommendations				
Outreach and Education				
	Implement the *Rich Fork Creek Watershed Restoration Plan*	Create Programs to Protect Rural Lands and Direct Development to Lexington	Finish *Rich Fork Creek Watershed Restoration Plan*	Use Water Quality Data to Determine if Watershed Restoration Successful
	Thomasville Invests in Sewer Infrastructure	Use StreamWatch to Mark Progress	Use Water Quality Data to Determine if Non-Point Source Programs Effective	Continue to Invest in Addressing Pollution Sources
	Adopt Stormwater Ordinance to Address Non-Point Source Pollutants	Create Stormwater Retrofit Program and Invest in Priority Projects	Determine if watershed is Achieving Economic and Environmental Sustainability	Continue to Invest in Open Space, Farmland, & Natural Resources
	DC FISH Stimulates Stewardship	Invest in Recreational and Urban Opportunities with Marketing Campaign	Begin to Aggressively Restore Streams	Continue to Stimulate Development Using Low Impact Techniques and Minimizing Stormwater Impacts
	Implement Phases 1 & 2 of Greenway	Implement Projects 5, 6, 7, 8, 9	Implement Projects 10, 11, 12, 13, 14, 15	Implement Projects 16 - 25
	Remove Copper From 303(d) List			
	Adopt Stream Buffer Ordinance			
	Opportunities to Development Community Evaluate Economic Value of Open Space, Farmland, & Natural Resources			
	Implement Projects 1, 2, 3, 4, 25			

Regulatory Background of Watershed Restoration

The US EPA has developed a *Strategic Plan* for the period of 2006 – 2011. This Plan features five key goals that are guiding the US EPA in all respects, and include two relevant to this *Restoration Plan*: Clean and Safe Water, and Healthy Communities and Ecosystems (US EPA 2010).

The US EPA's Office of Water has adopted the "Clean and Safe Water" and "Healthy Communities and Ecosystems" goals as its guiding mandate for 2011. Within the Clean and Safe Water goal, the US EPA has a duty to ensure the protection of human health and water quality by ensuring:

- water is safe to drink;
- fish and shellfish are safe to eat;
- water is safe for swimming;
- water quality is improved on a watershed scale; and
- coastal and ocean waters are improved.

Within the Healthy Communities and Ecosystems goal, the US EPA has a duty to ensure to communities and to restore and protect critical ecosystems by:

- sustaining and restoring the U.S./Mexico border environmental health;
- sustaining and restoring Pacific Island territories;
- increasing wetlands;
- facilitating the ecosystem-scale restoration of significant estuaries; and
- improving the Great Lakes, Chesapeake Bay, Gulf of Mexico, Long Island Sound, Puget Sound Basin, and the Columbia River Basin.

These duties and guidance have been relayed to the states, and have guided their water resource protection and restoration efforts in the last five years. In North Carolina, this has mainly affected the NC Department of Environment and Natural Resources (NC DENR), but has also impacted the Department of Commerce and the Department of Transportation, especially in their interactions through the State Sustainability Office. These goals have guided all investments by the state in water quality protection and restoration, including the funding of this project with funds from the 319 program.

Obviously, not all of the aspects of the *Lower Abbotts Creek Watershed Restoration Plan* address the aforementioned objectives for the Key Goals, but it does address a significant number of them. If fully implemented, the *Lower Abbotts Creek Watershed Restoration Plan* will address water quality concerns at the watershed scale; identify new wetlands for protection and restoration; will improve Lower Abbotts Creek and High Rock Lake so that they will be safe for recreation; and will protect High Rock Lake should it ever be used for drinking water.

The *Lower Abbotts Creek Watershed Restoration Plan* also addresses the US EPA Nine Key Elements of Watershed Planning:

1) Identifying the causes and sources of pollution;
2) Recommending management solutions to improve water quality;
3) Estimate the load reductions from taking these measures;
4) Estimate the technical and financial assistance needed to improve water quality;
5) Employ an education and outreach effort to address sources of pollution;
6) Create an implementation timeline;
7) Define milestones of success in improving water quality;
8) Define how water quality success will be determined; and
9) Monitor water quality to determine if milestones are being met.

Elements 1, 5, and 9 have been addressed in the *Lower Abbotts Creek Watershed Assessment* (PTCOG 2011b). Elements 2, 5, 7, and 8 are addressed in Section 3, "Watershed Policy Recommendations." Elements 2, 3, 4, and 5 are addressed in Section 4, "Project Atlas." Elements 1, 2, 5, 6, 7, 8, and 9 are addressed in this section, the Implementation Timeline.

This Lower Abbotts Creek Watershed Restoration Implementation Timeline is designed to serve all of the needs of the watershed and its stakeholders. It packages the findings of the *Lower Abbotts Creek Watershed Assessment* with the Policy Recommendations and the Project Atlas projects. It concisely packages all of these elements so that they will address the water quality impairments distressing the Lower Abbotts Creek watershed: ecological habitat, turbidity, chlorophyll-a, and copper. As seen in the Policy Recommendations and Project Atlas, it attempts to incorporate these needs into other community goals stated by Davidson County and the City of Lexington. The Implementation Timeline is supposed to be an easy-to-use summary of what needs to be done to remediate and finally restore health water quality conditions to the Lower Abbotts Creek watershed. The detailed descriptions of what those steps will require are found in Sections 3 and 4 of this document, the Policy Recommendations and Project Atlas, respectively.

The Lower Abbotts Creek Implementation Timeline attempts to coordinate policy and project needs for cost-effective and quick watershed recovery. The policies and the projects are only worth pursuing together; policy and project improvements will be futile without the other. The Implementation Timeline recommends the optimal coordination of these watershed stewardship measures, but is not final. Most steps taken to improve watershed conditions are steps in the right direction and are recommended and supported in the service of restoring a healthy, functioning watershed to Lower Abbotts Creek. The only caveat to this statement is that downstream stream restoration projects will be undermined by unaddressed upstream stormwater impacts. The goal of the Implementation Timeline is to offer a map that enables communities to best address these watershed needs, and with the most effective and efficient strategy.

Phase 1 (2011 – 2016)

NC DWQ attributes much of Lower Abbotts Creek's ecological habitat, turbidity, and chlorophyll-a impairments to stormwater and agricultural sources (NC DENR 2007; NC DENR, 2010). The Lower Abbotts Creek Watershed Assessment *refutes these presumptions based upon the water quality data and field data assessed for this effort (PTCOG 2011b). These data clearly show that Rich Fork Creek tributary is the most significant source of sediment, nutrients, and high volume flashy flows due to stormwater runoff and wastewater infrastructure failures that are causing water quality impairments in Lower Abbotts Creek. There are stormwater and nutrient concerns more immediately degrading water quality conditions in the Lower Abbotts Creek watershed, and second to the problems in Rich Fork Creek are the lack of legal capacity by Davidson County and the City of Lexington to address non-point sources of pollution in their jurisdictions, namely soil and erosion control and especially illicit discharges. Field assessment and water quality data clearly shows that reliance upon the Winston-Salem office of DENR is not able to respond promptly to reports of these impacts due to staffing and resource capacities. Dedicating local knowledge and resources to these concerns will be a more effective way to consistently and thoroughly reduce the impacts of these non-point sources of pollution. The Winston-Salem DENR office has been encouraging Lexington and Davison County to take local control of such a program for these very reasons. These conclusions have been verified by streambank assessments conducted in support of this planning effort and are supported by water quality data collected by NC DWQ, the YPDRBA, and the City of Lexington.*

This 2009 study by PTCOG found that stormwater runoff in the Rich Fork Creek watershed is causing massive amounts of erosion and downstream flash flooding, carrying large amounts of pollutants, including trash, oils, and fecal material. The water quality data analyzed for this planning effort has determined that these impacts are being transferred downstream to Lower Abbotts Creek. Thus far, none of the seven management recommendations or thirty-two priority projects have been pursued by any of the Rich Fork Creek watershed communities. If Lower Abbotts Creek is to improve, it will have to be accompanied by improvements in Rich Fork Creek. If these investments can be coupled to greenway and blueway developments recommended in the first five Project Atlas priorities, it could be a highly effective way to shepherd in watershed stewardship, economic development, and a sustainable management and investment strategy by local stakeholders.

Action Steps

1) **Policy Recommendation 1**: Immediately implement the *Rich Fork Creek Restoration Plan*, prioritizing the following items:
    - Create 50-foot riparian buffer network along all streams, or a program to incentivize their creation
    - Expand the enforcement staff and programs within all jurisdictions, as field assessment data showed a lack of soil and erosion controls and persistent illegal dumping in urban and suburban areas
    - Thomasville pursues grant and loan funding for **Project 01** (*Winding Creek Golf Course)*
    - Create a stormwater retrofit program that will regularly collect data on the most cost-effective sites within the respective jurisdictions to improve watershed conditions
    - Enforce bank denuding with herbicides (i.e. RoundUp) with fines and penalties
    - Enforce trash dumping with the ability to levy fines and penalties
    - Davidson County SWCD Pilot View RC&D pursue grant and loan funding for the large restoration and conservation **Project 04** (*Kanoy Bottoms Priority Wetlands Site*)
2) Thomasville invests in rehabilitating its wastewater system through local funds and state and federal grants and loans (especially the NC Construction Grants and Loans program)
3) **Policy Recommendation 2**: Draft and Recommend ordinances for Illicit Discharges and Soil & Erosion Control
    - Sustainable funding structure to support local staff, supplemented by a stormwater fee

- Alternatively, draft a countywide watershed ordinance that features these elements
- Document violations as program is rolled out

4) City of Lexington, Davidson County Schools, and Stormwater SMART invest in **Project 01** (*Davidson County School Administration Site*)
   - Integrate into curriculum needs using existing programs (Project WET, Environmental Education Fund, etc.)
   - Promote with Safe Routes to Schools
5) DC Tourism & Recreation Partnership (DC TRIP), DC S&WCD, and Lexington invest in **Project 03A** (*City Lake*) **& 3B** (*ATV Site*)
   - Implement Phase I of Davidson County greenway
   - Work with ATV site landowners to improve environmental footprint
   - Invest in stormwater retrofit on S-01 (owned by City of Lexington)
   - Ecological survey of public lands
   - Develop recreational and stormwater plan for City Lake and Lake Thom-a-Lex
6) **Recommendation 5**: DC FISH recruits up to 10 StreamWatch groups throughout Davidson County to adopt priority streams and improve conditions on them
   - Focus on urban streams and dumping hotspots
   - Integrate with greenway developments
   - Seek out partnerships with Master Gardeners and other local citizens groups
7) **Policy Recommendation 10**: Lexington Water Resources Department appeals to NC DWQ to remove Lower Abbotts Creek's copper impairment from the 303(d) list
   - Water quality data collected by the City of Lexington
   - Develop partnership with ambient water quality monitoring program to use multiple data sources in use support status determination, including a 5 samples in 30 days analysis
8) City of Lexington and PTCOG implement **Project 02** (*Lexington Parkway Plaza*) and **Project 04** (*Lexington Industrial Site*)
   - Promote as first stormwater retrofit projects in Lexington
   - Pilot projects in infill development and marketing the Uptown Lexington area
9) **Recommendations 8 & 9**: Develop an economic assessment of natural resources, farmland, and open spaces for recreational, tourism, and pollution prevention services
   - See Randolph, Guilford, and Chatham Counties for examples
   - Seek out landowners for willingness to participate in development of recreational opportunities in Davidson County
10) **Policy Recommendation 4**: Draft and Recommend a 50-foot stream buffer ordinance for all perennial streams in Davidson County and all its cities
    - Include prohibition on development on slopes >15%
    - Extend efforts to the Rich Fork Creek watershed and develop universal stream and slope requirements throughout Davidson County
11) DC TRIP, DC S&WCD, and Lexington invest in **Project 06** (*Lexington Golf Course*)
    - Develop recreational and stormwater plan for golf course
    - Use as demonstration project with public
    - Partner with Master Gardeners, Cooperative Extension, and local citizens groups
12) **Policy Recommendations 3, 5, 8, & 9**: Expand DC TRIP to a full-time position and program, and hold roundtable discussions with stakeholders regarding economic, social, and environmental sustainability in Davidson County
    - Assess economic values of Open Space, Farmland, and Natural Resources
    - Promote infill development in blighted urban cores through a marketing campaign, financial incentives, and ordinances that account for community livability
13) Lexington, PTCOG, and NC DWQ review water quality data, field conditions, and public perceptions in watershed to mark progress
14) City of Lexington, Davidson County, and PTCOG invest in **Project 05** (*Abbotts Creek Corridor*)
    - Create an overlay zone for Creek-side properties
    - Implement Phase II of Davidson County Greenway

- Ecologically assess all project properties with potential investment partner (LandTrust for Central NC, Conservation Trust of NC, private consultants County)
- Develop conservation and/or recreation plans for all properties
- Create parking lot at Lexington WWTP
- Stormwater SMART to focus outreach efforts on trash accumulation in Creek

Phase 2 (2017 – 2022)

Immediate actions to redress the non-point sources of pollution – namely in Rich Fork Creek watershed – are the priority for the watershed. However, these steps will only be sustainable if they are accompanied by community investment at both the government and public levels. With DC FISH recruiting citizens to take a more active role in their watershed, official policies are needed to ensure that their efforts are not undone by sources of pollution that can be easily addressed (i.e. trash dumps). To this end, investments in public education and stewardship should be made that complement all project and policy steps, empowering local watershed residents to improve their quality of lives and watershed conditions. These programs can be linked to projects, reflect progress in watershed health, and benefit other established community goals such as economic and recreational development. Resources exist to create outreach and stewardship programs, and should be utilized in Phase 2 to ensure sustainable watershed stewardship.

Action Steps

- All **Phase I** actions are priority concerns. Persist with their successful implementation first.

1) **Recommendations 3 & 7**: Through economic working group including Uptown Lexington, DC TRIP, Lexington Chamber of Commerce, the D S&WCD to assess the values of natural resources and economic potential of redeveloping Lexington through infill development; develop ordinances and incentives programs to direct new developments into Lexington urban core
    - Lexington and Stormwater SMART invest in **Project 11** (*Downtown Lexington Retrofit*) and **Project 12** (*Lexington Suburban Site*)
        - Develop old landfill as recreational lands for more intensive activities (ATV use, horseback riding, etc.)
        - Develop residential rain garden and rain barrel program
        - Ensure public access to large open public spaces
    - Marketing campaign should highlight opportunities and advantages to developing within Lexington, including LID incentives
    - Develop environmentally-sensitive standards
        - Avoid impacts to rare habitats
    - Tie LID practices to explicit financial incentives
    - Market available urban sites to development and investment communities through the US EPA's Brownfields program
2) DC TRIP, Lexington, and PTCOG invest in **Project 07** (*Finch Park*)
    - Implement Phase II of Davidson County greenway
    - Develop recreational and stormwater plan for Finch Park in concert with DC FISH
3) DC TRIP and LandTrust of Central NC (LTCNC) invest in **Project 08** (*High Rock Lake Open Space Site*)
4) **Recommendations 5 & 6**: Use the StreamWatch groups created through DC FISH to document watershed health and progress. Create a permanent municipal stormwater and non-point source outreach and involvement program that identifies best stormwater retrofit opportunities
    - Stormwater SMART, Lexington, & Davidson County schools invest in **Project 09** (*Central High School & Middle School*)
        - Integrate with curriculum needs
        - Create a Safe Routes to Schools artery
5) **Recommendations 8 & 9**: Utilize the economic evaluations as tools to guide ecotourism and recreational development in Davidson County
    - DC TRIP, DC S&WCD, NC WRC, & ALCOA invest in **Project 08** (*High Rick Lake Open Space Site*) and **Project 10** (*ALCOA Conservation Site*) and promote them as regional recreational spots for multiple uses, but especially swimming
        - Integrate with greenway developments

- Protect ecologically sensitive areas
- DC TRIP and Uptown Lexington develop a marketing campaign that highlights these features and plans for Davidson County and the watershed

6) Lexington, PTCOG, and NC DWQ review water quality data in watershed to mark progress

Phase 3 (2023 – 2032)

After ten years of implementing the Lower Abbotts Creek Watershed Restoration Plan, significant changes in water quality and watershed conditions should be apparent and measurable. Water quality monitoring data collected by the City of Lexington, the YPDRBA, NC DWQ, and the StreamWatch groups started through DC FISH should be documenting improvements in local water quality conditions and in High Rock Lake. If no progress is being made, then these recommended strategies need to be revisited. If no actions have been taken in the Rich Fork Creek watershed, it will explain a great deal about why water quality improvements are not being seen in Lower Abbotts Creek, and there is a limit to the progress Lexington and Davidson County should be held accountable for regarding the health of Lower Abbotts Creek and High Rock Lake. This is a larger question tied to interpretations of the US Clean Water Act regarding interjurisdictional relationships and responsibilities for managing water quality that have not been resolved.

Hopefully, water quality conditions will improve, ushering in a new phase of watershed management that serves community investment and development needs. The economic assessments of farmland, open spaces, and natural resources for their respective social, environmental, and recreational values should be finished at this point, giving all watershed stakeholders a dollar figure that can be tied to watershed stewardship and ecosystem services. It is at this point that continuing to invest healthy waters and ecosystems becomes a community investment issue, not just a concern of social and environmental responsibility. Thoughtful protection of open space and ecosystems has the potential to yield economic benefits in recreation and urban revitalization. Promoting development in urban cores and preserving the agricultural legacy without the need to invest in additional infrastructure and protecting open spaces and natural resources can be integrated into the recreational development Lexington and Davidson County could spur and support a local stewardship ethic will make investments of local funds in such programs popular.

<u>Action Steps</u>

- All Phase 1 and 2 actions are priority concerns. Persist with their successful implementation first.

1) Assess whether the water quality goals of the 10 Policy Recommendations and 10 Project priorities are being met.
2) **Recommendation 1**: Finish implementing *Rich Fork Creek Watershed Restoration Plan* (2030)
    - Assess success of implementing watershed plan in reducing stormwater runoff in the watershed and perhaps reassess restoration strategy if ineffective thus far
3) **Recommendation 2 & 4**: Evaluate if non-point source pollution is being addressed
    - Draft and adopt a uniform stormwater ordinance for all communities with Davidson County, so that there will not be any stormwater hotspots
    - Lexington and Stormwater SMART invest in **Project 13** (*Lexington Furniture Site*) as a demonstration project featuring attractive stormwater BMPs on residential and commercial properties
        - Partner with Master Gardener and other citizens groups
4) **Recommendations 3, 6, & 7**: Evaluate the economic growth and development within the watershed. If sprawling development is occurring without Lexington's urban core being redeveloped, then a re-evaluation of local incentives and ordinances is in order
    - Lexington invests in **Project 14** (*Martin Marietta Site*), showcasing the recreational value to the Triad and local economies
    - Midway invests in **Project 16** (*Welcome Center Industrial Park*), showcasing the retrofit opportunities on industrial sites
    - Feature **Project 17** (*Pounder Fork Headwaters*) and **Project 18** (*Pounder Fork Conservation Site*) as sites that can be preserved as rural space through such programs

- Invest in **Project 19** (*Abbotts Creek Conservation Site*) as a demonstration project of economic, recreation, and environmental values of open space protection

5) **Recommendation 5**: Stormwater SMART will continue to provide a customized outreach and involvement program to watershed residents
   - Focus efforts on **Project 15** (*Lexington High School*), ensuring that it meets curriculum needs and enhances the school's appeal and working environment

Phase 4 (2033 – 2042)

Lower Abbotts Creek is currently impaired for exceeding NC DWQ criteria for chlorophyll-a, turbidity, and ecological/biological integrity, based upon samplings of fish and benthic organisms. It also violates the NC action level for copper. Basically, there is too much dirt, nutrients, and stormwater flowing into the Creek from Rich Fork Creek and many unaddressed sources throughout the watershed. The first three Phases detailed in this Implementation Timeline delineate a route to successfully deal with these issues and restore healthy waters to the Creek and its tributaries. At this point (2033), these improvements should be obvious and measureable. They should be due to aggressive actions and investments in the Rich Fork Creek watershed to implement its Restoration Plan *and reduce stormwater impacts degrading both Rich Fork and Lower Abbotts Creeks; stronger ordinances and codes that protect environmentally sensitive areas (steep slopes, wetlands, etc.) and prevent non-point sources of pollution (i.e. erosion from construction) from polluting the Creek; economic evaluations and programs to reinvigorate Uptown Lexington and protect open space and farmland; and investments in stormwater retrofits and other projects to directly address known pollution problems in the watershed.*

With the successful implementation of the first three phases of the Lower Abbotts Creek Watershed Restoration Plan*, Lexington and Davidson County can capitalize upon its healthy watershed. It will still be important to review water quality data to ensure that water quality conditions continue to improve, and to amend local policies and investments accordingly, but with a healthy, stable watershed immediately upstream to High Rock Lake, Lower Abbotts Creek could be a keystone to the local economy and identity. The projects recommended for implementation largely build off of this concept, primarily focusing on the conservation needs and recreational opportunities the 76-square mile watershed holds if restored to healthy conditions. There are still restoration needs, but they are largely local retrofits that can enhance a site's aesthetics or stream restoration work that can be ensured to be stable now that stormwater impacts have been addressed. Furthermore, all of these projects can be integrated into economic and recreational development plans for both communities, allowing them to use multiple funding sources that address multiple interests to create projects that will benefit Lexington and Davidson County's economy, environment, and community. Continued investments that realize the value of Lower Abbotts Creek and protect its health and function will yield universal benefits to the residents of the Lower Abbotts Creek watershed long into the future.*

<u>Action Steps</u>

- All Phase I – III actions are priority concerns. Persist with their successful implementation

1) **Recommendations 5, 8 & 9**: DC TRIP, DC S&WCD, PTCOG, LTCNC, & Wildlife Resources Commission (WRC) implement **Projects 22** (*Ideal Rural Conservation Site*)**, 23** (*Rural Residential Site*)**, & 25** (*Open Space Preservation*)
    - Integrate into ongoing stewardship efforts initiated by DC FISH
    - Integrate into recreational planning efforts, including greenway and blueway developments
    - Ideal cases for the need for a County-run Open Space/Farmland Protection program
    - Target streams and wetlands for mitigation value to offset development impacts elsewhere in the watershed
    - Ensure that stream and buffer restoration work accompanies conservation investments
2) **Recommendations 2, 3, 4, 6, & 7**: City of Lexington, Davidson County schools, Stormwater SMART, and DC S&WCD implement **Projects 20 ((***Midway Glass Factory***), 21** (*Business 85 Retrofit*)**, & 24** (*Lakeside Retrofit Site*)
    - Ensure that they enhance the properties and their values
    - Showcase to others in the business community about the benefits of retrofitting and restoring structures and properties

Section 3: Watershed Policy Recommendations

Current Watershed Policies and Summary of Recommendations

The Lower Abbotts Creek watershed is located in Davidson County and the City of Lexington, and in a small portion of its critical headwaters, the Town of Midway. However, the upstream Cities of Thomasville and High Point are the main sources of stormwater pollution affecting its water quality (PTCOG 2009). The *Lower Abbotts Creek Watershed Assessment* provides a detailed summary of the ordinances, rules, and programs the County and the City currently administer that have either direct or indirect impacts upon watershed health and function (PTCOG 2011b). Upon review, it is apparent Davidson County and the City of Lexington have similar policies related to watershed management, though the City retains a few more incentives for sustainable designs. It is also clear that they both need to improve their policies to improve watershed conditions for Lower Abbotts Creek.

Based upon the review of the codes, ordinances, and programs currently used by the City of Lexington and Davidson County that affect the Lower Abbotts Creek watershed, ten management strategies are recommended as the most effective policy tools to address the bioclassification, turbidity, copper, chlorophyll-a, and pH impairments, and restore sustainable health and function to the Lower Abbotts Creek watershed (NC DENR 2010). The recommendations here are based upon the sources of different pollutants; the needs of the watershed (i.e. flood prevention, ecological health); implementation feasibility; and community benefit. The recommendations are informed by the data and observations collected through fieldwork, computer-based watershed analysis, NC DWQ monitoring data, and discussions held with the Stakeholders Committee. These strategies are intended to be coordinated with putting projects on the ground to most effectively restore the watershed using a two-pronged approach that improves water quality and sustainably manages healthy watershed conditions long into the future.

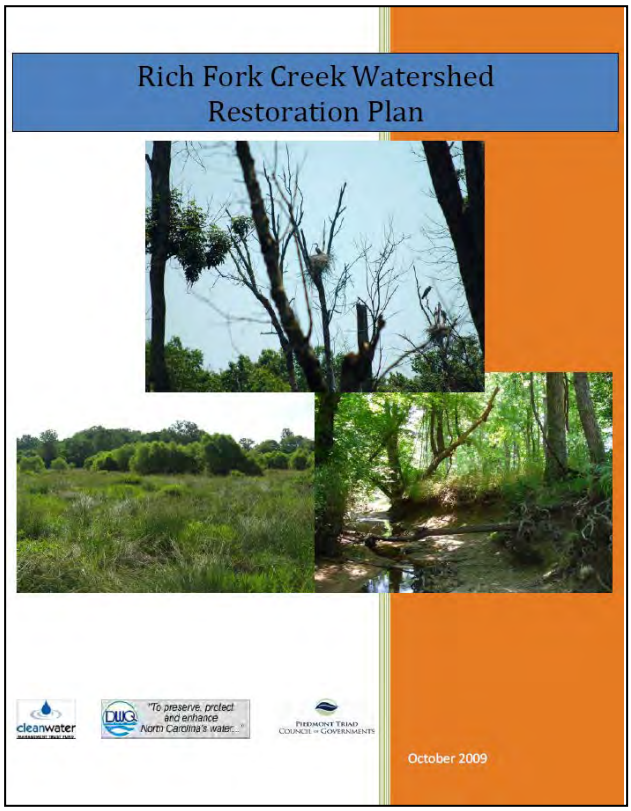
Lower Abbotts Creek Watershed Management Strategies

1. Implement the *Rich Fork Creek Watershed Restoration Plan*
2. Address Non-Point Source Pollution
3. Promote Development in Uptown Lexington
4. Restore the Stream Buffer Network
5. Improve Watershed Stewardship
6. Retrofit Stormwater Problems
7. Improve Site Design Requirements to Protect Natural Resources
8. Recognize the Economic Value of Farmland and Open Spaces
9. Recognize the Economic Potential of Recreation
10. Reassess the Copper Concerns on Lower Abbotts Creek

The top ten management strategies and other policies should be enacted consistently amongst all jurisdictions affecting water quality in Lower Abbotts Creek to achieve truly sustainable watershed management, including those communities upstream of the Creek itself. This approach has the benefit of also coordinating and preparing for impending nutrient reduction legislation coming out of DWQ's TMDL assessment of High Rock Lake. Coordination of efforts now as a single body that can implement these policies and projects will save considerable money, resources, and time.

Recommendation 1: Implement the Rich Fork Creek Watershed Restoration Plan

The Problem



The primary source of pollution to Lower Abbotts Creek is Rich Fork Creek. Water quality data indicate that the Lower Abbotts Creek is receiving significant sediment, nutrient, and stormwater loads from Rich Fork Creek and its urban tributary Hamby Creek. An accumulation of water quality insults have built up over the years due to past intensive industrial uses of the watershed to support the local furniture and textile industries, and current development of sensitive headwaters in the Rich Fork Creek watershed (PTCOG 2009). Investments in improved stormwater infrastructure – especially retrofits – must be made to improve the waters in both watersheds, and especially to protect and improve the economically-valuable recreation waters of High Rock Lake.

As the Rich Fork Creek 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 Rich Fork Creek and Lower Abbotts Creek. Stormwater impacts is the main source of pollution impairing the ecological habitat (and thereby the bioclassification scores) in Rich Fork Creek. PTCOG conducted a local watershed planning effort from 2008 through 2010 in the Rich Fork Creek watershed similar to this planning effort. Field work from this project showed repeated evidence of stormwater impacts, with upstream impervious surfaces leading to downstream trash accumulation, high soil mobility, flooding, and universal streambank erosion.

The water quality data analyzed in the *Lower Abbotts Creek Watershed Assessment* clearly shows a direct correlation between nutrient and turbidity levels in Rich Fork and Hamby Creeks and those seen in Lower Abbotts Creek (PTCOG 2011b). Furthermore, while the City of Lexington and the major highways are definitely contributing stormwater runoff to the Creek and its urban tributaries, there is simply not enough impervious cover (<2%) in the headwater tributaries of Leonard's Creek and Lake Thom-a-Lex to degrade ecological habitat conditions and erode streambanks to the levels seen. The most dramatic examples of stormwater insults are downstream of the confluence of Rich Fork and Lower Abbotts Creeks, and are due to stormflows in Rich Fork Creek.

This will be even more of a pressing issue if these communities have to reduce their nutrient contributions in the High Rock Lake watershed in light of a Total Maximum Daily Load study that DWQ is conducting. Due to its status as neither a non-water supply watershed, nor a NC DWQ-designated critical watershed, the Rich Fork Creek watershed is currently one of the least regulated hydrologic systems in Davidson County, with no restrictions upon development, and few environmental regulations. The TMDL will

require the communities of the Lower Abbotts Creek watershed to account for the water quality being discharged directly to High Rock Lake, which means that the water quality discharged to Lower Abbotts Creek must be improved.

Stormwater Degradation, Hanks Branch

Stream Erosion from Stormwater, Rich Fork Creek Headwaters

Recommended Management Strategy

The *Rich Fork Creek Watershed Restoration Plan* is the product of two years of watershed assessments including land use analysis, stream assessments, and policy analysis using core watershed management principles developed by the Center for Watershed Protection (PTCOG 2009). It recommends the immediate implementation of seven management policies and thirty-two priority restoration and conservation projects on ninety-eight different properties, including stormwater retrofits and illicit discharge eliminations. It features an Implementation Timeline that attempts to address immediate water quality concerns, other community priorities, and the economic and political feasibilities of implementing some of these measures. The projects are distributed throughout the watershed, and focus on preserving open space on the urban boundaries and remediating the urban cores of High Point and Thomasville through large-scale stormwater retrofit and stream restoration projects. However, more universal needs (i.e. illicit discharge detection and elimination, municipal rain garden and rain barrel giveaway programs) are addressed through the recommended management strategies, as they are in this watershed restoration plan. The seven management strategies recommended for most effectively improving water quality conditions in the Rich Fork Creek watershed are:

1) ***Stormwater Retrofits***
2) ***Riparian Buffer Restoration***
3) ***Rural Lands Protection***
4) ***Watershed Education & Outreach***
5) ***Improved Site Design***
6) ***Improved Enforcement of Existing Rules***
7) ***Stream Repair Projects***

Progress has begun in this watershed, and stakeholders have taken initial steps to implement each measure in the following ways:

1) The City of Thomasville has applied to the NC DWQ for a stormwater retrofit design project for an 11-acre Brownfields property on Hamby Creek, as well as receiving over $1

million in state grants and loans to address failing sewer infrastructure on North Hamby Creek, a significant source nutrients to Lower Abbotts Creek.

2) Davidson County staff introduced the concept of mandatory fifty-foot riparian buffers to their commissioners when they were writing a new Land Development Plan and Ordinance, and while it was discussed at length, this regulation was ultimately not adopted. However, the concept is new to many in the watershed, including the political establishment, and could gain ground with continued discussion on cost-effective methods for improving water quality. The City of High Point requires 100-foot buffers for all new development (City of High Point 2007).

3) Davidson County's Farmland Protection Plan cited the need for a Farmland Preservation Committee, assigned with the task of preserving the rural and agrarian culture of Davidson County. This new initiative is promising in the need to limit urban sprawl to these watersheds, though it needs economic and planning tools to realize that goal.

4) PTCOG was awarded a 2011 NC DWQ 205j grant to partner with the County, Cities, and public schools to create a stream stewardship initiative throughout the County called Davidson County citizens For Improving Stream Health (DC FISH). It will begin work in Fall 2011, and will focus its stewardship efforts in the High Rock Lake watershed, and build upon the momentum of public interest generated by the project. Key pollutants that will be addressed by this program include lawn fertilizers, pet waste, and illicit discharges (i.e. greywater pipes).

5) The new *City of Lexington Land Use Ordinance* requires greater environmental considerations in site designs, and incentivizes stormwater management and urban redevelopment. Though the City is not in the Rich Fork Creek watershed, it offers an encouraging example from a neighboring community of the type of development necessary for watershed restoration (City of Lexington 2010).

6) While no steps have been taken to support staff agencies in enforcing the few ordinances in the cities and county that protect water quality, the use of the Abbotts Creek ATV site by hundreds of people has created a negative public response, and recognition that more tools may be necessary to protect the welfare of watershed residents and water quality. The Winston-Salem office of NC DENR is unwilling to revoke the sites stormwater and soil ad erosion control permits. Discussions have acknowledged that the presence of County soil and erosion control or illegal dumping ordinances would enable the County to protect the Creek and the downstream neighbors of this site.

7) Pilot View, Inc., received a 2009 NC Clean Water Management Trust Fund grant to restore over a quarter mile of Rich Fork Creek just upstream of its confluence with Lower Abbotts Creek. The presence of this project emphasizes the need to improve stormwater conditions upstream, or the project could be undone within the next decade due to physical stream from the dramatic stormflows in Rich Fork Creek.

Next Steps

- Consult the *Rich Fork Creek Watershed Restoration Plan* Implementation Timeline for details;
- Present the *Lower Abbotts Creek Watershed Plan* to all communities' elected officials and planning boards in the Rich Fork Creek and Lower Abbotts Creek watersheds;

- Use these *Plans* as a centerpiece and resource tool for DC FISH;

- Work with DC TRIP and a new Davidson County Farmland Preservation committee to implement both *Plans* and protect open spaces and natural resources;

- Work with local government planning and public works staffs to pursue NC DWQ 319, 205j, and NC Clean Water Management Trust Fund grant monies to implement both *Plans*; and

- Integrate the goals of these *Plans* into the US Department of Housing and Urban Development Regional Sustainability grant-funded effort for the 12-county Triad region.

Recommendation 2: Address Non-Point Sources of Pollution
The Problem

Lower Abbotts Creek is polluted by eroded soils, nutrients, and stormwater, which have led to NC DWQ declaring it "impaired" for turbidity, chlorophyll-a, and bioclassification (NC DENR 2010). These sources of pollution are all non-point (having multiple roots), and distributed fairly evenly throughout the watershed. These pollutants are the responsibilities of all watershed residents. Evidence of erosion does decrease markedly in areas on the Abbotts Creek Arm of High Rock Lake.

Based upon water quality data, it appears that addressing these problems in the Rich Fork Creek watershed will have a significant benefit to Abbotts Creek water quality (PTCOG 2011b). The investments by the Cities of High Point and Thomasville to upgrade their respective wastewater treatment plants and wastewater infrastructures – particularly on the Hamby Creek outfalls in Thomasville – should reduce fecal coliform bacteria and nutrient inputs to Hamby and Rich Fork Creeks, and thereby improve water quality in Abbotts Creek (PTCOG 2009). It will be interesting to see any recent improvements in the last ten years since High Point finalized its entire wastewater system upgrade in 2010, as it will be to document Rich Fork Creek water quality in the coming five to ten years to see a change due to Thomasville's investments.

High Rock Lake, Fall 2010

Illicit Discharge Source, Lower Abbotts Creek Headwaters

Compounding water quality concerns of these non-point sources of pollution is that there are currently no ordinances or legal framework in Davidson County or the City of Lexington to address them. Neither community is considered a part of the National Pollutant Discharge Elimination System (NPDES) stormwater program, and consequently has not had to institute the six minimum measures to address non-point source pollution required under this federal program. Currently, the Winston-Salem Regional NC DENR office administers all soil and erosion control and stormwater permits and inspections for these communities. The standard practices for this office is to inspect a site once during construction, and then only return if there are complaints. However, many citizens are not aware of this responsibility, nor of how to contact the regulatory office. This has allowed a number of problematic sites to degrade further so that they are now significant sources of pollution to Lower Abbotts Creek. The requirements for fulfilling each permit are inconsistent and dependent upon the individual staff reviewing a permit, frustrating both developers and communities. There is a vested interest on their parts to make sure that they fulfill all of stormwater and pollution control requirements so that they don't have to address these issues later with a much more expensive retrofit. Consistency and clarity is lacking in communication from this particular regional office, and needs to be improved as soon as possible. This is especially notable at some Duke Energy sites and at the Davidson County ATV site, where stream assessment teams observed few soil and erosion control practices and soil was eroding directly into headwater tributaries.

All of these concerns could be addressed through a stormwater ordinance, which neither the City of Lexington nor Davidson County currently have (City of Lexington 2010; Davidson County 2009). It is strongly recommended that both the City of Lexington and Davidson County create their own programs to address non-point source pollutants as soon as possible. This watershed planning effort documents the need for these programs, inventorying sites of suspected illicit discharges, illegal dumps, significant erosion, and failing wastewater systems. Such programs, if carried out well, are inexpensive but highly effective tools to reduce soils, nutrients, and stormwater loadings to Abbotts Creek and its tributaries. While all of these concerns can be addressed in Davidson County by the Department of Inspections, creating specific ordinances will explicitly address these public health and water quality concerns, both locally and related to High Rock Lake. The public hearing stage in ordinance development will also increase public awareness regarding these issues.

Recommended Management Strategy

The most effective strategy to address these non-point sources of pollution is to explicitly focus on each one with an ordinance. The City of Lexington and Davidson County do not have stormwater ordinances. A stormwater ordinance is an extremely powerful tool that is often appreciated by the private sector and development community, as it explicitly addresses the values a local entity places upon water quality, and clear guidance on how a new development can successfully be integrated into the existing watershed community. A good stormwater ordinance includes sections addressing illicit discharge detection and

elimination, illegal dumping, or soil and erosion control, as well as managing stormwater flows from new and existing developments. A stormwater ordinance will be able to address persistent but difficult pollution sources such as pet waste and lawn fertilizers.

The most effective stormwater ordinances include non-point source discharge codes, stormwater BMP design requirements, floodplain codes, and open space requirements such as those currently existing in both jurisdictions. In terms of water quality and watershed sustainability, the most successful ordinances are those that are uniform throughout a jurisdiction, avoiding a patchwork of land use regulations that ultimately prove frustrating for developers and planning staff. Even more successful are those watershed communities that adopt Memoranda of Agreement or uniform stormwater ordinances that standardize the land use and stormwater management requirements for all development within a County or watershed, thereby avoiding interjurisdictional feuding or competition over attracting development or investment, and ensuring that the watershed won't be exposed to greater regulation and protections in some areas rather than others. A stormwater ordinance is preferable, and will be the eventual goal for this recommendation. However, if these issues can be addressed more quickly with separate specific ordinances, then that is preferable.

There are many local examples of strong and simple ordinances that address pollution sources directly and lay out penalties for noncompliance clearly. The City of Greensboro, a NPDES Phase I community, has had such ordinances and operating related programs since 2001. Their ordinances are highly effective at achieving compliance due to their simplicity and significant penalties. Larger communities generally have more resources to create dedicated programs to address these concerns, while communities the size of Lexington and Davidson County usually need to find alternatives, and coordinate efforts with the Department of Inspections, the police department, public works department, or a Department of Environmental Health. This model has worked well elsewhere in NC, including the highly successful Charlotte-Mecklenburg Land Use and Environmental Services (LUESA) program (Mecklenburg County Government 2011). The value of citizens' input through a simple website or hotline (usually existing to report nuisances or minor crimes) should not be underestimated, particularly when initiating a program.

Funding inspections and enforcement positions can be challenging, but successful fee-based systems exist throughout North Carolina, and could be successful in both the City and County. Adopting a stormwater fee for all residents of Lexington and Davidson County is the recommended finance strategy. Stormwater fees are utility fees, and are solely dedicated to addressing stormwater issues. They frequently use different fee structures for residential and non-residential properties, holding those lands with large parking lots and traffic volumes to higher standards due to their pollutant loads to the receiving waters. Stormwater fees should be at a level to fully fund a stormwater program that can inspect and maintain stormwater BMPs, as well as providing illicit discharge, soil and erosion control, and

Illegal Dump Behind Suburban Residences

education services. An effective stormwater program must have ordinances allowing public employees access to private lands to inspect and maintain stormwater devices, something not available to employees in Lexington and Davidson County. This practice and policy is standard throughout much of NC and should be adopted by these jurisdictions as a way to ensure that these funds are well spent and watershed conditions are improving. As detailed in the following paragraph, there are supplementary sources of funding that can augment the stormwater budget, removing some of the financial pressure from one program and the residents supporting it.

Revenue derived from an annual inspections fees from all landowners operating underground storage tanks, grease traps, septic systems, etc., could finance the illicit discharge program, a standard program elsewhere in the state. Similarly, any fines from illegal dumpsites could also fund the position. With slow development in the watershed, it will currently be difficult to have a fee-based position to address soil and erosion control, but it would be sustainable with economic recovery and robust development. If there are still concerns with creating such a program, all of these inspections services could be combined as one program, and it could even be shared by the City of Lexington and Davidson County, with any offer to other communities if they are interested in protecting their community with this program. The Charlotte-Mecklenburg County Water Quality program does just this, serving eight different communities ranging in size from the Town of Huntersville to the City of Charlotte (Mecklenburg County Government 2011).

Next Steps

- Draft a comprehensive stormwater ordinance that is funded with a stormwater fee and addresses stormwater requirements for new development, illegal dumping, illicit discharges, and soil and erosion control, and features enforcement measures that rely on inspections, warnings, and significant penalties;

- Present ordinance to elected officials and planning boards to pursue adoption;

- Create separate inspections and enforcement programs in collaboration with appropriate existing department staffs (police, inspections, public works, planning) that have sustainable financing, perhaps through a program funded by multiple jurisdictions, including Davidson County and Lexington;

- Use the inventory of illicit discharges and illegal dumps PTCOG has on file to address known concerns;

- Davidson County, Lexington, and any other participating municipalities develop a website and hotline so that residents can report violations directly to either the Police Department or the Department of Environmental Health, and accompany this with an outreach effort; and

- Petition NC DENR either directly or through the NC League of Municipalities and/or the NC Association of County Commissioners to develop clarity and consistency in their stormwater and soil and erosion control practices for permitting, development, and inspections purposes.

Recommendation 3: Promote Development in Lexington

The Problem

Stormwater is a significant source of water quality pollution in the Lower Abbotts Creek watershed, and while Rich Fork Creek is the main source of this pollutant, the City of Lexington is the next most significant source. The City completely occupies Subwatershed 4 on the western bank of Lower Abbotts Creek. Though it represents only 9% of the entire watershed, which is not of enormous concern when using Center for Watershed Protection criteria for evaluating impervious surface cover, it does occupy 100% of Subwatershed 4. The level of impervious cover in this subwatershed is 15%, predicting that water quality conditions will be poor in this area, which is indeed what was documented by the stream assessment field teams (Schueler & Holland 2001; PTCOG 2011b). Though not as bad as conditions in the Rich Fork Creek watershed, streambanks were incised (sometimes over 10 feet in height), had scoured beds, and were frequently habitat to invasive plant species. Similar impacts were seen downstream of the City and on Lower Abbotts Creek in the streams of the suburban residential Subwatershed 3, immediately north of Lexington. If Lower Abbotts Creek is to not degrade further, it will be essential to ensure that future development in the City and County does not use traditional, environmentally-insensitive methods. It is also essential to limit the sprawl around the City of Lexington while encouraging redevelopment of its urban core.

Impacts of urban Sprawl to Streams

The City of Lexington has been hit hard economically for the past couple of decades. While it still has the highest population densities in the entire Lower Abbotts Creek watershed, it is losing population and jobs quickly. Once a thriving furniture production capitol, it lost 6% of its population between 2000 and 2010, has a home vacancy rate up to 4,253 homes per square mile, a 0% or worse business growth rate, and is in the bottom 5th percentile for median household income in the twelve-county Triad region (PTCOG 2011b). A Future Growth Scenario reflecting these trends and growth pressures was done on behalf of this project (Fig. 2). It shows the highest potential for growth near the Town of Midway in the watershed headwaters, near High Rock Lake, and along the interstate corridors.

According to this estimation, the City of Lexington is a patchwork of growth potential, with some areas experiencing negative growth and others holding great promise. The city is presently a center of urban blight, perhaps seen best at the one million square foot Lexington Home Brands furniture factory that sits abandoned in the center of Uptown Lexington. The factory has gone through Phases I and II of the US EPA Brownfields program, but without private investment in the restored space, the US EPA is reluctant to grant the site further restoration funds. There are similar, if smaller, properties throughout Lexington.

The City attempts to guide development within its jurisdiction using five planning districts that describe the types of development city leaders and planners would most like to see, and how they can create a natural flow of industry, commerce, and residences throughout Lexington. The City has few requirements for stormwater management for redevelopment, but does incentivize mixed use developments, alternative transit options, and the creation of recreational spaces. However, development has been slow to return, though it persists in other areas such as High Point and Midway. The greater these areas develop, the more sensitive headwater tributaries to Lower Abbotts Creek will degrade and make full restoration of the watershed difficult. It is the best interest of the watershed to revitalize the Lexington economy.

Recommended Management Strategy

Davidson County and the City of Lexington would be well-served as community, economic, and watershed partners to discuss *how* they would like to see the area develop in the future. Given the development lull, this is a prime opportunity to enter into a Memorandum of Agreement with regard to what types of development are appropriate throughout Davidson County, and how both the jurisdictions would be best served to redevelop the urban core and protect open spaces and natural resources. The staffs of both communities already communicate regularly, and could be well-served with some guidance on how to most cost-effectively and sustainably redevelop their communities so that they can refer interested developers to their peers if their land use seems more appropriate to the County or City. An initial conversation amongst the Davidson County Planning Department, the Lexington City Planning Department, economic planners, Davidson County Tourism and Recreation Partnership (DC TRIP), Uptown Lexington, Davidson County Soil & Water Conservation District (DC S&WCD) is needed to identify and develop ways for these communities and this watershed to sustainably prosper, and ensure that all communities are working together to promote economic and environmental sustainability.

Consideration should be given to the demands of extending public services infrastructures – namely water and sewer – to new developments when that infrastructure already exists within Lexington. The Lexington wastewater plant was designed to accommodate 6.5 million gallons per day, including industrial processes, and its current capacity is about half of that. If a new development demands extension of infrastructure, that cost should be evaluated and considered as part of the development project. Similarly, stormwater needs for new developments should be adopted and integrated into development requirements for both communities, using the minimum standards for NPDES communities (on-site retention of 85% of total suspended solids in the first inch of rainfall runoff). Flexibility can be integrated into these requirements and developers unwilling or unable to manage the first inch of rainfall on a development can purchase *in lieu* fees. These fees can then be used by the City or County to mitigate stormwater pollution elsewhere in the watershed, using this Plan's Project Atlas for guidance.

The City and County could identify the redevelopment sites with the greatest economic and social potential, and market them to prospective developers. PTCOG is the lead planning agency on a $1.2

federal Housing and Urban Development (HUD) community sustainability grant, and could assist these watershed communities in identifying these properties, marketing them to the private sector, and developing projects to redevelop the blighted areas of the watershed. Should developers take advantage of the existing infrastructure, as opposed to developing greenfields and adding impervious surfaces to the watershed, this could be recognized with a tax break, permit fee waiver, or some other financial compensation. Further financial acknowledgements should be made if developers wish to improve local sustainability by going above and beyond current state and local regulations through the creation of bicycle-friendly facilities, stormwater management, and/or increased tree cover.

The City of Lexington and Davidson County use planning districts to guide the development community on how they may contribute to the existing communities. PTCOG developed a Future Growth Projection map that relies on current growth trends and planned developments to anticipate where development in the Lower Abbotts Creek watershed is likeliest. Some of these areas – particularly in the headwater subwatersheds 1 & 2 – are of particular concern given their potential to degrade water quality conditions further by adding to the stormwater burden of the watershed. As detailed in Recommendations 7 & 8, economic evaluations of the public services these open spaces currently provide in air and water quality improvements need to be assessed, as does the recreational potential of the bountiful lands and waters throughout Davidson County. By anticipating these potential impacts and their economic and environmental costs, and instead cooperating to guide development to areas where they may be more appropriate, the City of Lexington and Davidson County can reinvigorate the local economy, improve stormwater management, and protect the urban and rural characters of these two communities that proved so attractive to families in the twentieth century.

Next Steps

- Draft a MOA between Davidson County and the City of Lexington to create an economic development plan that will serve the revitalization needs of both the City and County and determine appropriate uses for different areas of the Lower Abbotts Creek watershed so that water quality is protected;

- Work with PTCOG through the $1.2 HUD Community Sustainability grant project to identify and market the sites in Lexington and Davidson County that will have the greatest economic, social, and environmental benefits;

- Integrate infrastructure costs into the Technical Review process of development and permitting to assess the true total costs of a project;

- Work with staffs to draft a comprehensive stormwater ordinance that meets NPDES stormwater mitigation requirements for new development, and offers an *in lieu* fee option to developers;

- Incentivize both urban redevelopment and stormwater management through tax deferments, fee waivers, or other financial recognition of partnership to achieve local sustainability goals; and

- Pursue private investment of the one million square Lexington Home Brands Brownfields site that will be redeveloped with environmentally-sustainable methods and features.

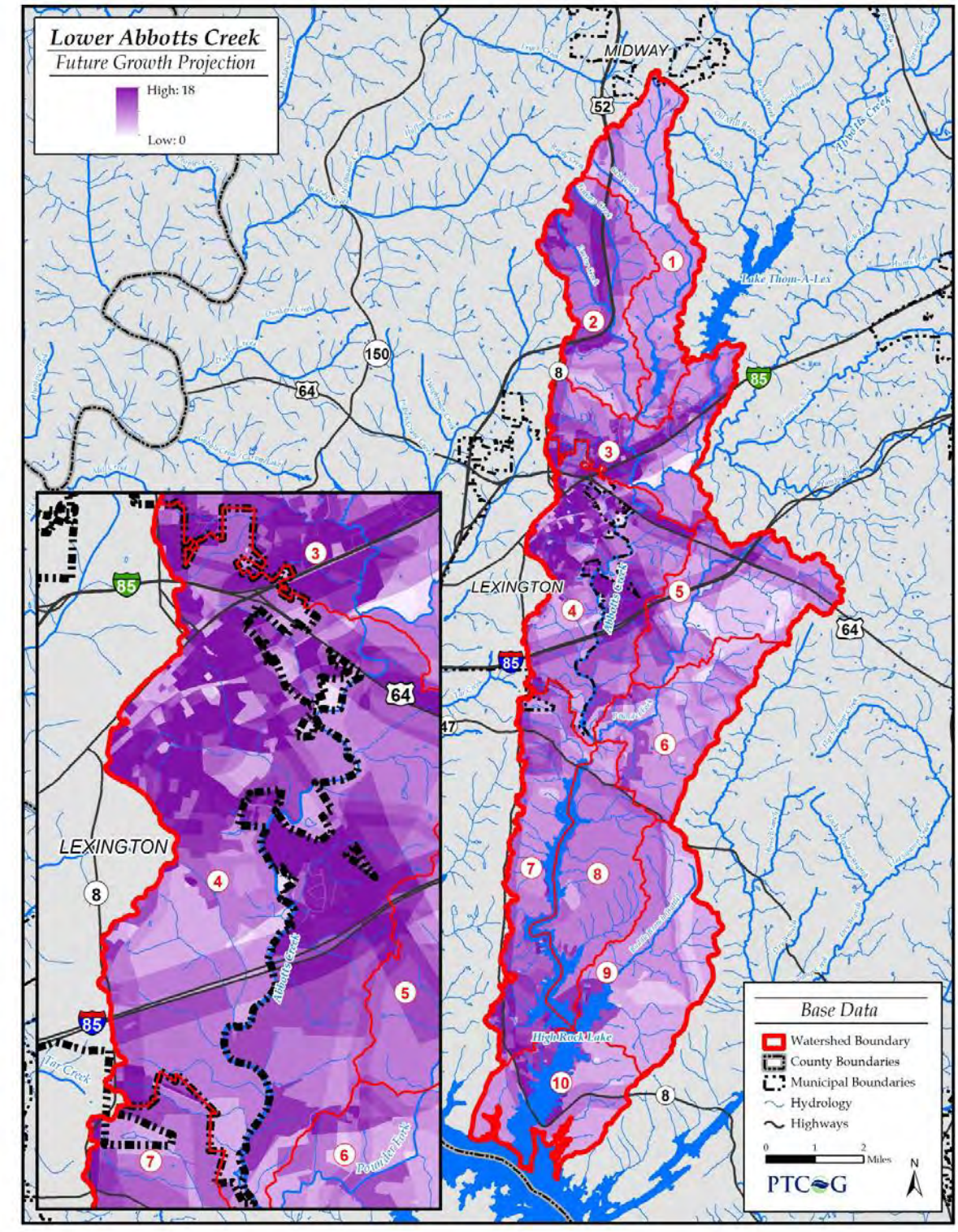


Figure 2 Future Growth Scenario for Lower Abbotts Creek Watershed

Recommendation 4: Restore the Riparian Buffer Network

The Problem

Stream Buffer Enhancement Need, Lexington Golf Course

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 Lower Abbotts Creek watershed, 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, nutrients, and sediment from surface flow before it reaches catchment waters. Perhaps most importantly, riparian buffers have the ability to attenuate the velocity and disperse the volume of stormwater runoff before it reaches streams and erodes their banks and beds. Armored streambanks in urban subwatersheds 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. The stream assessment field teams discovered 325 instances of needed riparian buffer improvements, ranging from mild enhancements (i.e. stop mowing) to full restoration of vegetation (i.e. restructuring of a degraded stream buffer) (PTCOG 2011b).

Both the City of Lexington and Davidson County have regulations limiting development within the 100-year floodplain, and protecting water supply watersheds and critical watersheds. Furthermore, the City of Lexington encourages developers to use their open space requirements to better protect the riparian zone. However, the current rules apply to new development only and don't account for the high levels of development with the riparian zone that already exist and allow stormwater runoff to directly discharge the Creek and its tributaries.

Recommended Management Strategy

Healthy Stream Buffer, Pounder's Fork Subwatershed

To avoid further stresses to the watershed, both jurisdictions should consider a minimum fifty-foot stream buffer that must not be disturbed. The City of High Point or Randolph County have both taken extensive steps to ensure that new developments will not stress their watersheds through strict riparian buffer, steep slope, and sensitive waters regulations and could be used as guidance (City of High Point 2007; PTCOG 2009). These buffer needs could be coupled to stewardship efforts of DC FISH, and presented to the public as a single stewardship package. Specifically, the benefits of restoring

buffers in combination with proper fertilizer use and pet waste clean up should be emphasized, given their potential to significantly reduce nutrient inputs to the Creek. There are a number of resources to draw from when addressing these needs, including the NCSU Cooperative Extension Buffer-In-A-Bag program that provides landowners with a bag of live stakes of riparian trees to plant directly into their streambank(s) to stabilize it with improved root structure.

Davidson County and Lexington should also consider stream buffer restoration in the context of mitigation banking. Under the Clean Water Act, there can be no net loss of streams or wetlands (US EPA 2010b). This requires all developers who disturb any of these water features to enhance, restore, or protect streams or wetlands within the same watershed. Private mitigation banks are common in NC, as is the Ecosystem Enhancement Program, which is run jointly by NC DENR and the DOT to mitigate the impacts to streams and wetlands from transportation projects (NC DENR, EEP, 2011). Governments are free to invest in their natural resources and be paid by private developers (or their own development projects) for impacts to local water features. These two communities can both restore impaired areas of the watershed and invest in untouched streams – they all have mitigation value. The Project Atlas in Section 4 features twenty-five projects that would be ideal for such investments, and repay the respective governments within a short time.

Next Steps

- Draft a minimum 50-foot undisturbed riparian buffer ordinance that prevents all development within 50 feet of any perennial or intermittent stream and present it to elected officials for adoption;
- Immediately improve the riparian buffers along all public easements and lands held by the City of Lexington – begin with Project 25, the City Golf Course;
- Integrate buffer restoration as a central campaign of DC FISH, including the NCSU's Cooperative Extension's Buffer-In-A-Bag program;
- Create an incentives program for landowners who allow their stream buffers to grow back ($1/sq ft of re-greened buffer);
- Integrate riparian buffer needs into the *Davidson County Master Greenway Plan*, and evaluate the water quality benefits of enhancing or restoring the riparian buffer with all greenway projects;
- Estimate the economic value of a 50-foot wide, 100-foot long buffer in addressing stormwater flows, nutrient pollution, and sediment loading, and include it in a marketing campaign for riparian buffer restoration; and
- Explore interest in acquiring wetlands and streams to mitigate development impacts elsewhere in the watershed and set up a local, public mitigation bank.

Recommendation 5: Improve Watershed Stewardship
The Problem

Armoring Tributary with Concrete, Lexington

Stewardship Need at Lexington Golf Course

The Lower Abbotts Creek watershed suffers from non-point sources of pollution, most of which can be addressed through more awareness, understanding, and involvement of the residents in the sustainability and stability of their watershed's health and function. Much as was seen in the Rich Fork Creek watershed planning effort, landowner education was an obvious need throughout the watershed, with 242 opportunities for behavior and land use improvements documented by stream assessment teams (PTCOG 2011b). 92 trash dumps and 82 possible illicit discharges were found in watershed, and disproportionately in the urban areas. Smaller and simpler concerns can also be addressed through stewardship programs, namely pet waste clean up programs, fertilizer reduction programs, tree planting projects, and stream buffer enhancements (see Recommendation 4). Sources of nutrient, sediment, and litter pollution can be addressed and reduced quickly and cheaply through simple and direct outreach programs that target all watershed residents and use resources that are readily available to both Davidson County and the City of Lexington. Projects must be invested in and protected by the communities they serve if they are to have long-term benefits to the watershed and its residents. They also need to have local ordinances that address these same issues and prevent them from becoming a recurring problem.

The City of Lexington and Davidson County are already members of a stormwater education and outreach program called Stormwater SMART. Stormwater SMART is hosted by PTCOG and mainly serves to address the Public Involvement and Community Outreach measures of the federal NPDES program; Davidson County and the City of Lexington are voluntary members (PTCOG 2010). Stormwater SMART has worked in Davidson County and with its major municipalities since 2008, when it was formed to respond to these federal mandates to address and control stormwater. It contributed to both the Rich Fork Creek and Lower Abbotts Creek watershed restoration planning efforts, addressing nutrient and stormwater management as well as the need for an improved buffer network in the Rich Fork Creek watershed.

Responding to the primary concerns in the Lower Abbotts Creek watershed, Stormwater SMART has focused on reducing trash accumulation in the Creek and at High Rock Lake, where it collects in coves along with the stagnant backwater in the Lake. Trash is a surrogate of stormwater concerns, evident in the urban debris (i.e. grocery carts) and recreation-related trash (i.e. cans and bottles) frequently found collecting in High Rock Lake. These efforts have paid off, with increasing citizen involvement since 2008, when these efforts began, and lately culminating with a stream cleanup and paddle event on Lower Abbotts Creek as part of National Trails Day, 2011.

Recommended Management Strategy


Trash Accumulation at High Rock Lake

Stormwater SMART recognizes the need to not lose the momentum generated by the outreach tied to these planning efforts, and sought federal funding to continue outreach and stewardship efforts in Davidson County. They received a 2011 205j grant to create the organization DC FISH that will focus on creating at least ten citizen-led StreamWatch groups that will regularly monitor the habitat and water quality conditions of creeks, streams, and lakes throughout Davidson County, and work with local governments to address concerns found through these efforts. Accompanying these efforts on the ground will be discussions of the non-point sources of pollution and the fairly simple solutions that can fix them, such as picking up after your dog, making trash bins more common and accessible in areas where trash is a problem (i.e. the High Rock Lake banks), applying fertilizer appropriately and infrequently, and ensuring all citizens have access to the public staff who can address known water quality concerns. DC FISH will also be promoting stream buffers and tree plantings, due to their enormous capacities to intercept stormwater runoff. DC FISH will cover streams throughout the County, but will focus their efforts on the tributaries to the impaired High Rock Lake, including tributaries to Lower Abbotts Creek, and perhaps the Creek itself. It will also identify properties in the City and County that can take advantage of the cost-share and tax deferment programs available through the DC S&WCD, including CCAP and EQIP.

While citizen involvement is certainly the most cost-effective method of mitigating nutrients and stormwater throughout the watershed, concrete progress to improve watershed stewardship must be supported by local programs and policies. Addressing these key non-point sources of pollution with ordinances and enforcement (as detailed in Recommendation 2) will be enormously helpful to the watershed and invested citizens. There are a number of simple things that the City of Lexington and Davidson County could do to enhance watershed protections, improve water quality, and engage the public and private sectors on the need to protect water quality and natural resources in these communities. Should an inventory and/or map of valued natural resources areas be available (see Recommendations 7 & 8), an ordinance could require specific development restrictions to protect that recreational or ecological resource. An ordinance limiting development to slopes <15% would have a small impact upon potential development areas in the watershed (only 16% of the total watershed, and

mostly within the 100-year floodplain restricted areas), but a profound impact upon watershed health and stability, as it will prevent more erodible areas of the watershed from being developed and adding to the turbidity problems in Lower Abbotts Creek and High Rock Lake. An acknowledgement by these jurisdictions that weather patterns have been growing more extreme in recent years and that the 100-year floodplain limitations on development do not offer the same protections to landowners that they once did could be addressed through an amendment to the current floodplain ordinances that extends their application to the 500-year floodplain, available from the Federal Emergency Management Agency (FEMA). Doing so will better protect the residents and businesses of the Lower Abbotts Creek watershed from flash flooding and high flow events, but will also limit the levels of impervious cover and storage of potentially harmful substances near the water.

All of these concerns could be addressed through a stormwater ordinance, which neither the City of Lexington nor Davidson County currently have. A stormwater ordinance is an extremely powerful tool that is often appreciated by the private sector and development community, as it explicitly addresses the values a local entity places upon water quality, and clear guidance on how a new development can successfully be integrated into the existing watershed community. The most effective stormwater ordinances include non-point source discharge codes, stormwater BMP design requirements, floodplain codes, and open space requirements such as those currently existing in both jurisdictions. In terms of water quality and watershed sustainability, the most successful ordinances are those that are uniform throughout a jurisdiction, avoiding a patchwork of land use regulations that ultimately prove frustrating for developers and planning staff. Even more successful are those watershed communities that adopt MOA's or uniform stormwater ordinances that standardize the land use and stormwater management requirements for all development within a County or watershed, thereby avoiding interjurisdictional feuding or competition over attracting development or investment, and ensuring that the watershed won't be exposed to greater regulation and protections in some areas rather than others. As in Recommendation 2, cooperation between the City and the County could enhance economic revitalization of the watershed communities, simplify the technical review process for developers, and ensure that the watershed is under a consistently common level of watershed protection.

Next Steps

- Draft a Stormwater ordinance in cooperation with the Davidson County and City of Lexington staffs, and present them to planning boards and elected officials for adoption;

OR

- Draft ordinances that address illicit discharge detection and elimination, illegal dumping, soil and erosion control, the 500-year floodplain, steep soils development restrictions, and natural and recreational resources protections;

- Present ordinance to elected officials and planning boards to pursue adoption;

- Initiate DC FISH and recruit up to ten citizens StreamWatch groups to address water quality and habitat needs in Davidson County streams, as well as non-point sources of pollution (fertilizers, pet waste, littering, etc.);

- Create outreach and public involvement programs that focus on the need for riparian buffers, pet waste cleanup, fertilizer application reductions, and illegal dumping controls;

- Create an incentives program for landowners who allow their stream buffers to grow back ($0.25/sq ft of re-greened buffer would grant the owner of a 100-ft. long, 50-ft.wide restored buffer $2,500);

- Work with public and private sectors to promote the use of no-phosphorous fertilizers;

- Foster partnership between DC FISH and the DC S&WCD office to promote federal and state cost-share and tax deferment programs to eligible landowners; and

- Use DC FISH as a leverage to pursue further funding from public and private partners to put small BMPs (pet waste stations, stream signs, trash bins, etc.) in watershed at strategic locations.

Recommendation 6: Retrofit Stormwater Sites
The Problem

Stormwater Drains, Lexington

Stormwater is the main source of pollution that is degrading ecological habitat in Lower Abbotts Creek (PTCOG 2011b). It has two general sources: Rich Fork Creek and the City of Lexington. The majority of the stormwater flows are coming from Rich Fork Creek, which has had all of its headwaters urbanized over the last century to accommodate furniture and textile industries, as well as residences for the people working within these industries. As the economies in these cities have shrunk and changed over the last couple of decades, the urban cores have not been redeveloped for a new purpose, but abandoned, pushing new commercial and residential developments out into unused greenfields surrounding the cities. As the Rich Fork Creek 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 Rich Fork Creek and its tributaries (PTCOG 2009). The stormflows flushing into Rich Fork Creek and its tributaries are increasingly flashy and violent, sometimes growing from a 2 cubic feet per second (cfs) base to a 20,000+ cfs stormflow within a couple of hours. These stormflows are transporting large masses of sediment and nutrients to Lower Abbotts Creek, and compromising water quality for downstream residents and those using High Rock Lake. The *Rich Fork Creek Watershed Assessment* and *Restoration Plan* deal with this concern and its lasting impacts to that watershed in detail, and implementing this *Restoration Plan* is the top recommendation of the *Lower Abbotts Creek Watershed Restoration Plan*.

Though not the primary source of stormwater problems in the Lower Abbotts Creek watershed, the City of Lexington completely occupies one of the ten subwatersheds within it, and represents a significant source of stormwater that is degrading urban tributaries and downstream waters. The stormwater impacts recorded in the Lower Abbotts Creek watershed are largely located in the two subwatersheds representing the suburban and urban core of Lexington. Of the 142 stormwater concerns in the watershed, 111 were found in these two subwatersheds (PTCOG 2011b). Improved citizen stewardship is highly needed, with 69 of the 92 trash dumps and 58 of the 82 possible illicit discharges found in these subwatersheds. All of these concerns could be addressed through a stormwater ordinance, which neither the City of Lexington nor Davidson County currently have (City of Lexington 2010; Davidson County 2009). It is strongly recommended that both the City of Lexington and Davidson County create their own programs to address non-point source pollutants as soon as possible. Such programs, if carried out well, are inexpensive but highly effective tools to reduce soils, nutrients, and stormwater loadings to Abbotts Creek and its tributaries. The public hearing stage in ordinance development will also increase public awareness regarding these issues.

15% of these local subwatersheds have impervious surfaces that must be addressed through stormwater retrofit projects. The Center for Watershed Protection has studied the correlation between impervious cover and stream health, and has determined that a 15% impervious coverage of a (sub)watershed is indicative of "poor" stream health, which was observed by the stream assessment field teams (Schueler & Holland 2001). While all future developments must not be allowed to further degrade watershed health and function, it is important to recognize that Lower Abbotts Creek and its tributaries are degraded due to past uses that must be addressed through retrofitting. Without direct and immediate attention given to the stormwater burden originating in the City of Lexington, the ecological habitat conditions in the urban tributaries and immediately downstream of the City on Lower Abbotts Creek cannot ever be expected to recover to healthy conditions.

Discolored Water Due to Stormwater Pollution, Pounder's Fork

Recommended Management Strategy

Stormwater retrofit projects often can accompany redevelopment of a site and/or serve parks and recreation goals if new green spaces are sought within the urban core of Lexington. 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, and can add to property values (Hunt, 2005). In conjunction with the recommendation to redevelop the Uptown Lexington urban core, it is vital to address the stormwater needs in this area, as this is the highest density of impervious cover within the watershed. Creation of a financial incentives system to promote such projects could achieve both economic revitalization and better stormwater mitigation.

Source of Stormwater Pollutants, Lexington

The high number of stormwater projects identified in and around the City of Lexington should be viewed positively, as these are largely potential retrofit projects that can accompany redevelopment of the City's urban core and be a key component of its economic revitalization. It would be worth the City's time and resources to consider a marketing campaign that caters to the local and regional public that promotes both economic and environmental sustainability as mutually beneficial concepts that could define Lexington's future. If the resources of the County and the City are pooled into a comprehensive,

systematic approach to retrofitting sites throughout the watershed, they can be prioritized for maximum efficiency and efficacy in addressing non-point source pollutants, namely stormwater. Those projects on public lands or the property of interested landowners will then be eligible for grant-funded retrofit projects, including CCAP funds that are managed by the DC S&WCD office.

PTCOG is the lead planning agency on a $1.2 federal Housing and Urban Development (HUD) community sustainability grant, and could assist these watershed communities in identifying these properties, marketing them to the private sector, and developing projects to redevelop the blighted areas of the watershed. This *Restoration Plan*'s Project Atlas (see Section 4) has attempted to prioritize projects based upon benefit, but it may be ignorant of some factors that affect the feasibility of the project. Such a financing system would also encourage interjurisdictional watershed management and investments and use resources and funds more efficiently. This could be achieved by raising stormwater utility fees or creating an escrow account that current development and construction partners pay into for "community sustainability."

This will be even more of a pressing issue if these communities have to reduce their nutrient contributions in the High Rock Lake watershed in light of a Total Maximum Daily Load study that NC DWQ is conducting. Lower Abbotts Creek discharges directly to the Lake, and both Davidson County and the City of Lexington will receive wasteload allocations and management strategy for reducing nutrient inputs separate from the rest of the High Rock Lake watershed. It remains unknown if the watershed models under development will show a need to do more or less than other communities throughout the 4,000+-square mile watershed. It is known that stormwater management will be a central part of the legislation, likely including the mandatory retrofits of impervious surfaces with BMPs in each community. Both communities will need to invest further resources to truly address the stormwater impacts upon their watershed through a systematic retrofitting of their most impervious and high impact areas and will likely need to create a stormwater fund supported by local stormwater fees to do so. Pooling resources in a partnership and/or a watershed-scale planner/manager may be the most cost-effective and holistic approach to this problem.

Next Steps

- Implement the *Rich Fork Creek Watershed Restoration Plan*, namely investing in the stormwater retrofit projects and promoting stormwater outreach and involvement campaigns through Stormwater SMART;
- Use the *Lower Abbotts Creek Watershed Restoration Plan*'s Project Atlas as a guiding document to prioritize stormwater retrofit projects, especially in the City of Lexington;
- Identify priority retrofit projects with PTCOG through this plan and the HUD Sustainable Communities grant, and market them to interested developers and/or funding agencies;
- Draft a comprehensive stormwater ordinance that is funded with a stormwater fee and addresses stormwater requirements for new development, illegal dumping, illicit discharges, and soil and erosion control, and features enforcement measures that rely on inspections, warnings, and significant penalties;
- Present ordinance to elected officials and planning boards to pursue adoption;

- Work with PTCOG to obtain financial support for stormwater retrofit projects;
- Create a financial resource that is shared between the County and the City to pay for these projects;
- Create a financial incentive for developers willing to redevelop a site with stormwater BMPs that achieve at least the pre-development runoff volumes for the site;
- Work with staffs to draft a comprehensive stormwater ordinance that meets NPDES stormwater mitigation requirements for new development, and offers an *in lieu* fee option to developers; and
- Consider creating an ordinance mandating that all newly and redeveloped sites meet pre-development stormwater runoff levels and capture nutrients and sediment with the BMP(s).

Recommendation 7: Improved Site Design Requirements

The Problem

Traditional site designs and developments are part of the reason Lower Abbotts Creek is currently impaired. Sprawling commercial and residential developments add impervious coverage to the watershed, and the City of Lexington and Davidson County have never required developers to offset this impact through stormwater BMPs or (until recently) riparian buffers. The land use assessment of the watershed determined a number of areas throughout the watershed that are environmentally-sensitive (steep slopes, wetlands, etc.), and the stream assessments revealed that there are likely far more areas that are benefitting the watershed and could be valuable open space and recreational areas if protected from intensive development. Furthermore, there is an enormous opportunity to redevelop the urban core using available infrastructure and development patterns that date back one hundred years.

In urbanized subwatersheds, the high volumes and intensity of stormwater flows demonstrate the legacy of business-as-usual when it comes to site design and development. Streambanks unprotected by riparian buffers erode easily under precipitation events; stormflows are massively flashy; trash and debris accumulates at High Rock Lake; and, eventually, the natural systems that make the Creek and the Lake local assets are lost. The best way to restore a degraded stream is to address the sources of pollution impacting it (see most of the other recommendations). The best way to ensure that a watershed will not degrade further, and that all of the investment and initiatives to restore the watershed are not undone, is to ensure that future developments and land use consider and minimize their environmental impacts. Known as Low Impact Development (LID), this strategy manages stormwater on development sites so that post-development stormwater peak flow and total volume are attenuated to the greatest extent possible, and so that no additional pollutant loadings of nutrients or sediment burden receiving waters.

The NCSU Cooperative Extension's Water Quality Group has developed a BMP handbook for North Carolina that was published in 2009 (Perrin et al. 2009). Though the Piedmont impermeable clay soils make LID more challenging than in the Mountains or the Coastal Plan, the handbook does do a good job of breaking down the essential points and purpose of LID, its benefits, and is a good guiding document for implementing this restoration plan. Until then, direct contact with the Water Quality Group is recommended.

The Center for Watershed Protection offers a seven-tool approach to address stormwater impacts in developing communities through LID solutions (http://www.cwp.org/Resource_Library/Controlling_Runoff_and_Discharges/sm.htm). However, this approach is a generalized toolkit, and will need to be adapted to each watershed. 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, and the Town of Huntersville now mandates it for all new developments (City of High Point, 2007).

Both Lower Abbotts Creek watershed jurisdictions address the need for less intensive development within their limits (City of Lexington 2010; Davidson County 2009). The incorporation of "mixed use," "new

traditional," and "greenspace" planning into communities is named by both the City of Lexington and Davidson County as the direction they would like to steer future development within their communities. The City of Lexington allows for creative design that incorporates the current landscape and does not limit development to the restrictive standards of what is commonly viewed as "single-family development," allowing for more mixed uses of properties, and innovative ways of working with their open space and riparian buffer requirements. They have a mandate that developers set aside 15% of a property as open space, and dedicate two-thirds of that space to community recreation. The City also has planning districts in which it has declared a desired function for the City-at-large. They do not currently require any measures beyond some minimal stormwater management measures and riparian buffer protection, though they certainly promote innovative designs and development.

Davidson County also recommends the use of innovative site designs and minimizing the environmental footprint of development, but they do not state any standards, goals, or requirements for developers to meet (Davidson County 2009). Under the current ordinances and rules, LID and creative mixed-use planning remains only a good idea waiting to be implemented in both the City and the County. Neither community discusses the environmental features of a site such as slope, soil erodibility, or accessibility to other areas of the community. Though zoning does exist in both jurisdictions, there is no discussion of the best use of lands, or the need to ensure that all newly and redeveloped areas serve all members of the community, including the elderly.

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 mitigation, rainwater capture, landscaping, infiltration, and conveyance (Perrin et al., 2009). While this is easier to achieve on the blank slate new development offers, there are retrofit opportunities in Lexington that can be designed to minimize stormwater runoff. The LID approach also may allow developers to save money by minimizing earth movement and foundation cost, infrastructure investments, and, until mandated, could be incentivized as recognition of developers making any effort to harmoniously join the natural and social fabric of the community.

Lower Abbotts Creek jurisdictions are 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. A plan to retrofit all publicly owned structures and parcels – similar to a Capital Improvement Projects timeline – is recommended. Public lands are the easiest to manage and feature as demonstration projects, and these projects could be coupled to public outreach campaigns to improve watershed stewardship and address other community concerns (see Recommendations 2 & 4).

Neither Davidson County nor the City of Lexington are NPDES communities. However, they do voluntarily abide by most of the NPDES Phase II regulations as a way to limit stormwater impacts to their communities. NC DWQ is conducting a TMDL study of the pollution causing chlorophyll-a water quality standard violations in High Rock Lake. This study will likely lead to legislation focusing on reducing nutrient inputs to all waters within the Lake's watershed. The Abbotts Creek watershed, including Rich Fork Creek, is being assessed with the effort, but is seen as a hydrologically-distinct unit that will require its own strategy to reduce pollution. It is unknown how much watershed communities will be required to reduce their pollution levels from point and non-point sources of pollution, nor the timeline they will have to comply with this legislation, but based upon what was seen in the Jordan Lake and Falls Lake TMDL

processes, it can be expected that compliance will be expensive and fundamentally alter how development can impact water quality. Engaging in stormwater mitigation and management now may decrease required investments in these efforts following the adoption of Rules. Pro-active promotion and use of LID standards will benefit all Lower Abbotts Creek watershed communities economically, environmentally, and politically.

It is strongly recommended that all Lower Abbotts Creek watershed jurisdictions revise their existing stormwater management policies for new development to meet a hydrologic performance standard such as LID. Both the City and the County state that they have an interest in decreasing the impacts of development within their limits, and to cooperating with regional partners on improving community conditions. Certainly, creating regional stormwater requirements or even a consistent ordinance meets these needs. The City of High Point's stormwater ordinances are good guidelines to begin these efforts, and the Charlotte-Mecklenburg County LUESA program offers a guiding model for how to successfully share resources amongst many communities of diverse sizes to address watershed management needs (City of High Point 2007; Mecklenburg County Government 2011). This consolidation of resources will not only benefit the watershed, but will prove cost-effective to all communities involved, addressing current development needs, environmental concerns, and ensuring that developers can have all of their questions answered by a single staff.

Next Steps

- Work with staffs to draft a comprehensive stormwater ordinance that meets NPDES stormwater mitigation requirements for new development, and offers an *in lieu* fee option to developers;
- Identify priority retrofit projects with PTCOG through this plan and the HUD Sustainable Communities grant, and market them to interested developers and/or funding agencies;
- Create a financial incentives program that acknowledges the goodwill of developers that use some of all LID principles for a new or redeveloped site;
- Draft a development ordinance that requires all new developments to achieve pre-development stormwater runoff volumes;
- Draft an ordinance detailing the LID features desired by the community that can be invested in by a developer;
- Draft an ordinance that ensures all new developments will avoid or minimize impacts to the natural and recreational resources of the Lower Abbotts Creek watershed (see Recommendations 7 & 8);
- Implement the Project Atlas with LID practices, and market the redevelopment of Uptown Lexington to the development community as a design laboratory;

- Work with PTCOG to pursue an urban redevelopment project in the City of Lexington that incorporates LID principles, reduces stormwater runoff, and restores the local catchment.

Recommendation 8: Assess the Economic Value of Farmland and Open Space

The Problem

Pristine Wetland Just Outside Lexington

Wetlands On Top of Old Lexington Landfill

The Lower Abbotts Creek watershed is largely composed of open spaces and undeveloped lands. Only 9% of the watershed is urbanized, and though there is some sprawl radiating from Lexington, the suburban area occupies part of Subwatershed 3. According the 2006 NLCD land use data for the watershed, 30% of the properties in the Lower Abbotts Creek watershed are listed as "Vacant," 14% are dedicated as "Forest," and an additional 4% is used for agriculture, which can include raising livestock, crops, or timber. Furthermore, there is an additional 39% of the watershed that is used for residential purposes, and while this includes a significant number of small properties within and just outside of the city limits, 74% of these properties are rural residential, large in size, and mostly unmanaged. This leaves a large amount of the Lower Abbotts Creek watershed fairly untouched and benefitting water quality and the aquatic and riparian habitats.

These open spaces are home to a number of economically-valuable game species (turkeys, deer, etc.) and ecologically-valuable species, including the "globally-vulnerable" Greensboro burrowing crayfish and the state-threatened bald eagle. The NC Natural Heritage Program has identified five significant natural heritage areas within the Lower Abbotts Creek watershed that are home to these rare species as well as more regionally-rare and interesting species like mountain laurel (NC NHP 2004). Many of these areas are within the 100-year floodplains that are regularly imperiled by the extremely flashy stormflows from Rich Fork Creek and largely off-limits to development. These areas need to be recognized by all jurisdictions, and explicitly identified and protected by their land use ordinances and plans. These protections should also include the impacts from stormwater runoff, noise disturbance, and habitat fragmentation. At the recommendation of the NC Wildlife Resources Commission (WRC), 100-foot riparian buffers should be considered in these more sensitive areas of the watershed (Cook 2011).

The National Wetlands Inventory (NWI) currently lists 241 wetlands within the Lower Abbotts Creek watershed. However, the stream assessment teams that conducted fieldwork for the *Lower Abbotts*

Creek Watershed Assessment recorded 47 wetland occurrences that are not part of the NWI dataset. These data refute the soils data provided by the US and NC Geologic Surveys, which assert that the hydric soils necessary for wetlands to exist are not present anywhere in the watershed. The NWI dataset was last updated in 1977, and is poorly maintained. There is a high need to address the inconsistencies present in both the NWI and SSURGO data through new field inventories.

These natural resources not only protect water quality and ecological habitat, they are integrated into the historical culture of Davidson County and its cities. Though Lexington was an industrial center for furniture production throughout much of the twentieth century, it was always a city within a larger natural and agrarian landscape. Davidson County clearly states that it values its identity as a rural community of open spaces and farms, and the few land use regulations it does have are designed to protect that legacy, including mandatory visual buffers on residential developments that could disrupt the County's otherwise rural character. To this end, Davidson County recently cited the need to create a Farmland Preservation Committee to protect agricultural uses and spaces in this urbanizing county. Hopefully, the creation of this Committee will be realized soon.

Recommended Management Strategy

Pristine Mature Piedmont Forest Near high Rock Lake

Guilford County recently created a Working Group within their Farmland Preservation Committee to actively address the loss of open spaces, farmland, and ecosystem services in their county, and identifying those areas most likely to be lost to development. This working group also partnered with the Natural Resources Conservation Service, a division of the US Department of Agriculture, to assess the economic value of open space and farmland, and found a clear economic advantage in preserving these lands. Davidson County would be wise to follow suit. While Davidson County growth pressures are not largely within the Lower Abbotts Creek watershed, the need to protect these open spaces – especially in the headwaters – is imperative, as their undeveloped nature is providing valuable services and functions for downstream residents, including the City of Lexington and all enjoying the amenities of High Rock Lake.

What is not usually included in these assessments of open space and farmland is the cost of extending services from utilities, impacts to the surrounding environment, or additional tax burdens such as increasing the school children population. These analyses are a strong tool that can relay to the public of often undervalued lands and resources that add to the quality of life for a community and a watershed. It is strongly recommended that the Davidson County Farmland Preservation Committee be created, and work with the Tourism & DC TRIP work with the Davidson County Soil and Water Conservation District (DC S&WCD) to conduct such an economic evaluation. It is also recommended that the cities within Davidson County support this study, as they benefit directly from the open, agrarian landscapes that they

rest within.

The DC S&WCD staff of Andy Miller and Lloyd Philips have worked on behalf of these values to protect farmlands and open spaces with federal cost share programs and voluntary agricultural districts that grant tax deferred status to property owners willing to make the land management investments required to protect these lands and their surrounding natural resources from the more degrading intensive land uses. There are obstacles to the work that the district office can offer, including limitations placed upon the tax deferment program if landowner information is slightly different in any way (John Doe vs. John X. Doe). This is unfortunate, as it prevents landowners of multiple parcels from consolidating these parcels into a single plan and sustainably managing those properties as a single project. It also prevents more creative land management strategies of continuous properties by adjacent landowners. This obstacle to watershed protection and open space and natural resources preservation is due to problems within federal and state statutes, and must be addressed at that level before it can be a local solution.

Davidson County and Lexington should also consider stream buffer restoration in the context of mitigation banking. Under the Clean Water Act, there can be no net loss of streams or wetlands. This requires all developers who disturb any of these water features to enhance, restore, or protect streams or wetlands within the same watershed. Private mitigation banks are common in NC, as is the Ecosystem Enhancement Program, which is run jointly by NC DENR and the DOT to mitigate the impacts to streams and wetlands from transportation projects. These two communities can both work with these sectors to restore impaired areas of the watershed and invest in untouched streams – they all have mitigation value. The Project Atlas in Section 4 features twenty-five projects that would be ideal for such investments, and repay the respective governments within a short time.

Next Steps

- Implement the adopted Davidson County Farmland Preservation Plan;
- Create a Farmland Preservation Committee Working Group to manage the open spaces and natural resources of the Lower Abbotts Creek watershed and Davidson County;
- Invest in an economic evaluation of Davidson County's agricultural and open spaces through a partnership amongst the Davidson County TRIP, Farmland Preservation Committee, and Soil & Water Conservation District, with support from the Cities of Lexington, Thomasville, and High Point;
- Draft an ordinance that requires 50-foot buffers for all perennial streams throughout Davidson County and the City of Lexington;
- Update the wetlands inventory and soils survey for Davidson County;
- Draft an ordinance that identifies and permanently protects the Natural Heritage Element Areas within the watershed, including with 100-foot riparian buffers;
- Explore interest in acquiring wetlands and streams to mitigate development impacts elsewhere in the watershed and set up a local, public mitigation bank;

- Appeal to the NC Department of Agriculture and Consumer Services and the US Department of Agriculture to alter the tax deferment and cost share program landowner requirements so that a single landowner with slightly different deeds can enter into a single management plan;

- Appeal to the NC Department of Agriculture and Consumer Services and the US Department of Agriculture to alter the tax deferment and cost share program landowner requirements so that a neighboring landowners can enter into a single management plan for continuous properties.

Recommendation 9: Assess the Economic Value of Recreation

The Problem

High Rock Lake, the Future Economy Lexington & Davidson County?

The Lower Abbotts Creek watershed offers a wealth of untapped recreation potential. Noted in the field notes by every stream assessment team were opportunities to capitalize upon the natural beauty, interesting landscape, and centrally-located water features of the watershed. 137 ecological conservation opportunities were identified evenly distributed throughout the watershed (PTCOG 2011b). Unlike the wetland opportunities identified by stream assessment teams, these potential projects were noted simply because they possessed ecological value to neighboring lands and ecosystems, and could serve residents and tourists interested in passive recreation such as hiking, walking, and/or camping.

Mountain Laurel and Potential Hiking Area, High Rock Lake Area

Davidson County recognizes the value of developing its recreational resources, especially to the 1.6 million people living in the Triad region. Davidson County TRIP was created to address the recreational potential and development of the County, and to work across departments to showcase Davidson County's assets to the surrounding communities. The program is managed by a half-time position, and has assisted in this project, the Rich Fork Creek watershed planning effort, Davidson County greenway planning, and creating an Amtrak rail stop in Lexington.

Through DC TRIP, Davidson County and PTCOG have partnered to produce the *Davidson County Master Greenway Plan* and the *Davidson County Blueway Plan* (PTCOG 2005; 2011a). The Greenway Plan has been adopted by the County Commissioners and the DC TRIP Board, and the Blueway Plan awaits adoption. The *Greenway Plan* led to the award of a $241,000 NC Clean Water Management Trust Fund grant to acquire a recreation and conservation easement that extends from Lake Thom-a-Lex along Abbotts Creek toward the City of Lexington for a 1.5 mile trail. The next phase of the plan calls for extending the trail 6 more miles to Finch Park in Lexington. This trail will create an opportunity to address not only stream and riparian buffer enhancement needs, but the public health and recreation needs of the City and the County. The creation of a trail system will provide opportunities for more physical activity

and to reduce the impacts of disease related to sedentary lifestyles. Future phases of the trail will connect the City to High Rock Lake via Swearing Creek (impaired for biological habitat) or to an unused granite quarry currently owned by Martin Marietta.

Recommended Management Strategy

Potential Lower Abbotts Creek Blueway, Finch Park, Lexington

There are several locations along Abbotts Creek that have been identified as ideal for a boat landing for a blueway extending from the City of Lexington's Finch Park to High Rock Lake. Joe Mickey, one of the stream assessment consultants and a aquatic habitat professional with decades of experience in restoring fishing habitats and creating paddle trails, felt that Abbotts Creek would be an ideal novice-level paddle trail in an area largely lacking in such opportunities (*personal correspondence*). Should local and state investments be made in a trail paralleling Abbotts Creek, creating boat landings along the trail would be relatively simple and cost-effective.

Similarly, other stakeholders have mentioned the potential to develop some of the watershed lands for other forms of recreation, including horseback riding, mountain biking, hiking, and perhaps a triathlon route that would include High Rock Lake and the City of Lexington. The potential to develop these lands for such purposes is mentioned throughout the Project Atlas. However, until there is an economic incentive (i.e. recreational easement) or a recreation plan for Davidson County, it will be difficult to market the concept as a public investment to watershed residents.

With all of these tools and potential opportunities, no stakeholders have an economic estimate of the value of fully developing these recreational resources. The *Greenway Master Plan* and *Blueway Plan* were only completed recently, and the open spaces that could have recreation potential have just been identified by this planning effort. Investment in an economic study that looks both individually and collectively at the values of a fully realized greenway, blueway, and county parks systems is needed to pursue and fully realize this potentially extremely valuable asset to this watershed and all communities in Davidson County.

<u>Next Steps</u>

- Implement Phase I of the Davidson County *Master Greenway Plan* with the $241,000 NC Clean Water Management Trust Fund grant;
- Pursue funding to continue the trails network throughout Davidson County and connect Lexington to Lake Thom-a-Lex and High Rock Lake;
- Renegotiate all utility easements to permit public access for walking, running, and cycling;

- Pursue funding to implement and market a blueway along Lower Abbotts Creek, with a boat landing in Finch Park;

- Invest in an economic evaluation of Davidson County's recreation potential through a partnership amongst the Davidson County TRIP, Uptown Lexington, and the Davidson County Economic Development staff, including the potential public health benefits more recreational options will deliver to City and County citizens, and potential ecotourism revenue;

- Investigate the Martin Marietta property for potential conversion to a recreational water feature, bridle trail, and/or ATV site;

- Contact landowners with ecologically-significant properties and investigate their willingness to partner in developing those properties as parks for hiking and camping, possibly in partnership with the Boy and Girl Scouts; and

- Expand the hiking trails, highlight the endemic ecology, and investigate the potential for camping at Finch Park.

Recommendation 10: Reassess the NC DWQ Copper Impairment

The Problem

Despite an historic record of high levels, no evidence of a copper action level violation is currently available for lower Abbotts Creek from either the YPDRBA or the NC DWQ (NC DENR 2010). The last evidence of copper levels surpassing the NC action level was more than five years ago, when copper sulfate was commonly used to suppress algal growth in Lake Thom-a-Lex, impaired for violating NC DWQ chlorophyll-a levels (a surrogate measurement for algal growth). The historic presence of copper levels only immediately downstream of the Lake Thom-a-Lex discharge to Lower Abbotts Creek supports this hypothesis. Solar-powered aerators are currently used to suppress algal growth.

The City of Lexington is conducting intensive water quality monitoring for copper throughout Lower Abbotts Creek, including other subwatersheds such as Leonard's Creek. The staff has conducted roughly six months of monitoring and found no presence of copper in Lower Abbotts Creek or its tributaries. While it is possible that copper could have another non-point source, the only other potential source could be stormwater runoff from I-85 BUS, which is used heavily by large, 18-wheeler trucks. It is highly recommended that the NC DWQ and/or the US EPA reconsider Lower Abbotts Creek's impaired status for high copper levels. It is no longer present, and does not currently appear to be a relevant water quality stressor.

Next Steps

- City of Lexington and Davidson County petition NC DWQ and the US EPA to revisit the impaired classification for copper on Lower Abbotts Creek, allowing these regulatory agencies to conduct their own monitoring for water quality to confirm if copper is no longer a relevant water quality stressor to the watershed.

Section 3: Project Atlas

The Lower Abbotts Creek Project Atlas is a product of analyses done over an 18-month watershed restoration planning effort. It correlates land use and land cover data obtained from state and federal resources with watershed conditions observed during stream assessments conducted in November 2009, January 2010, and January 2011 (PTCOG, 2011). These efforts were led by two private ecological consultants, and focused on streambank and ecological conditions. These conclusions were made from adaptations from the NC State University's (NCSU) Water Quality Group's *Stream Restoration Evaluation Assessment Form* (NCSU, 2006). Both restoration and conservation needs were noted in the assessments recorded as GPS waypoints, and integrated into a geodatabase for display and analysis with ArcGIS.

In total, 138 miles of streams and tributaries were walked or paddled within six subwatersheds selected by the watershed stakeholders as being the highest priorities for detailed review. These priorities were a reflection of stakeholders' concerns regarding trash buildup, flash flooding, and stormwater impacts. Of the six subwatersheds selected for detailed fieldwork, two are urban, two are rural, and one is suburban.

The watershed projects identified through Lower Abbotts Creek field assessments were grouped into 17 categories describing their current impact or value to the watershed. These data were collected as both an Excel spreadsheet and as a geodatabase that can be used in ArcGIS systems, and are accompanied by photographs and written descriptions of the reason the site was catalogued, often including a recommendation on what type of project would best serve it. General conclusions from Lower Abbotts Creek fieldwork include:

- The stormwater impacts are largely located in the Subwatersheds 3 & 4, representing the suburban and urban core areas of Lexington, respectively. Of the 142 stormwater concerns in the watershed, 111 were found in these two subwatersheds. Improved citizen stewardship is highly needed, with 69 of the 92 trash dumps and 58 of the 82 possible illicit discharges found in these subwatersheds. Though there are larger concerns with how the watershed is managed, it is clear that individual landowners are currently contributing to some of the problems, and many of them live in Lexington.

- There are a total of 177 conservation opportunities in the Lower Abbotts Creek watershed that are uniformly distributed, including areas in the urbanized subwatersheds. These opportunities include a number of large, relatively untouched tracts of land in adjacent properties that would be ideal for hiking, camping, or other forms of passive recreation. There are also many opportunities to capitalize upon Lower Abbotts Creek and its tributaries as a paddle trail and greenway feature.

  These potential projects represent the relatively good conditions still present throughout this watershed, as well as ecotourism and recreational opportunities that remain untapped assets for the City and the County. Subwatershed 3 has a somewhat higher number of potential wetland projects that offer a wealth of stormwater management and water quality pollutant filtration benefits in an already developed area. Acquisition of some of these natural systems by the City or the County could financially benefit them as an investment option for any developers needing to mitigate their impacts to streams or wetlands elsewhere in the Abbotts Creek watershed. This mitigation would also permit high-density developments in the urban core of Lexington, where it might be limited due to the level of build out and available space away from streams.

- Stream assessments identified 242 opportunities to educate landowners on how to better care for their streams and watershed. These needs were distributed equally throughout the watershed (though Subwatershed 8 has few needs), and demonstrate the need for improved resident

stewardship of the watershed. The Stormwater SMART program (www.stormwatersmart.org) is a PTCOG-supported program designed to improve watershed education, public involvement, and stormwater management. It recently received a small federal grant to work with up to ten groups throughout Davidson County communities to improve watershed stewardship through increased public awareness and involvement about what they need to do to improve water quality. The program will be called Davidson County citizens For Improving Stream Health (DC FISH). It will use the data from this watershed planning effort to guide its goals and progress.

- A fully functioning stream can access its floodplain, is curved rather than straight, and does not experience dramatically flashy flows. There are 421 potential projects to enhance or completely restore stream health and function in the Lower Abbotts Creek watershed. These projects can provide enormous benefits to watershed health and function, and are extremely effective at generating public interest and stewardship of a watershed. However, stream restoration projects will be for naught if the upstream non-point sources of pollution remain unaddressed by watershed residents. Stormwater mitigation from High Point, Thomasville, and Lexington is a higher priority for the watershed, and is absolutely necessary for stream restoration work to be successful and stable for the long-term future.

- The riparian buffer network is disconnected and in need of restoration uniformly throughout most of the watershed. Subwatersheds 7 & 8 on the Abbotts Creek Arm of High Rock Lake had much better buffer networks and should be referenced as the ideal example for other watershed residents. Stream buffers are not required in Davidson County, outside of the water supply watershed areas, where they are state-mandated. They are now required in the City of Lexington, which is an encouraging development for the watershed. This, however, was a recent development, so almost all of the impervious cover in Lexington had stream buffer restrictions. Consequently, the majority of lands within the watershed are left without a buffer network. Many of the urban stream buffers in need of enhancement are also habitat for invasive plants such as kudzu or multiflora rose, which may be good erosion stabilizers but can quickly take over the local ecosystems.

The fieldwork yielded 1,733 individual project opportunities at 830 different sites that could all improve watershed health and function (Fig. 2). Some of these opportunities had multiple advantages if addressed (e.g. wetland restoration + buffer enhancement + stormwater improvement), which actually created more project opportunities than sites. With 1,733 data points, the need for simplification of projects was evident. The PTCOG used a simple analysis of grouping all projects within 0.25 miles of each other into “project clusters,” creating a more manageable list of 25 total priority projects (Figure 3). Due to its size, Project 05 was broken down into four smaller projects, labeled A – D. As expected, the impacts were mostly evenly distributed throughout the watershed, with headwater stormwater impacts leading to downstream erosion. There were also a greater number of conservation opportunities in the non-urban subwatersheds.

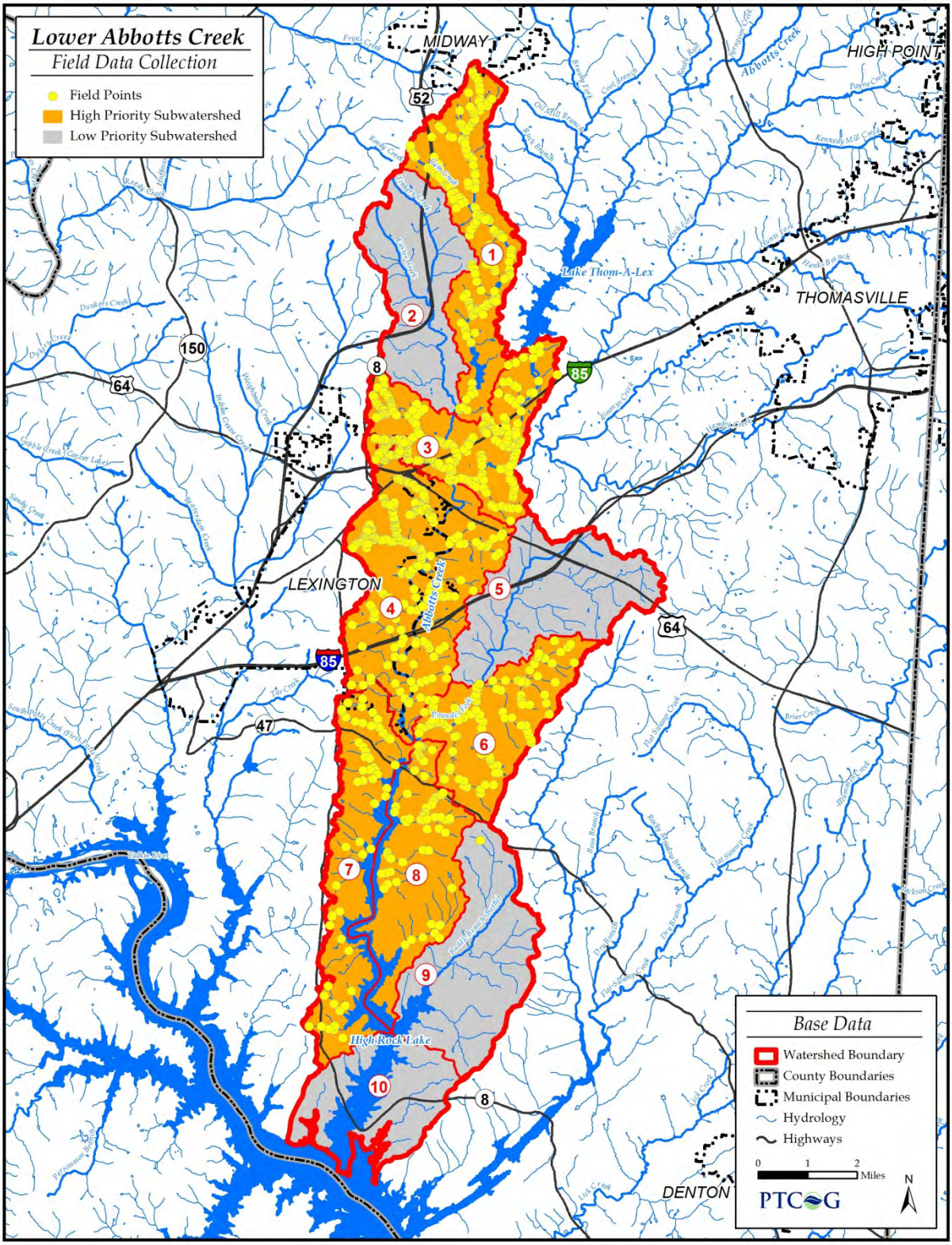


Figure 3 Data Points Collected in Lower Abbotts Creek Watershed, Winter 2010 - 2011

Parcel Assessment & Ranking System

In creation of the Project Atlas, both the top fifty stress parcels (restoration opportunity sites) and the top fifty conservation parcel sites were selected using a GIS-based model. Eighteen land use and land cover stress factors were used to identify the top fifty conservation sites (see Table 1), and fifteen factors were used to identify the top fifty stress sites (see Table 2).

Each land use and land cover data layer was converted from a vector format (points, lines, or polygons) into a raster layer with a 10-foot resolution to match the resolution of the available elevation data. The use of the raster data format rather than a vector format eliminated the constraint of man-made boundaries that would have been present if, for example, property boundaries were used to define the landscape. Many of the analysis layers, such as hydric soils and steep slopes, are natural features and not confined by man-made boundaries.

Each of the eighteen conservation factor layers was input into the "Weighted Sum" tool in the ArcGIS Spatial Analyst program. This tool overlaid multiple rasters using the weighted value specified in Table 1 and sums the value of each cell into one output raster (see Figure 4). This process attempted to identify areas within the watershed with the highest conservation value for watershed health and function, so that these areas can continue to be preserved in future projects. The conservation characteristics that were included in this study were low impervious cover, high forest cover, proximity to streams, large parcel size, low impact land use (agricultural, voluntary agricultural districts, recreation, open space, vacant, forested, and rural residential), publically owned lands, conservation lands, significant natural heritage areas and natural heritage element occurrences, landscape habitat indicator guilds, lake/river access, wetlands, hydric soils, erodible soils, floodplains, steep slopes, greenways, bike paths, and locations near current BMP sites (Table 1). Some of these land use and land cover characters were weighted to have greater consideration in project selection (its value had a multiplier). These decisions were made by the stakeholders committee and are based on their interests and priorities in the projects that will benefit the watershed.

The output conservation raster for the weighted sum tool (see Figure 5) had a range of values from 0 (least conservation potential) to 28 (most conservation potential). The maximum cell value possible in the conservation analysis was 39, but no areas attained this high of a value. Once the landscape was characterized by these potential conservation values, parcel boundaries were layered over the output conservation raster. Only parcels greater than 0.5 acres were used because smaller parcels do not provide enough potential for conservation or restoration benefits. The "Zonal Statistics as a Table" tool was used with the parcel boundaries as the input zones and the output conservation raster as the input value raster. This tool summarized the values of the input raster within the parcel zones and reported the average conservation cell values for each parcel zone. Then, parcels containing the top fifty average conservation values were selected.

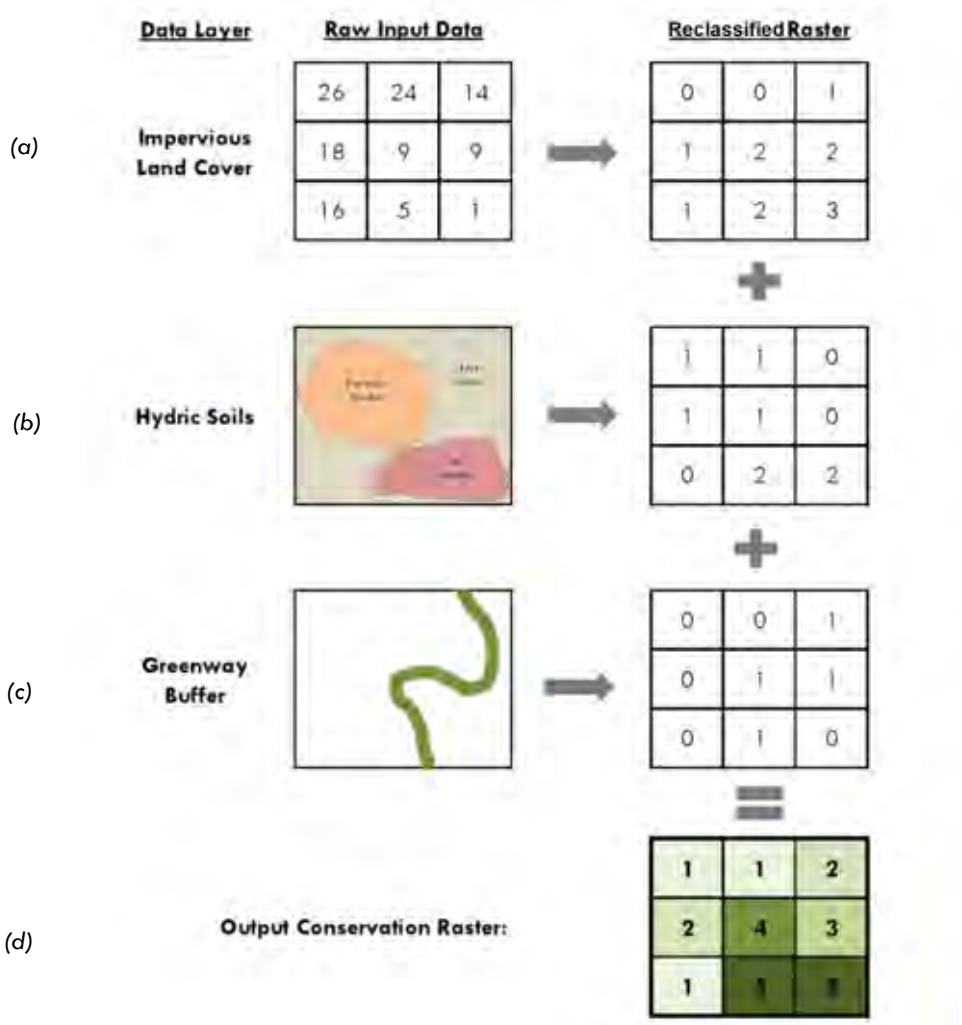


Figure 4: Sample input layers for the creation of the conservation raster. (a) The original raster layer for impervious surface cover was reclassified. (b) The hydric soil polygon vector layer was rasterized and reclassified with new values. (c) The greenway polyline vector layer was buffered, rasterized, and then reclassified with new values. (c) All of the reclassified raster layers were input into the ArcGIS Weighted Sum Tool, which summed each corresponding input cell and created the output conservation raster. Higher values in the output raster represented areas of higher conservation potential.

The same process was applied in order to select the top fifty stress sites, using the fifteen stress data layers. Again, all of these layers were input into the weighted sum tool with the specified weight value (see Table 2), and the output stress raster (see Figure 6) had a range of values from 0.25 (least stressed) to 21.5 (most stressed). Similar to output conservation raster, the maximum possible stress cell value was 32.5, but no areas within the watershed possessed this high of a stress value. The parcels greater than 0.5 acres were overlaid on this output stress raster as well, and the top fifty stress parcels were selected with the highest average values after the zonal statistics function was performed. The input stress layers were selected to identify the highest stress areas within the watershed that require restoration or remediation. The stress analysis targeted areas with high impervious surface cover, low forest cover, proximity to streams, large parcel size, high impact land use (commercial, industrial, government, institutional, offices, utilities and multifamily), publically owned lands, wetlands, hydric soils,

erodible soils, floodplains, steep slopes, locations near stress BMP sites, animal operation permit sites, and a high potential for future growth (Table 2).

This future growth raster layer was also created by PTCOG in order to identify areas at high risk for development (see Table 3). Factors included areas in municipal and ETJ boundaries, proximity to water and sewer lines, future water and sewer service areas outside the city limits, comprehensive transportation plans, population density, population density change and vacant household density. The future growth raster was created in a similar manner to the process described above in both the stress and conservation raster datasets, and was then used as one of the input layers in the stress analysis.

The basis for selecting each parcel is identified in its label: the numbers are ranked according to their conservation or stress value assigned by the GIS-based analysis; the letters designate whether the parcel is Conservation or a Stress opportunity. Of these top fifty stress and top fifty conservation parcels, nine parcels emerged as having both high stress cell values and high conservation cell values, indicating intensively-used land of high potential restoration value. Therefore, only ninety-one total parcels were identified between the stress and conservation analysis.

Parcels within 0.25 miles of each other were grouped into projects to yield twenty-five total projects. Parcels were grouped regardless of their categorization (stress or conservation). This simplification yielded 25 total projects, all of which would be ideal investments for any of the Lower Abbotts Creek watershed stakeholders to make to improve watershed conditions and restore ecologically-supportive conditions to the waters and lands of these 76 square miles.

Point System for Parcel Conservation Assessment and Ranking				
Criteria	**Data Source**	**Factors**	**Possible Points**	**Weight**
Low Impervious Surface Cover	2001 NLCD	0-4%	3	1
		5-9%	2	
		10-19%	1	
High Forest Cover	2001 NLCD	> 50%	1	1
1st & 2nd Order Streams	NC CGIA	Within 50 foot buffer	3	1
		Within 100 foot buffer	2	
		Within 330 foot buffer	1	
Large Parcel Size	Davidson County	> 50 acres	3	2
		20-49 acres	2	
		10-19 acres	1	
Low Impact Land Use	2011 County Data	Forest, Recreation	1	2
Low Impact Land Use	2011 County Data	Agriculture, SFR (Rural Res. >= 5 acres), Vacant, VAD	1	1
Publically Owned Land & Managed Conservation Lands	2011 County Data	City, County, or State	1	2
Significant Natural Heritage Area & Natural Heritage Element Occurrences*	DENR (Oct 2010)	4 points - any SNHA	6	1
		3 points - any NHEO S1 or S2 rank that is not a SNHA	5	
		2 points - any NHEO S3 or S4 rank that is not a SNHA	4	
		1 point - floodzones of the Greensboro Burrowing Crayfish combined areas (even though "very low" spatial accuracy)	3	
		0 points - all other "very low" spatial accuracy or "historic" species	2	
		**overlapping polygons were summed; values range from 0 to 6	1	
Landscape Habitat Indicator Guilds	NHP		1	1
Parcels with Lake/River Access	PTCOG; Davidson County	Existing Public	2	1
		Existing Private or Proposed Public	1	
Wetlands	NWI		1	1
Hydric Soils	SSURGO	All Hydric	2	1
		Partially Hydric	1	
Erodibility (K factor)	SSURGO	0.40-0.49	2	1
		0.24-0.39	1	
500 Year Floodplain	NC Flood Map		1	1
Steep Slopes	USGS 1/9 Arc Second DEM	> 15% Gradient	1	1
Conservation BMP Locations	PTCOG Field Data	Point	2	1
		0.25 mile buffer	1	
Proposed Greenways	PTCOG; Davidson County	Primary	2	1
		Secondary	1	
Bike Paths	PTCOG; Davidson County	0.25 mile buffer	1	1
		Total Possible Points	**39**	

Table 1: LAC Conservation Analysis Point System

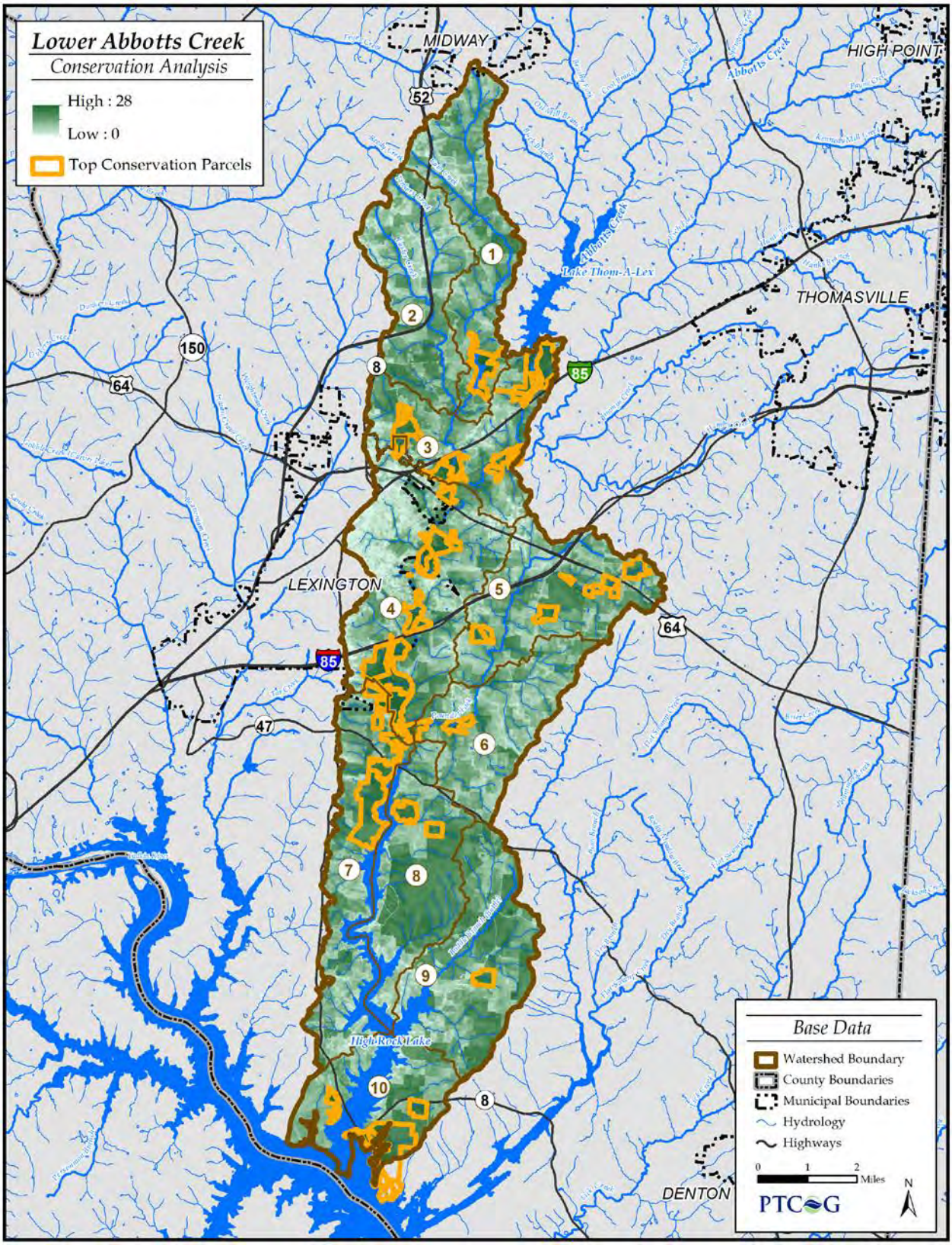


Figure 5 Output conservation raster with top fifty selected conservation parcels

Point System for Parcel Stressor Assessment and Ranking				
Criteria	**Data Source**	**Factors**	**Possible Points**	**Weight**
High Impervious Surface Cover	2001 NLCD	> 20%	3	1
		10-19%	2	
		5-9%	1	
Low Forest Cover	2001 NLCD	<50%	1	1
1st & 2nd Order Streams	NC CGIA	Within 50 foot buffer	3	1
		Within 100 foot buffer	2	
		Within 330 foot buffer	1	
Large Parcel Size	Davidson County	> 20 acres	3	2
		10-20 acres	2	
		5-10 acres	1	
High Impact Land Use	2011 County Data	Commercial, Industrial	1	2
High Impact Land Use	2011 County Data	Government, Institutional, MFR, Office, Utilities	1	1
Publicly Owned Land	2011 County Data	City, County, or State	1	2
Wetlands	NWI		1	1
Hydric Soils	SSURGO	All Hydric	2	1
		Partially Hydric	1	
Erodibility (K factor)	SSURGO	0.40-0.49	2	1
		0.24-0.39	1	
500 Year Floodplain	NC Flood Map		1	1
Steep Slopes	USGS 1/9 Arc Second DEM	>15% Gradient	1	1
Stress BMP Locations	PTCOG Field Data	Point	2	1
		0.25 mile buffer	1	
Animal Operation Permits	NC CGIA		1	1
High Potential for Future Growth	*See table 3*		0 - 18	0.25
		Total Possible Points	**32.5**	

Table 2: LAC Stress Analysis Point System

Point System for Future Growth Layer				
Criteria	**Data Source**	**Factors**	**Possible Points**	**Weight**
Municipal Boundaries	Davidson County		1	1
ETJ Boundaries	Davidson County		1	2
Sewer (Outside City)	City GIS website		1	3
Water (Outside City)	City GIS website		1	2
Future Sewer	NC CGIA		1	2
Future Water	NC CGIA		1	1
Davidson County and City of Lexington CTPs	6 - Expressway/Freeway - Needs Improvement (0.25 Mile Buffer) 5 -Expressway/Freeway- Existing (0.25 Mile Buffer)	13 - 16	5	1
	4 - Boulevard/Major Thoroughfare - Needs Improvement (0.25 Mile Buffer) 3 - Boulevard/Major Thoroughfare- Existing (0.25 Mile Buffer)	10 - 12	4	
	2 - Minor Thoroughfare - Needs Improvement (0.10 Mile Buffer)	7 - 9	3	
	1 - Minor Thoroughfare - Existing (0.10 Mile Buffer)	4 - 6	2	
	**The points from overlapping road buffer areas were summed (values ranged from 0 to 16)	1 - 3	1	
Population Density (Persons/Sq Mi)	2010 Census	11 - 298	1	1
		298 - 789	2	
		789 - 1,871	3	
		1,871 - 23,525	4	
Population Density Change	2000 & 2010 Census	1 - 3	1	1
		12 - 55	2	
		71 - 109	3	
Vacant Household Density (Vacant HH/Sq Mi)	2010 Census	1-16	1	1
		16-83	2	
		83-248	3	
		248-4,253	4	
		Total Possible Points	**27**	

Table 3: LAC Future Growth Layer Point System

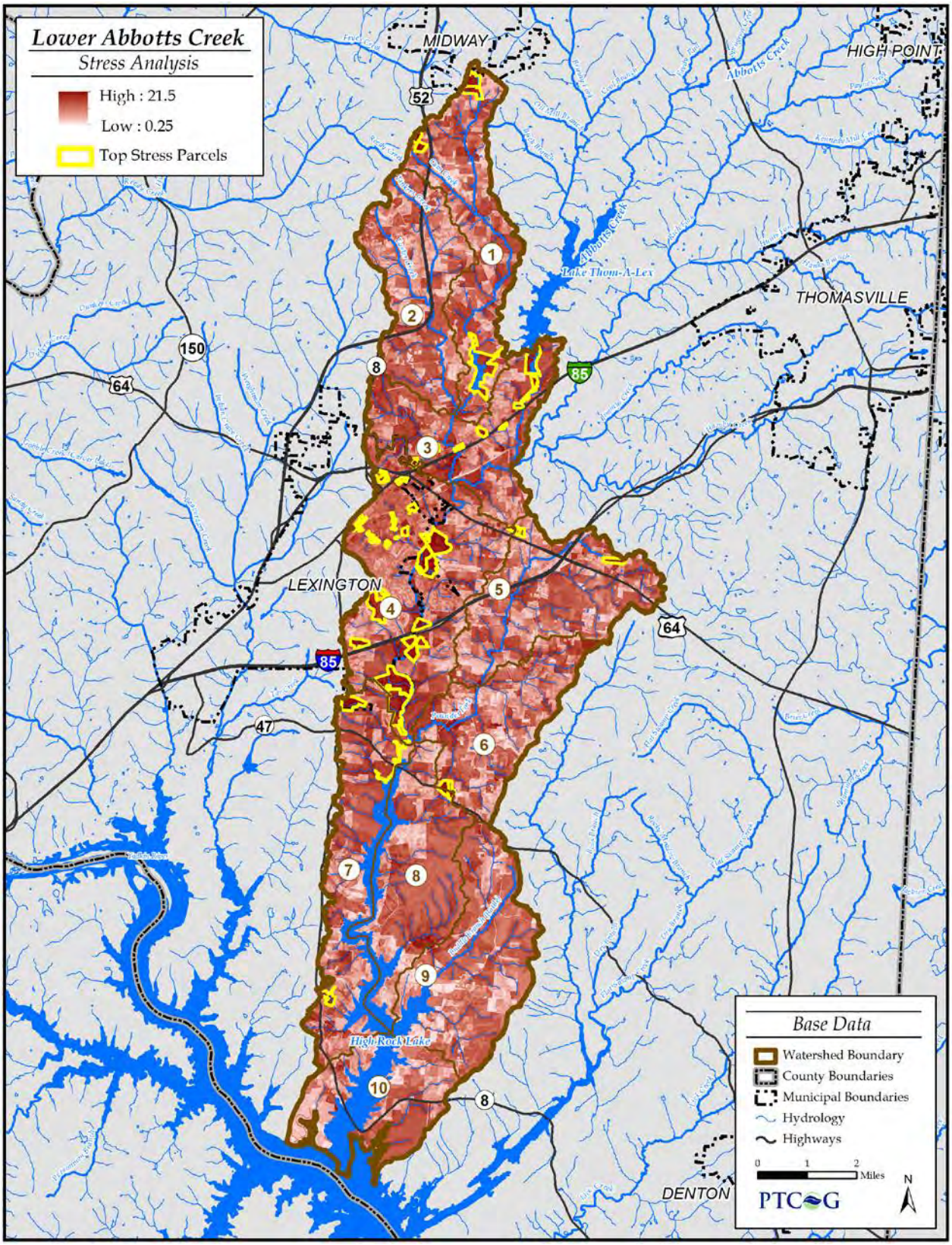


Figure 6 Output stress raster with top fifty selected stress parcels

CITYgreen Application

In an effort to provide watershed stakeholders, landowners, and potential grantors with data on the benefits of stormwater retrofit projects and community greening efforts, PTCOG employed CITYgreen, software developed by the national non-profit American Forests (http://www.americanforests.org/productsandpubs/citygreen/). It evaluates the ecosystem services of vegetated cover, estimating pollutant reductions and the related economic benefits from the trees, shrubs, and grasses on a given landscape. This software can be applied at various scales, requiring impervious surface and "leaf-on" land cover data with a resolution of a minimum of 4-meters. CITYgreen has been used by Guilford County and Greensboro to quantify the public health and air quality benefits of current tree cover in those jurisdictions. CITYgreen has the ability to create persuasive economic-based arguments for watershed stewardship through increased tree cover, stormwater Best Management Practices (BMPs), and the removal of impervious surfaces within the watershed. PTCOG is particularly interested in applying this software to assess the values in mitigating the stormwater flows that are the greatest source of degradation to Lower Abbotts Creek, and reducing air pollutants locally, which is a non-attainment ozone and particulate matter area for US EPA air quality standards.

CITYgreen software was applied to restoration opportunities at the parcel scale in the Lower Abbotts Creek watershed, using 1-meter resolution impervious surface data of Lexington developed by the North Carolina Center for Geographic Informational Analysis (CGIA), current tree cover (leaf-on) data at 0.5-foot resolution provided by 2010 Davidson County Orthophotography, and land use data provided by the respective jurisdictions.

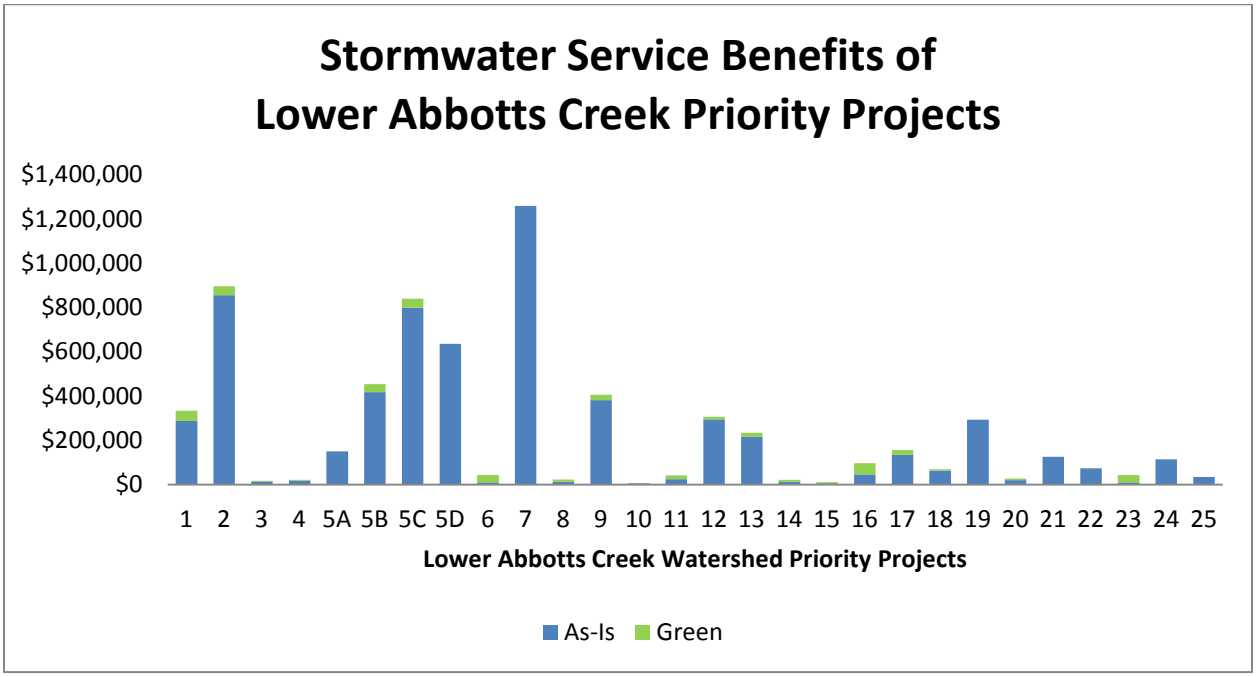
For each conservation and restoration parcel, PTCOG digitized the different types of impervious and pervious land covers using the above mentioned data sources. Impervious land cover types include buildings, paved surfaces, and unpaved surfaces such as compacted dirt and gravel. Pervious land cover types include open space with grass and scattered trees, forest cover, and shrubs. The CITYgreen software package took these input land cover types and, using the UFORE model developed by the U.S. Forest Service, calculated both the pounds of air pollutants removed each year and the amount of annual carbon storage based on the area of tree cover for each site. CITYgreen also assigned a curve number to each land cover type and computed an overall existing conditions curve number along with a replacement land cover curve number that would model the stormwater conditions if all of the existing trees were removed from the site and replaced with some type of impervious cover. From this change in curve number value, CITYgreen computed the amount of additional stormwater runoff that would need to be managed if the trees were removed and the construction cost to build additional stormwater management facilities to control the additional water. The cost savings was then calculated to show how keeping those existing trees on the site would monetarily benefit the community.

PTCOG then created an alternate "best scenario" land cover scheme for each conservation and restoration parcel site, which replaced much of the non-essential paved surfaces on a property with tree cover. The CITYgreen software then performed the same air pollution calculation and curve number procedure for each new scenario to determine the additional amount of air pollution removal, carbon storage, and stormwater savings by implementing these low impact development designs. The existing conditions stormwater value was compared to the best scenario stormwater valued to determine the additional cost savings. Each parcel's current ecosystem services, and those under the proposed (albeit optimistic) alternative green scenarios are summarized in an alternate, 250-pg report that is available upon request. The summaries were generated by the CITYgreen software package.

Results

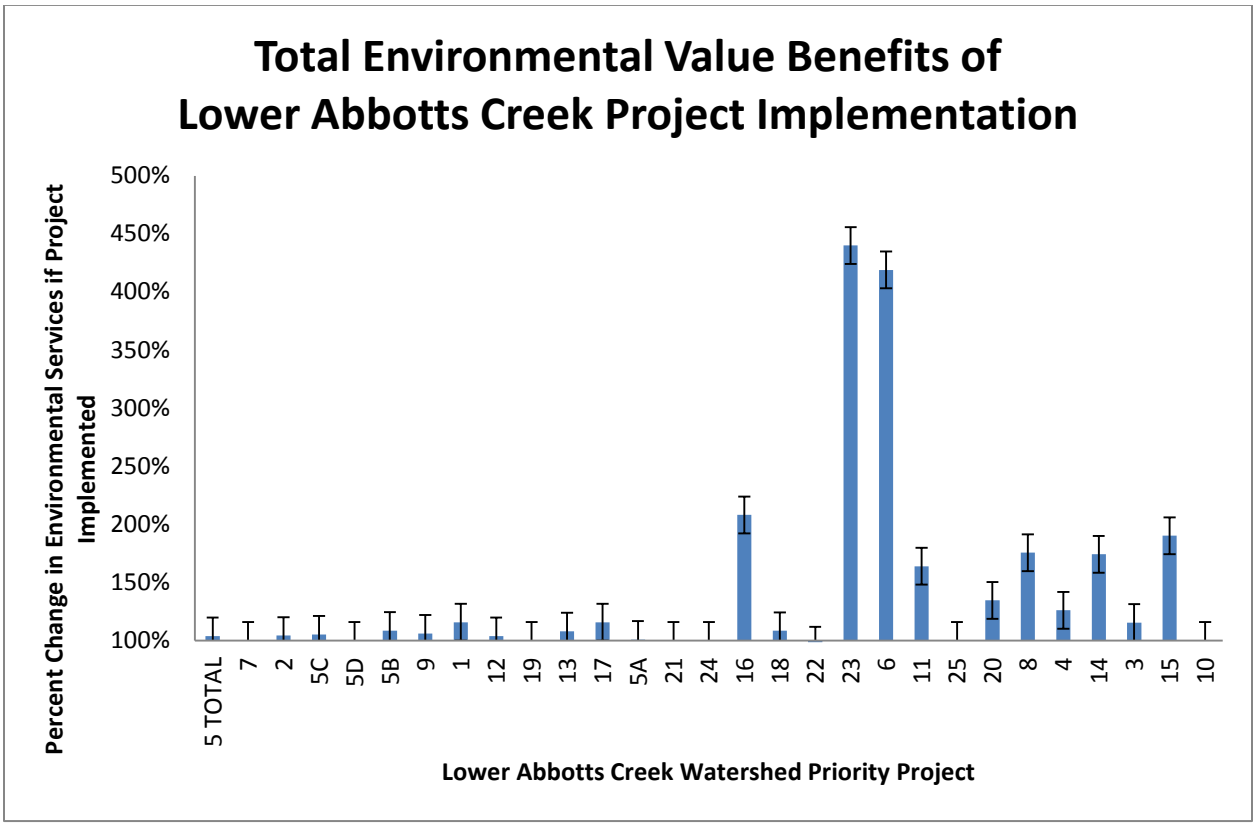
Improvements at all sites will benefit the public health and ecological sustainability of the watershed (Table 4). If the stakeholders invest in all 25 proposed projects, residents of Lower Abbotts Creek watershed will receive an additional $410,595 in annual stormwater services (i.e. flash flooding mitigation, pollution reduction, etc.), and $53,352 in annual air quality services (i.e. reduced pollutant levels, reduced hospitalizations, etc.) than they currently receive. Under a hypothetical carbon offset model for managing atmospheric carbon dioxide levels, the green measures could make watershed communities eligible annually for an additional $11,304 in offset payments from carbon polluters.

While all of these projects are worthwhile investments, it must be noted that they will provide varying benefits to the Lower Abbotts Creek watershed. Some of the conservation priorities are providing watershed residents high value services already, and CITYgreen reflects what will be lost if these parcels are lost to development. Projects 02, 05, and 07 (*City Lake*, *Abbotts Creek Corridor*, and *High Rock Lake Open Space Site*, respectively) individually already provide over $1 million in ecosystem services to watershed communities, mostly in stormwater mitigation services. Project 05 is already providing over $2 million worth of ecosystem services to the watershed's residents, and will continue to do so if they decide to protect these parcels. If these projects are lost to development, it would cost millions of dollars more to recover the air and water pollution benefits currently provided to the watershed. These projects are providing Lexington and Davidson County with enormous costs savings, and should not be lost.



In particular, *City Lake* and *Abbotts Creek Corridor* are ideal conservation projects: they involve public property, have some modest restoration needs, are prominently featured in Phases 1 and 2 of the *Davidson County Greenway Master Plan*, and are in sensitive areas of the watershed (headwaters and the urban fringe, respectively). The protection of these potential recreational resources could hold great dividends as a focus of developing a local ecotourism economy, and usher in broad-based support for protecting natural resources in the name of economic and community sustainability. If protected, the opportunities to educate the public on the significant services these ecosystems are providing the public

should not be lost.

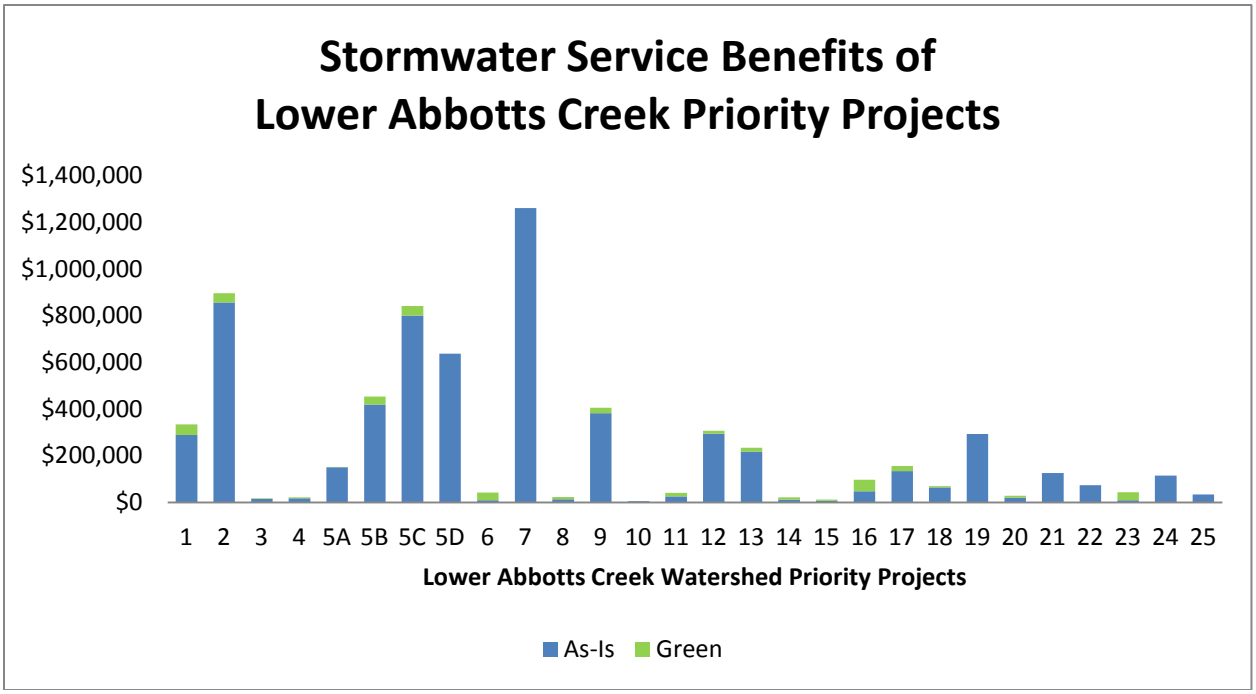


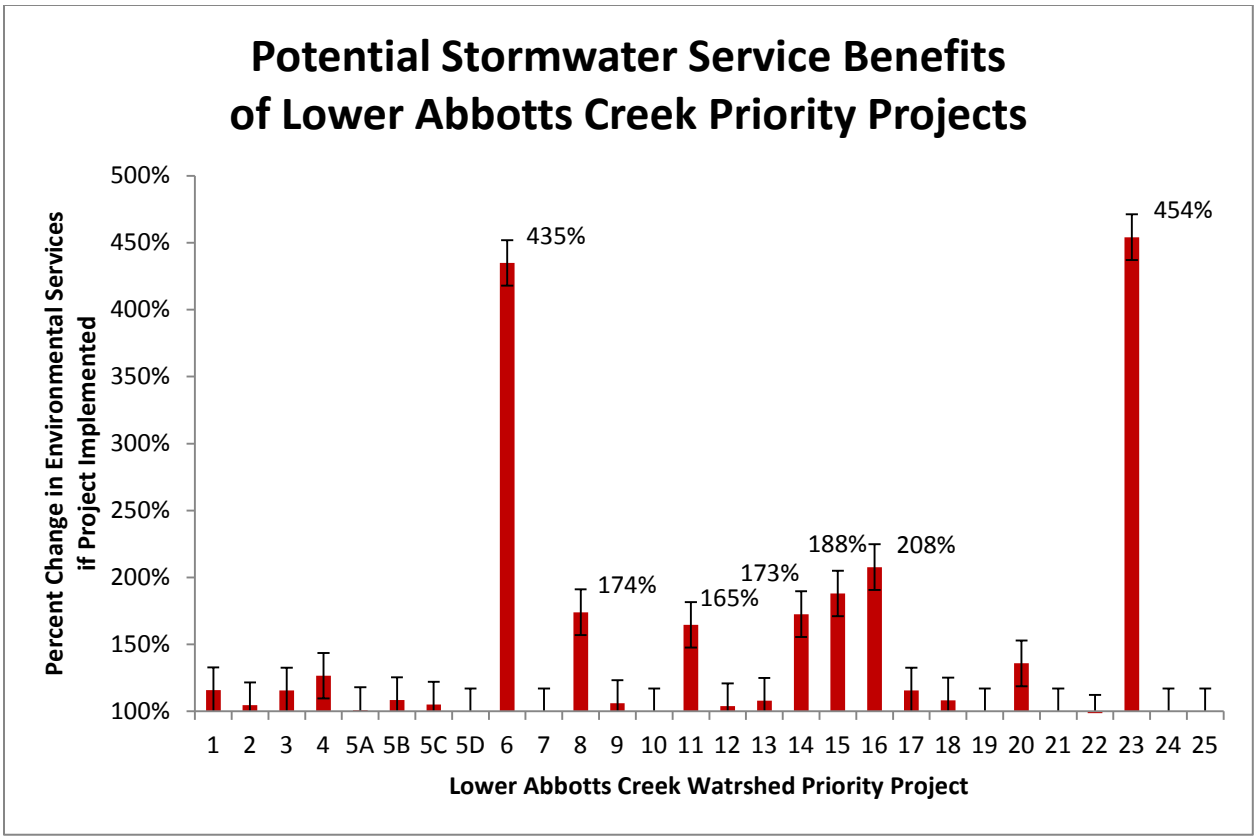
On the other hand, several projects will be completely transformed by restoration and/or retrofit investments from problematic stormwater runoff areas to greened properties providing significant ecosystem services to the rest of the watershed. Projects 23 and 6 will enhance their ecosystem services by over 400%, quadrupling the water and air quality benefits they provide the watershed. These projects are identified in the Project Atlas as the 31-acre *Lakeside Retrofit Site* and the 62-acre *Lexington Industrial Site*, respectively. These projects involve large areas of land that have been (partially) cleared of forest cover. This basically creates a blank slate for a restoration project involving stream restoration and a simple reforestation of the property. An additional five projects (11, 25 5, 16, and 24) enhance their ecosystem services by at least 150%, and represent the opportunity to significantly benefit the watershed-at-large through restoration projects.

The two top restoration opportunities according to CITYgreen have the potential to be used as pilot projects for both the rural and urban communities. The *Lakeside Retrofit Site* offers rural landowners a chance to see how stream restoration and reforestation can benefit their properties. It also could be an exciting pilot project for Davidson County and Lexington to invest in open space and farmland as a public good that needs to be protected. This could be accomplished through an easement management program, an extension of the Voluntary Agricultural District program, or the application of federal cost-share programs. These needs and recommendations are detailed in Management Recommendations 8 & 9.

The *Lexington Industrial Site* is a largely impervious site on the south side of Lexington. There are opportunities to enhance its use, its value, and its appeal to both employees and residents through stormwater retrofits. As demonstrated with the CITYgreen software, such investments will yield

enormous benefits in the mitigation of air and water pollutants, as well as to the general health of watershed residents. This site should serve as a demonstration project for the general public, as well the private sector, showing what practices can improve stormwater conditions on a problematic site and enhance the property value. It will also be a useful demonstration of what type of best management practices should be expected of new development in Lexington and Davidson County.





The final organization of the Project Atlas sites is presented in order of project importance, as determined by PTCOG Environmental Planning staff. Influencing the final order of projects is their environmental benefit, political feasibility, ease of implementation, proximity to urban centers (especially for conservation projects), public outreach impact potential, and coordination with other projects or programs recommended in this *Restoration Plan*. The top priority projects can be concluded to be of the highest value to improving watershed heath and function.

The Project Atlas is designed for user ease. The project name is presented along with its ranking out of all 25 projects within the Atlas. A high-resolution satellite view of the project site is provided and its environmental and land use features summarized in a legend (Figure 5). Underneath the satellite image is a short list of the "Recommended Actions" that PTCOG feels are necessary to address the environmental needs at that site. Project details are provided on the opposite page, showing engineering and planning staffs the extent of the project, and the hydrology and area that will be affected if the project is pursued. It also will be a useful tool if used for wetland or stream mitigation values. A detailed narrative of the project follows these more basic introductions to the project, and should address all environmental and community benefits from project investment. If any questions remain, readers are welcome to contact PTCOG Environmental Planning staff directly.

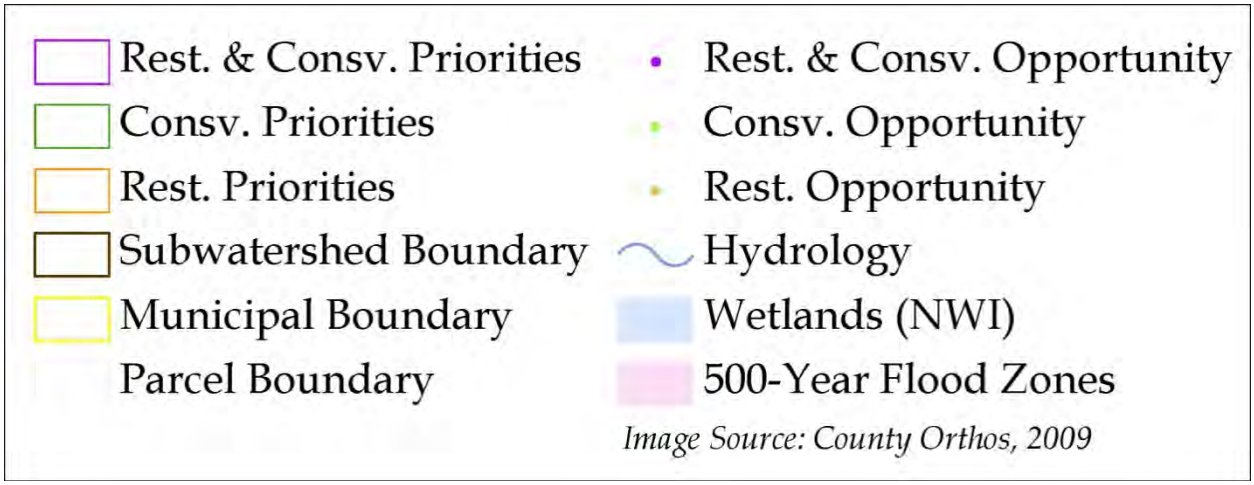


Figure 5: Project Atlas Legend

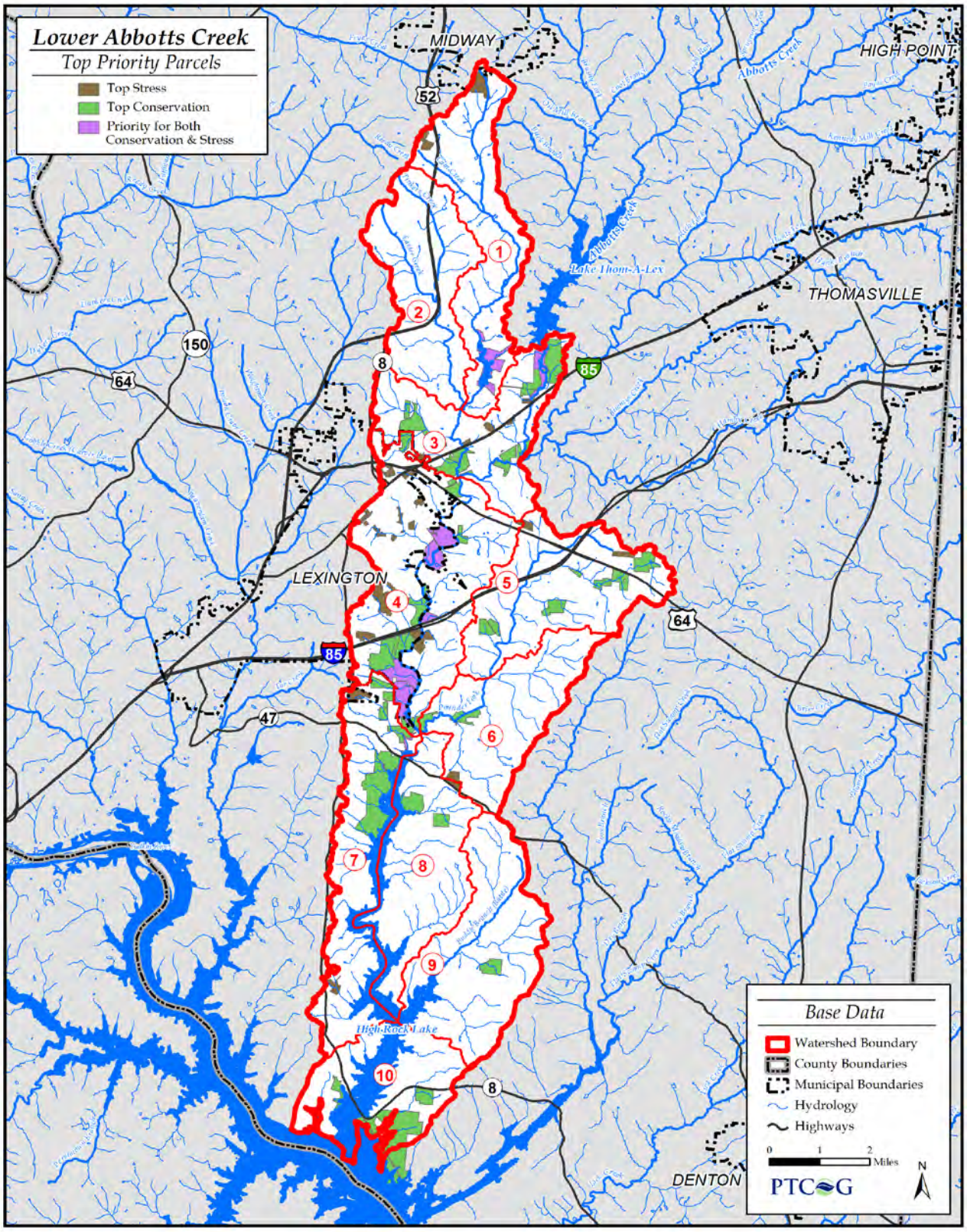
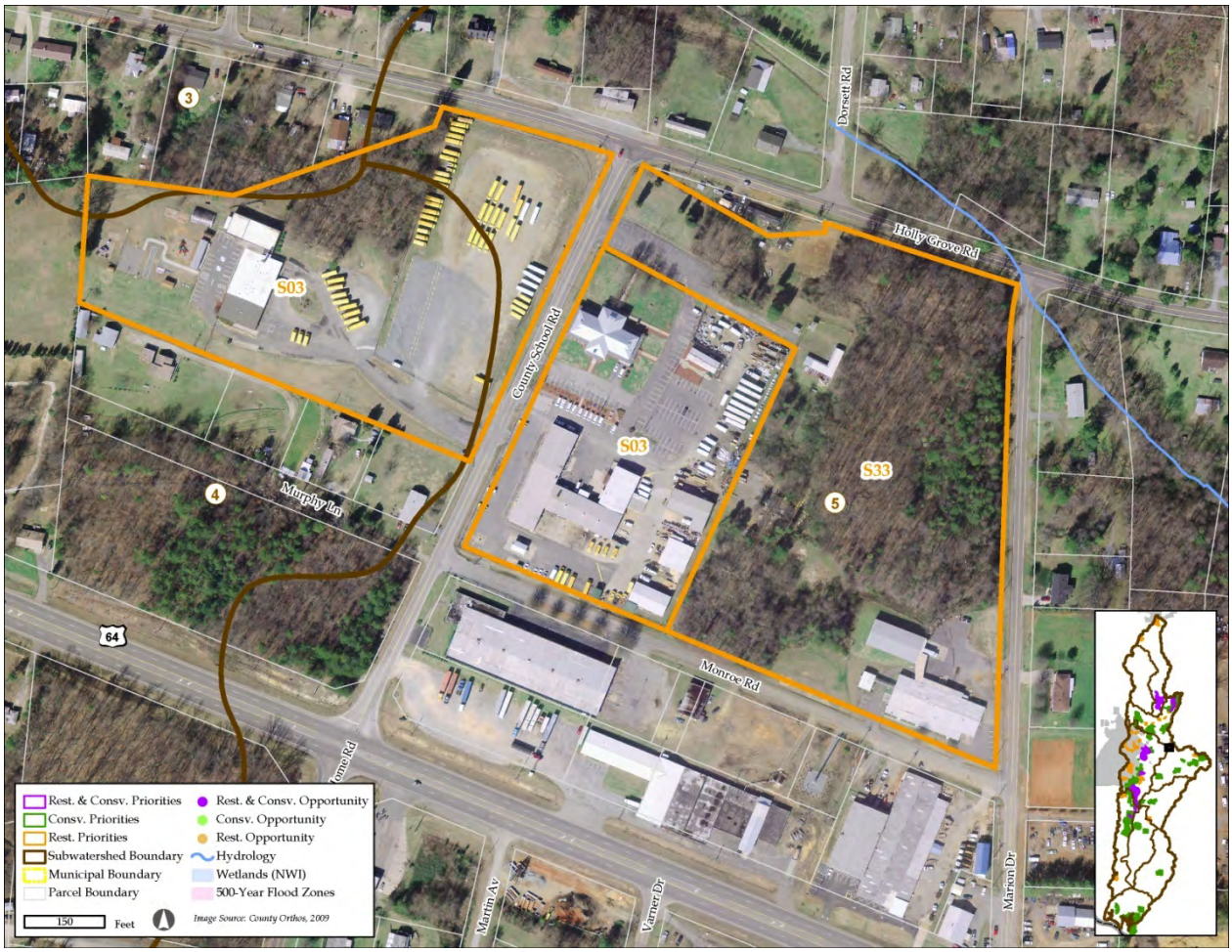


Figure 4: Top Priority Parcels

Lower Abbotts Creek Project Atlas				
Rank	Site Name	Project Type	Parcel Rankings	Page Number
01	Davidson County School Administration Site	Stress	S-03, S-33	
02	Lexington Parkway Plaza	Stress	S-02	
03A	City Lake	Conservation & Stress	B-02, B-03, B-04, C-07, C-08, C-13, C-22, C-29	
03B	ATV Site	Stress	S-01, S-42	
04	Lexington Industrial Site	Stress	S-04	
05A	Abbotts Creek Corridor #1	Conservation & Stress	B-06, C-01, C-40	
05B	Abbotts Creek Corridor #2	Conservation & Stress	C-03, C-14, C-31, S-30, S-35, S-36	
05C	Lexington Wastewater Treatment Plant	Conservation & Stress	B-05, B-08, C-06, C-11, C-23, C-25, C-35	
05D	High Rock Lake Timber Site	Conservation	C-34	
06	Lexington Golf Course	Stress	S-41	
07	Finch Park	Conservation & Stress	B-01, B-07, B-09, C-26, C-41	
08	High Rock Lake Open Space Site	Conservation	C-02, C-12, C-27	
09	Central High School & Middle School	Stress	S-05, S-07	
10	Alcoa Conservation Site	Conservation	C-24, C-36	
11	Downtown Lexington Retrofit	Stress	S-08, S-10, S-12, S-13, S-17, S-18, S-19, S-22, S-24, S-26, S-28, S-31, S-32, S-34, S-38	
12	Lexington Suburban Site	Conservation & Stress	C-04, C-05, C-15, S-09, S-14, S-39	
13	Lexington Furniture Site	Stress	S-21	
14	Martin Marietta Site	Conservation & Stress	C-09, C-20, C-32	
15	Lexington High School	Stress	S-15, S-23, S-25	
16	Welcome Center Industrial Park	Stress	S-06, S-16	
17	Pounder Fork Headwaters	Conservation & Stress	C-10, C-16, C-28, C-39, S-11	
18	Pounder Fork Conservation Site	Conservation	C-17	
19	Abbotts Creek Conservation Site	Conservation	C-18, C-19, C-21, C-33	
20	Midway Glass Factory	Stress	S-20, S-29	
21	Business 85 Retrofit	Stress	S-27, S-40	
22	Ideal Rural Conservation Site	Conservation	C-30	
23	Rural Residential Site	Conservation	C-37	
24	Lakeside Retrofit Site	Stress	S-37	
25	Open Space Preservation	Conservation	C-38	

Table 4: Project Atlas Table

Project 01: Davidson County School Administration Site



Recommended Actions:

- Immediately contact landowner to determine willingness to retrofit site for improved stormwater management (IC = 42%)
    - Develop a site-specific retrofit plan in concert with City of Lexington, NCSU B&AE staff, and Stormwater SMART
        - Currently no stormwater management on-site at all
    - Include green roofs, depressed parking islands, enhanced tree cover, and constructed wetland
    - Determine financial value of ecosystem services in on-site forest, especially to absorb emission pollutants of bus fleet
- Integrate stormwater plan with site needs, including bus fleet maintenance, school curricula needs, and Safe Routes to Schools

ATTRIBUTE	S-03	S-33	TOTAL
Site Location	Davidson County		
Subwatershed	3, 4, & 5	5	
Land Use	Institutional		
Area (acres)	14.37	11.2	25.57
Linear Stream (Feet)	N/A	N/A	N/A
Lake Area (acres)	N/A	N/A	N/A
Impervious Surface Cover	9.4 65%	1.4 13%	10.8 42%
Floodplain Area (acres)	N/A	N/A	N/A
Wetland Area (acres)	N/A	N/A	N/A
Forest Coverage (acres)	1.1 8%	7.8 70%	8.9 35%

Project Assessment:

This project offers a study in contrasts of how these properties were developed. S-33 has been largely left untouched, with almost 8 acres in forest of 11 –acre parcel. There are a couple of small buildings on the property, but both are far from the stream, which has been buffered from development on this property by the forest. This parcel does appear as a stress priority, though, due to its presence near headwater streams, location within valuable ecological habitat, institutional use, and public ownership. It is also in a heavily residential and industrial neighborhood at the border among three different subwatersheds of the larger lower Abbotts Creek watershed. However, no adverse impacts to water quality were identified directly on this property.

The Davidson County Schools Administrative buildings site, on the other hand, is highly impervious, is an area of intense vehicle use and washing, has very little tree cover, and does not appear to have stormwater controls. There are no streams on this property, but the impacts of such properties on downstream waters are the priority issue in this watershed. All of the Rich Fork Creek watershed headwaters are similarly developed and similarly disregarded stormwater management when developed. As a result, both Rich Fork Creek and Lower Abbotts Creek are subject to extreme flash floods following average rain events, have highly channelized stream structures resulting from these flashy events, and suffer from the nutrients and sediment pollution in this runoff. Though not lying immediately along any bodies of water, sites such as this administrative building have a larger impact than streamside properties that adequately buffer their streams and practice stewardship in the property management (i.e. minimal fertilizer use).

There are currently no stormwater retrofits anywhere in Davidson County, or in the Cities of High Point, Lexington, or Thomasville. There have been efforts to address current stormwater concerns with outreach, education, and improving future development practices, but little attention given to the expensive and needed retrofits to highly impervious properties in these communities that led to the currently-degraded conditions. This project is an example of the ideal site that could be retrofitted to improve the function of its site, workplace environment, and watershed conditions.

S-03 appears to have a bus lot, complete with a maintenance shed and wash station(s). A popular stormwater BMP elsewhere in NC has been to capture rainwater with a cistern and use this water when washing off vehicles. The runoff from the wash station is then filtered through a sand filter system or a bioretention cell to prevent the vehicle fluids from reaching receiving streams. The City of Raleigh recently retrofitted all of their fire stations with such systems, with great success and cost savings on their water bills. The property is also almost completely treeless. There are multiple areas within the parking lot where depressed parking islands could be retrofitted into the pavement, capturing the stormwater runoff with a network of small bioretention cells, and additional annual value of $4,100 in water quality benefits. Being public lands, there are also opportunities to work with stormwater engineers to design something more innovative for the site that would generate public interest as well as capture stormwater runoff. A green roof, constructed wetland, and/or rain garden network could all be placed on this site to benefit its aesthetic appeal, workplace comfort for employees wishing to see more green and/or have more shade, and intercept stormwater runoff.

S-33 should be reconsidered in similar ways, and definitely to mitigate the impacts of the runoff from 1.5 acres of impervious cover on this property. Given the more administrative appearance of the buildings on this property, and the appeal of the trees that buffer it both from the receiving stream and the road, aesthetically-pleasing rain gardens could be planted here. Rain gardens are also able to handle stormwater runoff from smaller areas of impervious cover. The Davidson County School Board also may want to consider developing the forested area as an 8-acre natural area. Being this close to Lexington and on public property, a site for mild hiking and walking would offer watershed residents an easily-accessible and safe park to use. Signs expressing the forested areas benefits to the watershed, as well as that of any BMPs on the property could educate visitors on the concept of a watershed and how this property fits into it, and what (changes in) behavior assists watershed function and health. This park would serve the public health and environmental needs of the watershed.

Project 02: Lexington Parkway Plaza

Recommended Actions:

- Immediately contact landowner to determine willingness to retrofit site for improved stormwater management (IC = 76%)
    - Develop a site-specific retrofit plan in concert with City of Lexington, NCSU B&AE staff, and Stormwater SMART
        - Currently no stormwater management on-site at all
    - Include green roofs, depressed parking islands, enhanced tree cover, and daylighting headwater stream
- Detailed assessment of stream structure and integrity downstream to determine stormwater impacts to downstream headwater stream

ATTRIBUTE	S-02
Site Location	Lexington
Subwatershed	4
Land Use	Commercial
Area (acres)	33.36
Linear Stream (Feet)	491
Lake Area (acres)	N/A
Impervious Surface Cover	25.5 76%
Floodplain Area (acres)	N/A
Wetland Area (acres)	0.81 2%
Forest Coverage (acres)	5.8 17%

Project Assessment:

This project shows the environmental legacy of development in and around the City of Lexington that brought it to prosperity in the twentieth century and now plagues its streams, air, and local utilities. This is the result of the lack of environmental considerations taken when the City was developed in the nineteenth and twentieth centuries. The National Environmental Protection Act was passed in 1972, only forty years ago. In contrast, the eastern United State and North Carolina have been growing as societies and economies since the early 1700s. Most communities grew up where there were ample resources – in the case of Lexington, which developed a furniture industry, where there were ample forests and water resources. This development only quickened with the damming of High Rock Lake by ALCOA to support its aluminum smelting operations in Badin, NC.

Today, we are dealing with the consequences of these intensive uses of our lands and waters. This property shows a combination of factors that must now be addressed as we recognize the jeopardy regulation-free development and use of our watersheds has placed on our valuable resources such as High Rock Lake. Unabated, the stormwater runoff from properties such as S-02 and many others will continue to carry sediment, nutrients, and flashy stormflows to Lower Abbotts Creek and add to its pollution burden. Fortunately, there are cost-effective remedies to this situation that address the environmental needs of the watershed and the economic needs of Lexington.

S-02 is a highly impervious (76%) 33-acre property on an urban headwater of Lower Abbotts Creek in the City of Lexington. It literally lies on the headwater of this stream, which was paved over for the shopping center and parking lot. This parking lot – like almost all developed in the last half of the twentieth century – is oversized and contains no stormwater BMPs to mitigate runoff from the considerable impervious cover here. There are opportunities to address this stormwater with

Green Space Retrofit Opportunity (S-02)

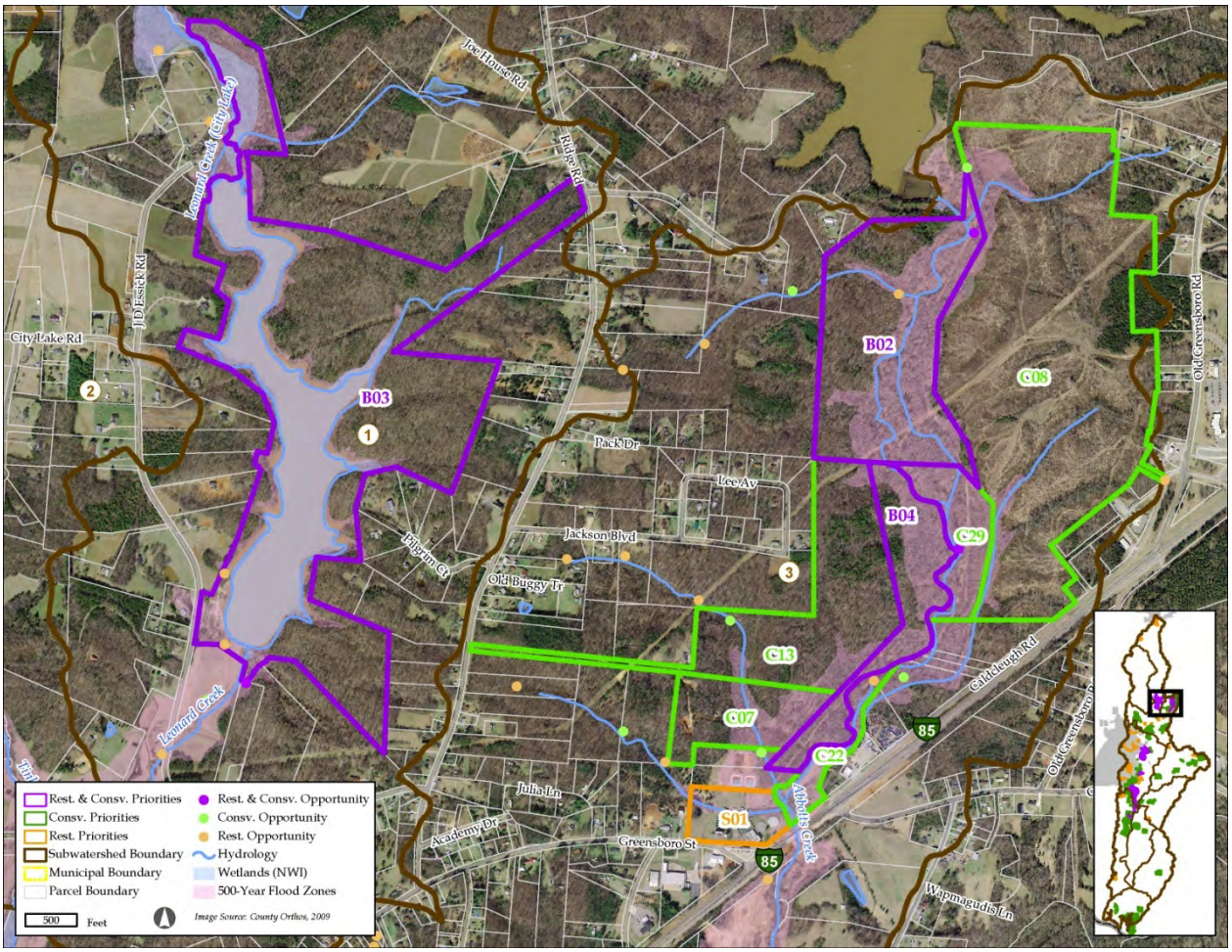
the vegetated areas present around the parking lot that could be developed into stormwater wetlands. There appears to the area to place two to four such BMPs around the current paved footprint on the property.

There are many more ambitious opportunities to retrofit the property to accommodate stormwater runoff better and perhaps restore the headwater stream underneath the parking lot at this site. There is too much parking area in this parking lot that could be removed and replaced with green space, trees, and/or stormwater BMPs such as constructed wetlands or bioretention cells. Any paved surface removal would have to prioritize daylighting the stream currently under the parking area. This stream restoration will decrease the flashiness of stormwater flows causing channelization downstream.

The property could also be landscaped to redesign the shopping center for consumer needs, including better shade cover, aesthetic comfort, and walkability from one side of the center to the other. There is even the possibility to retrofit the center so that a mini-greenway connects the two ends of the shopping center, as opposed to forcing shoppers to cross a hot paved surface in the summer. There are also opportunities to improve parking lot lighting and address stormwater runoff through the creation of depressed parking islands throughout the lot. These are being more common, and can be seen at Kernersville Botanical Gardens. They are extremely effective at filtering out nutrients and pollutants such as car oils from the stormwater runoff, and add to the aesthetic appeal of a shopping center. They also have the benefit of decreasing the heat island effect on these sites.

If the landowner is interested, the City and PTCOG will work with them to ensure that federal and state grant funds can support most of these changes and practices. Dedication of these areas on the property to stormwater mitigation and improving watershed stewardship will be a selfless gesture on the landowner's part, and will benefit all downstream residents. Any stormwater practices would be highlighted to the rest of the watershed community by Stormwater SMART in cooperation with the City of Lexington and Uptown Lexington. The benefits in enhanced property value, aesthetic appeal, and environmental services are large, and will be felt long-term in the community. Spreading these practices and retrofits throughout this traditionally-developed community would have a profound transformation to watershed conditions and how it develops in the future.

Project 03A: City Lake



Recommended Actions:

- Place a conservation/recreation easement on 204-acre City Lake property, create City Lake recreational plan, and invest in site as recreational/greenway feature using PART-F, CWMTF, and Healthy Communities monies
- Place conservation/recreation easement on the 115-acre 500-yr floodplain along Abbotts Creek
- Work with WRC, Davidson Co. TRIP, and a certified forester to determine a forestry management or recreation plan for priority parcels
    - Determine a reforestation plan for C-08 that serves landowner and watershed needs

ATTRIBUTE	B-02	B-03	B-04	C-07	C-08	C-13	C-22	C-29	TOTAL
Site Location	Davidson County								
Subwatershed	3	1	3						
Land Use	Forest	Rec.	Instit.	Forest			Vacant	Forest	
Area (acres)	69.32	203.70	27.08	20.59	164.78	54.57	8.13	15.94	564.11
Linear Stream (Feet)	5,644	3,224	569	694	4,142	913	2,469	2,192	19,847
Lake Area (acres)	N/A	52	N/A						52
Impervious Surface Cover	0.9 1%	0.5 0%	0.5 2%	0.6 3%	5.6 3%	1.2 2%	N/A	1.1 7%	10.4 2%
Floodplain Area (acres)	37.6 54%	93.6 46%	21.2 78%	9.1 44%	13.6 8%	5.5 10%	8.0 99%	15.9 100%	204.5 36%
Wetland Area (acres)	N/A	59.0 29%	N/A	N/A	N/A	N/A	N/A	N/A	59 10%
Forest Coverage (acres)	68.4 99%	136.0 67%	25.5 94%	20.0 97%	159.2 97%	53.3 98%	4.2 52%	14.0 88%	480.6 85%

Project Assessment:

The City Lake project offers four miles of stream restoration and enhancement opportunities and a wealth of unrealized recreational opportunities in the headwaters of the Lower Abbotts Creek watershed. It also features landowner behaviors that could be addressed if Davidson County invested in ordinances to address illicit discharges and illegal dumping. These same sites also offer Stormwater SMART outreach opportunities to work with landowners on alternatives to established degradative behaviors. The implementation of phase one of the Davidson County greenway through this project should make these goals more tenable and bring changes to this part of the watershed.

Wetland at City Lake (C-08)

The Davidson County greenway will run along Abbotts Creek from Lake Thom-a-Lex to City Lake and then streamside across public lands. These areas will be accessible to the public in ways that they never have been, as both lakes have been fenced off. The greenways can also be used to restore stream conditions and secure a healthy, wide vegetated buffer next to the streams. The time to open these lands up to the public is now, and the greenway is the logical first step towards realizing this recreational potential. With positive reception to

Pristine Headwater Tributary on Adjacent Property

these new recreational opportunities, it will make extending the greenway to Lexington and Thomasville and eventually south to High Rock Lake much easier.

Before these lands are opened to the public for hiking, biking, running, and horseback riding, it is important to assess the ecological value of the habitat on these properties. The consultants leading the stream assessment documented the presence of Carolina bluestem, a rare native grass, around City Lake. Follow-up assessments on this property and on all conservation properties identified with this project should be conducted to verify the presence of this species and any other regionally-significant species.

Illicit Discharge Pipe (B-04)

These properties will also need recreational plans to identify the best areas and paths for any proposed recreational developments of these lands. Public input should be solicited to ensure that the lands are developed for recreational and economic interests of residents. These lands and waters' recreational potential should consider how the greenway and other features may be created to cater to regional or interstate interests (i.e. triathlons, cycling events, BMX racing, etc.) Successes in Mt. Airy with restoration of the trout fishery and greenway network and the Virginia Creeper Trail in southern Virginia offer guiding examples on how to develop and market such features.

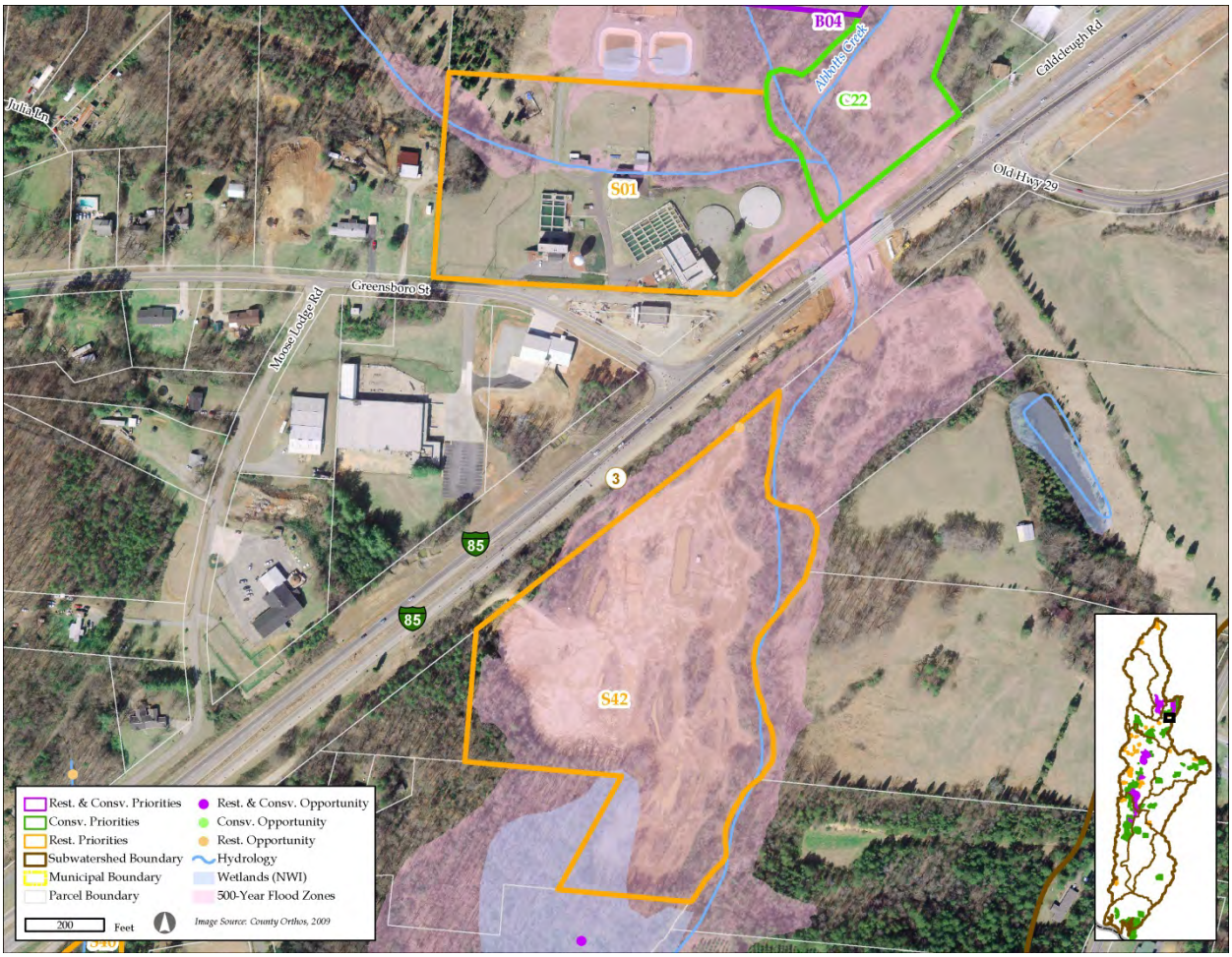
Illegal Dump on Nearby Tributary Stream

These properties are in the suburban Subwatershed 3, where development is always a pressing issue, but where the current lack of development is protecting natural resources and saving the City and County money due to the lack of need for infrastructure. Too small to be of interest to a land trust, these properties would be a worthy investment for Davidson County's recreational development. It could be developed in partnership with the landowner to host hunting, hiking, mountain biking, or many other purposes. The conservation easement would explicitly address these uses and compensate the landowner for this use. Currently, Davidson County's has no Recreation Department, and only supports a part-time position for DC TRIP. To best protect open spaces and agricultural lands – as stated in the Davidson County Land Development Plan – the County will need to invest in and/or incentivize the protections of these lands and resources. See Policy Recommendation 7 & 8 for more details on this topic. The benefits for the watershed could be enormous.

If these waters and lands are to be developed for recreational and public use, it will be necessary to ensure that they are clean and healthy resources. There are currently illicit discharges and illegal dumps in this area that remain unaddressed and compromises stream health. These can be addressed with a two-prong approach, but it must be an enforceable approach. The waters and their potential to be restored to good health make them excellent candidates for StreamWatch adoption under the DC FISH program. Regular monitoring of stream chemistry and inspection of stream health (i.e. identifying illegal

dumps) will be powerful tools in documenting improving conditions and/or where pollution hot spots occur. In those locations where the concerns can be immediately mitigated (i.e. illegal dumps), contact can be made with Davidson County to address the issue. Davidson County will have to have ordinances that allow them access to private property to inspect the complaint and proceed with addressing the non-point source of water pollution. See Policy Recommendation #2 for details on how the County might create such a legal and bureaucratic system.

Project 03B: ATV Site



Recommended Actions:

- Work with landowner of S-42 to develop a more sustainable and compatible land use and appearance to ensure harmony with adjacent and downstream landowners
    - Seek plans and funding for reforestation and BMPs
    - Identify areas in watershed where intense recreation is best done
- Work with County on zoning laws and ensuring that lands are zoned appropriately for their actual use
    - Ensure that enforcement tools are available to result in these best uses
- Investigate stormwater retrofit opportunities for parcel S-01

ATTRIBUTE	S-01	S-42	TOTAL
Site Location	Davidson County		
Subwatershed	3		
Land Use	Utilities	Vacant	
Area (acres)	10.53	14.14	24.67
Linear Stream (Feet)	936	1,506	2,442
Lake Area (acres)	N/A		N/A
Impervious Surface Cover	2.2 21%	8.7 62%	10.9 44%
Floodplain Area (acres)	3.4 33%	13.6 96%	17.1 69%
Wetland Area (acres)	N/A	0.79 6%	0.79 3%
Forest Coverage (acres)	1.2 11%	5.3 37%	6.5 26%

Project Assessment:

These two parcels represent possibly the most stressed non-urban area of the entire Lower Abbotts Creek watershed. The City of Lexington owns S-01, rated the most stressful parcel in the entire watershed due to its high level of impervious cover (21%), the total burial of a headwater stream underneath it, its utility classification, its presence in a high-growth of the watershed, and its large presence in the floodplain (33%). S-42 received less points in the parcel selection approach due its low impact land use and distance from the City, though its environmental features all show it to be a sensitive site. Based upon field work done for this planning effort, it is clear that the intensity of land use must be reduced if local and downstream water quality is to improve.

Parcel S-42 is the site of an active ATV site used by up to hundreds of people at a time. In conversations with the NC DWQ and DLR staff at the Winston-Salem regional DENR office, it was repeatedly stated and confirmed that the site was in compliance with its stormwater and soil and erosion control permits. Eyewitness accounts claim that some of the larger events were using the Creek for recreation, but no evidence could provided, and no evidence of this use was found by either NC DWQ or DLR staffs that inspected the site. There is an outstanding question regarding the appropriate and compatible use of this property, but that is a decision that lies with County officials and staff and will have to be enforced by either zoning ordinances or nuisance law.

ATV Impacts, Winter S-42

The landowners and site users might be interested in collaborating with other partners (DC TRIP, DC S&WCD, etc.) to improve the environmental footprint and to ensure that not only are all related pollutants

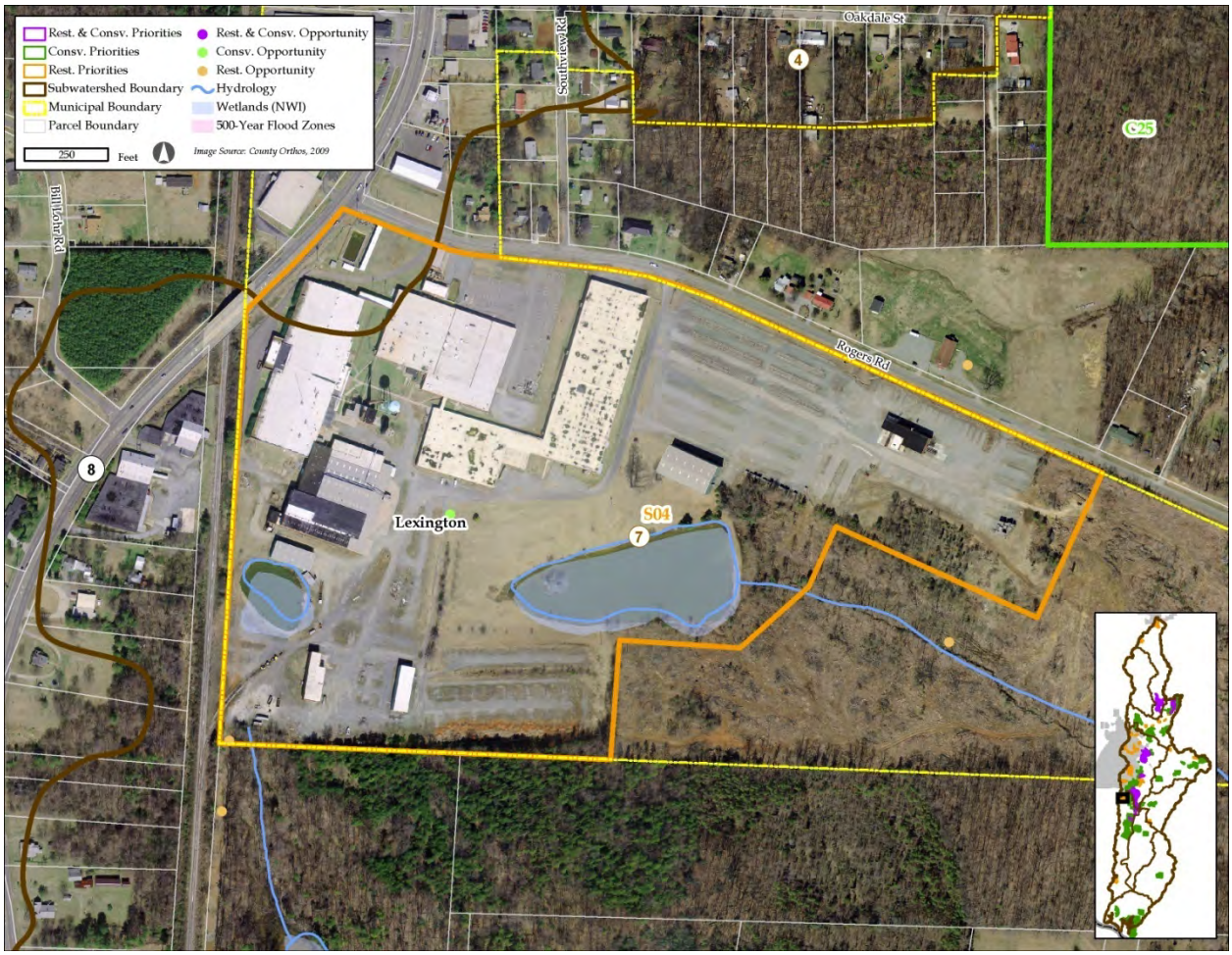
kept on-site by an earthen berm, but that they are being treated on-site by biological treatment. NC DWQ has worked with the landowners to improve the vegetation on the berm, but much more could be done to filter runoff pollutants and not disrupt ATV use. Re-grading the property and directing sheet flow to one or several wetlands and/or bioretention cells could greatly improve the potential to filter oils, metals, and other pollutants. These BMPs could easily be placed so that they are out of the way of the ATV course.

To ensure that land uses are harmonious to neighbors and the environment, it may be a worthy investment of staff time for the Davidson County Planning Department, Department of Environmental Health, and DC TRIP to identify parcels throughout the County that would be best suited to recreational use. These uses could both be the intensive use such as that seen at this parcel and more passive uses, such as hiking, running, camping, and hunting. Collaborations with the City of Lexington should be strongly encouraged where appropriate (i.e. City Lake). Care should be taken to ensure that these parcels only have the potential for this use, and not that Davidson County necessarily has any intentions for these parcels. It is strongly recommended that the potential economic value of these parcels' recreational use could be, and perhaps to create a new Rural-Recreational zone for (some of) these parcels currently identified as "Vacant."

There is also an opportunity to more radically transform the upstream landscape on S-01 for the better. Though challenging, the City should consider retrofitting this site to better address the water quality and stream structure needs on and downstream of this site. Any projects that could be done in concert with improvements on S-42 are highly encouraged. CITYgreen analysis of S-01 and adjacent parcel C-22 shows that greening these parcels would deliver about $10,000 in additional, annual water quality benefits to the watershed. The utility property could even be opened as parking for the greenway and for access to the two lake parks. Ideally, the whole stream would be daylighted, returning natural conditions to the stream, but this seems impractical, given the level of existing development. However, a project that would mitigate the stormwater flows so that they do not directly discharge to the stream has potential to improve stormwater runoff conditions, the impervious cover footprint of this publicly-owned property, and serve as a gateway educational opportunity for people using the greenway.

Stream Buried (S-01)

Project 04: Lexington Industrial Site



Recommended Actions:

- Contact landowner immediately about interest in retrofitting property to address any stormwater problems (flooding, erosion, etc.)
    - Identify other interested industrial/institutional landowners who are also interested and address common interests
- Attempt to capture greater stormwater from upstream neighbors at site with innovative and attractive BMPs
    - Retrofit old stormwater discharges with new BMPs
- Demonstrate air and water quality benefits of increasing tree cover on-site, and use federal and state cost-share programs to fund greening initiatives on multiple highly impervious properties in the watershed

ATTRIBUTE	S-04
Site Location	Lexington
Subwatershed	7
Land Use	Industrial
Area (acres)	61.95
Linear Stream (Feet)	200
Lake Area (acres)	4
Impervious Surface Cover	3.9 6%
Floodplain Area (acres)	N/A
Wetland Area (acres)	4.27 7%
Forest Coverage (acres)	6.9 11%

Project Assessment:

Buildings on S-04

This project has the greatest potential to improve stormwater conditions in the Lower Abbotts Creek watershed. It is on the watershed boundary with the Swearing Creek watershed, in the headwaters of Subwatershed 7, which flows directly to High Rock Lake. It has multiple opportunities to address stormwater impacts to the watershed, which are of greater concern due to the industrial use of the site. There is some mitigation of these runoff volumes by a natural wetland prior to their meeting the receiving streams. The intensity of this runoff has been enough to destroy the stormwater infrastructure on the property. Since these pipes only capture a fraction of the volume the wetland does, the impacts to habitat conditions from the intense stormwater runoff must be addressed on this property. Depending on the type of industrial products made at this property, the content of the stormwater runoff could be even more concerning than the volume of the runoff.

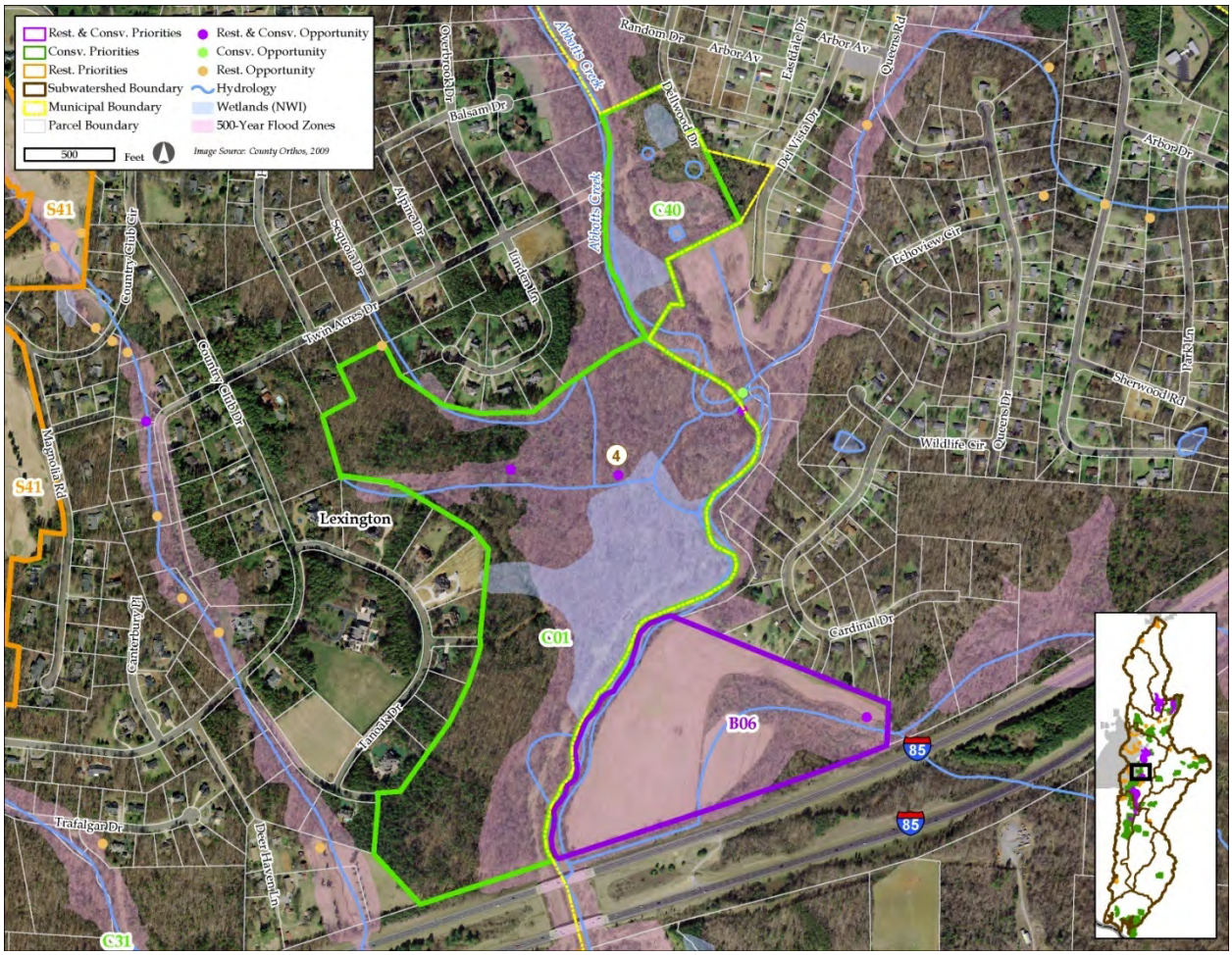
In addition to the concerns with the impervious cover issues at this property, there is also a need to protect some valuable wetland habitat in what is otherwise a commercial and residential district. Given the undeveloped land surrounding this property, it seems likely that it is used by waterfowl for habitat and may have some appeal to sportsmen. The protection is two-fold, in that this habitat needs to be protected from the general encroachment of development, noise and air pollutants, but also directly from S-04 itself, which is using the wetland as a BMP to filter the stormwater runoff. While this is an ideal system to treat stormwater runoff, it is also a reason to be concerned about the pollutant concentrations in the stormwater runoff from the site.

It appears unlikely that this property requires as large a parking area as it has, and this is an easy retrofit that could be first of a multi-step process to improve the stormwater footprint of S-04. Replacement of (part of) the paved surfaces with tree cover will have dramatic benefits for local air and water quality, directly addressing Lexington and Davidson County's water and air quality concerns with a four-fold increase ($42,693) in additional water quality benefits. Even simpler would be to stop mowing/managing the grassy area around the wetland, and plant it with trees to further reduce the stormwater runoff reaching the wetland. The entire property could be an exciting retrofit and redesign project that would reinvigorate the use of this property. Green roofs, walking trails, rain gardens, and artificial wetland systems could all be placed on this property if the landowner is interested. These BMPs could nullify the stormwater runoff that currently is unmitigated prior to reaching the natural wetland while serving the property owners' needs. Similarly, most of the funding would come from federal and state grant resources such as the NC Clean Water Management Trust Fund, the US EPA 319 fund, and the USDA CCAP fund. If done, it would be a leading example of what is possible to do with similar properties throughout the watershed, and what is expected of future developments in these communities.

Failing Stormwater Infrastructure (S-04)

Wetland Habitat Downstream of S-04

Project 05A: Abbotts Creek Corridor #1



Recommended Actions:

- Immediately contact landowners regarding property management incentives and plans for watershed and ecological need
- Place a conservation/recreation easement on 91-acre unmanaged streamside properties, create recreational/management plan, and invest in site as recreational/greenway feature using PART-F, CWMTF, and Healthy Communities monies
    - Propose and investigate parcels for canoe landing sites
    - Investigate landowner and City willingness to acquire land for public park
- Work with WRC, Davidson Co. TRIP, and a certified forester to determine a forestry management or recreation plan for priority parcels
    - Determine a reforestation plan for B-06 that serves landowner and watershed needs

ATTRIBUTE	B-06	C-01	C-40	TOTAL
Site Location	Lexington ETJ	Lexington		
Subwatershed	4			
Land Use	Vacant	Forest	Vacant	
Area (acres)	31.64	82.85	13.85	128.34
Linear Stream (Feet)	3,053	6,384	1,279	10,716
Lake Area (acres)	N/A	N/A	N/A	N/A
Impervious Surface Cover	N/A	N/A	N/A	N/A
Floodplain Area (acres)	30.2 95%	50.96 62%	10.03 72%	91.19 71%
Wetland Area (acres)	0.29 1%	17.75 21%	2.59 19%	20.63 16%
Forest Coverage (acres)	10 32%	77.5 94%	12.4 90%	99.9 78%

Project Assessment

The Abbotts Creek Corridor project, in total, offers four miles of stream restoration and enhancement opportunities and a wealth of unrealized recreational opportunities on Lower Abbotts Creek. It also features over 6 miles of Lower Abbotts Creek streambank lands and over 1,400 acres of priority projects that could be protected, conserved, restored, or mildly developed for passive recreation (i.e. hiking). For simplicity, this project has been broken down into four manageable smaller projects, which follow (5A, 5B, 5C, & 5D).

Open Space Along Lower Abbotts Creek (C-01)

Project 5A is an exciting project, as it represents the second stage of the planned Davidson County greenway. Davidson County was awarded a $241,000 2009 Clean Water Management Trust Fund grant to implement Phase One of the primary greenway route from their *Davidson County Master Greenway Plan*, and its terminus is immediately upstream of 5A at C-01, the most valuable conservation property in the watershed. This project is scheduled to begin in 2011 and finish around Summer 2012. C-01 is such valuable land due to its 1+ miles of streams, its close proximity to developed areas, its status as rare species habitat (Greensboro burrowing crayfish), its large size, and the location of the greenway on its property. The Davidson County greenway will run along Abbotts Creek from Lake Thom-a-Lex to City Lake and then streamside across public lands. These areas will be accessible to the public in ways that they never have been, as both lakes have been fenced off. The greenways can also be used to restore stream conditions and secure a healthy, wide vegetated buffer next to the streams. With positive reception to these new recreational opportunities, it will make extending the greenway to Lexington and Thomasville and eventually south to High Rock Lake much easier.

Ideally, C-01 will be placed entirely under a conservation easement, ensuring that it is protected for the public and for the watershed, and that the landowner receives financial compensation for delivering these

services to a larger population. Given the high profile and value of this property, it should be a project of interest to the LTCNC, if Davidson County and the City of Lexington are looking for partners to finance and manage the greenway projects and the easements associated with it.

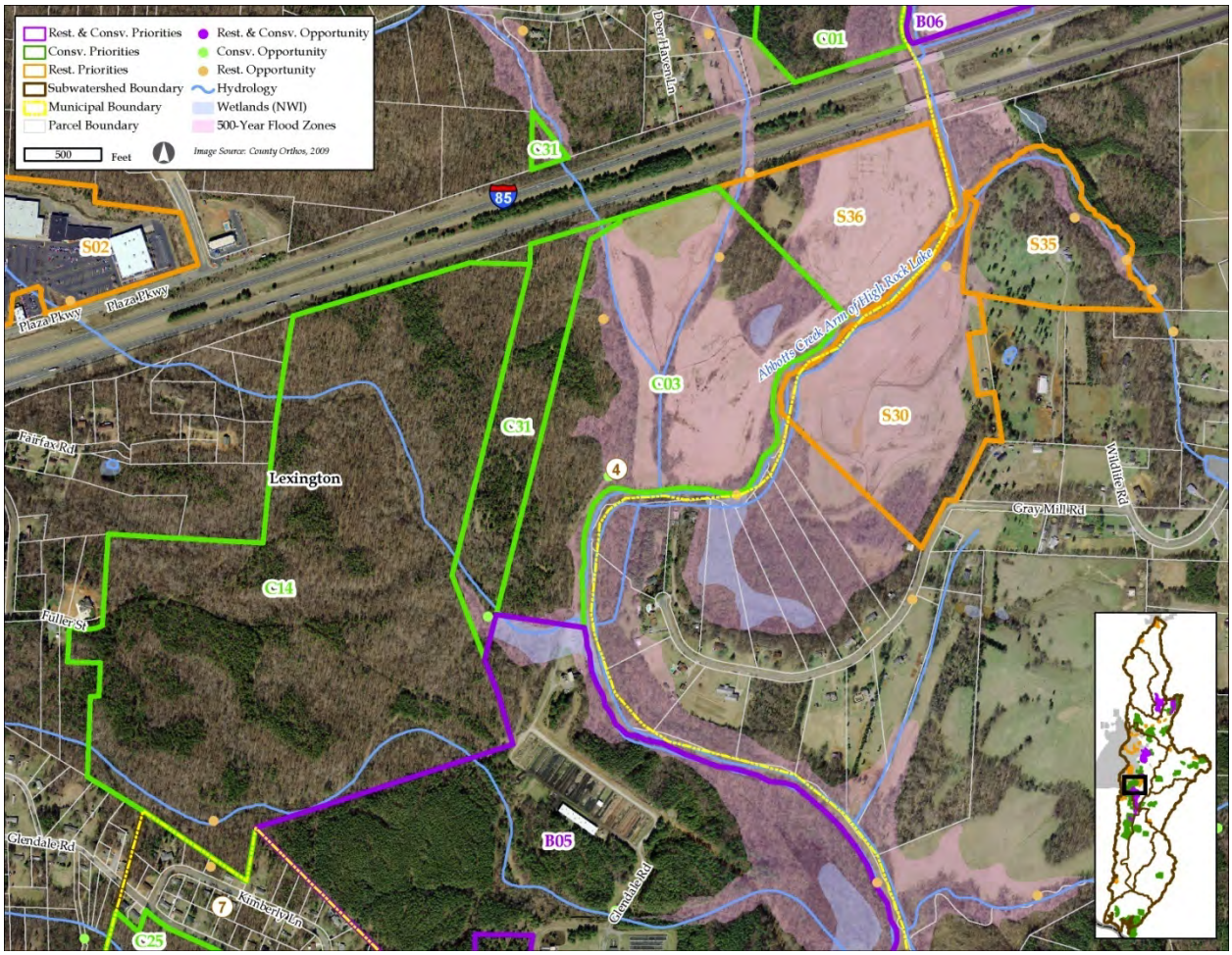
Debris Jams on Lower Abbotts Creek

If the greenway is going to be routed through these lands, it would be wise to contact all landowners of large parcels such as C-01 and B-06 to gauge their interests in conserving their entire properties for ecological habitat and/or recreation through a legal easement program. They could begin with the City-owned property featuring the pictured wetland on C-40. Such environmental features could be assets for the greenway, both to give the path a pastoral and peaceful setting, but also to create more opportunities for special interest groups who might want to use the trail, such as birders. Due to the large and ambitious nature of this project, it should also be of interest to the LTCNC and High Rock Outfitters in Lexington. Such partners will be needed for what could be a complex negotiation and financing process, but the benefits will be the permanent protection of hundreds of acres of pristine Piedmont forests for the people of Davidson County and the Triad.

This property is in the urban Subwatershed 4, where development is always a pressing issue, and where the development is constantly threatening natural resources and costing the City and County money due to the need for infrastructure and its maintenance. The opportunities to preserve areas such as these in Subwatershed 4 are few and far between. Too small to be of interest to a land trust, this property would be a worthy investment for Davidson County's recreational development. It could be developed in partnership with the landowner to host hunting, hiking, mountain biking, or many other purposes. The conservation easement would explicitly address these uses and compensate the landowner for this use. Currently, Davidson County's has no Recreation Department, and only supports a part-time position for DC TRIP. To best protect open spaces and agricultural lands – as stated in the Davidson County Land Development Plan – the County will need to invest in and/or incentivize the protections of these lands and resources. See Policy Recommendation 7 & 8 for more details on this topic. The benefits for the watershed could be enormous.

The intensive forestry operations on B-06 demonstrate the potential impacts to lands and possibly waters along the proposed greenway if these steps are not taken. Residences would not disallowed, and land management practices such as timbering would not necessarily be prohibited under such situations, but they would be regulated to preserve the ecologic, hydrologic, and visual values of these properties. These properties will also need recreational plans to identify the best areas and paths for any proposed recreational developments of these lands. Public input should be solicited to ensure that the lands are developed for recreational and economic interests of residents. These lands and waters' recreational potential should not be limited to that of regular, local use, but also how the greenway and other features may be created to cater to regional or interstate interests (i.e. triathlons, cycling events, BMX racing, etc.) Successes in Mt. Airy with restoration of the trout fishery and greenway network and the Virginia Creeper Trail in southern Virginia offer guiding examples on how to develop and market such features.

Project 05B: Abbotts Creek Corridor #2



Recommended Actions:

- Place a conservation/recreation easement on 327acres of property and invest in site as greenway using PART-F, CWMTF, and Healthy Communities monies
- Place conservation/recreation easement on the 103-acre 500-yr floodplain along Abbotts Creek
- Work with WRC, Davidson Co. TRIP, and a certified forester to determine a forestry management or recreation plan for priority parcels
    - Determine a reforestation plan for C-03, S-30, & S-36 that serves landowner and watershed needs

ATTRIBUTE	C-03	C-14	C-31	S-30	S-35	S-36	TOTAL
Site Location	Lexington			Lexington ETJ		Lexington	
Subwatershed	4						
Land Use	Vacant	Forest		Vacant	SFR	Vacant	
Area (acres)	71.39	154.60	21.60	35.01	20.05	24.65	327.30
Linear Stream (Feet)	6,247	4,864	579	1,988	1,292	1,780	16,750
Lake Area (acres)	N/A						N/A
Impervious Surface Cover	N/A	N/A	N/A	0.2 1%	0.2 1%	N/A	0.4 0%
Floodplain Area (acres)	46.1 65%	N/A	1.9 9%	30.7 88%	3.4 17%	21.2 86%	103.2 32%
Wetland Area (acres)	0.98 1%	N/A	0.03 0%	N/A	N/A	N/A	1.01 0%
Forest Coverage (acres)	39.7 56%	154.6 100%	21.6 100%	7.2 21%	11.5 57%	4.5 18%	239.1 73%

Project Assessment:

Wetland Along Lower Abbotts Creek (C-03)

Similar to Project 5A, 5B is an exciting project, with opportunities to protect valuable land over 3 miles of streams and 327 acres – including 103 floodplain acres – in land in close proximity to the City of Lexington, and hosting rare species habitat (Greensboro burrowing crayfish) on its property. It also holds great promise as the northernmost part of phase 2 of the Davidson County greenway that will connect Lexington's Finch Park to Lake Thom-a-Lex. With Phase 1 being supported with a $241,000 NC Clean Water Management Trust Fund grant, the prospects for funding and implementing Phase 2 are good. Ensuring that the landowners will be willing to allow their lands to be crossed by a greenway remains the largest obstacle, and one that must be addressed by the City of Lexington, Davidson County, and other vested stakeholders.

If put on the ground, these areas will be accessible to the public in ways that they never have been before, permitting at least visual access to open spaces and ecological habitat that they do not often get to experience. Such environmental features could be assets for the greenway, both to give the path a pastoral and peaceful setting, but also to create more opportunities for special interest groups from outside the county who might want to use the trail, such as birders and – potentially – paddlers. The greenways can also be used to restore stream conditions and secure a healthy, wide vegetated buffer next to the streams, which can both mitigate stormwater pollution from I-85 and serve as wildlife corridors in a heavy-traffic area. With positive reception to these new recreational opportunities, it will make extending the greenway to Lexington and Thomasville and eventually south to High Rock Lake much easier.

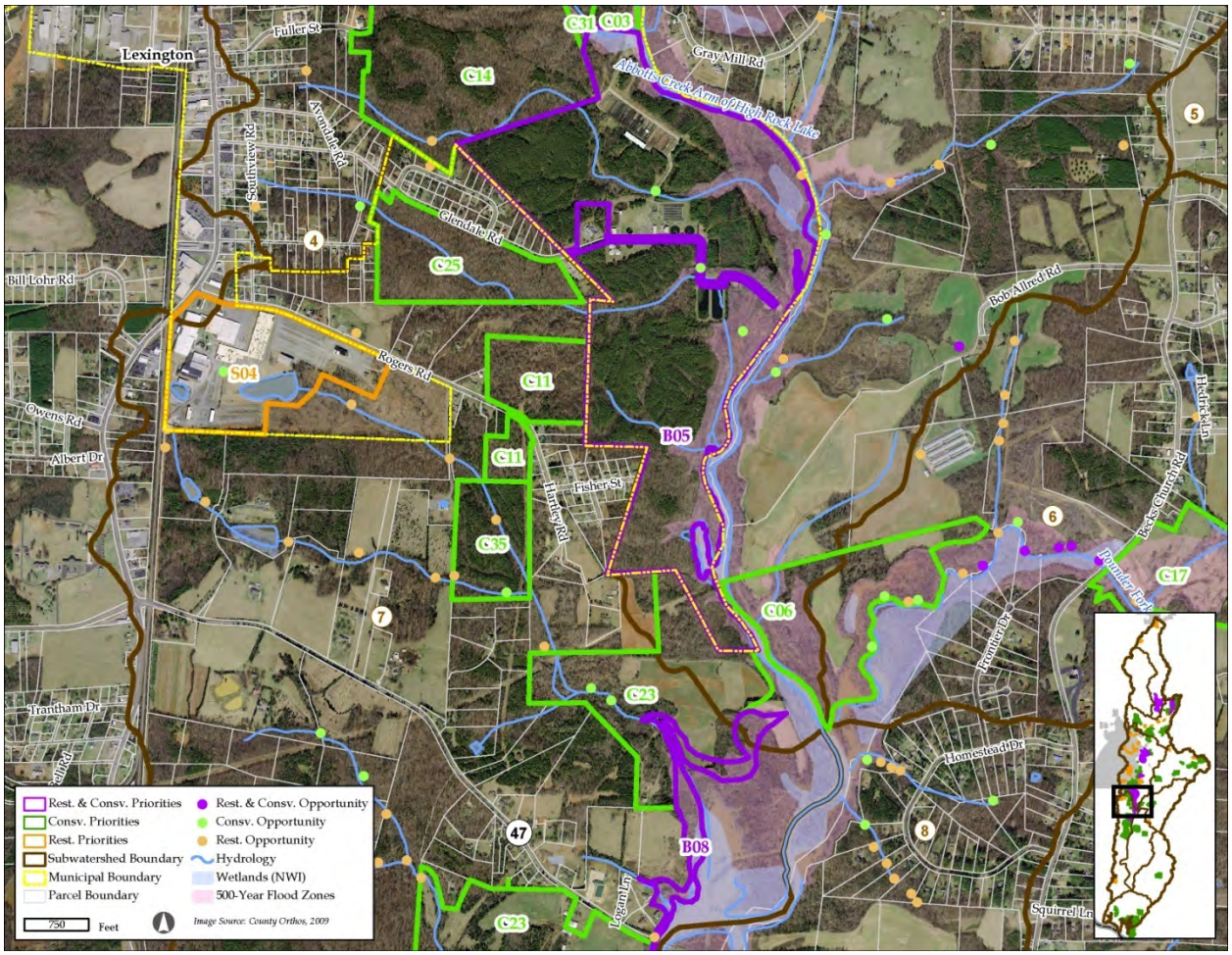
Contact with all landowners of these parcels to gauge their interests in conserving their entire properties for ecological habitat and/or recreation through a legal easement program needs to happen soon. They could begin with the City-owned property (C-40) featured in Project 5A. Ideally, all of the 5B lands will be placed entirely under a conservation easement, ensuring that they are protected for the public and for the watershed, and all landowners will receive financial compensation for delivering these services to a larger population. Residences would not be disallowed on these lands, and land management practices such as timbering would not necessarily be prohibited, but they would be regulated to preserve the ecologic, hydrologic, and visual values of these properties. For these land management considerations, all landowners will be compensated through a tax deferment or cost-share program such as the Davidson County VAD program. Currently, Davidson County has no financial program to compensate landowners for this "greater good" use of their properties, crippling local efforts to preserve open space and farmland. Greater funding of Davidson County TRIP and limiting the S&WCD office as part of a formal agricultural and conservation easement program would greatly enable the County and City's efforts to protect such lands.

Debris Jam on Lower Abbotts Creek (S-36)

The intensive forestry operations on S-30, S-36, and C-03 demonstrate the potential impacts to lands and waters along the proposed greenway if steps towards easements and permanent protections are not taken. Regardless of whether these properties are crossed by the greenway, these land management strategies need to be addressed. The intensive clearing of vegetation on these properties is allowing sediment and nutrients into Lower Abbotts Creek, contributing to the pollution burden in High Rock Lake. If allowed to reforest, the greening of parcels S-30 and S-35 would yield an additional $38,859 in annual water quality benefits to the rest of the watershed. Effort should be made immediately through the Davidson County S&WCD to contact these owners and enroll them in the VAD program and introduce sustainable land management techniques to these valuable lands. Should the landowners be interested in preserving these properties as open spaces and/or for recreation (i.e. the greenway), discussions of placing the properties under conservation/recreation easements should take place, and specify the future use of these properties.

Should the landowners be interested in allowing the easements across their properties, there should be conversation regarding their interest in developing their lands for passive (hiking, birding, etc.) or active recreation (mountain biking, camping, paddling, etc.). These properties will need recreational plans to identify the best areas and paths for any proposed recreational developments of these lands. Public input should be solicited to ensure that the lands are developed for recreational and economic interests of residents. These lands and waters' recreational potential should cater to regional or interstate interests (i.e. triathlons, cycling events, BMX racing, etc.) Successes in Mt. Airy with restoration of the trout fishery and greenway network and the Virginia Creeper Trail in southern Virginia offer guiding examples on how to develop and market such features. Given the high profile and value of this property, it should a project of interest to the LTCNC, if Davidson County and the City of Lexington are looking for partners to finance and manage the greenway projects and the easements associated with it. Such partners will be needed for what could be a complex negotiation and financing process, but the benefits will be the permanent protection of hundreds of acres of pristine Piedmont forests for the people of Davidson County and the Triad.

Project 05C: Lexington Wastewater Treatment Plant



Recommended Actions:

- Prioritize as recreational feature and highlight blueway and greenway potential of this stream corridor to the landowners and public
- Contact landowners immediately to discuss placing lands under conservation easements and developing greenways
    - Phase II begins at Lexington wastewater plant (B-05)
- Focus on this areas with DC FISH as a StreamWatch group, and contact nearby school about interest in partnering
- Investigate stormwater retrofits in neighborhoods and S-04 through the City Public Works and with County CCAP funds

ATTRIBUTE	B-05	B-08	C-06	C-11	C-23	C-25	C-35	TOTAL
Site Location	Lexington	Davidson County						
Subwatershed	4	4 & 7	4 & 6	7	4 & 7	7		
Land Use	Institutional		Vacant	Forest	Vacant	Forest		
Area (acres)	281.90	24.40	66.06	31.90	162.75	44.22	27.61	638.84
Linear Stream (Feet)	13,152	3,154	5,963	N/A	5,104	2,254	2,290	31,917
Lake Area (acres)	N/A							N/A
Impervious Surface Cover	9.5 3%	N/A	N/A	0.5 2%	0.7 0%	N/A	N/A	10.7 2%
Floodplain Area (acres)	67.9 24%	17.3 71%	41.9 63%	N/A	4.7 3%	N/A	N/A	131.8 21%
Wetland Area (acres)	7.4 3%	3.9 16%	1.85 3%	N/A	0.6 0%	N/A	N/A	13.7 2%
Forest Coverage (acres)	248.2 88%	18.4 75%	46.6 71%	31.4 98%	92.7 57%	44.2 100%	26.2 95%	507.7 79%

Project Assessment:

Wetland Habitat Along Abbotts Creek (B-05)

Project 5C displays the challenges of protecting natural resources in the transitionary suburban areas of Davidson County. All of these conservation properties are potentially eligible for cost-share funds and/or being placed under a conservation or agricultural easement, but they would be much more desirable and effective if they could be grouped together and managed as a single project totaling 640 acres and protecting 6 miles of streams and Lower Abbotts Creek. Currently, federal and state laws do not permit cost-share programs to recognize such creative and cooperative solutions. In fact, they disallow even the same owner with slightly different personal information (John Doe vs. John X. Doe) to group their own properties into a cost share or conservation program as a single unit, rejecting many valuable mid-sized properties from such programs. Consequently, the owners of these four conservation properties will have to progress through the enrollment and management process separately, rather than as a single unit of owners of hydrologically-valuable land. Such stumbling blocks imperil the 640 acres of open space and 6 miles of streams present on these lands. None of these properties are currently enrolled in a tax-deferment program or under a conservation easement.

These properties also lie along the primary route of the Davidson County greenway, and will connect Finch Park in Lexington to High Rock Lake via Lower Abbotts Creek. This has enormous potential for both the economy and environment of the Lower Abbotts Creek watershed, providing visitors to Davidson County a non-automotive bridge between the Lake and the nearest urban center, Lexington. However, crossing these properties will require a respectful negotiation with the owners of these properties. It would be wise to contact all landowners of these parcels to gauge their interests in conserving their entire properties for ecological habitat and/or recreation through a legal easement program. They should begin

with the large City-owned property B-05. Due to the large and ambitious nature of this project, it should also be of interest to the LTCNC and High Rock Outfitters in Lexington. Such partners will be needed for what could be a complex negotiation and financing process, but the benefits will be the permanent protection of hundreds of acres of pristine Piedmont forests for the people of Davidson County and the Triad.

Pristine Bottomland Forest and Tributary (C-23)

Davidson County S&WCD should contact these landowners as soon as possible to gauge their interests in enrolling in an agricultural or conservation cost-share program. These appear largely unmanaged, indicating that they might have valuable ecological habitat. It is clear that their lack of disturbance is stabilizing and benefiting the watershed, by remaining undeveloped and permeable to precipitation. Their value as a stormwater buffer between the urbanized residential and commercial district immediately west of this project is incalculable. It is the loss of such lands in the Rich Fork Creek watershed to urban development that has led to the dramatically degraded conditions seen in that Creek and Lower Abbotts Creek. This would be greatly aided by an economic evaluation of the open spaces and agricultural lands in Davidson County, and the ecosystem services they provide and economic revenue they generate annually.

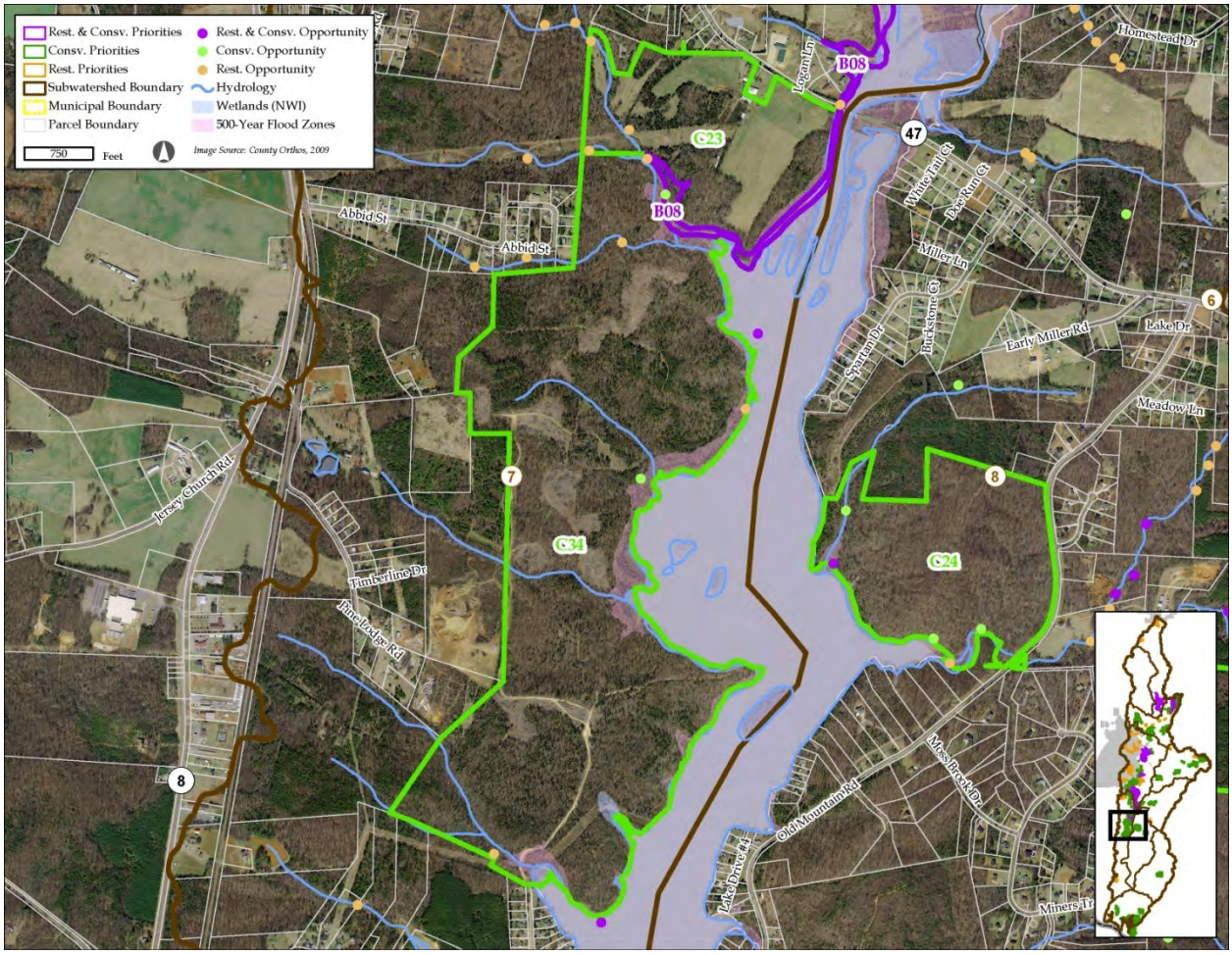
Streamside Wetland on Lower Abbotts Creek (C-06)

The one property owned by the City of Lexington totaling 282 acres, with 2.5 miles of streams and Creek banks to protect, is both the most desirable for a cost-share program and the least likely to be subdivided and developed. This property should immediately be placed under an easement permanently preserving its use for recreation and open space, with special care given to delineate and protect the proposed greenway route and 300-foot buffers along Lower Abbotts Creek and all streams. This could include use now for low-maintenance recreation like hunting. An ecological assessment of the property should be conducted to survey for rare and valuable species. If the property will be used for recreation, a recreation plan for this property needs to be drafted to ensure that any valuable ecological habitats are avoided and that conflicting uses (hunting and horseback riding) are not co-located. Marketing these new recreational lands and their role in the expansion of the greenway should be done to ensure public awareness and buy-in.

Many of these properties are along the suburban residential perimeter of the City of Lexington, and currently buffer these more intensive land uses from Lower Abbotts Creek. The proximity of so much open space close to a residential area presents an exciting opportunity to retrofit impervious cover with stormwater BMPs that can improve the environmental footprint of these homes. Rain gardens can address small runoff volumes and add to the aesthetic value of these properties. Constructed wetlands work well in Piedmont soils and could accommodate the runoff from multiples homes and their roads,

treating the automobile pollutants and fertilizer nutrients. There are also other, more innovative approaches to managing stormwater, including green roofs, treatment trains of stormwater BMPs, and large-volume underground storage of rainwater. All of these approaches will intercept runoff before it reaches Lower Abbotts Creek. DC FISH needs to work with the City and the DC S&WCD to contact these residences about their interest in retrofitting their homes and neighborhood, including increasing access to the open spaces of this project.

Project 05D: High Rock Lake Timber Site



Recommended Actions:

- Prioritize as recreational feature and highlight blueway and greenway potential of this stream corridor to the landowners and public
- Contact landowners immediately to discuss placing lands under conservation easements and developing greenways and/or converting their lands to recreation (hiking, hunting, horses, etc.)
    - Ideal locations for paddle access
- Ensure and require all forestry operations within 0.5 miles of High Rock Lake (inc. the Arms) use sustainable forestry practices, especially contracting with a consulting forester
- Ensure that all recreation on these sites (inc. hunting and fishing) have access to waste disposal and that litter outreach is focused here

ATTRIBUTE	C-34
Site Location	Davidson County
Subwatershed	7
Land Use	Forest
Area (acres)	390.42
Linear Stream (Feet)	21,595
Lake Area (acres)	N/A
Impervious Surface Cover	5.1 1%
Floodplain Area (acres)	34.12 9%
Wetland Area (acres)	9.5 2%
Forest Coverage (acres)	348.8 99%

Project Assessment:

This project could be a model to emulate for all rural conservation projects in the Lower Abbotts Creek watershed. Currently, the 390-acre forested property is owned by a lumber company, and shows evidence of having been logged in recent years. It is not enrolled in the Davidson County VAD program, showing that progress could be made to improve the management of this large property for watershed function and health, especially when it is acknowledged that it has a mile of tributary streams on it.

Pristine Wetland (C-34)

Enrollment in this program would also be enormous benefit to the landowner, granting them at least a partial tax-deferred status for annual property taxes. These parcels are host to unusual and economically-valuable Piedmont ecology, and hosts bald eagles. It was also central to the Sauratown Trail used by the original peoples of these parts, as well as European and American settlers. Some properties have taken these steps and should be sought as references for other landowners to discuss these programs and their benefits. Given these potential watershed and financial benefits, application of the VAD program to this property has a lot of potential for all those involved, and will be of interest to other parties, including other lakeside property owners (HOA's, ALCOA, farms, etc.), conservation groups (LTCNC), and recreational groups (High Rock Outfitters).

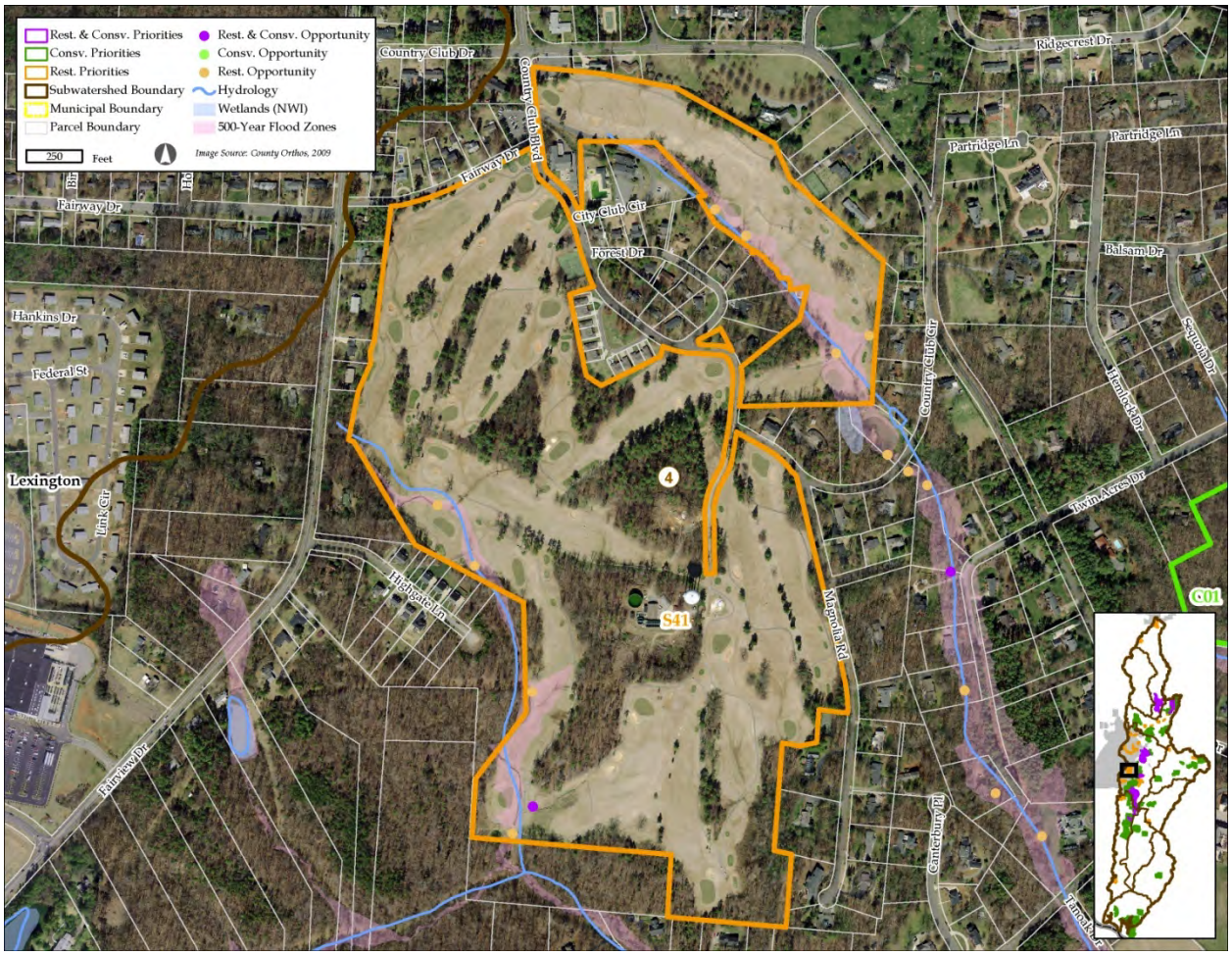
It is clear that these properties have the potential to be harvested for lumber. However, it does not mean

that it could not be harvested in ways that won't impact water quality. The NC DFR has Forestry Practice Guidelines that offer explicit management practices for forestry that will minimize erosion and water quality impacts. It is in the interest of Davidson County and all High Rock Lake users to require and enforce these FPGs locally, similar to how stream buffers and inspections programs are needed for more residential areas. Forestry consultants are recommended for management of all timber operations in NC, especially in cases such as this one, where so many environmental impacts could result from mismanagement of the site. Consulting foresters are not only experts on FPGs, but also are skilled in ensuring that a landowner will optimize their profits from a harvest, and potentially save them thousands of dollars.

Due to the large area of the property, it is in the interest of the LTCNC and the NC WRC to permanently protect this area as natural – if managed – space, especially since it is adjacent to High Rock Lake. It will be necessary to discuss the matter with the landowner and conduct ecological assessments of the properties to determine if they host rare or endangered species, as Swearing Creek does near High Rock Lake. The protection of these lands does not mean the exclusion of timber management or other uses (hunting, birding, etc.).

Pristine Mature Piedmont Forest (C-21)

Project 06: Lexington Golf Course



Recommended Actions:

- Work with the City of Lexington to design and improve the environmental sustainability and playability of the public golf course
    - Have play challenges integrated with watershed needs
        - Water hazards could be constructed wetlands
        - Sand traps could be sand filters
        - Rough could be stream buffers
    - Restore streams and their buffers
- Highlight efforts and their functions to the public through partnership with Stormwater SMART
    - Feature of the Davidson County greenway and Uptown Lexington

ATTRIBUTE	S-41
Site Location	Lexington
Subwatershed	4
Land Use	Golf Course
Area (acres)	114.36
Linear Stream (Feet)	2,369
Lake Area (acres)	N/A
Impervious Surface Cover	6.3 6%
Floodplain Area (acres)	5.89 5%
Wetland Area (acres)	0.02 0%
Forest Coverage (acres)	28.5 25%

Project Assessment:

Degraded Streams and Buffers on Golf Course (S-41)

Though there are other priority projects that represent more degraded areas of the Lower Abbotts Creek watershed, and though there are projects (especially in the headwaters) that can yield greater benefits for the watershed, the Lexington City Golf Course offers the most dramatic opportunity to improve a site out of all opportunities in this Project Atlas. There are over 2,000 linear stream feet on the golf course, almost all of which could be improved, if not fully restored to optimal function and health. The Course was designed prior to environmental landscaping, so the streams weren't protected, and they continue to be managed and mowed right down to the water's edge. This has created high entrenchment and channelization of these tributary streams, and adds to the stormwater burden of downstream waters. With the intense fungicides and herbicides applied to most golf courses, the quality and volume of stormwater runoff from golf courses is of even greater concern than all but the most industrial sites. As these streams are headwater tributaries, their physical state is not terrible, and their degraded status is entirely due to how they are managed by the golf course staff. It may even be possible to restore these streams to be better health by simply planting and cultivating a 25-foot stream buffer on both banks of the streams. These buffers do not need to be large trees that would disrupt play – a high density of shrubs and grasses will stabilize the stream structure and filter out pollutants almost as well as larger vegetation.

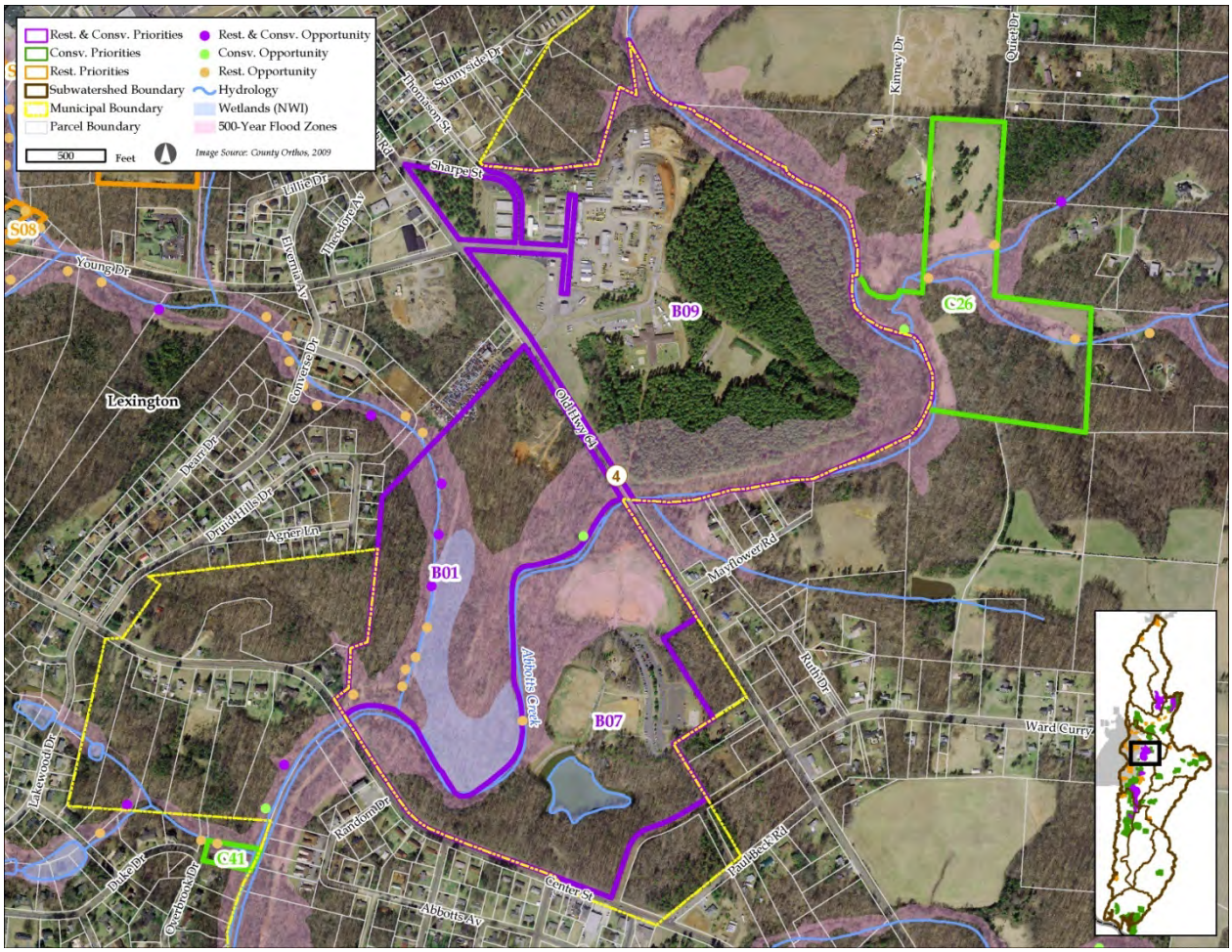
Stormwater Retrofit Opportunity (S-41)

There are numerous exciting opportunities to address water quality needs on the Lexington City Golf Course. The NC State University Biological and Agricultural Engineering (NCSU BAE) group has worked with the municipalities of Wilmington, Wilson, and Durham on their public golf courses to retrofit them to address stormwater runoff concerns as well as enhance playability. Converting water traps to constructed wetlands, sand traps to sand filters, and tees to bioretention cells are just some of the ideas that can be realized in a golf course redesign and retrofit.

If these ideas are of interest to the City, they are an ideal partnership opportunity for Uptown Lexington, the Davidson County Soil & Water Conservation District, and Stormwater SMART. The project will require patience and understanding from the public, but could also generate a lot of interest and will increase public awareness of stormwater needs. It also has the potential to be a high profile issue throughout the Triad, as this will be one of only a few sustainably-(re)designed golf courses in the region. It would be an ideal feature of both the Davidson County greenway and any walking tours of Lexington, and should be integrated into those efforts.

If the City and course manager are interested in this possible project they will need to sit down with PTCOG's Water Resources Planning staff, NCSU's B&AE staff, and a landscape architect to ensure retrofitting the course can improve playability. There should also be a discussion of the air and water quality benefits of such measures. If the City is supportive, the project can likely be financed with NC CWMTF and federal 319 monies, as the other courses were. Should there be any stormwater or wastewater infrastructure needs addressed through this project, it will enhance the proposal's competitiveness.

Project 07: Finch Park



Recommended Actions:

- Permanently protect the 6,900-ft., 500-yr floodplain (16 acres) as an unmanaged buffer that could serve greenway/blueway purposes
- Highlight ecosystem services and regionally-unusual ecology of the 126 acres in Finch Park and the Davidson Co. Prison with NC WRC and Stormwater SMART
- Use CCAP and PART-F monies to expand unmanaged areas to adjacent and highlighted lands, and feature residential leaders
- Integrate burial of water-sewer pipes below Abbotts Creek into Lexington CIP
- Expand upon the recreational and watershed management opportunities at Finch Park with expansions of trails system, alternative recreation options (i.e. mountain biking), creation of parking lot stormwater BMPs, and the creation of a canoe landing
    - Hold regular and well-publicized community events here
- Permanently protect the 11-acre wetland in Finch Park

ATTRIBUTE	B-01	B-07	B-09	C-26	C-41	TOTAL
Site Location	Lexington			Lexington ETJ	Lexington	
Subwatershed	4					
Land Use	Forest	Institutional		Vacant	Forest	
Area (acres)	56.14	59.97	110.25	32.05	1.02	259.43
Linear Stream (Feet)	3,383	3,457	3,405	2,559	367	13,171
Lake Area (acres)	N/A	3	N/A	N/A	N/A	3
Impervious Surface Cover	0.9 2%	11.7 20%	19.2 17%	N/A	N/A	31.8 12%
Floodplain Area (acres)	34.67 62%	22.06 37%	38.16 35%	9.98 31%	0.75 74%	105.62 41%
Wetland Area (acres)	11.41 20%	2.72 5%	N/A	N/A	N/A	14.13 5%
Forest Coverage (acres)	51.6 92%	36.2 60%	66.1 60%	18.6 58%	0.9 88%	173.4 67%

Project Assessment:

Potential Paddle Trail on Lower Abbotts Creek (C-26)

Finch Park is one of the most promising projects in the Lower Abbotts Creek watershed due to its status as urban open space and its large size. Though a significant portion of this land lies on the Davidson County Prison, there is still a lot of potential to develop the recreation potential and preserve the ecological habitat of these properties, provided all landowners are part of the conversation and progress responds to all of their needs. The Finch Park project offers the City of Lexington and Davidson County ways to address nearly every issue that plagues Lower Abbotts Creek: stormwater retrofits, stream restoration, nutrient retention, sediment control, recreational development, and open space conservation. The only significant water quality stressor that would remain unaddressed is Rich Fork Creek.

The 160 acres of publicly-owned land offer an exciting opportunity to preserve open space and ecological habitat in an urban environment, providing a potent stewardship example close to the population centers of the watershed. The size of the public space, its recreational services and potential, and some unusual ecology (i.e. mountain laurel) suggests that this property might be of interest to the LandTrust for Central NC (LTCNC), making protection of this space a little more feasible. The prospect of linking all of these undeveloped urban open spaces with a greenway that is already planned for the area makes the appeal of such a project even greater. Over a mile of liner stream feet could be enhanced/restored by such a project. The ecological consultants on this project identified this area of Abbotts Creek as ideal for a paddle trail landing, making stream restoration a potential economic investment. Permanent protection will make receiving grant funds more likely and working with recreational development and conservation partners easier.

Bank erosion (B-01)

The field assessment data documents the problems that were identified on these properties: there are infrastructure concerns with the wastewater system; channelized tributaries; and trash and stormwater runoff from the soccer and baseball fields and parking lots. The ecological assets available at this site are not currently known, though there is a history of rare species presence in this area: the Greensboro burrowing crayfish and the glade milkvine both have been identified in Finch Park, but the last ecological survey was done in 1997 and is sorely in need of an update. There are multiple opportunities to address these concerns and further develop the recreational opportunities in the Park at the same time. Many granting organizations will fund one part of the project (i.e. greenway implementation) if another part of the project is funded by another organization (i.e. stream restoration).

Sewer line crossing creates class 2 rapid (B-01)

Once Davidson County and Lexington finish the first phase of the greenway (Lake Thom-a-Lex to the I-85 BUS bridge), they should begin work on the second phase, which will include all of these properties but C-41. With public ownership, the Park will be an easy component to the greenway; the private lands between the Park and the first phase of the greenway will be more challenging to place a greenway on. With implementation of the greenway, it will be possible to address some of the wastewater infrastructure concerns on these lands. There are multiple instances of elevated sewer pipe crossings that need to be buried below the stream bed to prevent potential leaks from debris or fallen trees crashing into the pipes.

The greenway development also gives the City an opportunity to review the recreational development of Finch Park, and what else might be done to enhance those opportunities. First and foremost will be the need to link Uptown Lexington to Finch Park and the greenway by a safe sidewalk and/or bike route. There are currently some hiking trails, soccer fields, and baseball fields at the Park. There is the potential to develop the hiking trails further, and investigate the development of camp sites, bridle trails, and mountain bike paths, and this would be a worthy investment of the City and the DC TRIP.

Lexington sewer crossing causing upstream erosion (B-01)

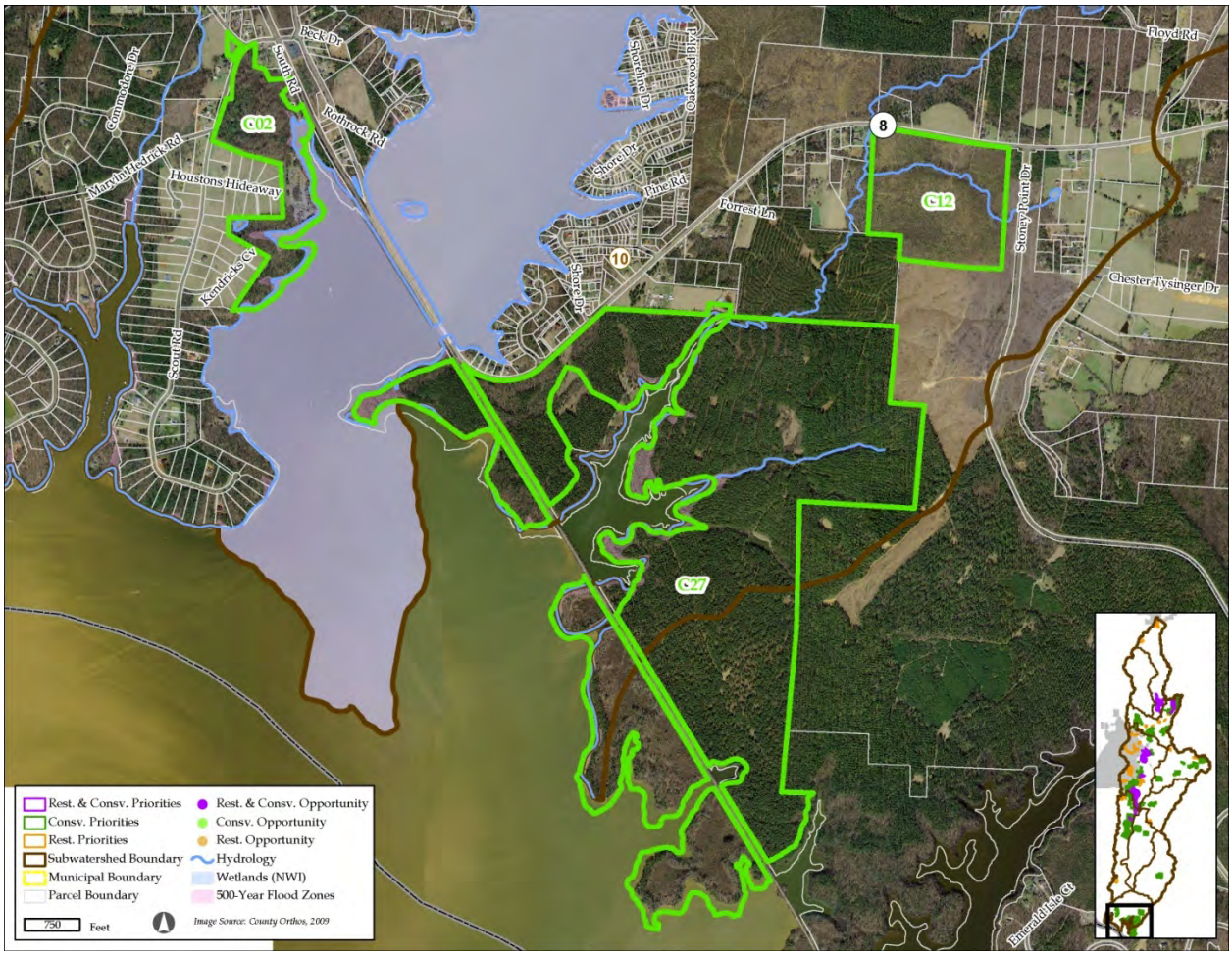
The greenway also offers the opportunity to enhance the educational opportunities at Finch Park. There are currently no signs discussing the native ecology of the Piedmont or Davidson County, despite the presence of bald eagles and endangered mole salamanders just south of the Park, and a historical role in the seasonal migration of the prehistoric Sauratown people. DC FISH could lead a StreamWatch group at Finch Park to keep an eye on conditions on Abbotts Creek and its tributaries, or Stormwater SMART could focus its energies for watershed stewardship there – especially on issues such as nutrient management and sediment control. Both groups could also work with the City and County on addressing project needs on the property.

There are both programmatic and structural BMP opportunities with this project. Finch Park is an ideal spot to begin applying less fertilizer to the grounds and initiating a pet waste outreach program featuring pet waste stations. Given the levels of nutrients recorded in the watershed, all efforts to reduce non-point sources of nutrients are needed, and the Park is central and often-used site that is ideal for rolling out these efforts, with the City leading the way. The parking lots and playing fields also offer the opportunities to put stormwater BMPs on the ground to capture stormwater runoff from impervious surfaces and filter out its pollutants. Small rain gardens would add to the attractiveness of the parking areas and capture runoff volumes; alternatively, a constructed wetland could capture the entire parking lot's runoff and then slowly feed into receiving streams. Bioretention cells could serve similar purposes, but potentially on a much grander scale. Guilford County's Northern High School created a bioretention cell out of its entire soccer field, filtering enormous volumes of runoff that are then used to irrigate the school grounds. Similar, large-scale projects could be created at Finch Park. Alternatively, a smaller, more dispersed network of stormwater BMPs such as rain gardens that could achieve similar water quality goals. Whatever decisions are made, educational efforts must be made to ensure that the purpose and services delivered by these BMPs are clear to the public and are seen as valuable. Ideally, these investments by the City and County will lead to smaller, behavioral investments by residents and businesses throughout the

Outfall causing channelization (B-01)

Lower Abbotts Creek watershed. CITYgreen software shows that simply increasing tree cover at the prison and on C-26 could provide the watershed with an additional $45,350 in water quality benefits annually. A pilot project for such greening efforts on public lands can be showcased to other rural landowners in the watershed, and create a simple and cost-effective solution to non-point source pollution.

Project 08: High Rock Lake Open Space Site



Recommended Actions:

- Prioritize as recreational feature and highlight blueway and greenway potential of this stream corridor to the landowners and public
- Contact landowners immediately to discuss placing lands under conservation easements and developing greenways and/or converting their lands to recreation (hiking, hunting, horses, etc.)
- Ensure and require all forestry operations within 0.5 miles of High Rock Lake (inc. the Arms) use sustainable forestry practices, especially contracting with a consulting forester
    - Make sure that they are enrolled in VAD program
- Ensure that all recreation on these sites (inc. hunting and fishing) have access to waste disposal and that litter outreach is focused here

ATTRIBUTE	C-02	C-12	C-27	TOTAL
Site Location	Davidson County			
Subwatershed	10			
Land Use	Recreation	Forest	VAD	
Area (acres)	56.16	68.54	562.85	687.55
Linear Stream (Feet)	4,571	2,335	37,119	44,025
Lake Area (acres)	N/A			N/A
Impervious Surface Cover	5.1 9%	N/A	N/A	5.1 1%
Floodplain Area (acres)	10.93 19%	N/A	66.4 12%	77.3 11%
Wetland Area (acres)	8.67 15%	N/A	26.7 5%	35.4 5%
Forest Coverage (acres)	43.6 78%	68.54 100%	538.9 96%	582.5 85%

Project Assessment:

This project is the model to emulate for all rural conservation projects in the Lower Abbotts Creek watershed. C-27 is enrolled in the Davidson County VAD program, protecting High Rock Lake from the impacts of the residential development in the surrounding areas. C-12 is also in a tax-deferment program for land management that will require it to use sustainable methods to ensure the protection of natural resources, including about 8 miles of streambanks and coastlines. The only flaws to this situation is that these programs are still voluntary, and the landowners can change their minds to develop these properties at the beginning of any given tax year. The surrounding development is almost entirely zoned residential and represents a potential conflict between economic and environmental progress if managed using traditional zoning and development tools. The good news is that these protected properties are providing $1,260,000 in water quality benefits to the Lake and surrounding communities through their preservation as open space; the landowners are being compensated for this dedication to watershed stewardship; and that the potential conflict is completely resolvable with a couple of development tools.

It is clear that the lands surrounding High Rock Lake have high residential development potential. Due to the 632-acre area of the two properties, it is in the interest of the LTCNC and the NC WRC to investigate the potential to permanently protect this area as natural space, especially since it is adjacent to known bald eagle roosts. Prior to doing so, it will be necessary to discuss the matter with the landowners and conduct ecological assessments of the properties to determine if they host rare or endangered species. The protection of these lands does not mean the exclusion of people – hunting preserves, birding areas, and passive hiking areas and limited development following Low Impact Development techniques are some of the most successful ways to engage a population with their environment and invest them stewardship activities.

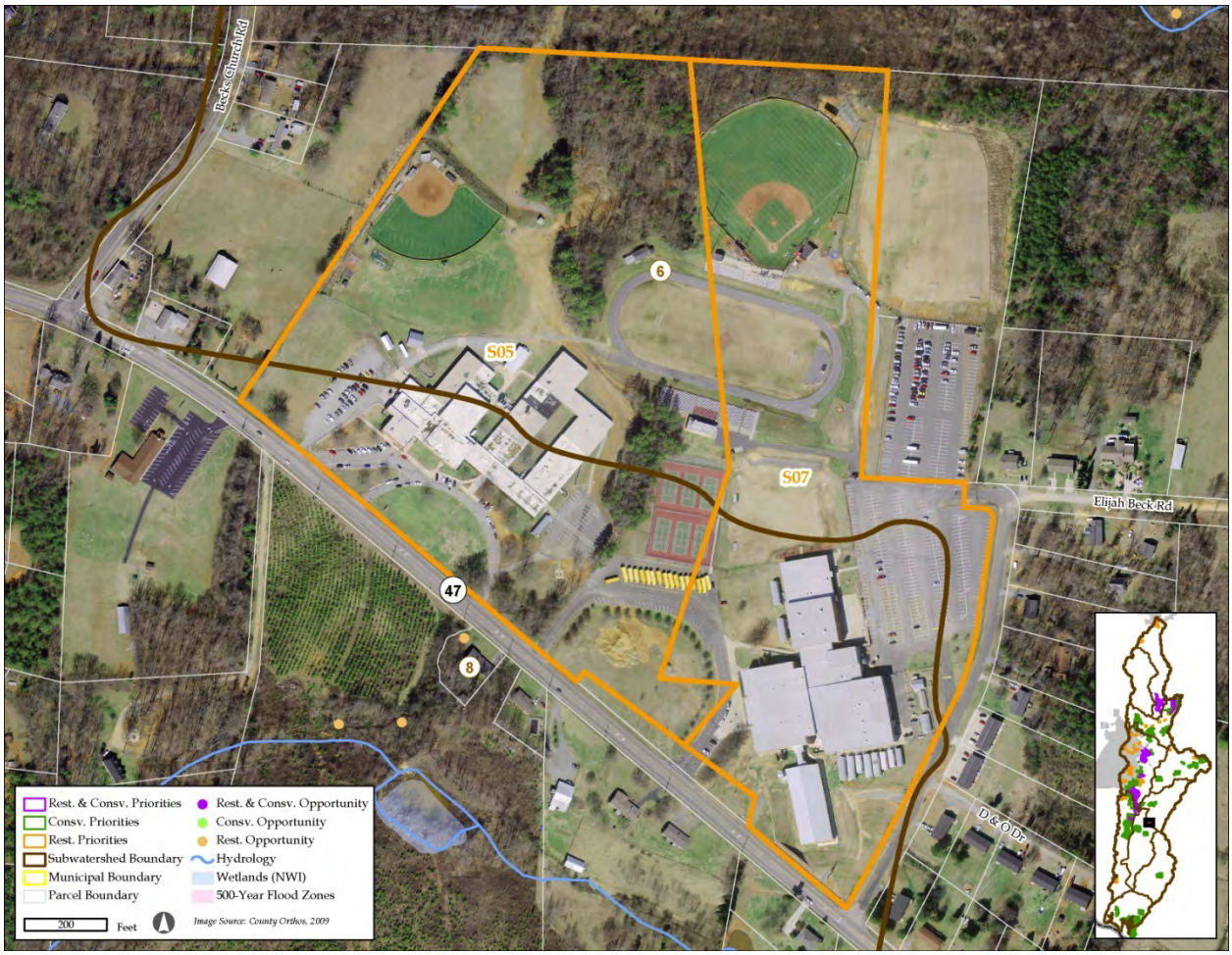
If these lands are going to (eventually) be developed, water quality impacts to High Rock Lake are avoidable with soil and erosion controls, regular inspections of septic systems and irrigation systems, setbacks, and mandatory buffers along the Lake and its direct tributaries. ALCOA already has a mandatory 100-foot lakeside buffer that it enforces, after the impacts of umitigated residential development to water quality became clear and concerning. These buffers could be managed to allow

some recreational structures (piers, docks, etc.) and viewsheds, but they need to be maintained as unpaved surfaces that are capable of intercepting and infiltrating runoff from the surrounding neighborhoods. The soil and erosion controls, setbacks, and inspections services will require ordinances that A) allow public employees onto private property to inspect such sites; B) provide property owners and developers with guidance on what they can and should do with such properties; and C) enforcement mechanisms that empower the County to redress violations of these ordinances. Given the proximity of the lands to the Lake, and the value of the Lake to Davidson County and all of its municipalities, it is advisable to place an overlay zone within a half-mile of High Rock Lake that has more stringent and protective requirements than less sensitive areas of the watershed and the County. These lands will still be extremely attractive to developers (they are in one of the high-growth areas under PTCOG's Future Growth Scenario for Lower Abbotts Creek) and are economically-valuable, they will just be better protected than they currently are. Please see Policy Recommendation #2 for more details.

The residential neighborhoods surrounding these lands offer cautionary tales of the impacts of unbridled development on High Rock Lake. The older houses are plagued by poorly-maintained and failing wastewater systems that sometimes discharge directly to High Rock Lake. The newer neighborhoods are densely developed, with no setback or buffer requirements in the Davidson County Zoning Ordinance to protect the Lake from the impervious cover and/or septic system discharges on these properties.

The residentially-zoned C-02 is owned by ALCOA and is not under any type of protection from development. It is currently serving as passive recreation space for the surrounding neighborhoods. It would be ideal if ALCOA were willing to pledge to permanently protect these 56 acres as natural habitat with a conservation easement that would permit (some) recreation but prohibit (most) development. This could be one of several fruitful partnerships between ALCOA and the LTCNC and/or DC TRIP. The LandTrust would manage the easement to ensure that it meets the requirements of the easement, and ALCOA would receive the financial benefits of dedicating lands to conservation. There are many ALCOA-owned properties along High Rock Lake which have been placed under conservation easements to protect them as open space dedicated to ecology and recreation. These protections are needed along Lower Abbotts Creek, both to mitigate the impacts from residential runoff before it reaches the Creek and to serve as a guiding example to other landowners – especially Davidson County and the City of Lexington – of the benefits and flexibility of placing lands under conservation easements.

Project 09: Central High School & Middle School



Recommended Actions:

- Contact school administrators and science teachers through DC FISH to see about interest in StreamWatch and on-campus stormwater management
- Investigate stormwater retrofit options (IC = 44%) on campus that address known concerns and meet school curricula needs
- Pursue stormwater BMPs with federal (319, CCAP) and state funding (CWMTF)
- Address other school (system) needs (Safe Routes to Schools, energy sustainability, etc.) through HUD Sustainability grant
- Demonstrate value of tree cover for improving air and water quality and implement using CCAP funds

ATTRIBUTE	S-05	S-07	TOTAL
Site Location	Davidson County		
Subwatershed	6 & 8		
Land Use	Institutional		
Area (acres)	27.97	21.77	49.74
Linear Stream (Feet)	N/A		N/A
Lake Area (acres)	N/A		N/A
Impervious Surface Cover	8.8 31%	13.1 60%	21.9 44%
Floodplain Area (acres)	N/A	N/A	N/A
Wetland Area (acres)	N/A	N/A	N/A
Forest Coverage (acres)	5.3 19%	1.3 6%	6.6 13%

Project Assessment:

Central High & Middle Schools offer one of the most potentially exciting projects in the Lower Abbotts Creek watershed. There is an immediate need to address stormwater runoff flowing to Lower Abbotts Creek, a need to serve curriculum needs with Stormwater SMART and DC FISH, and the potential to create a bridge between the urban and rural communities of the watershed. Any and all of these projects have the potential to address the watershed's needs, the school's education needs, and the citizen stewardship needs for the City and the County. Improvement at Central High and Middle Schools are needed and could have impacts to all residents of the watershed, serving as a model to follow for all schools in the watershed and the County.

Stormwater Runoff Across the Street from School

DC FISH is a federally-supported stream stewards program that PTCOG received funding for in 2011. It will be conducting targeted outreach through Davidson County, recruiting citizens interested in the StreamWatch program, and how they may improve watershed conditions more generally. It will focus on regular stream inspections as part of stream cleanups, train groups on how to conduct water quality monitoring, and coordinate these efforts with the responsible government entity, establishing a direct relationship between the utility department(s) and its community. Schools are ideal locations for DC FISH to focus on due to the pre-existing PTCOG relationship has with many schools through its Stormwater SMART outreach and education program, and the curricula needs that many teachers must fulfill through watershed education. StreamWatch and educating students on watershed concepts can address curricula needs for biology, chemistry, geology, history, social studies, and many other classes. Some Davidson County schools also have afterschool environmental clubs or host Scout troops that may have an interest in working DC FISH.

A greater boon to the educational needs at Central High and Middle Schools and for the Lower Abbotts Creek watershed would be to retrofit the campus with innovative stormwater BMPs. Constructed wetlands, bioretention cells, rain gardens, and sand filters would all greatly aid the campus in addressing its stormwater concerns. Even planting more trees on the campus to shield it from the sun and absorb more rainfall will reduce the energy footprint and stormwater footprint of this 44% impervious, 50-acre site, granting an additional $10,000 in water quality benefits to the watershed. There are many opportunities to beautify the campus, address its environmental needs, make it a more active learning center for students, connect it with the neighborhood, and address the respiratory health needs of the area through such tactics.

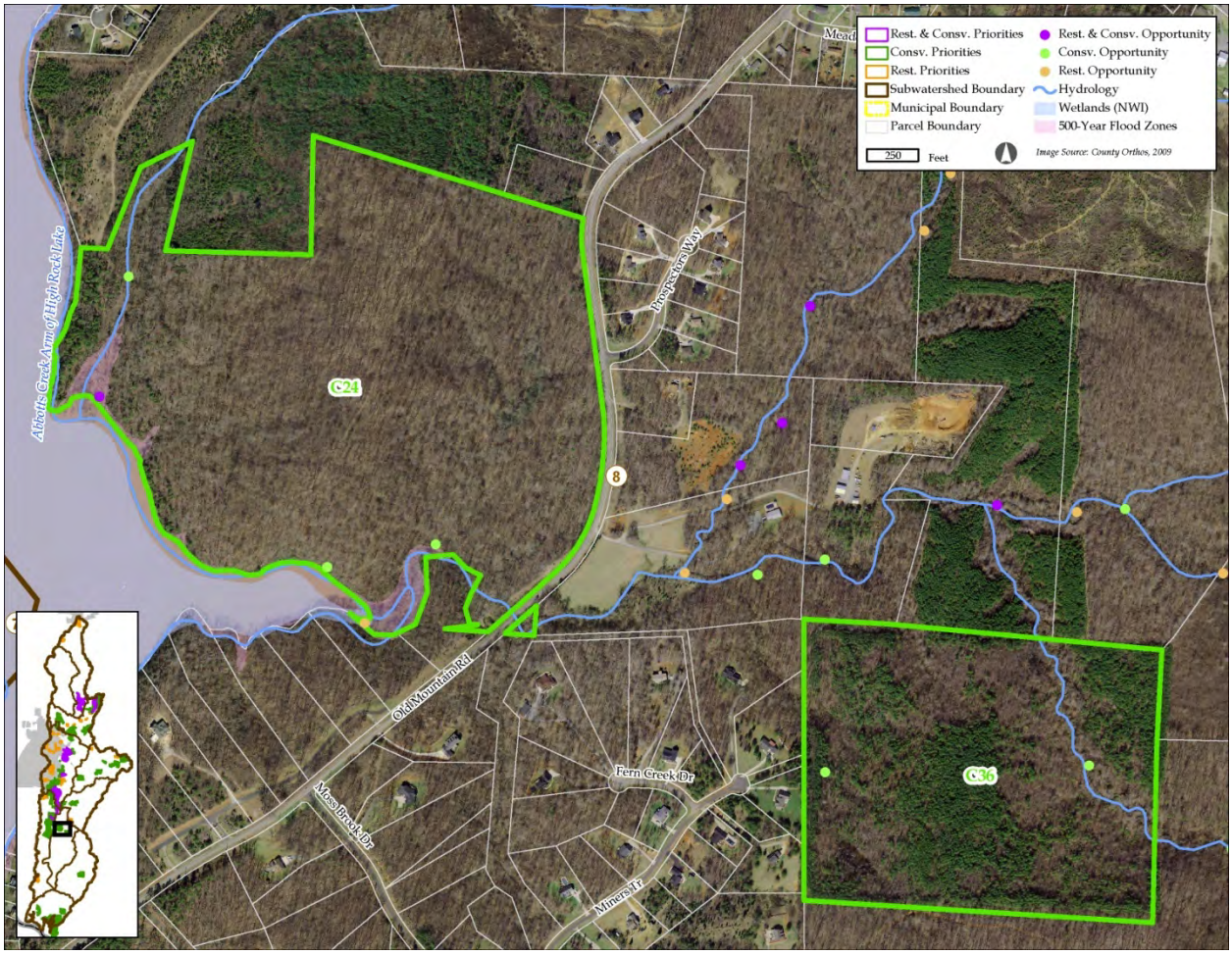
Though no streams or wetlands are found on the school's campus, the watershed, school, and students could benefit greatly for better stormwater management at this site. Retrofitting the high school campus with stormwater BMPs will have immediate tributaries in Subwatersheds 6 & 8, and create on-campus outdoor learning labs for students. As done at other schools in NC, rainwater capture systems could be set up to provide greywater irrigation for grounds staff and/or students maintaining gardens for science classes at the school. Constructed wetlands or bioretention cells could also be placed on campus to intercept the runoff from the parking lots and drives, intercepting their automobile-related pollutants; or from the athletic fields, where fertilizer use is intensive. More dramatic changes to campus could also be pursued, including green roofs, large-volume cisterns, or rain gardens throughout campus.

PTCOG will work with school administrators and teachers to ensure that BMPs placed on campus will be useful to classes and benefit the school. Such changes on campus could impact the surrounding area, including a neighborhood rain garden and rain barrel giveaway program, development of Safe Routes to Schools, and a greening program that would plant trees throughout residential areas, addressing non-attainment concerns for ozone and particulate matter, and stormwater, nutrient and sediment concerns in Lower Abbotts Creek. These investments can largely be made with federal and state environmental, education, public health, and transportation grants.

Land Stewardship Need Across Street from School

The City of Lexington and Davidson County are in immediate need of demonstration projects to show the benefits of stormwater management and retrofitting currently highly-impervious surfaces with engineering solutions that are both attractive and effective at reducing the stormwater footprint. The City occupies only 9% of the watershed-at-large, but occupies 100% of Subwatershed 4, and with an average impervious coverage of 15%, which is indicative of poor stream conditions, which is evident immediately downstream of the school. These impacts are additive and seen in much starker and worse examples farther downstream of these headwaters – Rich Fork Creek offers a prime example of how the impacts of many small watershed insults can lead to massive stormflows and watershed degradation. Retrofitting the school will reduce stormwater impacts to Lower Abbotts Creek and increase public acceptance of such strategies.

Project 10: ALCOA Conservation Site



Recommended Actions:

- Contact ALCOA to gauge interest in placing a conservation easement on properties and dedicating them to passive recreation (hiking, camping, biking, etc.)
    - Hire ecological consultant to survey properties for species of interest/value
    - Investigate potential to place boat landing for paddlers on C-24
    - Work with ALCOA to develop a recreational plan for these properties
- Work with ALCOA to remove unmapped artificial fish habitats, require a permit for placing any new artificial habitats in Lake, and educate fishing community on need to use habitats available

ATTRIBUTE	C-24	C-36	TOTAL
Site Location	Davidson County		
Subwatershed	8		
Land Use	Forest		
Area (acres)	99.47	52.31	151.78
Linear Stream (Feet)	4,913	1,309	6,222
Lake Area (acres)	N/A		N/A
Impervious Surface Cover	N/A	N/A	N/A
Floodplain Area (acres)	3.55 4%	N/A	N/A
Wetland Area (acres)	0.12 0%	N/A	0.12 0%
Forest Coverage (acres)	99.3 100%	52.31 100%	151.61 100%

Project Assessment:

This ALCOA property (C-24) is an ideal Yadkin Blueway site, and offers lands perfect for passive recreation (camping, hiking, hunting, mountain biking, etc.). It appears that it is currently used for hunting. It is unknown if the land is under a conservation easement to preserve it as open space and ecological habitat (as ALCOA has done elsewhere around High Rock Lake), but these steps should be taken as soon as possible to protect these valuable lands and waters for the public. The nearby property of 52 pristine forested acres is in a tax deferment program to preserve the property as open space, and serves as a great example for the minimal needs for the ALCOA property. With almost a mile of pristine streams on 100 acres of mature Piedmont hardwood forests, this property would be ideal for management by the LTCNC. This preservation is urgent, as the surrounding properties have recently been subdivided and developed as single family homes. Dramatic stormwater impacts due to these developments are already being seen on streams on neighboring properties, and show what might be in the future should this property have the same fate.

Erosion From Stormwater Runoff of Nearby Neighborhoods

Trash Accumulation on High Rock Lake (C-24)

Given the cursory glance by the stream assessment teams, both properties appear to host mature Piedmont hardwood forests, and may support species of interest to ecological groups such as the NC WRC. Should ALCOA be interested, an ecological assessment of these lands and its flora and fauna

should be done soon. Rare species have been identified immediately upstream on High Rock Lake at the confluence with Swearing Creek, and there may be similar undiscovered environmental treasures on these properties. The NC WRC and/or the LTCNC would be the best groups to contact about surveying these properties.

Pristine Forests on C-24 & C-36

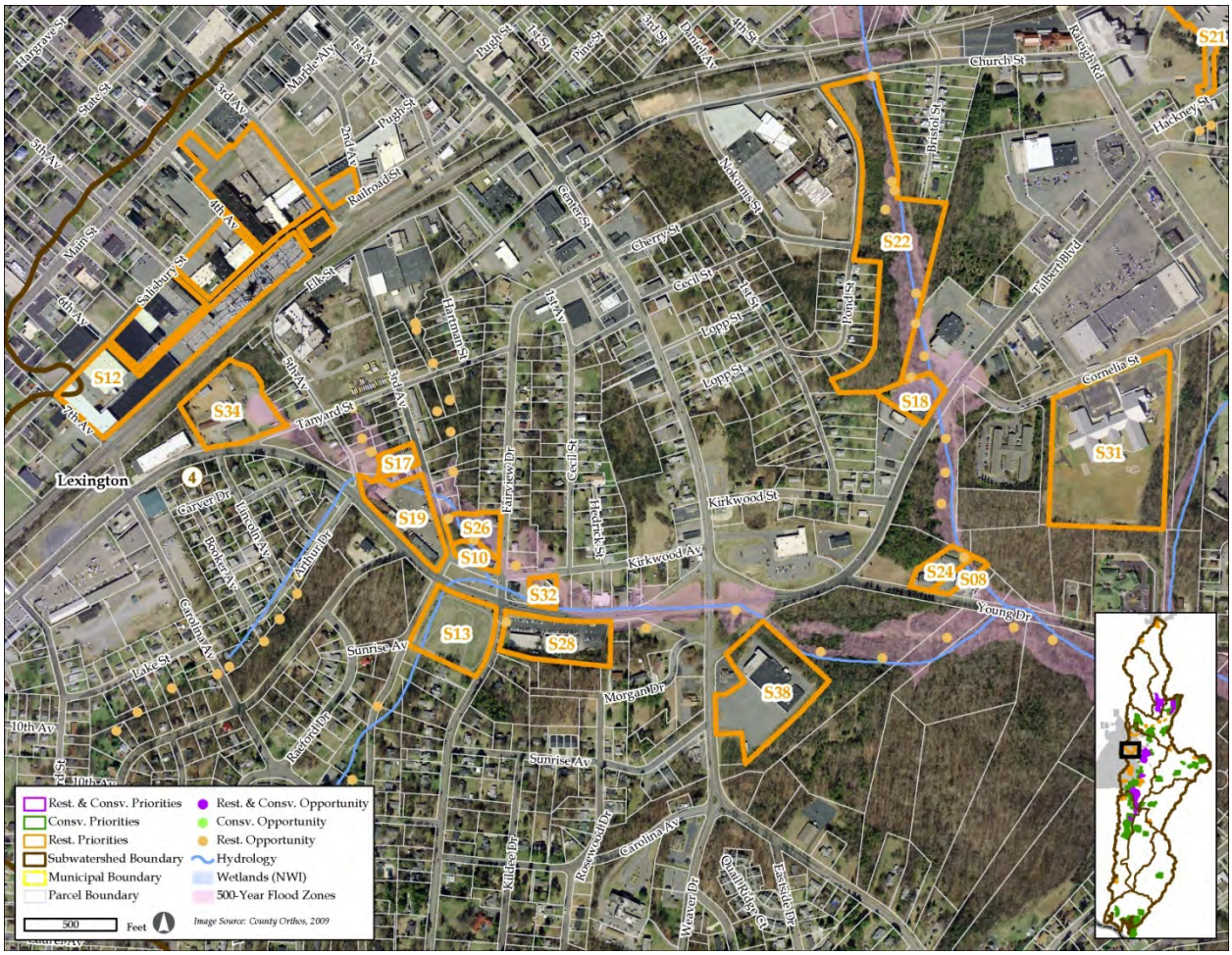
Ideally, ALCOA, Davidson County, and the LTCNC would enter into a partnership to protect these lands, which could include simple acquisition of the properties, placing a conservation/recreational easement on the properties, or simply signing a MOA of good faith regarding how and when this property will be developed, so that the County is not surprised should ALCOA decide to subdivide or develop it. PTCOG has developed a *Davidson County Blueway Plan* that focuses on the paddling opportunities afforded by the Yadkin River, High Rock Lake, and their tributaries. This property is perfectly situated to serve as a paddle station as well as the greenway terminus for the Davidson County Greenway, which has an eventual goal of linking Thomasville and Lexington to High Rock Lake via Abbotts Creek. It would be a huge step for the residents of and visitors to Davidson County if this property could be developed as a passive recreation site that could be use by day hikers, Lake paddlers, mountain bikers, or hunters. With 100 acres of untouched lands, there are surely strategies to create multiple uses without degrading the otherwise pristine wilderness. The NC WRC specializes in managing lands for hunting and fishing – including on multiple-use sites – and should be consulted on steps in this direction.

If ALCOA is amenable, their property would also be an ideal site for NC Big Sweep and DC FISH. There is a large accumulation of trash washed downstream in a cove along the property. This unmanaged and vacant property is the site of accumulated debris from all areas upstream. It emphasizes the nuisance poor stewardship upstream is having upon the Lake, its residents, and those who enjoy it for fishing and boating. This could be a key site of the StreamWatch network developed by DC FISH, and a catalyzing partnership for future recreational and water quality work along High Rock Lake and its tributaries.

Unfortunately, the owners of C-36 have done almost all they can do with that property to protect it from subdivision or development by enrolling it in a tax deferment program. This property is somewhat typical of Subwatershed 8, with large areas undeveloped and used mainly only for hunting, if at all. Too small to be of interest to a land trust, this property would be a worthy investment for Davidson County's recreational development. It could be developed in partnership with the landowner to host hunting, hiking, mountain biking, or many other purposes. The conservation easement would explicitly address these uses and compensate the landowner for this use. Currently, Davidson County's has no Recreation Department, and only supports a part-time position for DC TRIP. To best protect open spaces and agricultural lands – as stated in the *Davidson County Land Development Plan* – the County will need to

invest in and/or incentivize the protections of these lands and resources. See Policy Recommendation 7 & 8 for more details on this topic. The benefits for the watershed could be enormous.

Project 11: Downtown Lexington Retrofit



Recommended Actions:

- Top priority for DC FISH and their residential recruitment efforts for StreamWatch
    - Focus on illicit discharges and illegal dumps
- Ideal area for a residential rain garden and rain barrel giveaway pilot program
- Restore buffers throughout area so that there is at least a 25-ft unmanaged zone next to the streams (currently mowed)
- Identify stormwater retrofit opportunities on institutional and commercial properties that can enhance those properties and pursue federal and state funds to implement them

ATTRIBUTE	S-08	S-10	S-12	S-13	S-17	S-18	S-19	S-22
Site Location	Lexington							
Subwatershed	4							
Land Use	Industrial	Office	Industrial	Institutional		Commercial	Instit.	Forest
Area (acres)	0.5	0.6	18.1	3.4	0.6	1.2	2.8	10.5
Linear Stream (Feet)	82	172	N/A	364	14	154	208	1,218
Lake Area (acres)	N/A							
Impervious Surface Cover	0.3 58%	0.3 52%	17.8 98%	0.6 18%	0.4 71%	0.8 65%	2.3 83%	N/A
Floodplain Area (acres)	0.05 10%	0.3 52%	N/A	N/A	0.3 54%	0.9 72%	0.3 12%	3.1 29%
Wetland Area (acres)	N/A							
Forest Coverage (acres)	0.1 19%	0.3 52%	N/A	N/A	N/A	0.3 24%	N/A	9.6 91%

ATTRIBUTE	S-24	S-26	S-28	S-31	S-32	S-34	S-38	TOTAL
Site Location	Lexington							
Subwatershed	4							
Land Use	Comm.	Office	Comm.	Instit.	Vacant	Industrial	Comm.	
Area (acres)	0.9	1.2	3.1	12.0	0.5	3.8	5.6	64.68
Linear Stream (Feet)	83	164	N/A	N/A	149	N/A	N/A	2,608
Lake Area (acres)	N/A							N/A
Impervious Surface Cover	0.6 67%	0.5 43%	1.9 61%	4.4 37%	0.1 19%	2.7 72%	3.9 69%	36.6 57%
Floodplain Area (acres)	0.08 9%	0.9 77%	0.03 1%	N/A	0.3 51%	0.5 14%	0.03 1%	6.7 10%
Wetland Area (acres)	N/A							N/A
Forest Coverage (acres)	0.1 11%	0.4 35%	0.7 23%	1.5 13%	N/A	0.2 5%	1.3 23%	14.5 22%

Project Assessment:

Project 11 starkly highlights the need to address non-point sources of pollution in the Lower Abbotts Creek watershed, and especially in the City of Lexington. Small, uniform problems plague the urban watersheds, similar to those in the Rich Fork Creek watershed. The two subwatersheds that include the City of Lexington and its ETJ (Subwatersheds 3 and 4) are plagued with issues like illegal dumping, illciit discharge, lack of riparian buffers, and other concerns at a higher concentration than the other areas of the watershed. Much of this has to do with the simply higher population density in these areas, but there are also other concerns that reflect the urban setting of these problems. Stormwater impacts immediately heighten the impacts of many of these practices (littering), and has impacts on others like over-fertilization that can only be seen cumulatively with time.

To address this problem, DC FISH will focus some its efforts on creating StreamWatch groups in the City of Lexington. Many of these problems can be fixed relatively easily with simple behavioral changes or through some education on the impacts of some land management practices. Educating municipal grounds crews and other public employees in regard to stream buffer maintenance and fertilizer application will improve the public lands surveyed in the stream assessment and provide private landowners with visible examples of water quality stewardship. DC FISH will begin in Fall 2011 and recruit from the City's schools, churches, civic groups, and others who might be interested in improving their community through improving their streams and watershed. The focus will be on reducing nutrient inputs by educating the public on pet waste cleanup, proper fertilization of yards, and the need for riparian buffers. The StreamWatch group will use the data collected on behalf of this project to follow up on known illegal dumping and illicit discharge sites, and work with those landowners to remove those problems from the watershed. Until the City creates more targeted ordinances

Buffer Restoration Need (S-32)

Headcut and Stream Restoration Need (S-22)

Potential Illicit Discharge from Restaurant (S-18 & S-22)

that empower public employees to address these non-point sources of pollution, citizen watch groups are the best resource available to identify and remove them. The StreamWatch groups will also be able to track any progress the program and its campaign has on stream health.

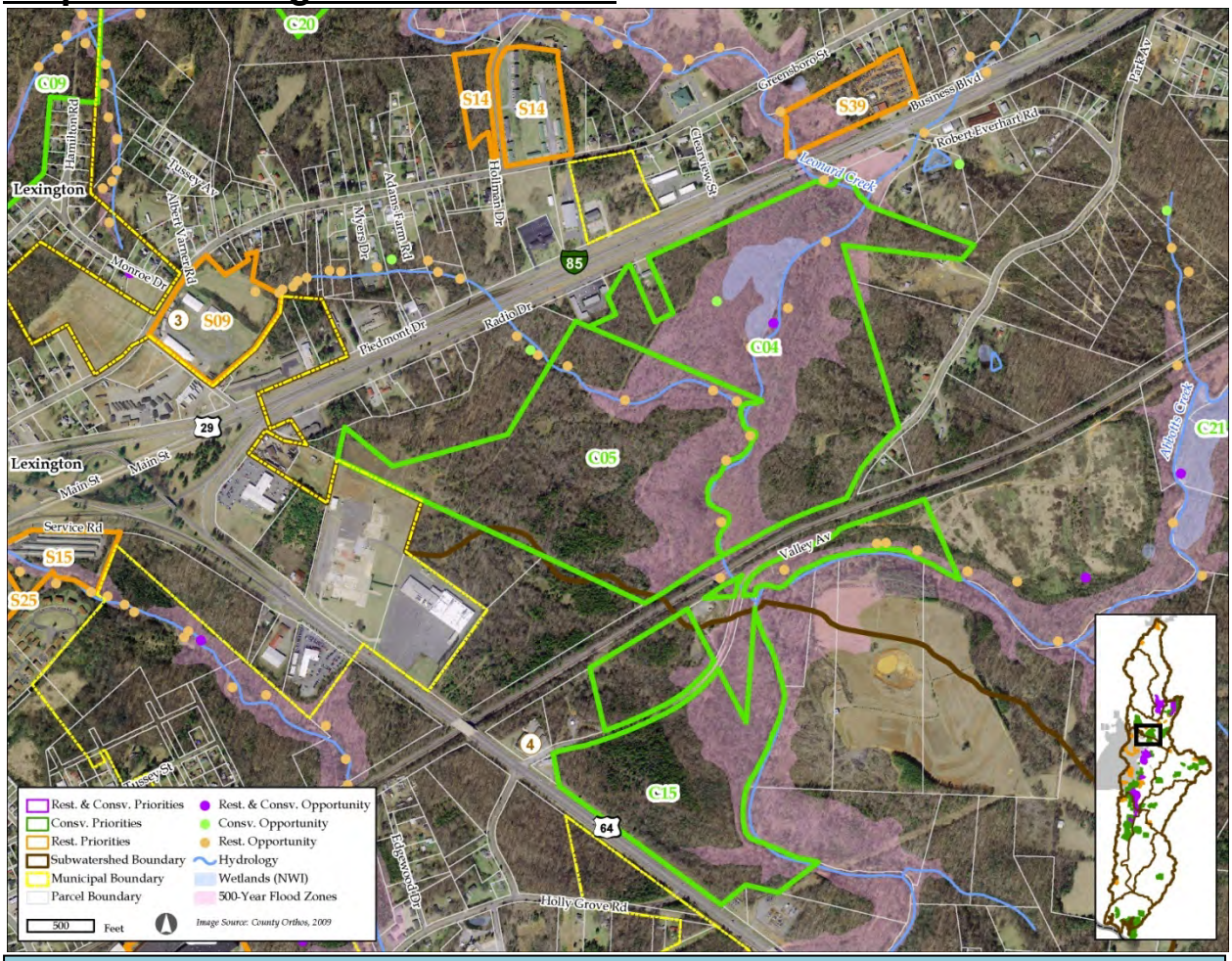
The urban streams of Lower Abbotts Creek do need better protection from the non-point sources of urban pollution. As discussed in detail in Policy Recommendation 2, illicit discharge, illegal dumping, and soil and erosion control ordinances are all needed to effectively identify and remove these problems for the watershed. A mandatory 25-ft. undisturbed stream buffer is also needed throughout the urban watershed. Larger buffers would be better, but when the City's still mowing the entire stream buffer, any buffer will be an improvement.

When the riparian buffer and stewardship behaviors improve, it will be worth the resources and time of the City to enhance and restore these streams. These improvements should begin with small but widespread practices, such as rain garden and rain barrel use. Programs to give away these BMPs to urban residents have met with great success in other communities, and can make enormous reductions in stormwater runoff volumes. If such steps are taken, investments in retsoring urban streams will be a good idea. Any investments in stream restoration prior to stormwater retrofits and reductions in non-point sources of pollution will be wasted money and time, as these sources of pollution are the reasons that the streams are in degraded conditions in the first place.

Stormwater Retrofit Need (S-38)

Exposed Sewer Pipe, Immediately Downstream S-18

Project 12: Lexington Suburban Site



Recommended Actions:

- Priority focus for DC FISH to improve stream health by reducing illegal dumping and illicit discharge eliminations
    - Clean up all dumps on Creek and work with landowners on finding alternatives
    - Provide landowners with greywater discharges the option to have a residential rain garden
- Place old Lexington landfill under conservation easement and develop it as a recreational resource and key feature of the Davidson County greenway network
- Address stormwater concerns on stressed properties (IC = 27%), including building artificial wetlands to accommodate residential runoff
- Pursue grant funding to enhance streams
- Ensure that all developments done on conservation priorities are done sustainably and avoid steep slopes, wetlands, and the 500-yr floodplain
    - All timbering operations need to use a certified forester

ATTRIBUTE	C-04	C-05	C-15	S-09	S-14	S-39	TOTAL
Site Location	Davidson County	Lexington ETJ					
Subwatershed	3		4	3			
Land Use	Forest			Institutional	MFR	Comm.	
Area (acres)	86.6	71.8	50.5	12.7	12.7	8.0	242.24
Linear Stream (Feet)	3,821	3,204	2,373	N/A	N/A	199	9,597
Lake Area (acres)	N/A						N/A
Impervious Surface Cover	N/A	N/A	N/A	3.0 24%	2.9 23%	3.0 38%	8.9 4%
Floodplain Area (acres)	49.0 57%	22.2 31%	14.9 30%	N/A	N/A	3.0 37%	89.1 37%
Wetland Area (acres)	5.3 6%	N/A	N/A	N/A	N/A	N/A	5.3 2%
Forest Coverage (acres)	86.6 100%	68.2 95%	50.5 100%	2.2 17%	4.6 36%	5.1 64%	217.1 90%

Project Assessment:

Project 9 illustrates the impacts of urban development upon watershed health and function, and the immediate need to better manage stormwater impacts to downstream communities. It also has one of the most dramatic incidences of poor watershed stewardship at the illegal dump at the Old Lexington Landfill. Through a combination of community outreach and involvement, stormwater management, and open space preservation, the issues that plague this project could be addressed quickly. To address them long-term will require more attention in the local policies to protect open space and promote watershed stewardship through stormwater mitigation and prohibition of illegal dumping and illicit discharges. With such mechanisms in place, it will be possible for the watershed to begin to recover and for investments in stream restoration to be long lasting and restorative to the local and downstream ecologies.

There are currently a number of non-point source impacts degrading watershed conditions on the stressed properties in this project. Many of these sites have small but significant problems that are additively causing the watershed to fail in its ability to create hospitable

Trash Dump on Tributary (S-09)

Residential Illicit Discharge Upstream of S-39

ecological conditions, have clear waters, and avoid algal blooms. Greywater pipes were observed discharging polluted water directly to streams. People had dumped large piles of trash in their backyards next to the stream; the trash was often falling into the water, including some potentially caustic materials like oil drums. There were also almost no streamside buffers anywhere in the urbanized/residential areas of this project, allowing these pollutants, as well as other unseen pollutants like fertilizers, to discharge directly to the streams and affecting their chemistry and stream stucture. These are behaviors and land management approaches that, practiced wide-spread over decades, have caused Lower Abbotts Creek to become degraded. The *Rich Fork Creek Watershed Assessment* illustrates the further degree that watershed conditions can degrade if these problems remain unaddressed.

Oil Drum Dump, Immediately Downstream of S-09

Residential Stormwater Retrofit Opportunity, Upstream of S-39

As discussed at length in Recommendation 2, there is an immediate need to redress these problems with local ordinances and enforcement programs. PTCOG has an inventory of all of the known illicit discharges and illegal dumping sites from their stream assessments done on behalf of this project, which will be a good start to identify and remove these non-point sources of pollution. These landowners should be first educated on the problems with these land management approaches and given alternatives on how to fix them. Stormwater SMART and/or DC FISH would be an appropriate entity to work with the City to deal with these issues. DC FISH could even recruit a StreamWatch group to monitor these urban streams, where such a stewardship effort is most needed in the Lower Abbotts Creek watershed. This should include an outreach program that focuses on the need to improve stream buffers along even ephemeral tributaries. Should landowners prove unwilling, the City of Lexington and Davidson County need to have regulatory mechanisms and staff in place to remove these pollution sources from the watershed.

The City of Lexington would benefit from leading efforts to clean up debris and illicit discharges and patrol its old landfill, which is now an illegal dumping spot for many watershed residents. Potentially dangerous items were found here, including refrigerators, ovens, car batteries, and oil drums. This site would be ideal for a focal point for the NC Big Sweep, a statewide effort for communities to clean up streams and lakes and take ownership of their watersheds. The hundreds of pounds of trash at this site are in need of immediate attention and would be a huge benefit to the watershed. Any cleanups would have to be followed by regular patrolling and inspection of this site, to ensure that all of these efforts are not undone. There is also a discharge pipe that is discharging a bright orange fluid directly to Lower Abbotts Creek. The City of Lexington states that it monitors the site to ensure that these discharges are not toxic, but this potential source of chemical pollutants is still concerning. Soil tests and water quality monitoring needs to be done to ensure that contamination has not occurred over decades of dumping.

Wetland On Top of Old Lexington Landfill (C-04)

At all of these sites, there is the opportunity to retrofit the properties to intercept and manage stormwater runoff. There are multiple residences with ephemeral streams that could be converted to stormwater BMPs like bioretention cells, rain gardens, or constructed wetlands. Currently, many of these sites are being used as part of the stormwater infrastructure, with either greywater pipes or the municipal stormwater infrastructure utilizing them for dispersing stormwater volumes and avoiding channelization. While this is good news (as opposed to allowing stormwater to channelize and erode areas of the watershed), these sites could be utilized for stormwater BMPs that can actively capture nutrients and sediment in the runoff, preventing them from reaching the streams and eventually High Rock Lake. Converting any stream to a stormwater BMP will require special permission and permitting from the US Army Corps of Engineers and NC DWQ. It is also viewed as an undesirable option by the Wildlife Resources Commission and many in the environmental community. However, this conversion may be a way to use existing hydrology to accommodate the artificial local catchment's stormwater runoff.

Illegal Trash Dump (C-04)

The landfill site could be retrofitted as a recreational site, complete with birding stations. It is pretty clear from the field assessment work that the site is already being used by horseback riders and ATV riders. It would be ideal to draft a recreational plan for this site, and, should the landowner be amenable, apply it to the property with federal and state grants. This property is also a highlight of the planned Davidson

County greenway. This property would be included in phase two of the greenway, which hopefully will be implemented in the next few years. This year has seen the awarding and implementation of the first phase of the greenway, from Lake Thom-a-Lex to the I-85 BUS overpass. The second phase will connect this greenway to Finch Park in Lexington. The top of the landfill is covered in many small wetlands that could serve as waterfowl habitat, as well as habitat for many terrestrial animals. These wetlands could serve sportsmen and birders if protected. Currently, no easements for conservation or recreation lie on these conservation priority properties. These steps need to be taken as soon as possible, with landowner contact made within the year.

Concerning Discharge Pipe (C-04)

Should all of these steps be taken, it will be ideal timing to invest in stream restoration projects. These restoration efforts are needed, but would be premature if the non-point sources of pollution that have caused the problems have not been rectified. Stream restoration work often accompanies greenway implementation, as they are both streamside efforts. If the greenway to connect Lexington to Lake Thom-a-Lex is going to be put on the ground within the next five years, immediate steps need to be taken to address the non-point sources of pollution in this area of the watershed, especially the flashy stormwater volumes from Lexington. If successful, the protected open spaces and remediated urban areas of this transitionary area of the Lower Abbotts Creek watershed could serve as a stewardship model to all suburban zones throughout the Piedmont.

Erosion on Lower Abbotts Creek (C-05)

Project 13: Lexington Furniture Site

Recommended Actions:

- Contact landowner immediately to see about interest in retrofitting property (IC = 77%) to manage stormwater runoff with innovative and attractive solutions
- Draft a stormwater retrofit design for the property, and ensure that it meets with the land use needs
    - Manage runoff from any wash stations or beautify the visitors' parking lot
    - Implement the retrofits with federal and state funds
- Address apparent illicit discharge and illegal dumping on neighboring properties

ATTRIBUTE	S-21
Site Location	Lexington
Subwatershed	4
Land Use	Industrial
Area (acres)	12.83
Linear Stream (Feet)	N/A
Lake Area (acres)	N/A
Impervious Surface Cover	9.9 77%
Floodplain Area (acres)	N/A
Wetland Area (acres)	N/A
Forest Coverage (acres)	2 16%

Project Assessment:

The Lexington Furniture site offers an opportunity to lead Brownfields redevelopment in Lexington. The core of Lexington is filled with many (formerly) industrial sites with significant structural, soil, and groundwater concerns. Many of these sites were developed prior to the EPA's regulation of building materials, soil and erosion control, or underground storage of materials. Consequently, many of these sites have significant public health and environmental concerns that must be addressed. The US EPA's Brownfields program was established to A) identify immediate hazards and threats to public and environmental health at these sites; and B) develop a strategy to redress these issues and redevelop the site for the community's economy and environment.

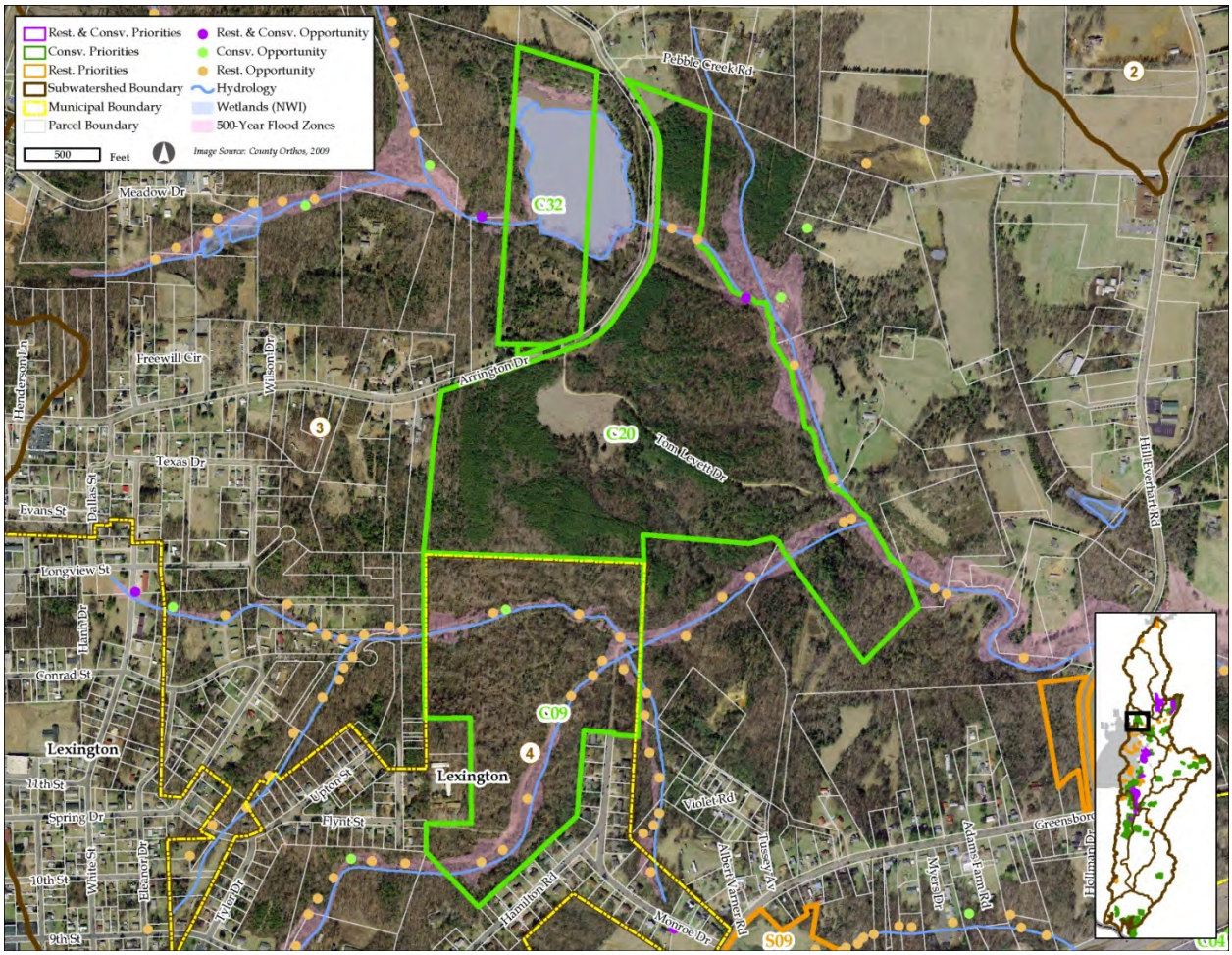
Stormwater Impacts (S-21)

At 77% impervious cover and with a long industrial past, there are already immediate water quality concerns with this site. There may be other concerns associated with the building materials use to construct the factory (lead-based paints, asbestos siding and beams, etc.) and in how waste is stored (underground storage tanks). The stormwater impacts were documented by the stream assessment teams, and can be immediately dealt with, provided the landowner is amenable to addressing these issues on their

property. Fortunately, there are large riparian buffers along the streams at this site, but the stormwater runoff could be better managed through BMPs specifically designed to reduce nutrient and sediment pollutants found in stormwater runoff.

While much of the property is covered in structures, there are opportunities to retrofit the parking areas with bioretention cells and constructed wetlands to intercept automobile-associated pollutants left on the pavement, and any runoff from wash stations at this site. There are many opportunities to work with the current landscape and, especially, to integrate these BMPs with the forested buffer around the factory. These BMPs will filter the runoff of pollutants before it reaches the forest and disperse flow so that it does not cause channelization or pump pollutants into the surrounding ecosystems. More creative BMPs could also be discussed, including green roofs and rain gardens. Discussions with the property owner about these options and the development of a stormwater design and Brownfields assessment are the first steps to creating an exciting industrial redevelopment project in Lexington.

Project 14: Martin Marietta Site



Recommended Actions:

- Prioritize as a connector loop for the Davidson County greenway
- Prioritize as recreational feature and highlight greenway potential of these stream corridors to the landowners and public
- Contact landowners immediately to discuss placing lands under conservation easements and developing greenways and/or converting their lands to recreation (hiking, hunting, swimming, etc.)
    - Ideal location for a swimming hole
- Conduct an ecological assessment of properties for species of interest
- Ensure and require all forestry operations use sustainable forestry practices, especially contracting with a consulting forester
    - Discuss land management strategy with utility companies
- Ensure that all recreation on these sites (inc. hunting and fishing) have access to waste disposal and that litter outreach is focused here
- Restore streams and Lower Abbotts Creek

ATTRIBUTE	C-09	C-20	C-32	TOTAL
Site Location	Lexington	Lexington ETJ		
Subwatershed	4	3		
Land Use	Forest			
Area (acres)	54.68	105.16	23.36	183.20
Linear Stream (Feet)	3,883	3,226	222	7,331
Lake Area (acres)	N/A		8	8
Impervious Surface Cover	0.6 1%	0.9 1%	N/A	1.5 1%
Floodplain Area (acres)	7.59 14%	5.18 5%	10.93 47%	23.7 13%
Wetland Area (acres)	N/A	N/A	8.44 36%	8.4 5%
Forest Coverage (acres)	54.1 99%	98.3 93%	12.5 54%	164.9 90%

Project Assessment:

Large Undocumented Wetland (C-20)

This project points to the possible future for the Lower Abbotts Creek watershed's economy and environment. These properties are currently not protected by either Davidson County or the City of Lexington, but remain undeveloped. They are close to the planned first phase of the Davidson County greenway, which the County has received a $241,000 CWMTF grant to implement, and would be a natural extension of the greenway, with the potential to develop the abandoned Martin Marietta granite quarry a regional recreational feature. There is a high need to protect these lands and waters to preserve hydrologic function and health of the Lower Abbotts Creek watershed so close to the City limits. Lastly, it is an ideal area for DC FISH to foster a StreamWatch group, as there are multiple instances of illegal dumps and illicit discharges that could be addressed by such as group.

The primary greenway is not intended to be routed through these properties, but they do lie on a secondary route proposed in the *Davidson County Master Greenway Plan*. The streams here are highly incised from stormwater runoff from residential and commercial development along NC 8, and these hydrologic issues could be addressed with greenway implementation, using greenway funds as match for a stream restoration along these properties and downstream to the confluence with Lower Abbotts Creek (and the main greenway route). An ecological assessment of these lands would need to be done to ensure that any sensitive or rare species in these lands and waters would not be disturbed by their development.

This secondary greenway status could change, though, if the Martin Marietta properties are developed for recreation. Already used for hiking, mountain biking, and perhaps even horseback riding, these properties host pristine ecological habitat, including 8 acres of mature wetlands, mature Piedmont forests, and an artificial lake where the quarry used to be. Though a significant liability risk for Davidson County, the potential public and private revenue that this lake could generate as a recreational resource is enormous. PTCOG has been told that the company has offered to donate the properties to the County in the past, and they should be contacted immediately to see if the offer still stands. Should management of the properties be a concern, a partnership with the LTCNC could be formalized to spread some of the responsibilities around and make management more feasible. This lake and the surrounding lands not only serve a valuable hydrologic role in intercepting and filtering stormwater runoff, but they could be a destination for many throughout the Triad, who must travel to Hanging Rock State Park for similar access to a small recreational lake. It could also draw visitors from High Rock Lake, routing them through Lexington (via the greenway), and bringing profits to business owners along Lower Abbotts Creek. If interested, DC TRIP will need to create a recreational plan for these properties to ensure that all activities here are safe and that the local hydrology and ecology are not degraded beyond the good conditions they are already in.

7-foot Bank Erosion at Tributary Confluence (C-20)

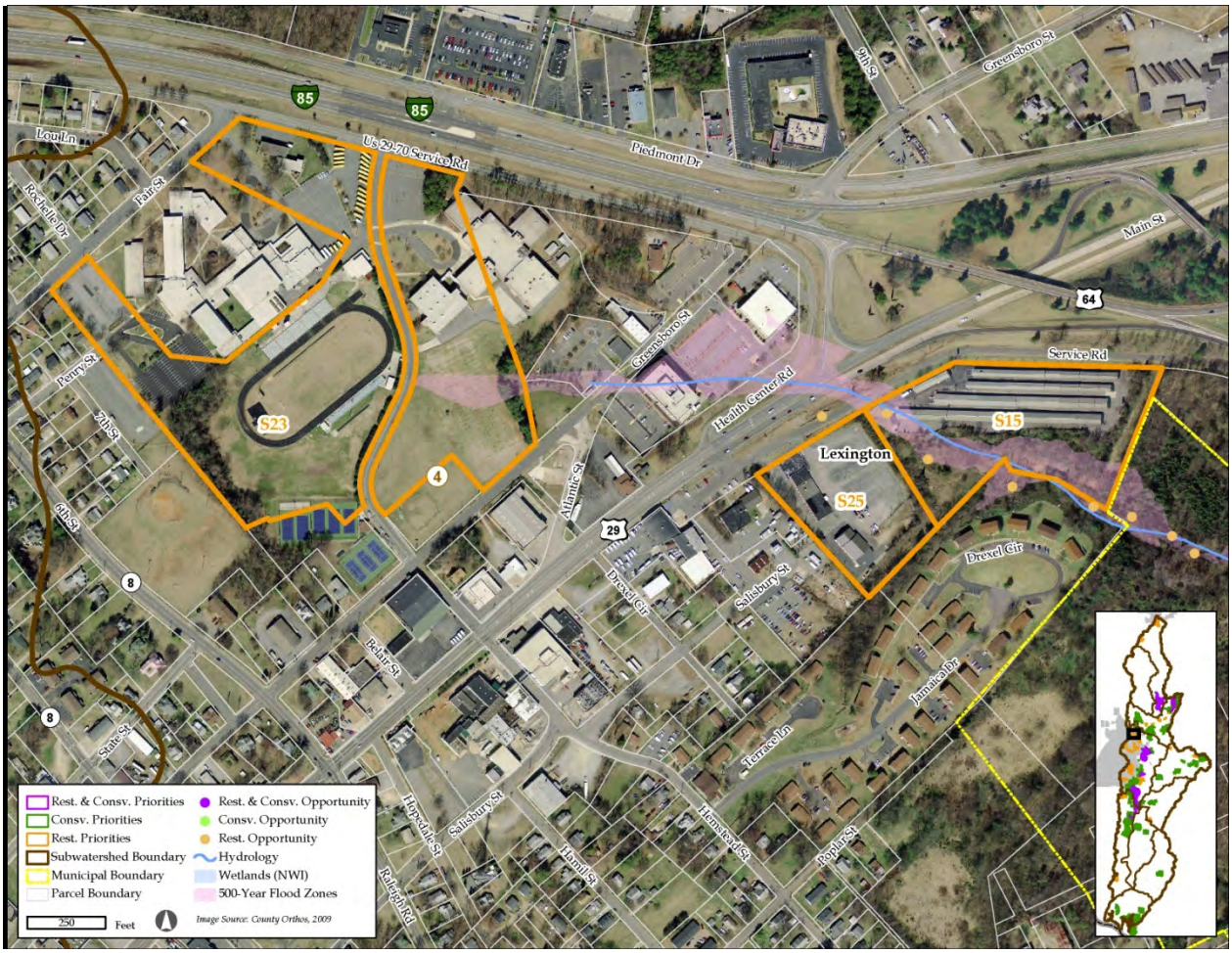
Cattle Access to Tributary, Across From C-20

Currently, despite being undeveloped and, in some cases, definitely abandoned to be open space, none of these lands are protected by cost-share programs or conservation easements. These steps should be taken as soon as possible, and can be amended should landowners determine that they would like to alter the management of the lands to accommodate recreation. These properties represent 183 acres of open space, 1.5 miles of streams and 18 acres of wetlands that could be protected within a mile of City limits. Tangible ecosystem services could be lost if these lands are not protected from development. Currently, Davidson County has no program to protect these lands for open space and/or recreation. An economic evaluation of this project and these other spaces like it in the watershed is one of the policy recommendations for this plan (see Recommendations 7 & 8). These programs should be administered by DC TRIP and/or Davidson County S&WCD.

These land management agreements won't prohibit development, but will require all intensive land management –including forestry and/or residential development – to be done sustainably and with the

protection of water resources and recreational potential as a priority. In return, the landowners will receive some financial compensation for these lands' ecosystem services. These lands hold current value as open spaces with pristine hydrology, and their potential development as a key recreational resource for the County, demonstrates the importance of such a project to the Lower Abbotts Creek watershed.

Project 15: Lexington High School



Recommended Actions:

- Contact school administrators and/or teachers immediately to gauge interest in addressing stormwater concerns (IC = 55%) with retrofits
  - Meet curriculum and practical needs on campus
  - Discuss school's position in the headwaters of a tributary
  - Pursue federal and state funding to implement projects
  - Promote the air and water quality benefits from increased tree cover on campus
- Ideal pilot project for DC FISH and Stormwater SMART
  - Gauge interest of surrounding landowners in participating in this project, beginning with the two priority properties identified here
- Enhance streams to return them to full function and health with federal and state funds

ATTRIBUTE	S-15	S-23	S-25	TOTAL
Site Location	Lexington			
Subwatershed	4			
Land Use	Commercial	Institutional		
Area (acres)	7.2	22.42	4.01	33.63
Linear Stream (Feet)	560	N/A	N/A	560
Lake Area (acres)	N/A			N/A
Impervious Surface Cover	3.4 47%	11.7 52%	2.8 70%	17.9 53%
Floodplain Area (acres)	2 28%	0.65 3%	0.01 0%	2.7 8%
Wetland Area (acres)	N/A	N/A	N/A	N/A
Forest Coverage (acres)	2.9 40%	1.9 8%	0.8 20%	5.6 17%

Project Assessment:

Stormwater Discharge Pipe (S-35)

Lexington High School offers one of the most potentially exciting projects in the Lower Abbotts Creek watershed. There is an immediate need to address stormwater runoff flowing to the headwater tributaries in Lexington, a need to serve curriculum needs with Stormwater SMART and DC FISH, and the potential to route the Davidson County greenway to the school with Safe Routes to Schools funds. Any and all of these projects have the potential to address the watershed's needs, the school's education needs, the public health needs for Lexington residents, and the alternative transit needs for the City and the County. If addressed through retrofits, there is the potential to double the water quality services these properties provide the watershed. The water quality grants that can enable this project to occur can be used as just a small piece of the funding strategy for the Lexington High School projects(s), as there are many sources available for addressing these diverse, related needs.

DC FISH is a federally-supported stream stewards program that PTCOG received funding for in 2011. It will be conducting targeted outreach through Davidson County, recruiting citizens interested in the StreamWatch program, and training them on how they may improve watershed conditions. It will focus on stewardship efforts including stream inspections as part of regular stream cleanups, how to conduct water quality monitoring, and coordinating these efforts with the government entity, establishing a direct relationship between the utility department(s) and its community. Schools are ideal locations for DC FISH to focus on due to the pre-existing PTCOG relationship has with many schools through its Stormwater SMART outreach and education program, and the curricula needs that many teachers must fulfill through watershed education. StreamWatch and educating students on watershed concepts address curricula

needs for biology, chemistry, geology, history, social studies, and many other classes. Some Davidson County schools also have afterschool environmental clubs or host Scout troops that may have an interest in working DC FISH.

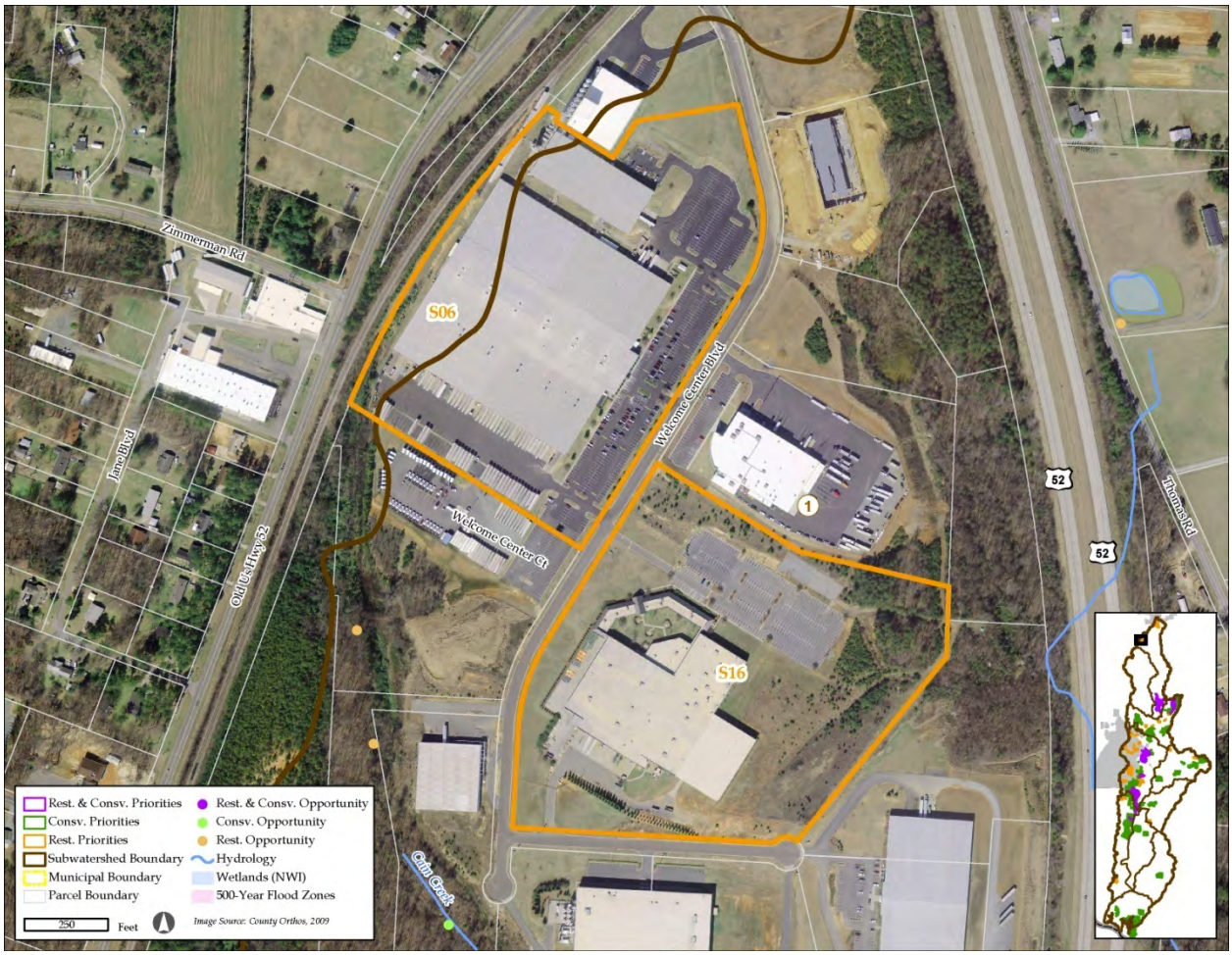
A greater boon to the educational needs at Lexington High School and for the Lower Abbotts Creek watershed would be to retrofit the campus with innovative stormwater BMPs. Constructed wetlands, bioretention cells, rain gardens, and sand filters would all greatly aid the campus by providing twice the stormwater services. Even planting more trees on the campus to shield it from the sun and absorb more rainfall will reduce the energy footprint and stormwater footprint of this 53% impervious, 34-acre site. There are many opportunities to beautify the campus, address its environmental needs, make it a more active learning center for students, connect it with the neighborhood better, and address the respiratory health needs of the area through such tactics.

Immediate Stormwater Impacts to Stream Structure (S-35)

The City of Lexington is in immediate need of a demonstration project to show the benefits of stormwater management and retrofitting highly-impervious surfaces with engineering solutions that are both attractive and effective at reducing the stormwater footprint. The City occupies only 9% of the watershed-at-large, but occupies 100% of Subwatershed 4, and with an average impervious coverage of 15% is indicative of poor stream conditions. The poor conditions are evident immediately downstream of the school. There is documentation of the direct discharging of stormwater to these small streams from the school's campus, which will continuously stress the stream and degrade its function and health. These impacts are additive and seen in much starker and worse examples farther downstream of these headwaters – Rich Fork Creek offers a prime example of how the impacts of many small watershed insults can lead to massive stormflows and watershed degradation. Retrofitting the high school campus with stormwater BMPs will have immediate and profound benefits for these degraded tributaries and create on-campus outdoor learning labs for students. If interested, PTCOG and the City of Lexington will work with school administrators and teachers to ensure that any BMP placed on campus will be useful to the classes and benefit the school. Such changes on campus could lead to other changes in the surrounding areas, including a neighborhood rain garden and rain barrel giveaway program, connection to the Davidson County greenway, and an urban greening program that would plant trees throughout the City, addressing Lexington's non-attainment concerns for ozone and particulate matter, and their stormwater, nutrient and sediment concerns in Lower Abbotts Creek. These investments can largely be made with federal and state environmental, education, public health, and transportation grants.

Stream Restoration Need (S-15)

Project 16: Welcome Center Industrial Park



Recommended Actions:

- Contact landowners immediately to gauge interest in retrofitting property to manage stormwater (IC = 66%)
    - Draft a design of how the restored property will be enhanced by stormwater practices
    - Pursue grant funds to implement stormwater projects
    - Discuss the Park's important headwaters location
- Restore eroded streams to full health and function
- Investigate partnerships with neighboring school to use any stormwater management on these properties as educational tools enabling teachers to meet their curriculum needs

ATTRIBUTE	S-06	S-16	TOTAL
Site Location	Davidson County		
Subwatershed	1		
Land Use	Industrial		
Area (acres)	22.5	22.49	44.99
Linear Stream (Feet)	N/A		N/A
Lake Area (acres)	N/A		N/A
Impervious Surface Cover	17.5 45%	12.3 55%	29.8 66%
Floodplain Area (acres)	N/A	N/A	N/A
Wetland Area (acres)	N/A	N/A	N/A
Forest Coverage (acres)	0.4 2%	2.1 9%	2.5 6%

Project Assessment:

Stream Impacts from Stormwater Runoff

The Welcome Center Industrial Park represents but an exciting opportunity to demonstrate sustainable methods of development and stormwater management in the headwaters of the Lower Abbotts Creek watershed, a potential problem to water quality if left unaddressed. There are already signs that the stormwater from these recently-developed industrial lands are having adverse impacts to water quality, degrading hydrologic stability due to a lack of stormwater BMPs. However, these issues are still minimal and can be easily rectified with some changes to land management and investment in a stormwater BMP. The large areas of impervious cover (30 acres total) on these parcels offer ample opportunities to invest in stormwater mitigation practices that can address these runoff issues and serve as a guiding example to other industrial and commercial developments in the watershed and Davidson County.

Subwatershed 1 is one of the highest growth areas in the Future Growth Scenario for the Lower Abbotts Creek watershed, largely due to the growth of the Town of Midway, a recently incorporated community in northern Davidson County. It is necessary for the Town to recognize the valuable location it occupies in the watershed and its potential impacts upon downstream water quality, including that of High Rock Lake, without impacting its potential for growth.

It is recommended that these properties be retrofitted so that they can mitigate stormwater runoff at pre-development levels. This may best be done with a few smaller BMPs that can protect the two tributaries these properties drain to. Using federal and state grants to create stormwater BMPs on these properties, highly creative and effective designs could be applied to these parcels, and enhance their value through improvements to the property aesthetics, working environment, energy footprint (especially from

improving shade cover), and stormwater treatment. If sustainability can be demonstrated in new developments in the headwaters of Lower Abbotts Creek, it could be a guiding principle for the entire watershed.

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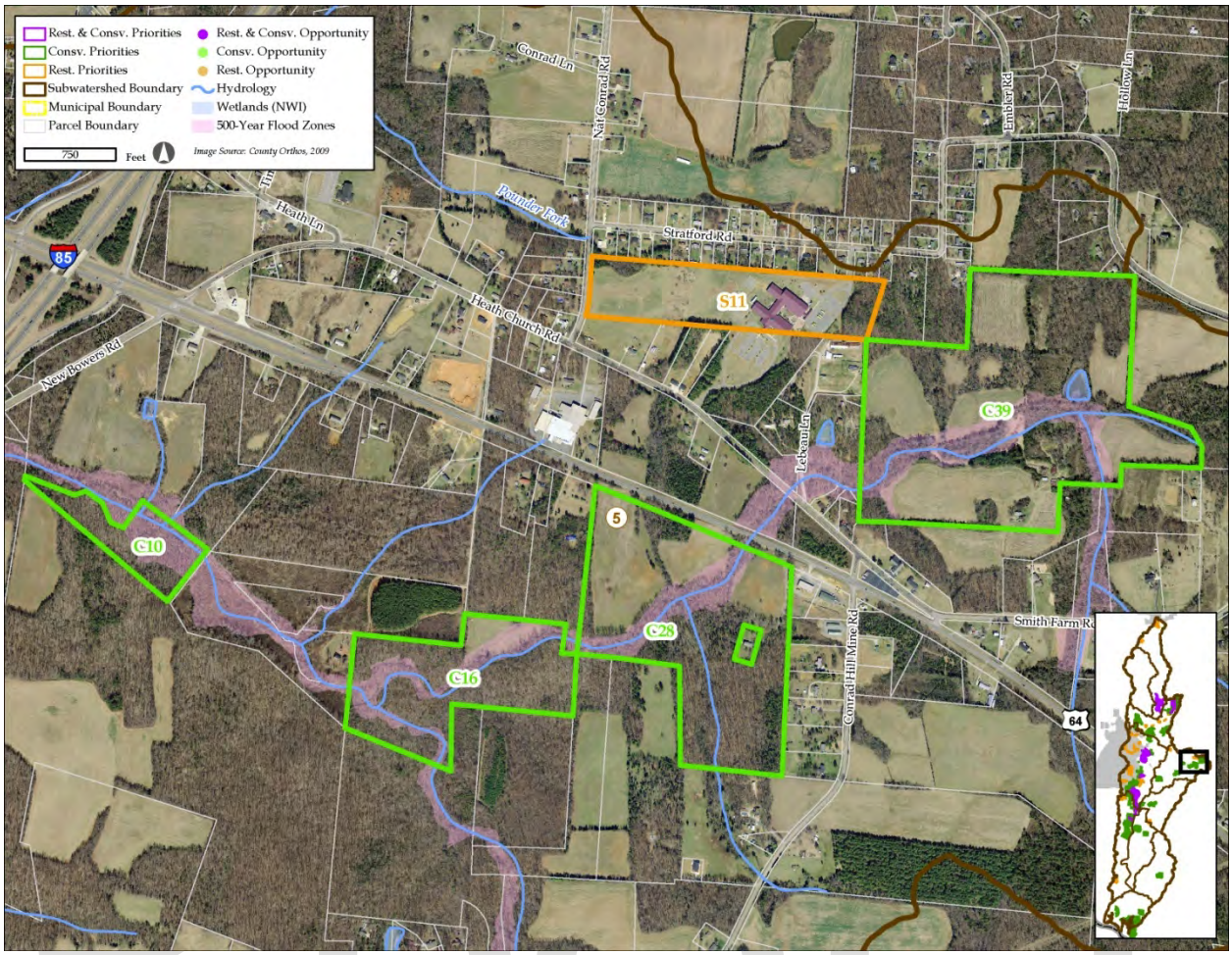
Project 17: Pounder Fork Headwaters



Recommended Actions:

- Contact landowners immediately to gauge interest in entering into voluntary agricultural district tax deferment program
    - Improve stream buffers and provide livestock alternative water sources
- Contact school to gauge interest in managing on-campus stormwater concerns (IC = 20%) with retrofits
    - Ensure that any projects will meet academic and practical needs
    - Pursue federal and state funding to implement projects
- Ensure that any forestry operations use a certified sustainable forester

ATTRIBUTE	C-10	C-16	C-28	C-39	S-11	TOTAL
Site Location	Davidson County					
Subwatershed	5					
Land Use	Forest	Vacant	Vacant	SFR	Instit.	
Area (acres)	11.42	33.86	59.84	93.93	26.6	225.65
Linear Stream (Feet)	853	3,093	3,176	3,743	N/A	10,865
Lake Area (acres)	N/A			1	N/A	1
Impervious Surface Cover	N/A	N/A	0.2 0%	0.3 0%	5.4 20%	5.9 3%
Floodplain Area (acres)	5.23 46%	8.8 26%	8.41 14%	15 16%	N/A	37.4 17%
Wetland Area (acres)	N/A	N/A	N/A	0.96 1%	N/A	1.0 0%
Forest Coverage (acres)	11.42 100%	30 89%	39.5 66%	52.1 55%	4.6 17%	137.6 61%

Project Assessment:

This project displays the challenges of protecting natural resources in the rural areas of Davidson County. All of these conservation properties are potentially eligible for cost-share funds and/or being placed under a conservation or agricultural easement, but they would be much more desirable and effective if they could be grouped together and managed as a single project. Currently, federal and state laws do not permit cost-share programs to recognize such creative and cooperative solutions. In fact, they disallow even the same owner with slightly different personal information (John Doe vs. John X. Doe) to group their own properties into a cost share or conservation program as a single unit, rejecting many valuable mid-sized properties from such programs. Consequently, the owners of these four conservation properties will have to progress through the enrollment and management process separately, rather than as a single unit of owners of hydrologically-valuable land. Such stumbling blocks imperil the 200 acres of open space and 2 miles of streams present on these lands.

Davidson County S&WCD should contact these landowners as soon as possible to gauge their interests in enrolling in an agricultural or conservation cost-share program. These properties are host to 37 floodplain acres in the headwaters of Subwatershed 5, and appear largely unmanaged, indicating that they might have valuable ecological habitat. It is clear that their lack of disturbance is stabilizing and benefiting the watershed, remaining undeveloped and permeable to precipitation. It is the loss of such lands in the Rich Fork Creek watershed to urban development that has led to the dramatically degraded conditions seen in that Creek and Lower Abbotts Creek. The loss of these services needs to be recognized by all watershed communities, and protected for the health of the watershed and its residents. This would be greatly aided by an economic evaluation of the open spaces and agricultural lands in Davidson County, and the ecosystem services they provide and annually economic revenue they generate.

The one stress property on this project is a Davidson County school, which is an exciting opportunity to retrofit a highly impervious (20%) property with stormwater BMPs that can improve its environmental footprint and its campus. Cisterns can be used to store rainwater for irrigation, either on large or small scales. Rain gardens can address small runoff volumes and add to the aesthetic value of the school's

property. Constructed wetlands work well in Piedmont soils and can accommodate the runoff from the school's parking lot and drives, treating the automobile pollutants and fertilizer nutrients, while serving as an on-campus field laboratory for science classes. Bioretention cells can seamlessly integrate with campus uses while treating large volumes of runoff. There are also other, more innovative approaches to managing stormwater, including green roofs, treatment trains of stormwater BMPs, and large-volume underground storage and re-use of rainwater. All of these approaches will intercept runoff before it reaches these sensitive headwater streams, stabilizing and protecting them. Davidson County school administrators and the teachers at this school need to be contacted about their interest in retrofitting this campus. If interested, a redesign plan will be drafted and presented to them for approval, and then federal and state funds can be pursued to finance the implementation of the campus redesign.

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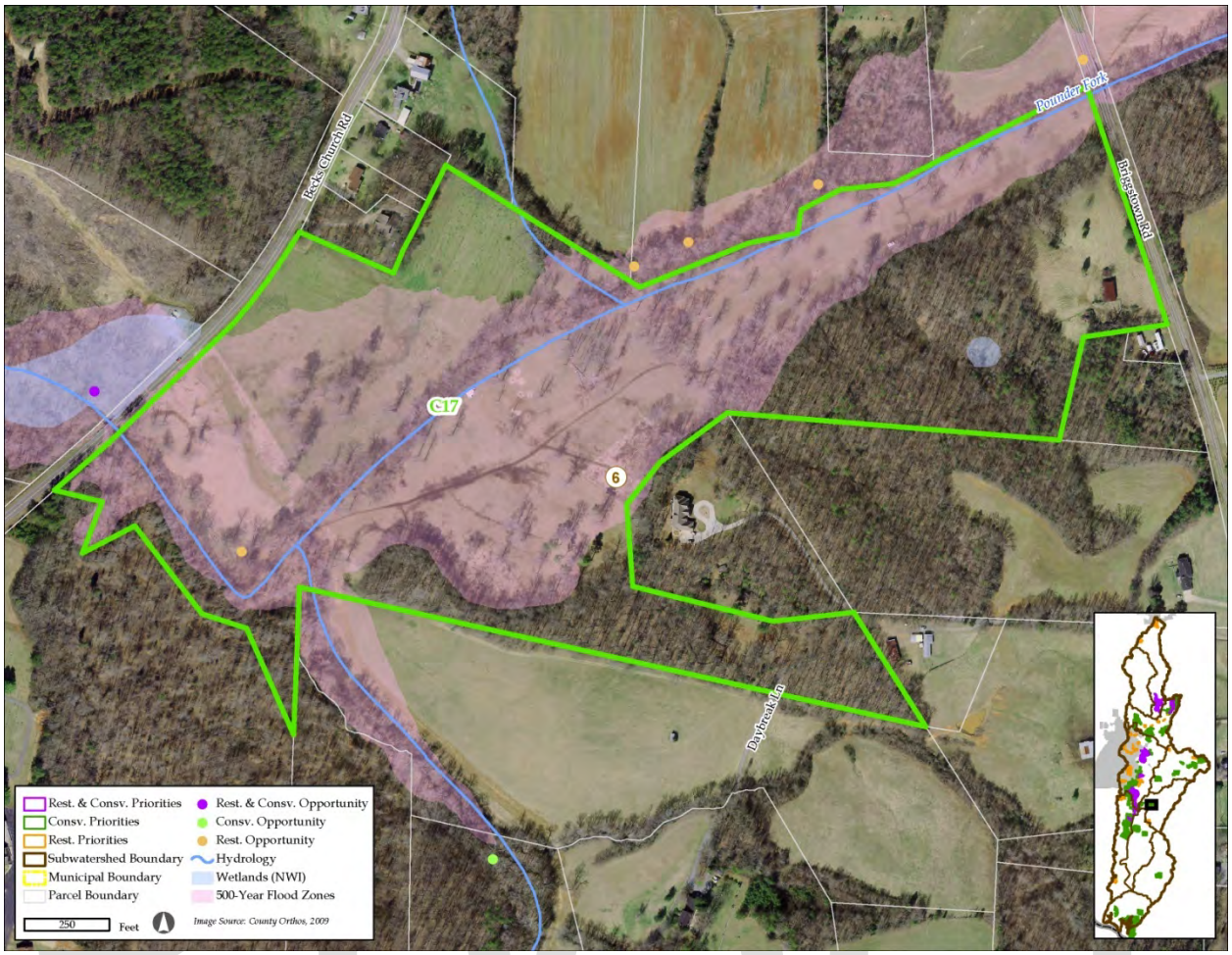
Project 18: Pounder Fork Conservation Site



Recommended Actions:

- Contact landowners immediately about enrolling in the Voluntary Agricultural District tax deferment program
- Restore buffers to streams and promote no-till cropping to landowners
- Ensure that any timber operations require a certified sustainable forester

ATTRIBUTE	C-17
Site Location	Davidson County
Subwatershed	6
Land Use	Vacant
Area (acres)	63.97
Linear Stream (Feet)	4,122
Lake Area (acres)	N/A
Impervious Surface Cover	N/A
Floodplain Area (acres)	37.29 58%
Wetland Area (acres)	0.16 0%
Forest Coverage (acres)	28.7 45%

Project Assessment:

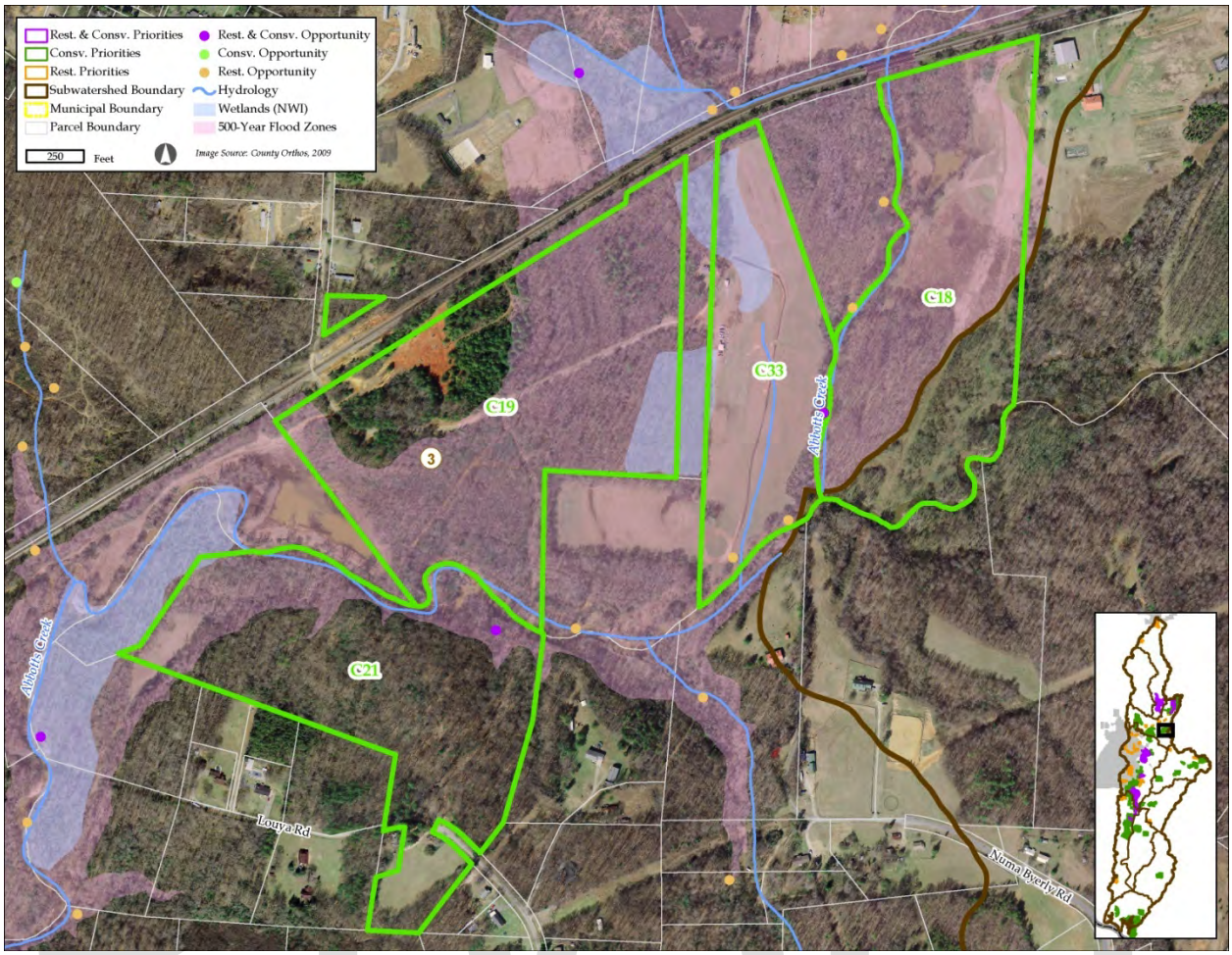
With 29 acres of mature Piedmont forest and over 4,000 linear feet of sensitive headwaters streams, the main management recommendation for this property is to improve its tree cover and ensure that it is not developed for any type of intensive land use. It is strongly recommended that the DC S&WCD contact the landowner to advise them on sustainable practices, and how the landowner might benefit from cost-share programs and/or the VAD tax deferment program. They could also discuss using the site for passive recreation or receiving cash in exchange for placing a conservation easement on it.

There is no reason that conserving such property must be a selfless investment: these ecosystem services provide tangible benefits to downstream residents that have economic value. It is important to ensure that the property is not developed by placing it under a conservation easement, but it is also important to ensure that the easement does not sacrifice the potential for the landowner to participate in a conservation-based free market, such as a Transfer of Development Rights program.

This property is somewhat typical of the Pounders Fork area, with large areas undeveloped and used mainly for agriculture and hunting. Many of the neighboring parcels are enrolled in some sort of sustainable land management programs to ensure that they protect water quality, as well as ensuring that the properties won't be subdivided and developed. It would be a boon for the watershed if this property that hosts the confluence of two headwater tributaries was similarly protected as open space.

Too small to be of interest to a land trust, it would be a worthy investment for Davidson County's recreational development. It could be developed in partnership with the landowner to host camping, hiking, mountain biking, or many other purposes. The conservation easement would explicitly address these uses and compensate the landowner in some way for this use. Currently, Davidson County's has no Recreation Department, and only supports a part-time position for DC TRIP. To best protect open spaces and agricultural lands – as stated in the *Davidson County Land Development Plan* – the County will need to invest in and/or incentivize the protections of these lands and resources. The benefits for the watershed would be enormous.

Project 19: Abbotts Creek Conservation Site



Recommended Actions:

- Immediately contact landowners to gauge interest in placing conservation easements and/or greenways on their lands
    - Ideal greenway section and possible boat access point
- Highlight the high quality wetlands and stream habitat on these properties
    - Restore buffers to tributary on C-33
- Ensure that all recreation on properties (hiking, hunting, etc.) has access to trash disposal
- Ensure that any land management is done sustainably
- Restore the Creek and develop as a paddle trail

ATTRIBUTE	C-18	C-19	C-21	C-33	TOTAL
Site Location	Davidson County				
Subwatershed	3				
Land Use	Vacant		Forest	Vacant	
Area (acres)	30.02	40.95	31.7	18.32	120.99
Linear Stream (Feet)	1,820	795	1,585	2,884	7,084
Lake Area (acres)	N/A				N/A
Impervious Surface Cover	N/A	1.1 3%	0.1 0%	N/A	1.2 1%
Floodplain Area (acres)	29.98 97%	32.01 78%	9.16 29%	18.32 100%	89.47 74%
Wetland Area (acres)	N/A	2.15 5%	0.14 0%	2.38 13%	4.67 4%
Forest Coverage (acres)	16.8 56%	38.3 94%	28.4 90%	2.3 13%	85.8 71%

Project Assessment:

These four parcels are in near-pristine condition, and provide valuable floodplain and ecological habitats for the watershed. These benefits have been noted by at least some of the landowners, who have established hunting grounds on these properties. There is one property that is cleared, and needs stream buffer restoration, but it is a small tributary that merely needs to not be mowed to restore its health. These lands have also been identified as being along a primary route for the proposed Davidson County greenway, and are crucial to connect the second phase of the primary greenway, which will extend from Lake Thom-a-Lex to Lexington's Finch Park. The CWMTF has given the County $241,000 to construct the first phase of this project, and these properties would be a part of the second phase. Should the landowners be amenable to allowing access the stream corridor, these properties would be extremely valuable recreational and environmental resources, giving the public more opportunities to have local exercise options and offering passive watershed outreach by exposing the public to the treasures a healthy watershed and stream offer their residents. This greenway could also be developed as a blueway that will connect Lexington to High Rock Lake, enhancing the economies of the lakeside communities and the City.

Tributary Stream With Poor Buffer Conditions, Downstream of C-21

Pristine Floodplain Forest Along Lower Abbotts Creek (C-18 & C-33)

Such access would have to be recognized financially, either through a tax credit, an easement, or outright purchase of the greenway corridor. Access could also be donated by landowners. The benefits would quickly outweigh the costs of such investments, and be seen in the health of the watershed's residents and environment. These streams are channelized due to stormwater flows from Rich Fork Creek, and these structural needs would have to be addressed simultaneously with the greenway construction. Such a project could be funded through a combination of CWMTF, PART-F, 319, and agricultural cost-share programs, as well as any funding DC TRIP might be granted from the Davidson County general fund.

Channelized Creek with Log Jams Due to Upstream Stormwater (C-18)

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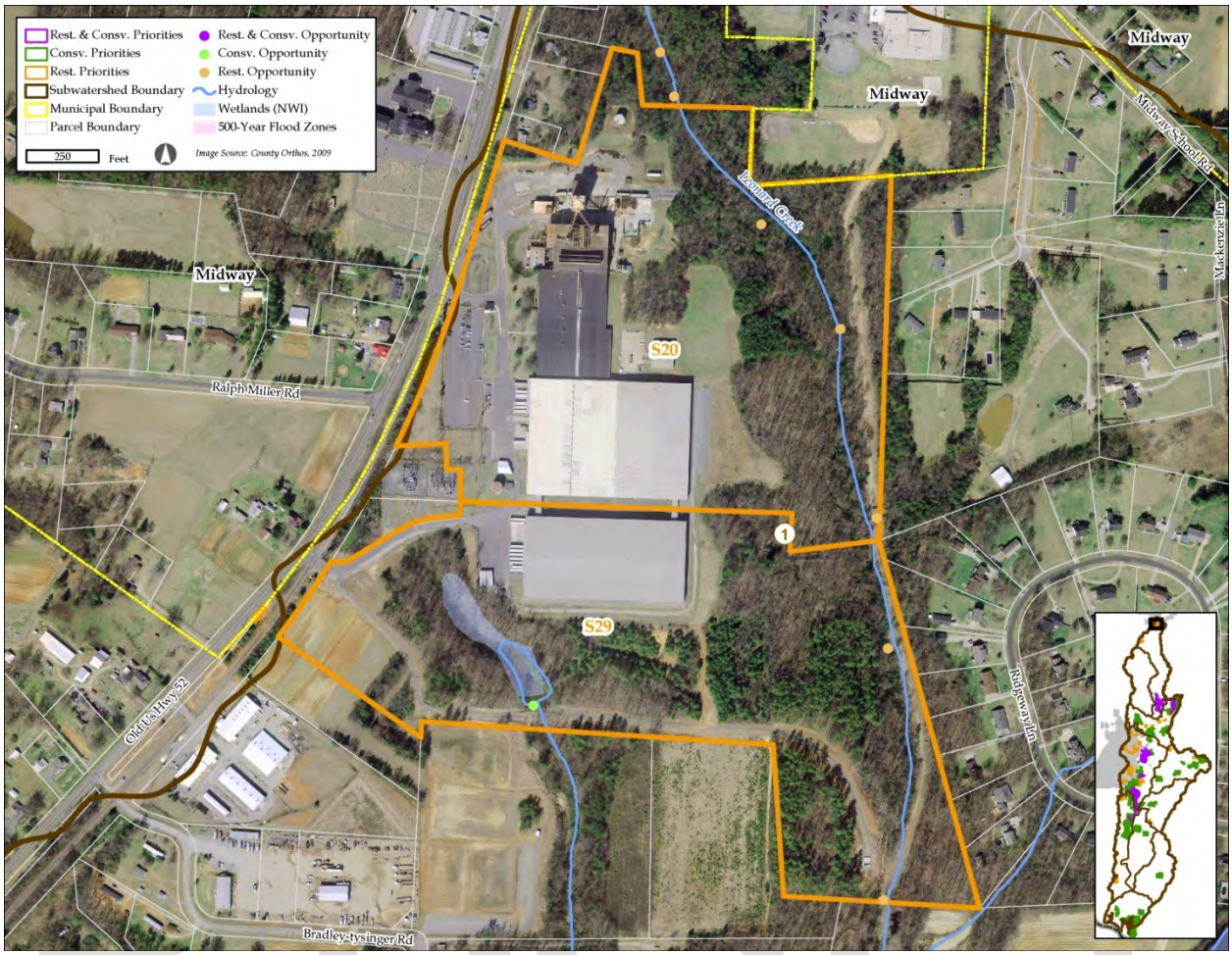
Project 20: Midway Glass Factory



Recommended Actions:

- Contact landowners to gauge landowner interest in retrofitting properties to address stormwater concerns (IC = 33%)
    - Ensure that any project meets landowner concerns for properties (aesthetics, nuisances, etc.)
    - Draft stormwater BMP designs for properties
    - Contact neighboring school to seek interest in partnering on a project to meet curriculum needs and student interests
- Contact utility companies to address impacts to stream conditions

ATTRIBUTE	S-20	S-29	TOTAL
Site Location	Davidson County		
Subwatershed	1		
Land Use	Industrial		
Area (acres)	44.33	41.43	85.76
Linear Stream (Feet)	1,716	1,376	3,092
Lake Area (acres)	N/A	1	1
Impervious Surface Cover	16.7 38%	10 24%	26.7 31%
Floodplain Area (acres)	N/A	N/A	N/A
Wetland Area (acres)	N/A	1.07 3%	1.07 1%
Forest Coverage (acres)	18 41%	24.8 60%	42.8 50%

Project Assessment:

The Midway Glass Factory represents an exciting opportunity to demonstrate sustainable methods of development and stormwater management in the Lower Abbotts Creek watershed, but a potential problem to water quality if left unaddressed. Currently the impacts from these highly impervious industrial properties are not having any obvious adverse impacts to water quality, but it is important to ensure that this level of hydrologic stability and health persist. Subwatershed 1 is one of the highest growth areas in the Future Growth Scenario for the Lower Abbotts Creek watershed, largely due to the growth of the Town of Midway, a recently incorporated community in northern Davidson County. It is necessary for the Town to recognize the valuable location it occupies in the watershed and its potential impacts upon downstream water quality, including that of High Rock Lake, without impacting its potential for growth.

The large areas of impervious cover (26.7 acres of 86 acres total) on these parcels offer ample opportunities to invest in stormwater mitigation practices that can serve as the guiding example to other industrial and commercial developments in the watershed and Davidson County. Given past growth in Midway, the presence of such examples will be important for its future development. Thankfully, both of these sites have taken the best first step in development that they could and completely avoided all water features on their parcels, buffering them with large forested areas. The use of buffers has effectively protected these sensitive headwaters from runoff from all but the most intense rainfall (i.e. hurricanes). This example should be shared with the energy utility company, which has an easement here and repeatedly crosses the stream in this sensitive headwaters region, directly degrading stream health.

Stream Crossing on Utility Easement (S-29)

There are still opportunities to treat the nutrients in the runoff from the fertilized lawns and the parking lots. Using federal and state grants to create stormwater BMPs on these properties, highly creative and effective designs could be applied to these parcels, and enhance their financial value through improvements in the aesthetics, working environment, energy footprint (especially from improving shade cover), and stormwater treatment. Due to the rural nature of this site, these practices will be useful for a diverse audience. Adjacent to this property is an agricultural property enrolled in the Davidson County VAD program, which requires them to use sustainable harvesting practices and BMPs that prevent agricultural runoff from reaching streams. If sustainability can be demonstrated in new individual developments in the headwaters of Lower Abbotts Creek, the whole headwaters region could be a guiding example for the entire watershed.

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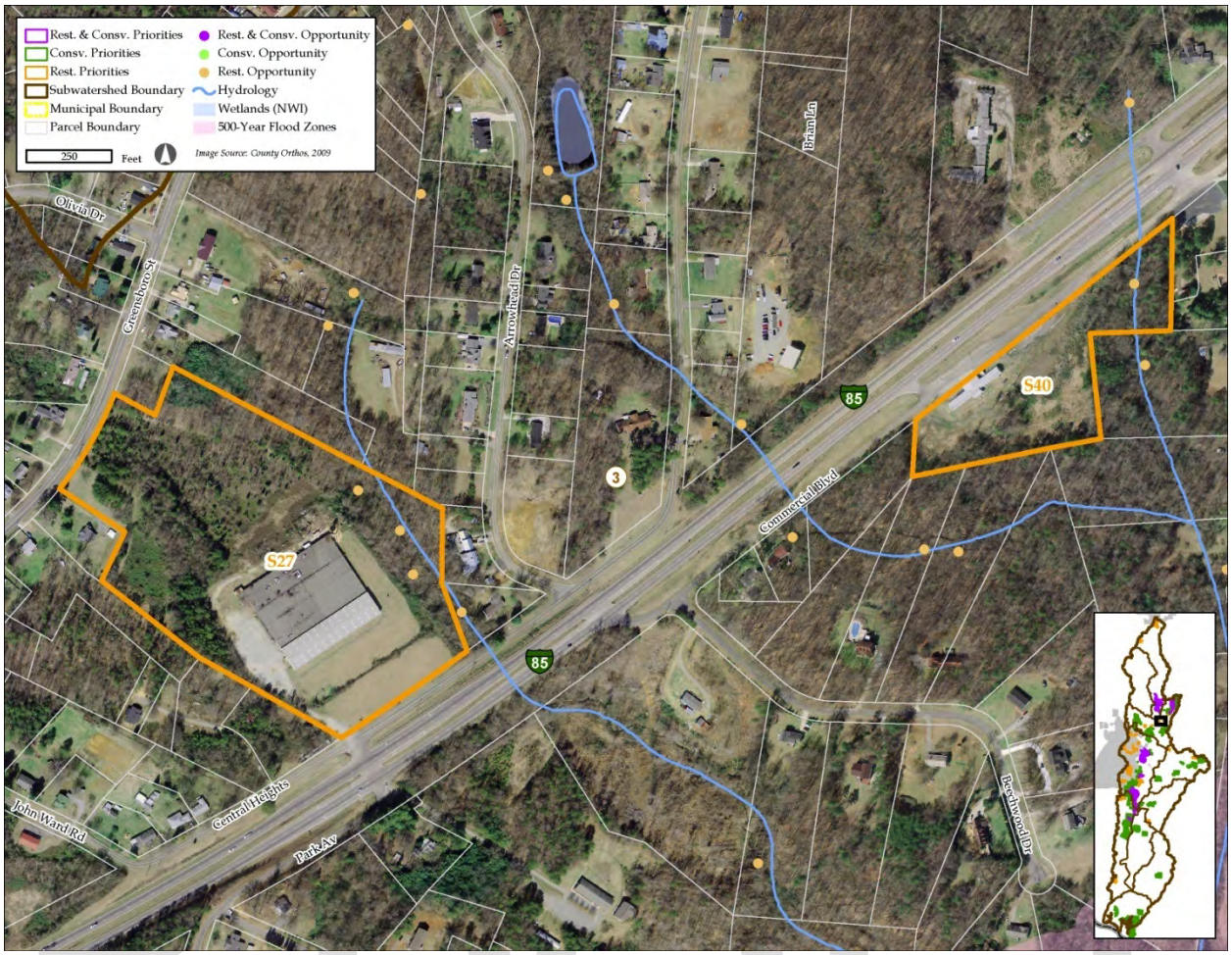
Project 21: Business 85 Retrofit



Recommended Actions:

- Contact landowners to investigate interest in retrofitting properties to address stormwater (IC = 16%) and trash concerns
    - Clean up trash/debris piles on S-27
    - Ensure that any retrofits meet landowner interest for the properties, and improve the lands and waters
    - Address current infrastructure concerns on S-27
    - Highlight any projects that face I-85 BUS, to increase interest and awareness of stormwater management

ATTRIBUTE	S-27	S-40	TOTAL
Site Location	Lexington ETJ	Davidson County	
Subwatershed	3		
Land Use	Industrial	Commercial	
Area (acres)	16.85	5.05	21.9
Linear Stream (Feet)	374	259	633
Lake Area (acres)	N/A		N/A
Impervious Surface Cover	3.1 18%	0.4 8%	3.5 16%
Floodplain Area (acres)	N/A	N/A	N/A
Wetland Area (acres)	N/A	N/A	N/A
Forest Coverage (acres)	10 59%	2.6 51%	12.6 58%

Project Assessment:

This project is a prime example of the environmental legacy of Lexington's industrial past. This former paint factory (S-27) just outside the city limits on I-85 BUS has less than 400 feet of stream crossing its area, but the impacts to water quality and stream stability are devastating, even though only 16% of this 17-acre property is impervious. The stormwater infrastructure discharges directly to the stream, but is elevated, causing channelization and erosion in the receiving stream. Adding further physical stress to the headwater streams and this catchment are the large masses of trash and debris that were dumped off the site (but not the property). There are large piles of innocuous trash – cinder blocks, cement bricks, tires, etc. – that appear to either be associated with small construction project or were perhaps discarded from a salvaging operation. Removing these piles from the property would be extremely helpful at addressing the stream channelization concerns, as stormwater runoff will have more access to more surface and is less likely to be channelized and highly energetic. There are also concerns of the content of the stormwater runoff – in the photos, it has a bright orange appearance and appears to have corroded the lip of the discharge pipe, though that may be caused by years of stress to the structure.

Trash/Debris and Discharge Concerns (S-27)

Channelized Stream on S-40

S-40 is an active business, and can offer a road map for how old industrial landowners such as those of S-27 could approach the stormwater issues on their lands. 8% of the 5-acre property is covered by impervious surfaces, all far from the streams, which is a great start. The streams are still channelized due to stormwater runoff from the highway, which is not the landowners' responsibility. However, grant funds could be used to manage the little bit of stormwater from the S-40 parking lot and business as well as that of the highway, and all that would be needed is the space to place a bioretention cell(s) on the property. If placed close to the highway, these BMPs would be excellent educational tools, showing the aesthetic and economic benefits to property owners who invest in managing stormwater. These BMPs would be designed to be attractive and no more maintenance than is currently spent on the property. These same approaches and principles could then be translated to more stressful industrial and commercial properties throughout the Lower Abbotts Creek watershed, especially in and around Lexington (i.e. S-27). Though stormwater management is more immediately needed upstream in Rich Fork Creek, it is still a priority concern for Lower Abbotts Creek, especially in Lexington. Publicly-funded grant projects on enthusiastic landowners' properties are needed to lead the way and show their peers how these measures can be easily implemented and serve the interests of the property owner as well as the watershed.

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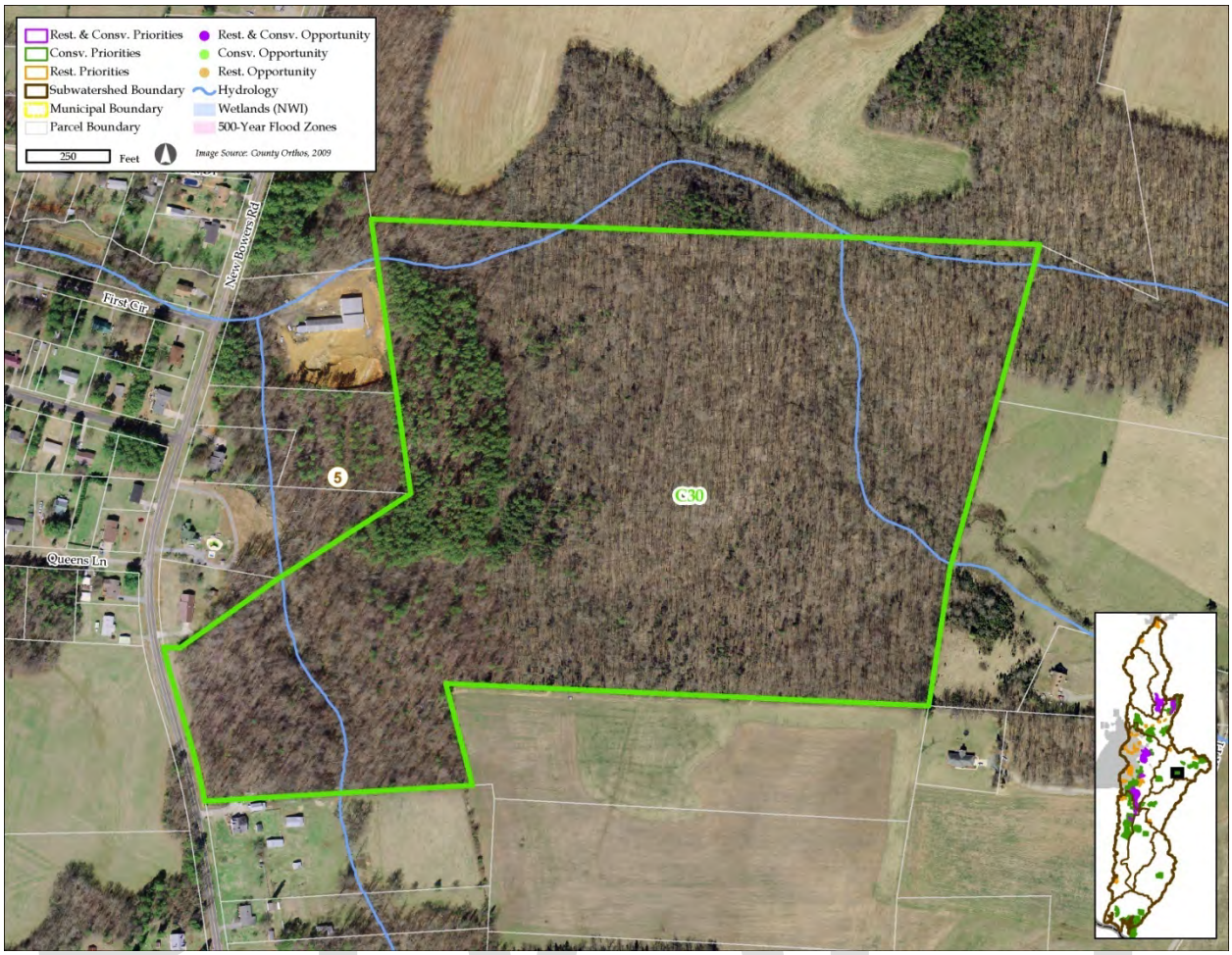
Project 22: Ideal Rural Conservation Site



Recommended Actions:

- Contact landowner immediately to gauge interest in joining the Voluntary Agricultural District tax deferment program
- Investigate interest in developing property as a passive recreation site (hiking, camping, hunting) and protecting it from development
- Ensure that any land use be sustainable
    - All timber operations must use a certified sustainable forester

ATTRIBUTE	C-30
Site Location	Davidson County
Subwatershed	5
Land Use	Forest
Area (acres)	66.91
Linear Stream (Feet)	2,973
Lake Area (acres)	N/A
Impervious Surface Cover	N/A
Floodplain Area (acres)	N/A
Wetland Area (acres)	N/A
Forest Coverage (acres)	66.8 100%

Project Assessment:

At 67 acres of untouched mature Piedmont forest with almost 3,000 linear stream feet, the main management recommendation for this property is to ensure that it is not developed for any type of intensive land use. If it is to be timbered by the landowner, it is strongly recommended that the DC S&WCD advise them to use a consulting forester to ensure that the site is harvested using sustainable practices and that the landowner receive top dollar for the harvest. It is also recommended that the DC S&WCD staff discuss other land use options with the landowner, including using the site for passive recreation or receiving cash in exchange for placing a conservation easement on it. It is not clear why this forested property is not enrolled in the VAD program. If it is to be timbered, the landowner could benefit from the tax deferment granted participating landowners, and protect water quality at the same time. Two adjacent agricultural properties are in tax deferment programs, and offer examples to this landowner of the financial benefits of being in the programs.

There is no reason that conserving such property must be a selfless investment: these ecosystem services provide tangible benefits to downstream residents that have economic value. It is important to ensure that the property is not developed by placing it under a conservation easement, but it is also important to ensure that the easement does not sacrifice the potential for the landowner to participate in a conservation-based free market, such as a Transfer of Development Rights program.

This property is in the suburban Subwatershed 5, where development is always a pressing issue. However, the current lack of development is protecting natural resources and saving the City and County money due to the lack of need for infrastructure. Too small to be of interest to a land trust, this property would be a worthy investment for Davidson County's recreational development. It could be developed in partnership with the landowner to host camping, hiking, mountain biking, or many other purposes. The conservation easement would explicitly address these uses and compensate the landowner for this use. Currently, Davidson County's has no Recreation Department, and only supports a part-time position for DC TRIP. To best protect open spaces and agricultural lands – as stated in the *Davidson County Land Development Plan* – the County will need to invest in and/or incentivize the protections of these lands and resources. The benefits for the watershed would be enormous.

Project 23: Rural Residential Site

Recommended Actions:

- Contact landowner immediately to gauge interest in joining the Voluntary Agricultural District tax deferment program
    - Surrounded by VADs
    - Need to restore stream buffer on property and encourage no-till cropping
- Ensure that any timber operations on property use sustainable forestry practices
- Investigate interest in developing property as a passive recreation site (hiking, camping, hunting) and protecting it from development

ATTRIBUTE	C-37
Site Location	Davidson County
Subwatershed	5
Land Use	SFR
Area (acres)	75.01
Linear Stream (Feet)	3,470
Lake Area (acres)	N/A
Impervious Surface Cover	0.1 0%
Floodplain Area (acres)	N/A
Wetland Area (acres)	N/A
Forest Coverage (acres)	42 56%

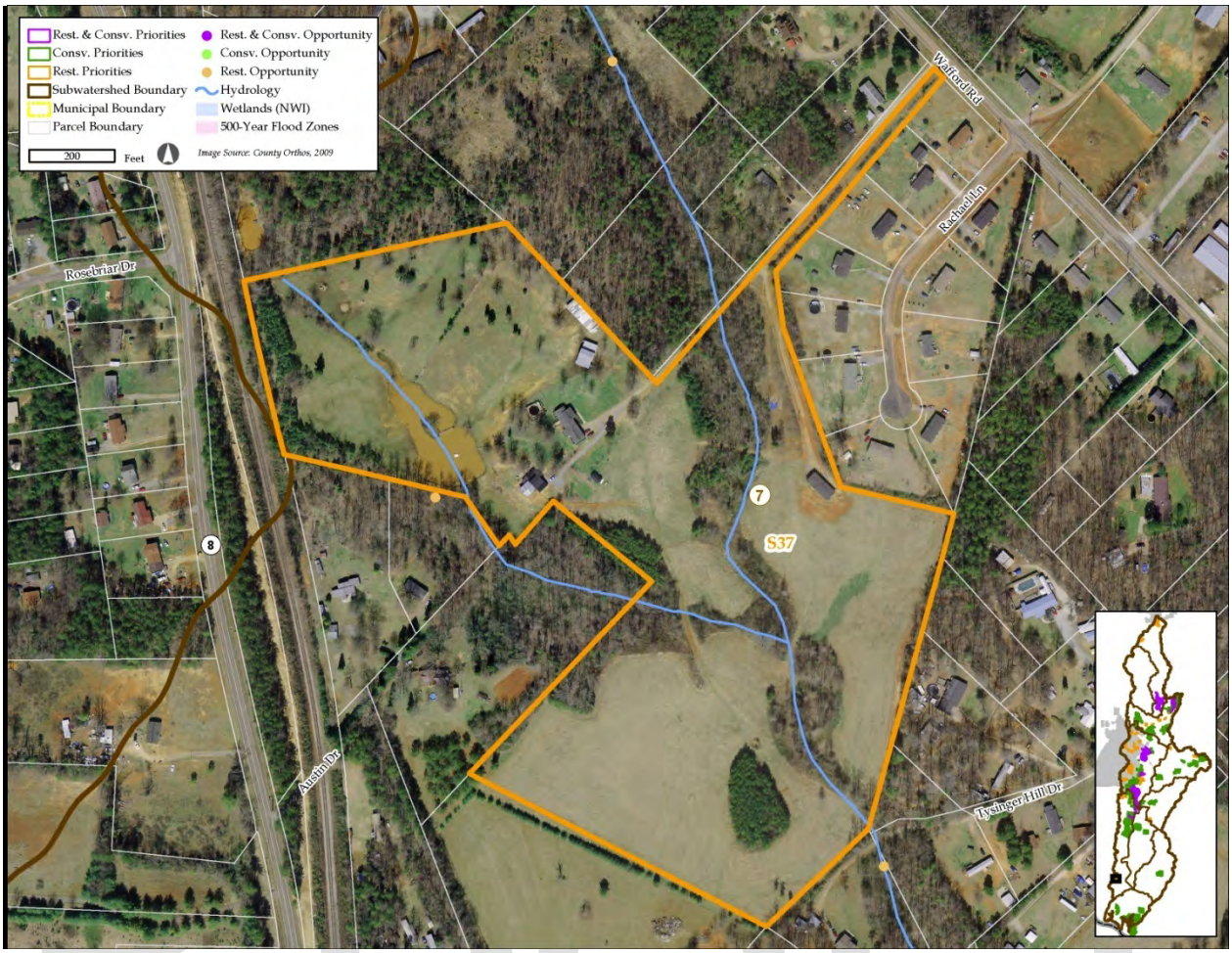
Project Assessment:

This residential property is one of the only properties not protected by the Davidson County VAD program in this immediate area. At 75 acres and featuring over a half-mile of streams with decent stream buffers only 1.5 miles from the City limits, this property is the ideal rural property for conservation. However, at 75 acres of largely cleared lands, it is unlikely that a land trust or the NC WRC will be interested in purchasing a conservation easement for the property. It is extremely vulnerable to subdivision and eventual development. If divided once and converted into residential and agricultural properties, this land could be enrolled into a VAD program for timber, though this would require the landowner to allow reforestation of those areas currently cleared.

This property is in the suburban Subwatershed 5, where development is always a pressing issue. However, the current lack of development is protecting natural resources and saving the City and County money due to the lack of need for infrastructure. Too small to be of interest to a land trust, this property would be a worthy investment for Davidson County's recreational development. It could be developed in partnership with the landowner to host hunting, hiking, mountain biking, or many other purposes. The conservation easement would explicitly address these uses and compensate the landowner for this use. Currently, Davidson County's has no Recreation Department, and only supports a part-time position for DC TRIP. To best protect open spaces and agricultural lands – as stated in the *Davidson County Land Development Plan* – the County will need to invest in and/or incentivize the protections of these lands and resources. See Policy Recommendation 7 & 8 for more details on this topic. The benefits for the watershed could be enormous.

At its fundamental core, the most important management recommendation for this property to protect the watershed is to ensure that any development that occurs on this headwater stream is minimal and non-intensive. Ideally, it would not be subdivided or developed at all, but allowed to reforest and return the improved air and water quality to the area. However, sustainable development practices will allow both economic use while preventing stormwater and sediment problems in Lower Abbotts Creek.

Project 24: Lakeside Retrofit Site



Recommended Actions:

- Contact landowner to gauge interest in placing the property under a conservation and managing it to improve water quality
    - Improve stream buffers on-site
    - Opportunity to capture stormwater runoff from nearby subdivisions
- Potential DC FISH project, with the stream and pond being monitored and cared for by immediate neighbors and landowner
- Restore streams with federal and state grant funds

ATTRIBUTE	S-37
Site Location	Davidson County
Subwatershed	7
Land Use	Mobile Home
Area (acres)	31.22
Linear Stream (Feet)	2,405
Lake Area (acres)	N/A
Impervious Surface Cover	1.3 4%
Floodplain Area (acres)	N/A
Wetland Area (acres)	N/A
Forest Coverage (acres)	6.8 22%

Project Assessment:

This project is an ideal pilot study for the DC FISH outreach program that will begin work in Fall 2011: it is zoned for mobile home use (an illicit discharge concern in this watershed), is immediately surrounded by residential homes, is along almost 2,500 feet of tributary streams that are easily accessible, and could be enhanced through simple yet effective changes to the land's management. The property is largely cleared of vegetation, and may have been timbered in the past, which has led to erosion on streams immediately downstream of this property. If reforested, it would provide four times the water ($43,929) and air quality benefits in ecological services it currently provides the watershed. This management has also allowed a significant number of invasive plant species – namely privet and English ivy – to take residence along the streams. Stream buffers are present on the two streams crossing this property, but they are small and could be enhanced to stabilize stream conditions. There is an old farm pond on the property that appears unused, though the structural integrity of the dam should be inspected for safety's sake. This property likely fails the criteria to be enrolled in a VAD program, but could qualify for a conservation easement that would protect these rural headwaters from being developed.

Old farm pond (S-37)

Eroded stream immediately downstream of S-37

Contact with the landowner should be initiated by PTCOG and the Davidson County S&WCD in October 2011, with the initiation of DC FISH. The landowner would have to be open to planting more trees on the property and along the streams, allowing a StreamWatch group access to their property (freed of liability),

and working with PTCOG staff to improve stream stability conditions on the property. There are EQIP, WRP, CRP, and CREP funds available through cost-share programs run by the Davidson County S&WCD that can aid the property owner in addressing these needs, especially when improving stream health and buffer conditions.

This property is in the suburban Subwatershed 7, where future growth is predicted to be the highest of anywhere in the watershed, but where the current lack of development is protecting natural resources and saving the City and County money due to the lack of need for infrastructure. Too small to be of interest to a land trust, this property would be a worthy investment for Davidson County's recreational development. It could be developed in partnership with the landowner to host hunting, hiking, mountain biking, or many other purposes. The conservation easement would explicitly address these uses and compensate the landowner for this use. Currently, Davidson County's has no Recreation Department, and only supports a part-time position for DC TRIP. To best protect open spaces and agricultural lands – as stated in the *Davidson County Land Development Plan* – the County will need to invest in and/or incentivize the protections of these lands and resources. See Policy Recommendation 7 & 8 for more details on this topic. The benefits for the watershed could be enormous.

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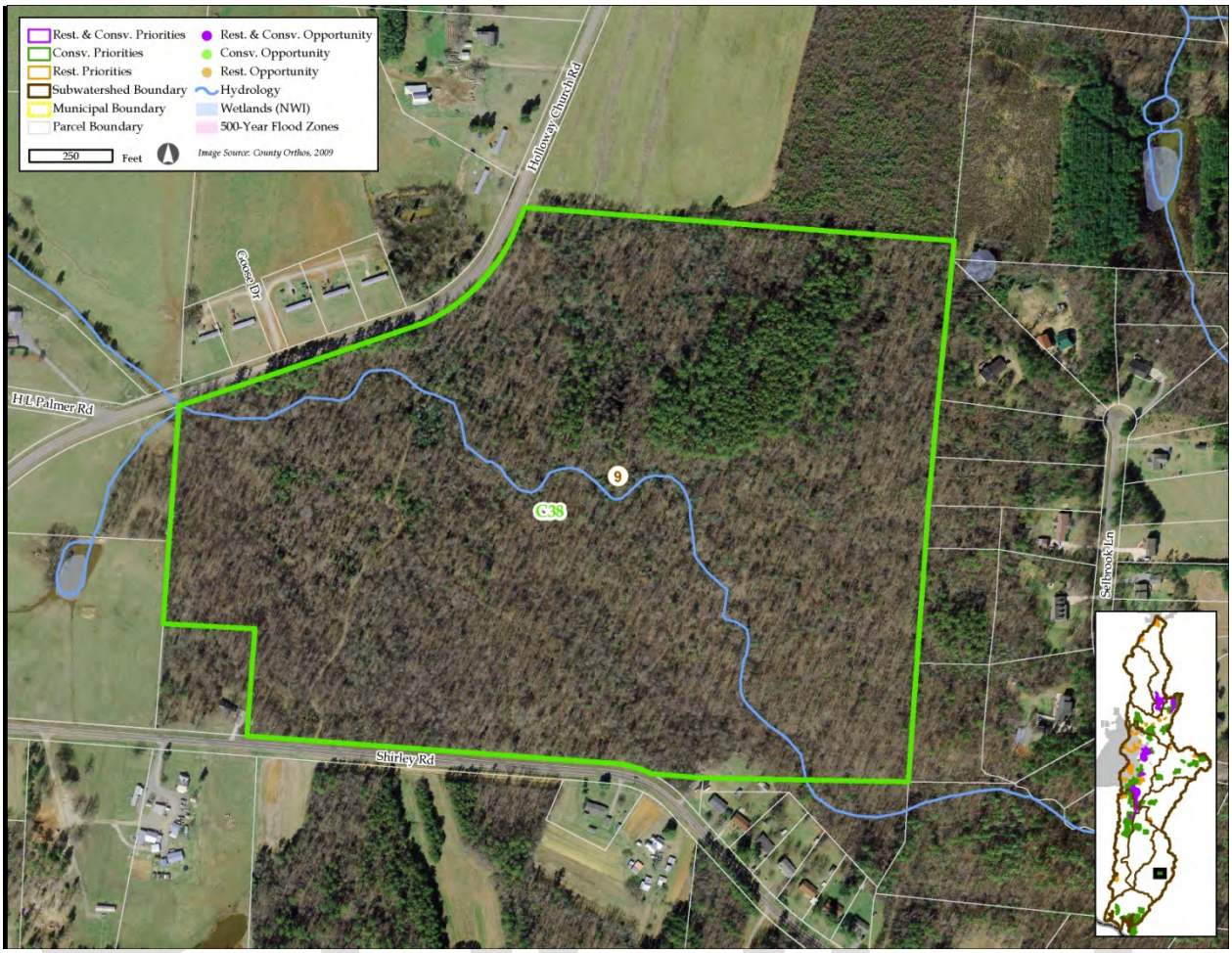
Project 25: Open Space Preservation



Recommended Actions:

- Contact landowner to gauge interest in placing property under a conservation easement to protect it better
- Investigate interest in passive recreation (hiking, mountain biking, hunting)
- Document and highlight the ecosystem services being provided by this unmanaged property to the downstream community
- Ensure that any development of the property is done sustainably through a zoning ordinance or overlay district

ATTRIBUTE	C-38
Site Location	Davidson County
Subwatershed	9
Land Use	Forest
Area (acres)	73.66
Linear Stream (Feet)	2,908
Lake Area (acres)	N/A
Impervious Surface Cover	N/A
Floodplain Area (acres)	N/A
Wetland Area (acres)	N/A
Forest Coverage (acres)	73.5 100%

Project Assessment:

At 73.5 acres of untouched mature Piedmont forest with almost 3,000 linear stream feet, the main management recommendation for this property is to ensure that it is not developed for any type of intensive land use. If it is to be timbered by the landowner, it is strongly recommended that the DC S&WCD advise them to use a consulting forester to ensure that the site is harvested using sustainable practices and that the landowner receive top dollar for the harvest. It is also recommended that the Soil and Water staff discuss other land use options with the landowner, including using the site for passive recreation or receiving cash in exchange for placing a conservation easement on it.

There is no reason that conserving such property must be a selfless investment: these ecosystem services provide tangible benefits to downstream residents that have economic value. It is important to ensure that the property is not developed by placing it under a conservation easement, but it is also important to ensure that the easement does not sacrifice the potential for the landowner to participate in a conservation-based free market, such as a Transfer of Development Rights program.

This property is in the rural Subwatershed 9, where the current lack of development is protecting natural resources. Too small to be of interest to a land trust, this property would be a worthy investment for Davidson County's recreational development. It could be developed in partnership with the landowner to host hunting, hiking, mountain biking, or many other purposes. The conservation easement would explicitly address these uses and compensate the landowner for this use. Currently, Davidson County's has no Recreation Department, and only supports a part-time position for DC TRIP. To best protect open spaces and agricultural lands – as stated in the Davidson County Land Development Plan – the County will need to invest in and/or incentivize the protections of these lands and resources. See Policy Recommendation 7 & 8 for more details on this topic. The benefits for the watershed could be enormous.

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Appendix: Lower Abbotts Creek Watershed Assessment Executive Summary

Lower Abbotts Creek Watershed Assessment

An Executive Summary

PIEDMONT TRIAD COUNCIL OF GOVERNMENTS

June 2011

DRAFT

Lower Abbotts Creek Watershed Assessment

An Executive Summary

Prepared By

Piedmont Triad Council Of Governments

Cy Stober, Water Quality Manager

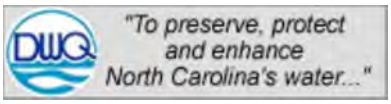
Elizabeth Jernigan, Stormwater Outreach & Education Coordinator

Malinda Ford, GIS Planner

Supported By

North Carolina Department of Environmental & Natural Resources,

Division of Water Quality 319(h) Program



June 2011

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Watershed Summary

The Lower Abbotts Creek watershed covers approximately 76 square miles between Lake Thom-A-Lex and High Rock Lake in central Davidson County, NC (Fig. 1). Lower Abbotts Creek has been impaired since 2004 due to "Fair" benthic community ratings at one site downstream of Lexington. In 2008, NC Division of Water Quality (DWQ) listed lower Abbotts Creek as impaired for violating water quality standards for turbidity and chlorophyll-*a*, and the action level for copper in 2010. The Abbotts Creek Arm of High Rock Lake has been listed by NC DWQ as impaired for chlorophyll-*a* and turbidity since 2004 (NC DWQ 2010).

In 2008, the Piedmont Triad Council of Governments (PTCOG) was awarded a 319 grant from the NC DWQ to develop a local watershed plan that would identify the sources of pollution to Lower Abbotts Creek, the local ordinances and programs existing (or not) to address these problems, and a restoration plan featuring project and policy recommendations that can improve water quality and watershed conditions. In 2009, the NC Clean Water Management Trust Fund provided this project additional funding. PTCOG retains an Water Resources Planning staff that is fully capable of water quality and watershed planning, and is qualified to conduct watershed restoration planning relying upon public stakeholder input, streambank assessments, Geographic Information Systems (GIS) – based analysis, and assessments of local rules and regulations presiding over the watershed. Their work includes the *Rich Fork Creek Watershed Restoration Plan*, a similar effort on Lower Abbotts Creek's main tributary (PTCOG, 2008; PTCOG 2009). The watershed community provided invaluable input in this effort, and represents multiple stakeholder interests in the watershed's recovery and well-being.

Lower Abbotts Creek
Watershed Restoration Plan Stakeholders Committee

Conservation Trust of North Carolina
- Edgar Miller, Director of Government Relations

Davidson County
- Guy Cornman, Planning Director
- Cathy Dunn, County Commissioner
- Billy Joe Kepley, County Commissioner
- Scott Leonard, Planner

Davidson County Soil & Water Conservation District
- Andy Miller, District Director & Agent
- Lloyd Phillips, District Resources Specialist

Davidson County Tourism Recreation Investment Partnership (TRIP)
- William Deal, Executive Director

Friends of Rich Fork Creek
- Mary Cridlebaugh, Executive Director

High Rock Lake Association
- Larry Jones, Executive Director

LandTrust of Central North Carolina
- Jason Walser, Executive Director

City of Lexington
- Giselle Comer, Water Resources Lab Director & Pretreatment Program Coordinator
- Roger Spach, Water Resources Director

NCSU Cooperative Extension Office
- Scott Welborn, Davidson County Extension Agent

North Carolina Wildlife Resources Commission
- Shari Bryant, Habitat Conservation Biologist

Piedmont Triad Council of Governments
- Malinda Ford, GIS Analyst
- Elizabeth Jernigan, Stormwater Outreach and Education Coordinator
- Cy Stober, Water Resources Manager

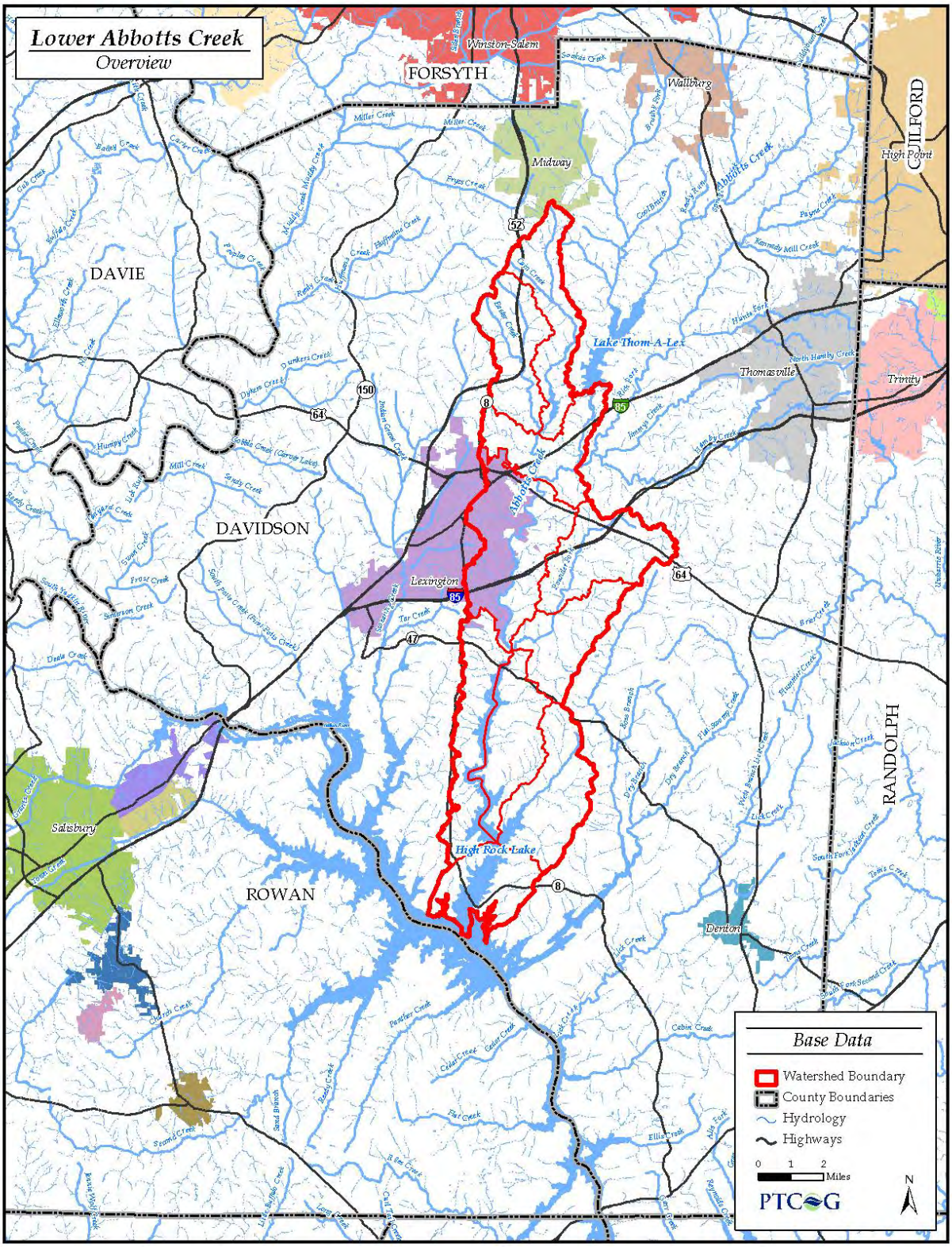
Lower Abbotts Creek
Overview
FORSYTH
Winston-Salem
Midway
Wallburg
GUILFORD
High Point
DAVIE
DAVIDSON
Lake Thom-A-Lex
Thomasville
Trinity
Lexington
Abbotts Creek
RANDOLPH
Salisbury
ROWAN
High Rock Lake
Denton
Base Data
Watershed Boundary
County Boundaries
Hydrology
Highways
0 1 2
Miles
N
PTCOG

Figure 7

Lower Abbotts Creek receives direct and impaired inputs from Rich Fork Creek and Lake Thom-A-Lex, though the impacts they have upon current water quality conditions had not been determined prior to this Assessment. Rich Fork Creek fails to meet bioclassification criteria established by the NC DWQ, and a watershed assessment conducted by PTCOG in 2009 concluded that this is due to stormwater impacts from High Point and Thomasville (PTCOG 2008; PTCOG 2009). Though not rated for violating water quality turbidity standards, the rates of erosion in Rich Fork Creek and its tributaries are extraordinarily high, and it is now known that large masses of sediment are being transferred by them to Abbotts Creek.

Lake Thom-A-Lex has been listed as impaired for chlorophyll-a since 2007. Chlorophyll-a levels represent the degree of algal growth in a water body, and whether that algae in jeopardizing a lake's use for recreation and as an ecological habitat. The Lake receives runoff waters from northern Davidson and southern Forsyth Counties, a high-growth area in the Piedmont Triad. It also receives direct input from Upper Abbotts Creek which is impaired for violating benthic biological standards (NC DWQ 2008; NC DWQ 2010). It is assumed that the downstream transfer of pollutants over the Lake Thom-a-Lex dam is insignificant, a conclusion supported by water quality data for this study.

High Rock Lake, November 2009

Lower Abbotts Creek is a tributary to High Rock Lake, which is violating water quality standards for turbidity, chlorophyll-a, and pH (NC DWQ 2010). NC DWQ is conducting a TMDL assessment of the Lake's water quality to determine the sources of nutrient pollution compromising its use as a recreational resource and as ecological habitat. Please visit http://portal.ncdenr.org/web/wq/ps/mtu/specialstudies#high_rock_lake for detailed information. Rich Fork Creek was noted by PTCOG to have extremely high rates of erosion, and YPDRBA water quality data indicates that this tributary is contributing significantly higher levels of total nitrogen, total phosphorous, fecal coliform bacteria, total suspended solids, and turbidity levels that are directly degrading downstream water quality, including that of High Rock Lake.

This watershed assessment is designed to analyze watershed conditions and identify sources contributing to current impaired conditions, which must be addressed if local communities wish to improve and protect watershed functions. Local watershed planning principles established at the Center for Watershed Protection (CWP) and the US Environmental Protection Agency (US EPA) were used to assess the local policies and programs to measure the local stewardship of the watershed. Two weeks of stream assessments were done using guidance from NC State University's stream evaluation protocols. Historical land use and water quality data was also provided to PTCOG by multiple sources, and has been critical in determining in how the past has created current degraded conditions, and where existing hot spots of pollution exist. The actions necessary to improve water quality will be detailed in the *Lower Abbotts Creek Watershed Restoration Plan*, due in July 2011.

Restoration of the Lower Abbotts Creek watershed needs to be approached through projects, programs, and policies. Projects address obvious impacts to watershed health, such as shoring up eroding streambanks and stormwater retrofits. Policy changes provide a more long-term strategy for sustainable

watershed stewardship, and programs facilitate public awareness necessary for understanding how behaviors impact water quality. This document – the *Lower Abbotts Creek Watershed Assessment* – assesses current conditions in the watershed and briefly addresses the practices, policies, and histories that contributed to the watershed's currently degraded state.

Land Use Summary

Lower Abbotts Creek is almost entirely (91%) rural, with the City of Lexington occupying 6.5 square miles of its total 76 square mile area. This urban area coincides almost entirely with the City of Lexington, which also includes almost all of the industrial and commercial land use (4% total). Land use in the Lower Abbotts Creek watershed is overwhelmingly residential (39%), vacant (30%), or forested (14%). There is a significant area (5%) of land dedicated to mobile home use, said to be having a significant impact upon water quality due to straight-piping gray water and failing septic systems (Fig. 2). Land use data for the Lower Abbotts Creek watershed gathered from the Davidson County's Planning Department, the 2006 National Land Cover Data was used (NLCD), and the NC One Naturally website.

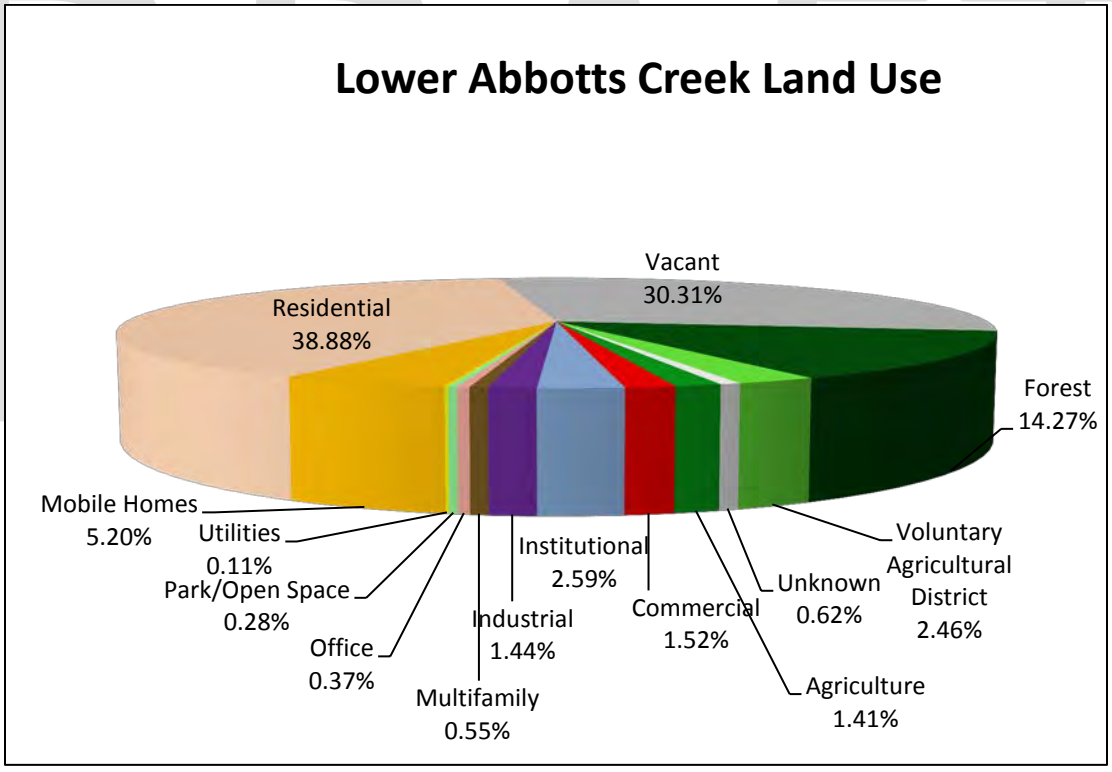

Figure 8

According to the US Census data, the Lower Abbotts Creek watershed population decreased by 45% in the last ten years, mostly in downtown Lexington. The most environmentally-sensitive subwatersheds around Lower Abbotts Creek are actually experiencing the highest growth rates in the watershed. The City has ample space for commercial, industrial, and residential growth that could be accompanied by environmental retrofits to reduce water and air quality pollution and improve the local quality of life (US Census Bureau, 2006).

It is possible to estimate development growth patterns upon current residential and commercial growth trends using federal, state, and local data. Using 2010 data for business growth (0%), population growth (-6%), and average household income (the lowest 5% of the Triad), a Future Growth Scenario can anticipate which areas within the watershed are likeliest to experience development and accompanying watershed stresses (Fig. 3). Much of the projected growth will be in the I-85 and I-85 BUS corridors and the urban core of Lexington, with some additional residential development on the Abbotts Creek Arm of High Rock Lake. These patterns will further burden the stormwater stresses focused on Subwatershed 4, and disturb the most environmentally-sensitive area, Subwatershed 8.

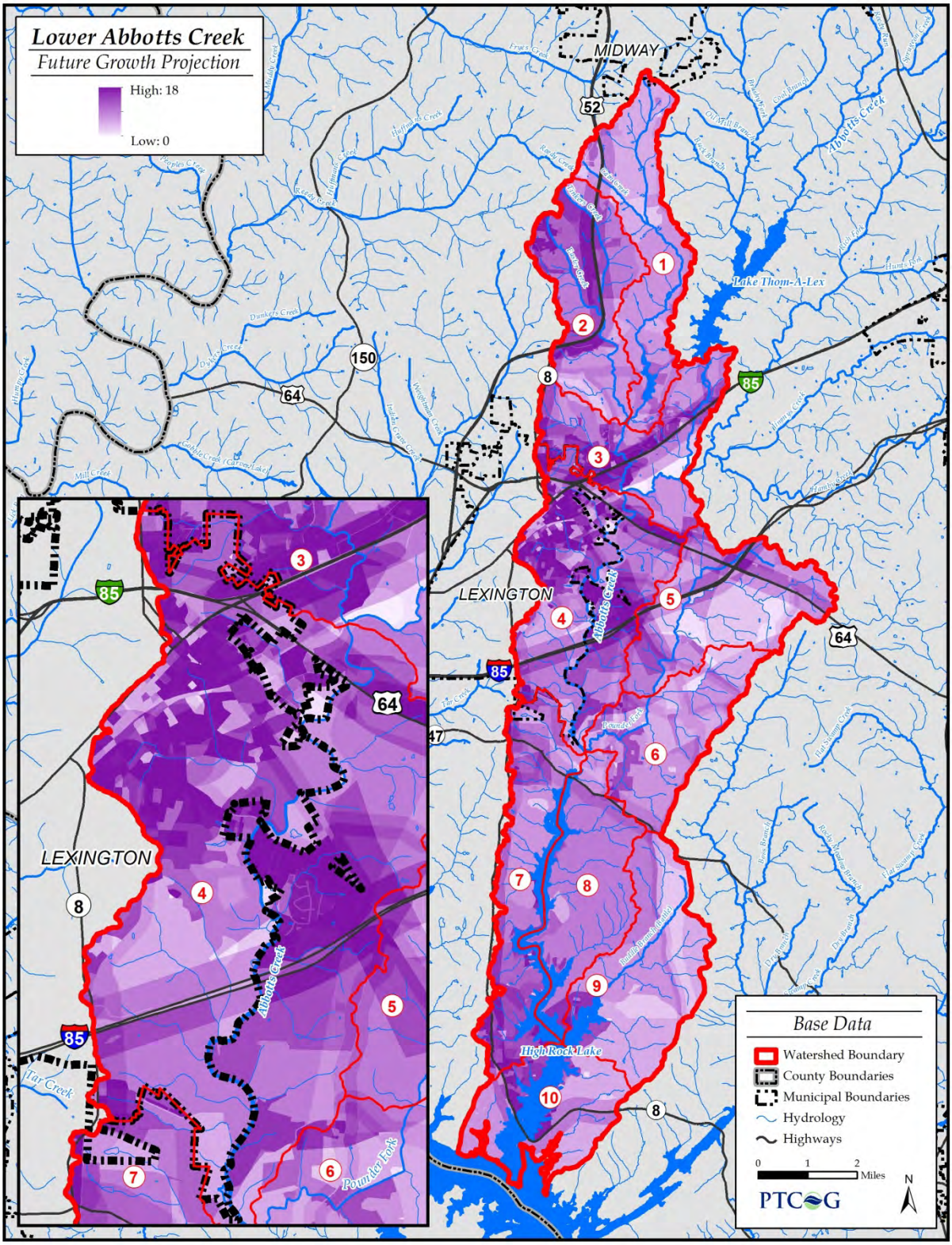
Lower Abbotts Creek
Future Growth Projection
High: 18
Low: 0
MIDWAY
LEXINGTON
LEXINGTON
Lake Thom-A-Lex
High Rock Lake
Abbotts Creek
Abbotts Creek
Tar Creek
Tar Creek
Pounder Fork
Base Data
Watershed Boundary
County Boundaries
Municipal Boundaries
Hydrology
Highways
0 1 2 Miles
N
PTCOG

Figure 9

Local Policy Summary

The policies in both the City of Lexington and Davidson County show these communities transitioning into watershed stewards.. Both communities acknowledge water as valuable and something to protect from the impacts of development, but both mostly only utilize incentives to achieve these protections rather than regulations. Until some concrete steps are taken to regulate some of the non-point sources of pollution identified through this study, neither Lexington nor Davidson County should expect to see Lower Abbotts Creek significantly improve.

Both communities do restrict development within the 100-year floodplain, and Lexington prohibits development in the 50-foot zone along the Creek. Stream buffers have been show to have a disproportionate benefit to watershed residents if left untouched and/or restored. Lexington has also created an Overlay District to promote greenways and address the public health and recreation interests. Davidson County has the same Greenway Overlay District, but no mandated buffers, making implementation more difficult. These overlays have not been universally applied to current utility access easements.

The City of Lexington has taken the basic steps to protect water quality by prohibiting development on slopes >10% and in the 50-foot stream zone, but Davidson County has not yet followed suit. Neither community maps or addresses the environmental stresses of developing upon highly erodible soils. Neither community addresses the illicit discharge, illegal dumps, or erosion problems that PTCOG staff identified in their field work for this project. Many neighboring communities have programs and ordinances that simply and effectively address these sources of pollution, and cost-effectively removed them from the equation.

Other than filling in streams or wetlands, or putting intensive developments in the 100-year floodplain, developers are free to create almost any kind of development wherever they like in the Lower Abbotts Creek watershed. There are few restrictions in either jurisdiction's Zoning Ordinance that will protect the watershed and downstream water quality from intense developments. Lexington does guide development with Planning Districts, but their *Land Development Plan* does not explicitly require any specific types of development, just recognizing the existing infrastructure that would shepherd in a vibrant Uptown region again. Low Impact Development, which would maximize the use of space and minimize the environmental costs, is not mandated by the City, though it is discussed in the *Development Plan*. There is no Transfer of Development Rights program or other means for the County and City to recognize the values of optimizing economic development while minimizing environmental impact. Due to the flexibility in zoning codes and no guidance for development through regulatory mechanisms, there is nothing currently to halt the suburban sprawl seen throughout both the Rich Fork and Lower Abbotts Creek watersheds over the past few decades.

Fortunately for the watershed, there are stronger protections for the agricultural community that have benefitted water quality. There are multiple federal- and state-funded cost-share programs to aid farmers in reducing their environmental footprints, as well as preserving Davidson County's agricultural heritage. Many of these programs deal explicitly with the need to improve stream buffers, exclude livestock from streams, and use no-till cropping to minimize nutrient runoff to streams. The County Commissioners have recognized the need to further bolster these needs through the creation of a Davidson County Farmland Preservation Committee. Hopefully, the needs of the shared resource of water will be a priority for the committee as it progresses and ensures the survival of Davidson County's agricultural community.

Water Quality Summary

Lower Abbotts Creek is impacted by stormwater impacts resulting from a legacy of poor watershed stewardship. The water quality shows that the stormwater impacts to the tributaries are having a cumulative degradation to water quality in High Rock Lake. Without efforts being made to address water quality stressors at their sources throughout upstream tributaries, water quality recovery in High Rock Lake will never be achievable. Hamby and/or Rich Fork Creek water quality records show significant contributions of phosphorous, fecal coliform bacteria, and turbidity to Abbotts Creek. PTCOG received a 2008 Clean Water Management Trust Fund (CWMTF) grant to investigate the sources of pollution in the Rich Fork Creek Watershed, and determined that the primary sources of stress are stormwater and a history of poorly-maintained sewer systems in High Point and Thomasville (PTCOG 2008). The rural tributaries Buddle Branch and Leonard's Creeks also contribute nitrogen and phosphorous, and rural landowners need to address sources of nutrients such as illicit discharges.

The Lower Abbotts Creek water quality assessment included NC DWQ, YPDRBA, and City of Lexington data throughout the watershed, as well as data from Rich Fork Creek and Hamby Creek, which are the most significant tributaries to this watershed (Fig. 4). Findings at all of the sites show violations of standards for biological habitat conditions, which are thought to be largely the result of stormwater flows from Rich Fork Creek, I-85, I-85 BUS, and the City of Lexington.

The nutrient data show very high levels of nitrogen originating in the rural tributaries of Buddle Branch and Leonard's Creek. Buddle Branch was also a site of persistently high phosphorous levels which could be due to backflow from the nutrient-rich High Rock Lake. For phosphorous data, Hamby Creek levels closely trended with those of Rich Fork and Abbotts Creeks and it appears to be a significant source of phosphorous pollution.

Hamby Creek and Rich Fork Creek have the highest fecal coliform bacteria levels of anywhere in the watershed, and have a direct influence upon high fecal coliform bacteria readings downstream, as recorded at NC-47 by NC DWQ. The only time in which the Lexington WWTP appears to significantly contribute any fecal coliform bacteria to the Creek is in summer 2010. Fecal coliform bacteria data was not collected at Buddle Branch or Leonard's Creek. Due to the rural setting of these tributaries, a genetic analysis of the fecal coliform bacteria to determine the pollution source(s) (wildlife, livestock, or human) would be extremely useful.

Turbidity data for Abbotts Creek shows an additive effect upon water quality conditions and levels in the watershed. High turbidity readings at Hamby and Rich Fork Creeks are not diluted as they progress downstream (as with nutrients), but accumulate. The Lexington wastewater treatment plant does not appear to be a significant source of turbidity pollution, nor the City, as the readings at the NC-47 bridge are nearly the same as those taken at the WWTP, if not lower. Turbidity data was not collected on Buddle Branch or Leonard's Creek, though total suspended solids data indicates that they may be a significant source of turbidity. Also of concern is the ATV site at the confluence of Leonard's and Abbotts Creeks.

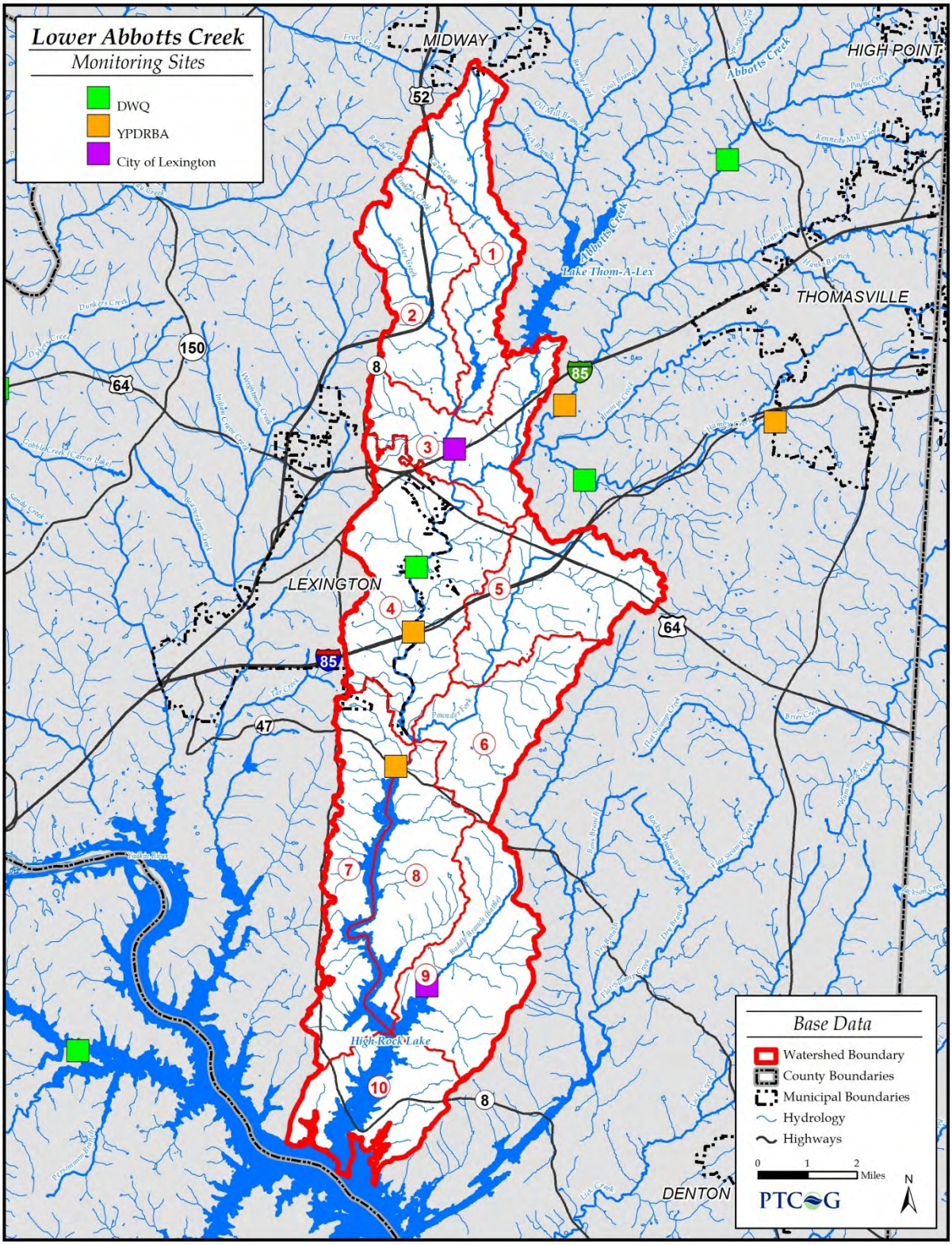
Lower Abbotts Creek
Monitoring Sites
DWQ
YPDRBA
City of Lexington
MIDWAY
HIGH POINT
THOMASVILLE
LEXINGTON
DENTON
Lake Thom-A-Lex
High Rock Lake
Abbotts Creek
Base Data
Watershed Boundary
County Boundaries
Municipal Boundaries
Hydrology
Highways
0 1 2 Miles
N
PTCOG

Figure 10

Stream Assessment Summary

Stream assessments can identify the most promising restoration projects within a watershed, and preserve those sites that already benefit the watershed. GIS-based assessments characterize watershed conditions, particularly how land use affects water quality, but direct evaluations of field conditions are necessary to "ground truth" the conclusions of the computer-based analyses. Furthermore, direct field assessments are the only ways in which to evaluate watersheds for illicit discharges, (most) illegal dumps, and the potential lands to be protected.

The public and stakeholders' most frequent concern and complaint for the watershed is trash buildup and flooding. Given these concerns, it was determined that both urban and rural watershed conditions needed to be surveyed. Consequently, one of the subwatersheds selected was urbanized (4); four were rural (1, 6, 7, & 8), and one was a suburban subwatershed (3) (Fig. 5).

Fieldwork was initiated the week of November 9, 2009, but incomplete due to heavy rains and deer hunters. Field work was finished the week of January 5, 2010. Three teams of two were assigned subwatersheds, and they directly assessed 47 square miles of subwatersheds and 138 linear stream miles over ten days, using Center for Watershed Protection and NC State University stream assessment guidelines.

The field teams found 1,635 individual opportunities at 830 sites to improve watershed function and health for Lower Abbotts Creek (Table 4). Most of these opportunities had multiple advantages if addressed (i.e. wetland restoration + buffer enhancement + stormwater improvement), which created more opportunities than sites. As expected from public input, the impacts were mostly centered in and around Lexington, with large amounts of trash collecting in the Abbotts Creek Arm of High Rock Lake. There were also a greater number of conservation opportunities in the non-urban subwatersheds.

Watershed	Buffer Enhancement	Buffer Restoration	Cattle Exclusion	Invasive Plants	Landowner Education	Log Jam	Pond Work	Stream Enhancement	Stormwater Pipe	Stream Restoration	Sanitary Sewer Maintenance	Stormwater Retrofit	Trash Dump	Wetland Enhancement	Wetland Preservation	Wetland Restoration	Ecological Conservation	SUM
1	28	57	32	17	34	15	11	44	10	25	3	5	8	5	2	6	17	**319**
3	36	22	3	49	49	34	4	99	20	53	5	16	30	9	4	6	26	**465**
4	78	21	4	48	88	18	3	76	38	55	11	37	39	5	6	2	37	**566**
6	29	17	15	9	32	13	1	14	6	10	1	0	6	0	4	0	15	**172**
7	19	0	8	0	26	0	6	15	1	11	0	2	4	0	2	1	18	**113**
8	14	4	5	3	13	0	1	12	7	7	0	0	5	2	1	0	24	**98**
TOTAL	**204**	**121**	**67**	**126**	**242**	**80**	**26**	**260**	**82**	**161**	**20**	**60**	**92**	**21**	**19**	**15**	**137**	**1733**

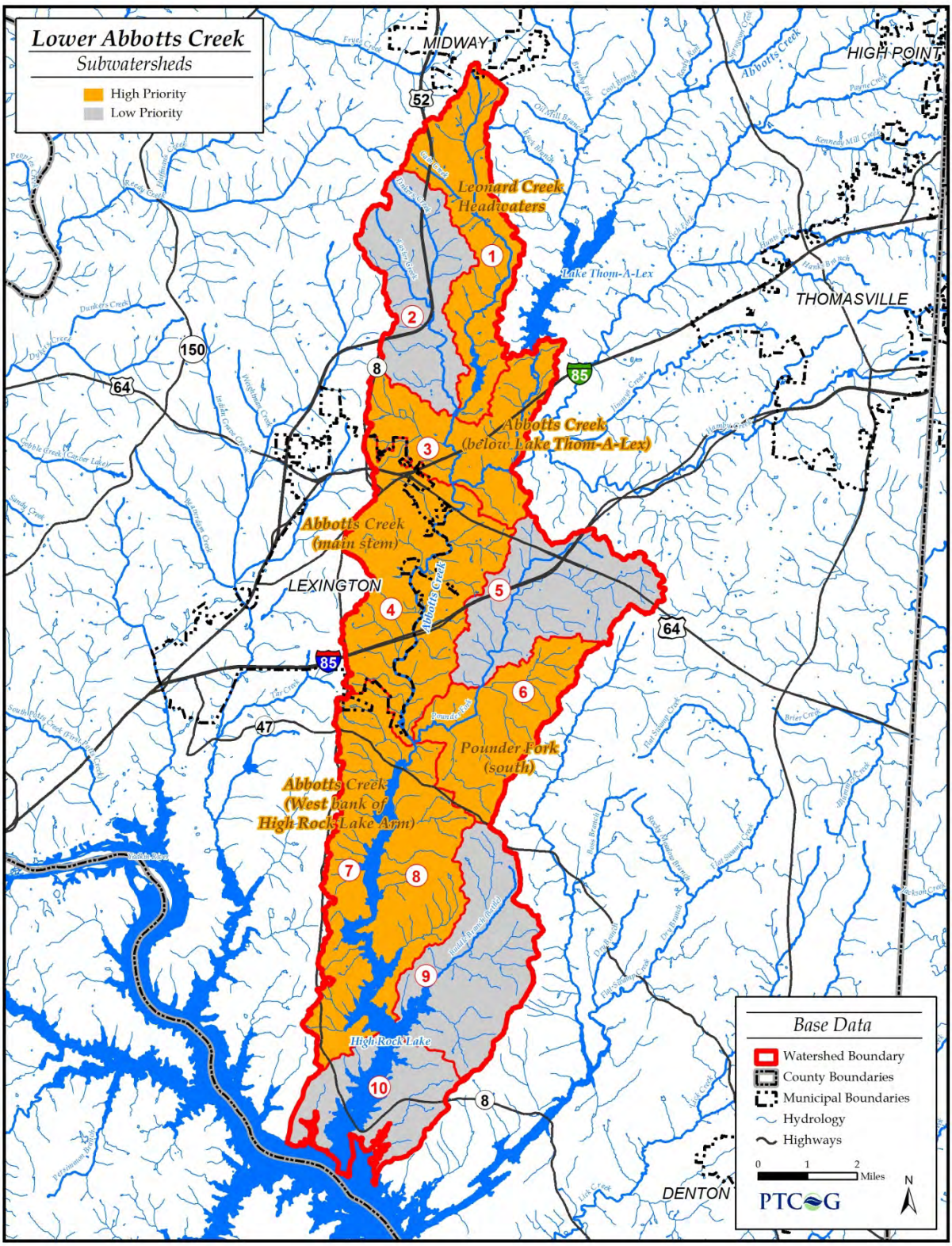
Lower Abbotts Creek
Subwatersheds
High Priority
Low Priority
MIDWAY
HIGH POINT
THOMASVILLE
LEXINGTON
DENTON
Leonard Creek Headwaters
Abbotts Creek (below Lake Thom-A-Lex)
Abbotts Creek (main stem)
Pounder Fork (south)
Abbotts Creek (West bank of High Rock Lake Arm)
Lake Thom-A-Lex
High Rock Lake
1
2
3
4
5
6
7
8
9
10
Base Data
Watershed Boundary
County Boundaries
Municipal Boundaries
Hydrology
Highways
0 1 2 Miles
N
PTCOG

Figure 11

Despite the large number of proposed projects, watershed conditions were acknowledged to be better than feared by field teams. Improved stormwater management, coupled to buffer restoration would account for over 400 (27%) of the project recommendations for Lower Abbotts Creek. 242 instances of a lack of landowner education were observed throughout the watershed, indicating a water quality impact due to poor stewardship (i.e. cattle access, general litter).

Old Lexington Landfill

Two significant point sources of pollution were identified in the Lower Abbotts Creek watershed. One is the old Lexington City Landfill, which is being used as an unofficial public dump. Much of this trash is heavy household appliances (i.e. washing machines, refrigerators), and is one of the largest public concerns for the watershed. There are also some underdrains that directly discharge landfill drainage to the Creek, which are monitored.

The ATV site at the confluence of Leonard's Creek and Abbotts Creek is a significant source of stormwater runoff and sediment. The property has no riparian buffer. This parcel has a NPDES Phase II stormwater permit from the Winston-Salem Regional DENR office. DWQ claims that an earthen berm along the riparian corridor protects the Creek from sediments and pollutants. The ability of one BMP that does not treat nutrients, sediment, or oils and greases to protect Abbotts Creek from the intensive uses at this site – which can be as many as several hundred people at one time – is dubious. However, NC DWQ claims that the site is performing adequately and no stream degradation is occurring. However, if NC DWQ is sincere about addressing aquatic habitat and turbidity conditions in Abbotts Creek and High Rock Lake, it must comprehensively restore this site so that it is no longer a point source of pollution.

Abbotts Creek ATV Site

Watershed Summary

The degraded water quality conditions in the Lower Abbotts Creek watershed are largely due to poor quality waters from Rich Fork Creek and its severely degraded tributary Hamby Creek; to a lack of enforcement in both the City of Lexington and Davidson County to address illicit discharges, soil and erosion control, stormwater inspections, and exclude livestock from streams; to a history of sprawling development patterns; and to stormwater impacts from the City of Lexington, though these are less severe than originally feared. There are both historical and current impacts to water quality conditions in this watershed that must be addressed, and investments in ecological restoration and improved stormwater infrastructure must be made simultaneously with sustainable policy revisions and amendments to empower local governments to protect the waters of the people, especially the economically-valuable recreation waters of High Rock Lake.

The Lower Abbotts Creek watershed was generally in better shape than its "impaired" status would suggest. The primary source of pollution to Lower Abbotts Creek appears to be Rich Fork Creek, which stresses the Creek with extremely flashy flows. Water quality parameters indicate that Lower Abbotts Creek is receiving significant nutrient loads from Hamby and Rich Fork Creeks, as well as its rural tributaries Leonard's Creek and Buddle Branch; significant sediment loads from Rich Fork and Hamby Creeks and the City of Lexington; and is most degraded in and around Lexington from stormwater. The watershed's narrow dimensions (only 6 miles wide and 18 miles long), funnels all pollutants into the Creek's main stem. Stormwater carries metals, fertilizers, and soils – all stressors that will need to be better controlled if pH and turbidity in Lower Abbotts Creek are to be addressed. Improved stormwater controls and landowner education will need to be addressed to control the littering and trash buildup residents and visitors complain of when visiting High Rock Lake. There are many infill development and Brownfields opportunities in Lexington that could result in exciting projects, address many pollution concerns in the watershed, as well as the economic revitalization goals for the City of Lexington. These projects and policy recommendations will be covered in detail in the *Lower Abbotts Creek Watershed Restoration Plan.*

The *Lower Abbotts Creek Watershed Restoration Plan* will identify the policy initiatives and project investments that must be undertaken if Lower Abbotts Creek is to improve. An Implementation Timeline will couple the policy and project investments so that they will be most effective in improving and sustainably manage these waters. With no active public groups in the watershed, this responsibility currently falls to Davidson County and the City of Lexington.

Lower Abbotts Creek has a history of intensive use in the City of Lexington, which used its waters for furniture production, and by Davidson County to support its agriculture. These impacts – in conjunction with more intensive industrial uses of Rich Fork Creek by Thomasville and High Point – have created conditions that degraded biological habitat in and around the City of Lexington; muddied the waters with sediment; and raised the pH close to High Rock Lake due to high nutrient loadings. These impacts will all be addressed in the *Lower Abbotts Creek Restoration Plan.* The partnership throughout the assessment process has been impressive, and holds great promise for investment in the *Restoration Plan* and non-point source pollution mitigation in the larger High Rock Lake watershed. Lower Abbotts Creek can once again be an economic asset to local communities, providing them with a natural resource that enhances local lifestyles, attracts visitors, and provides local ecology with a sustainable environment that permits them to recover and thrive.