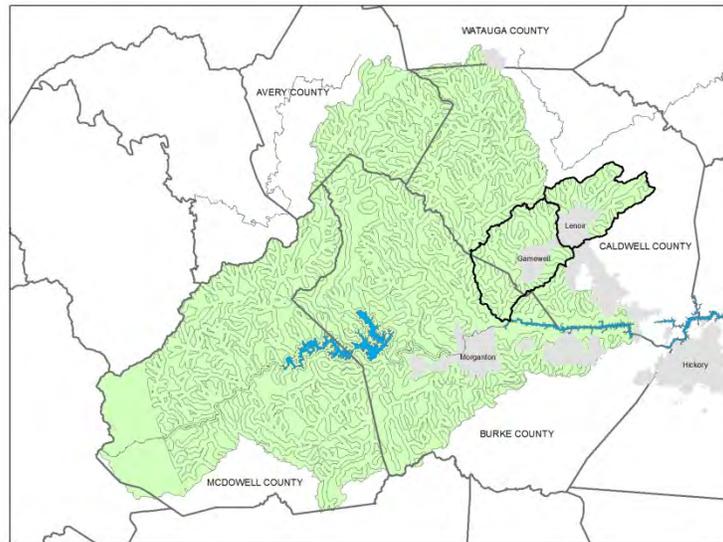


Lower Creek Source Water Protection Plan



October 2012

Western Piedmont Council of Governments



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1 - Executive Summary

The purpose of the Lower Creek Source Water Protection Plan (LCSWPP) is to build on the Lower Creek Watershed Management Plan that was written in 2006 by providing updated information on monitoring; listing Potential Contaminant Sources in the Watershed, and providing new strategies and priorities in the Watershed that improve water quality as it relates to drinking water sources. The plan acts as a first step for larger, more comprehensive Source Water Protection Plan's for the area.

Existing strategies in the Lower Creek Watershed Management Plan also relate to source water protection, so they will be further emphasized in the new LCSWPP. They include:

1. Adopt the Lower Creek *Watershed Management Plan* as a supplement to comprehensive plans.
2. Develop comprehensive stormwater management ordinances
3. Amend subdivision ordinances to promote Low Impact Development and other measures that limit development impacts
4. Adopt and enforce more comprehensive riparian buffer ordinances
5. Monitor compliance with and enforcement of erosion and sedimentation control ordinances
6. Develop steep slope ordinances
7. Amend ordinances to prohibit development in the 100 year floodplain
8. Develop a robust public education program
9. Adopt a comprehensive watershed-based land use plan for the Lower Creek watershed to protect Lake Rhodhiss.

The plan re-emphasizes priority projects from the LCWMP, and updates on what has been accomplished so far:

10. Continue to support and seek funding for preservation, restoration and BMP projects outlined in the Lower Creek Watershed Management Plan.

The Plan also recommends new strategies that apply to Source Water Protection:

11. Continue and increase support for projects to identify and correct onsite residential sewage treatment systems.
12. Continue water quality monitoring to identify problem areas and document improvements. Incorporate a volunteer monitoring component and alternative monitoring methods.
13. Build upon the existing education and outreach program in the agricultural industry to promote use of BMP's.
14. Improve monitoring and detection of potential leaks in sewage distribution systems.
15. Work with local governments and other relevant organizations to begin county wide Hazardous Waste Drop-off program.

16. Work with local health department and other relevant organizations to begin a prescription drug buy-back program (s).
17. Increase awareness and encourage participation in local stream clean-up programs.
18. Abandonment requirements/Brownfield programs for Potential Contaminant Sources.

The LCSWPP will provide methods to address previously known water quality issues (nutrients and fecal coliform) as well as previously unaddressed contaminants to drinking water in the lower creek watershed.

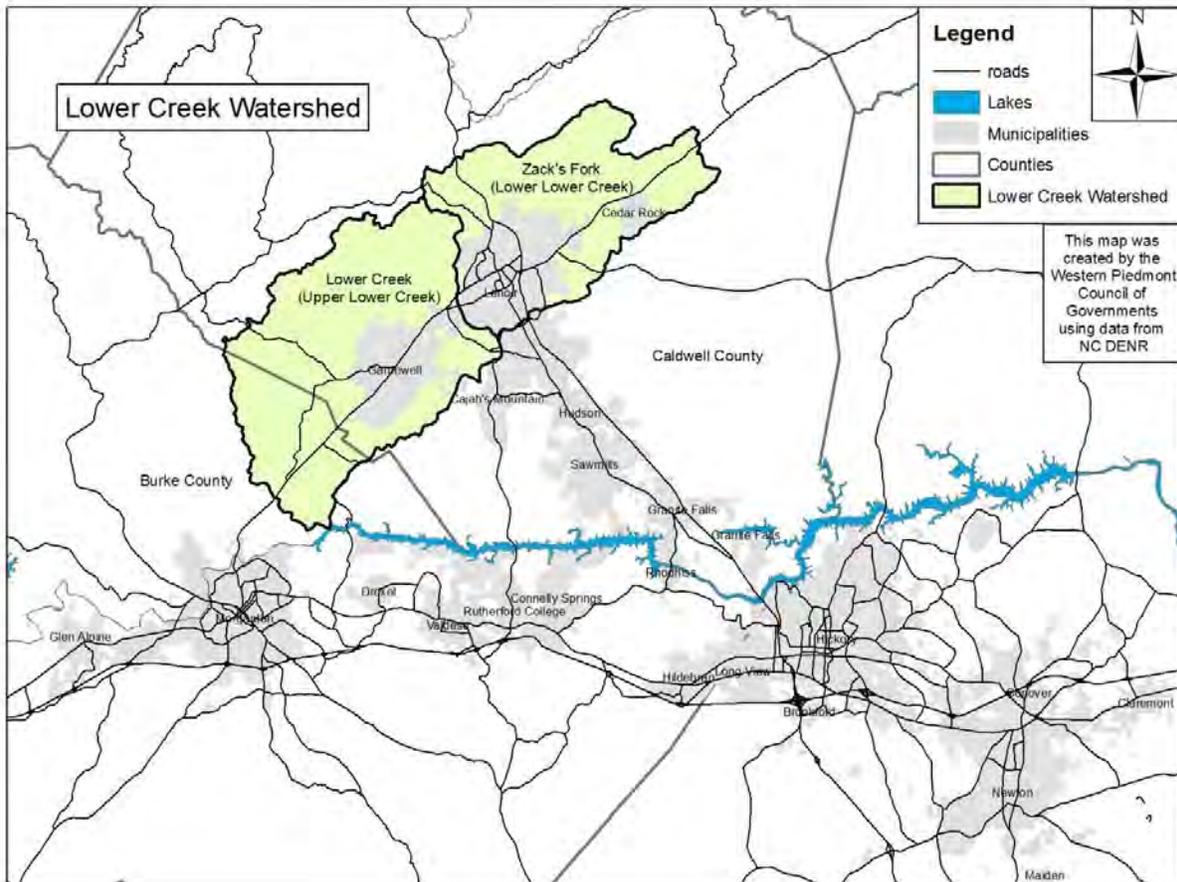
2 – Project Planning Area

2.1 – Lower Creek Watershed

The focus of this Source Water Protection Plan (SWPP) is the Lower Creek watershed, consisting of two 14-digit hydrologic units (HUs). This includes the Upper Lower Creek (03050101080020) which is approximately 57.58 square miles. Within this sub-basin are the Town of Gamewell, and a portion of the City of Lenoir. The other watershed is the Lower Lower Creek (03050101080010) sometimes referred to as Zacks Fork, and is approximately 50.59 square miles. The two watershed combined are located in Caldwell and Burke Counties, with a total drainage area of approximately 98 square miles.

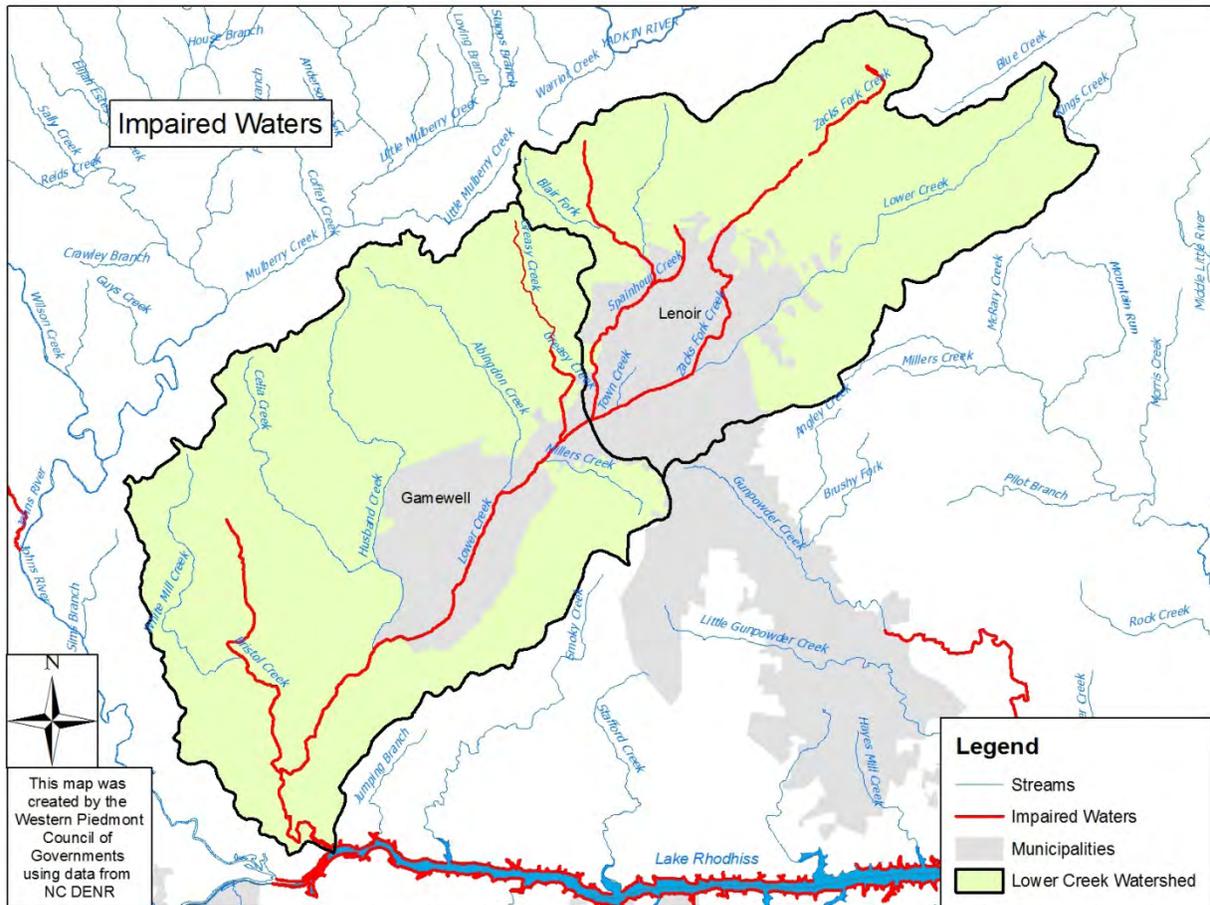
For the purposes of this plan, the two watersheds will be referred to as just Lower Creek or “the watershed” as that is how they are referred to in the Lower Creek Watershed Management Plan. The watershed includes the communities of Lenoir, Gamewell, Cedar Rock, and a portion of Cahah’s Mountain. Major tributaries in the watershed include: Zacks Fork Creek, Blair Creek, Spainhour Creek, Abingdon Creek, Husband Creek, Celia Creek, Bristol Creek, and White Mill Creek. The watershed drains into Lake Rhodhiss, the water supply source for Lenoir, Gamewell, Hickory, and portions of Catawba, Caldwell and Burke Counties.

Map 1: The Lower Creek Watershed



Lower Creek and several of its feeder streams are on North Carolina’s 2012 list of impaired waters — Lower Creek, Zacks Fork, Spainhour Creek, Greasy Creek, and Bristol Creek. These streams suffer from excess sedimentation, degraded habitat for aquatic organisms, fecal coliform bacteria contamination, excessive stormwater flows, and pollutants such as nutrients, metals, and other toxicants from various non-point pollution sources. In addition, Lake Rhodhiss, into which Lower Creek flows, is on the 303(d) list due to factors related to excess nutrients.

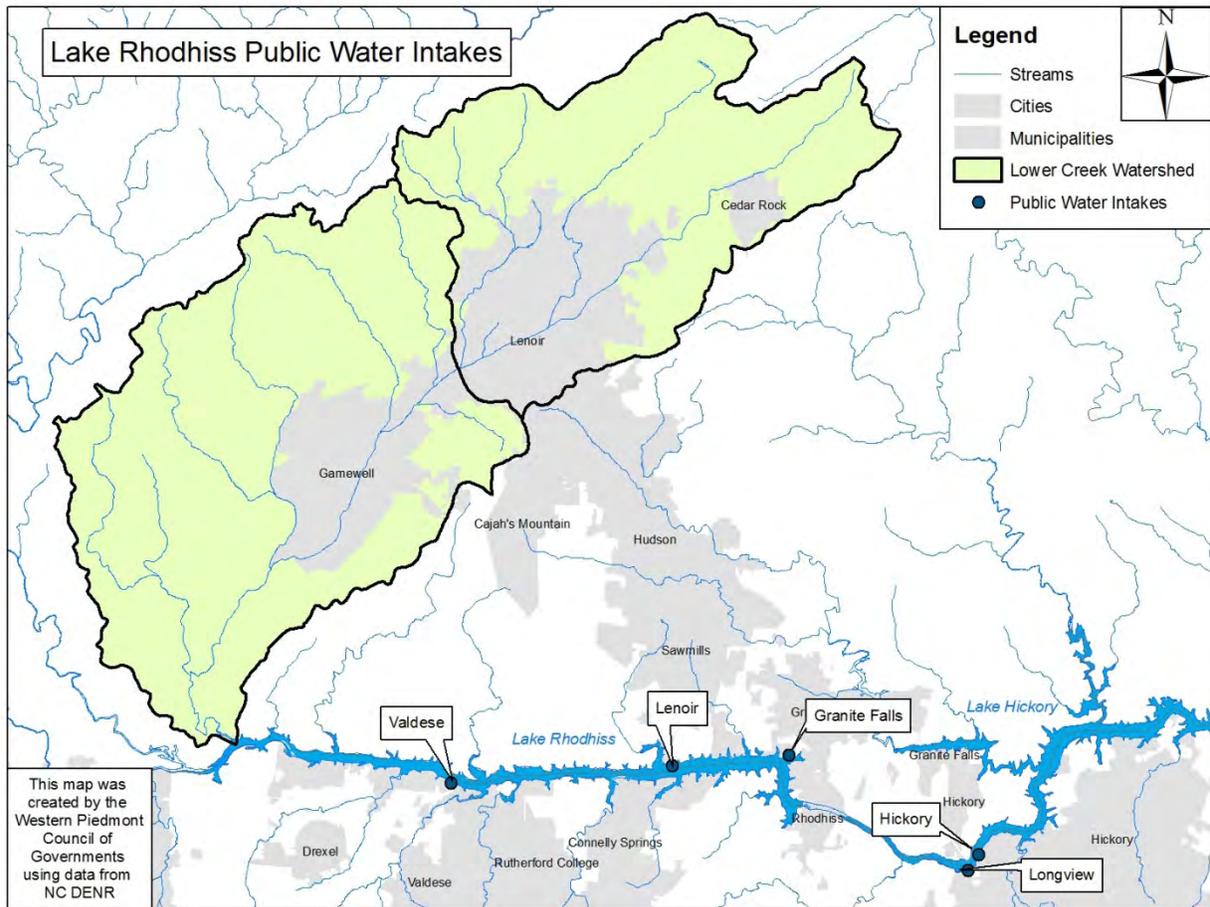
Map 2: Impaired Waters in the Lower Creek Watershed



2.2 – Lake Rhodhiss

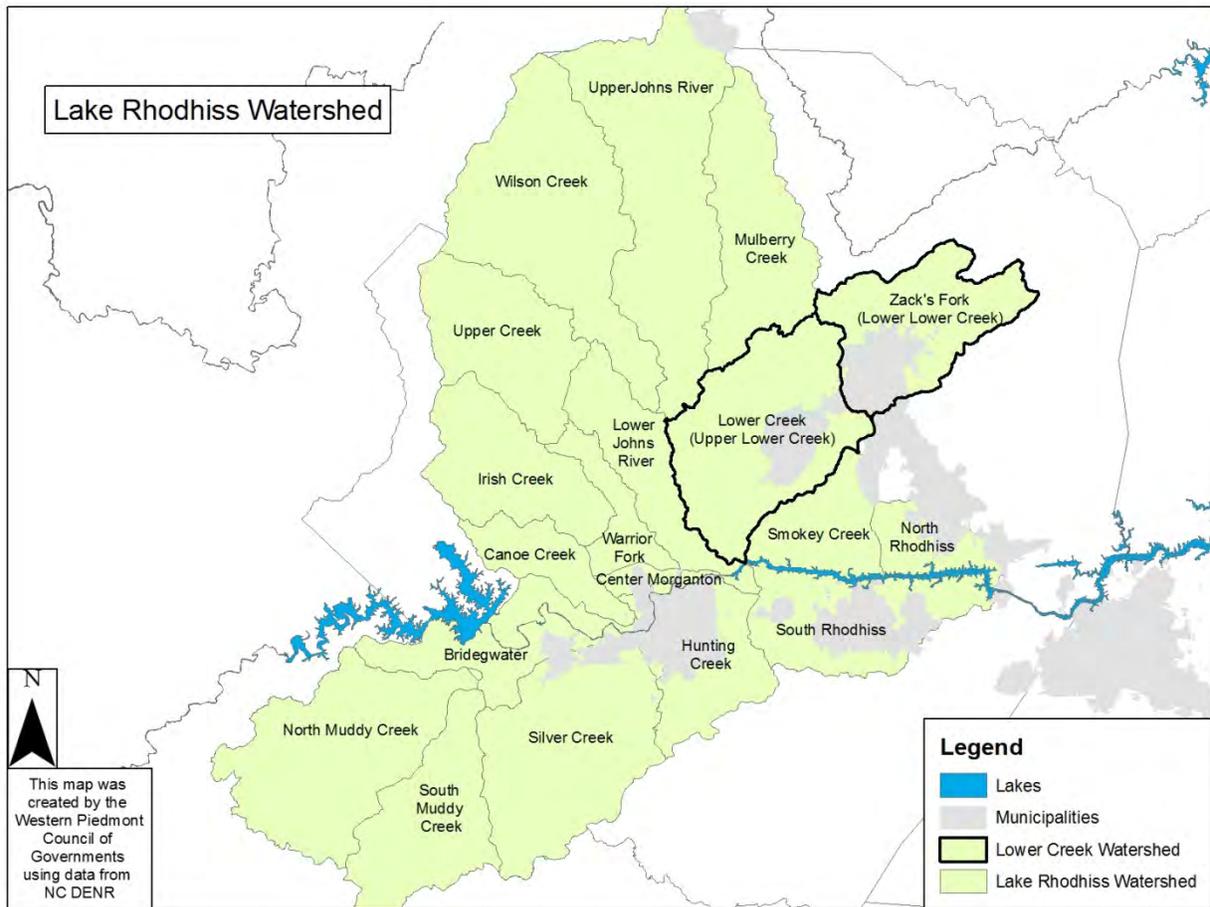
Lake Rhodhiss is a 3,515-acre reservoir located on the Catawba River in western North Carolina. This lake lies within Burke and Caldwell Counties and is a run-of-the-river reservoir located on the Catawba River downstream of Lake James and upstream of Lake Hickory. It was impounded in 1925 by Duke Energy for generating hydroelectric power. Three municipalities, Granite Falls, Lenoir, and Valdese, have public water intakes located along the lake. Water from the lake is also used for waste assimilation, drinking water, industrial water supply, recreation, and habitat for fish and wildlife species.

Map 3: Lake Rhodhiss Public Water Intakes



The watershed area of Lake Rhodhiss is 710 square miles in size, and the lake has the greatest watershed: surface area ratio of any North Carolina impoundment along the Catawba. Topography and soils vary considerably within the watershed. The northern portion of this watershed is very rural, undeveloped and contains substantial federal land holdings. Urban areas are generally concentrated in Lenoir, Morganton and Marion, as well as the I-40 and US 70 corridors between Morganton and the unincorporated Icard area of Burke County. Development activities are concentrated along these corridors.

Map 4: Lake Rhodhiss Watershed

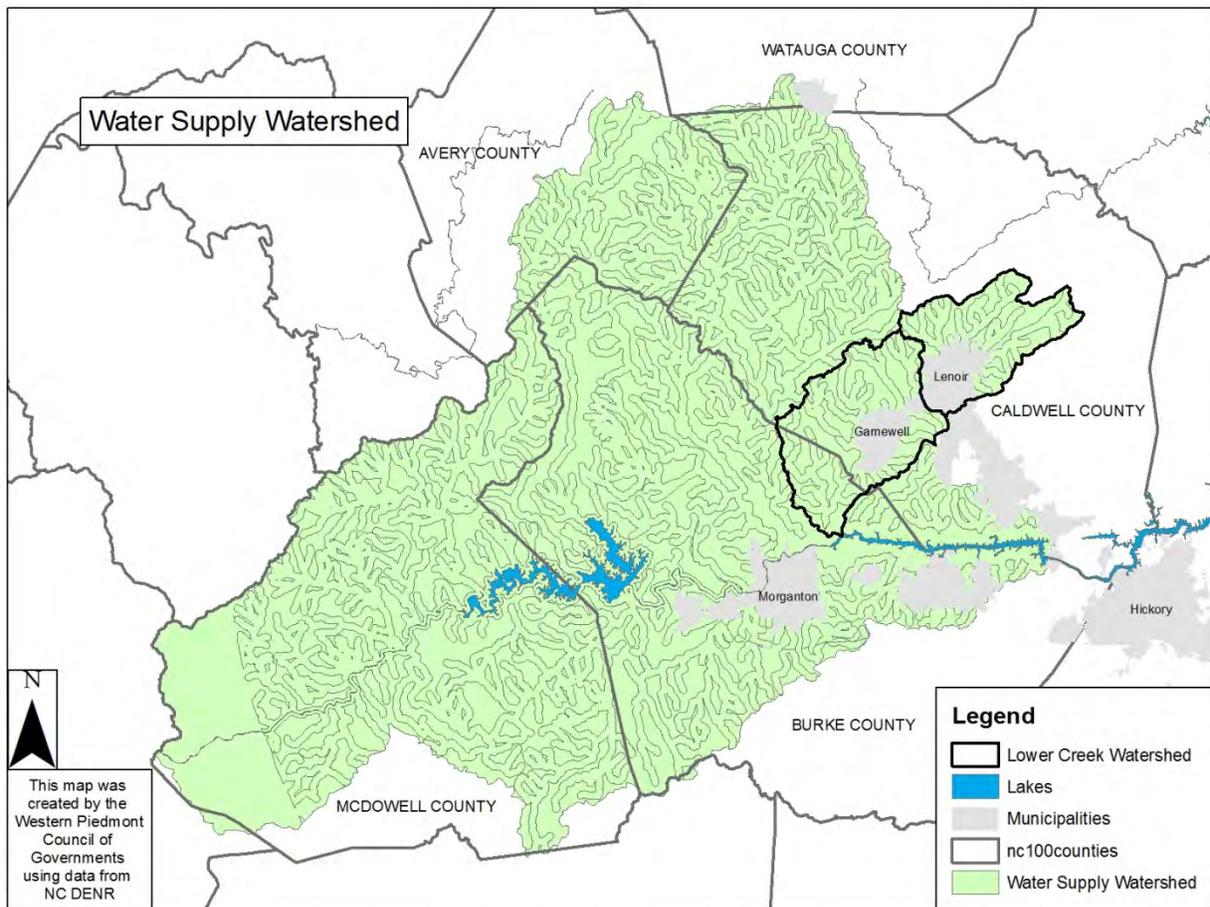


2.3 – Source Water Watershed Boundaries

The area delineated for surface water source(s) for source water assessments is the water supply watershed. In general, the water supply watershed is the area through which contaminants, if released to the environment, can be reasonably expected to move across the land surface following the path of overland flow or shallow subsurface flow and into the surface water body (stream or lake). Map 5 shows the water supply watershed for the City of Lenoir. The boundaries are also the same for the Cities of Valdese, Morganton, and if the boundary is extended slightly farther east, it reaches the City of Hickory Source Water intake.

The water supply watershed boundaries are very close to what is considered the Lake Rhodhiss Watershed, except for the western side, where the water supply watershed extends farther north into McDowell County.

Map 5: Source Water Watershed Boundaries



This Planning Project focuses only on a portion of the source watershed rather than the entire area that impacts a particular water intake. This is mainly due to funding limitations. The Lower Creek watershed was selected due to an already established program, ongoing monitoring efforts and existing public buy-in. Future source water protection efforts in the region are anticipated to incorporate whole watershed water supply boundaries.

3 – Planning Process

The *Lower Creek Source Water Protection Plan* was developed by the Western Piedmont Council of Governments using input from multiple groups such as a Technical Advisory Committee, the Lower Creek Advisory Committee (LCAT), the Water Resources Committee, and using data provided by NC DENR, Caldwell County Soil and Water, the NC Ecosystem Enhancement Program and the Western Piedmont Council of Governments.

The heart of the *Lower Creek Source Water Protection Plan* are recommended strategies for education and outreach, planning and policy, restoration and retrofits, and research and monitoring. Section 7 includes all the recommendations together in summary and tabular form for quick reference

3.1 – Planning Team

The Technical Advisory Committee included staff from the Western Piedmont Council of Governments. This Committee met as a whole a few times to develop the project and monitor its progress. The Technical Advisory Committee for this project includes staff members from the Western Piedmont Council of Governments (WPCOG). The Committee included:

- John E. Wear III, Environmental Planner, Western Piedmont Council of Governments
- Tony R Gallegos, Natural Resources Administrator, Western Piedmont Council of Governments
- Taylor Dellinger, GISP, Data Analyst& Geographer, Western Piedmont Council of Governments

3.2 – The Lower Creek Advisory Team

The Lower Creek Advisory Team (LCAT) was formed in August of 2006 at the end of the EEP local watershed planning (LWP) initiative. The LCAT was established as a subgroup of Caldwell County Pathways and represents a continuation of the Lower Creek Technical Advisory Committee (TAC) that supported earlier phases of the LWP effort. The LCAT mission, as determined at its first official meeting in September 2006, is:

“To restore and protect Lower Creek and its tributaries, while increasing public awareness of local water quality issues”.

The LCAT membership consists of representatives from most of the same groups represented on the original Lower Creek TAC and other organizations, including Local Governments: many department staff (Planning/Community Development, Public Works, Stormwater and School Districts) from – Burke and Caldwell County, the City of Lenoir, the Town of Gamewell; Soil & Water Conservation Districts; State Agencies: NC State Cooperative Extension Service, NCSU

Science House, NC Division of Water Quality, Ecosystem Enhancement Program; Federal Agencies: Natural Resource Conservation Service; Non-Governmental Organizations: Caldwell County Pathways, Reese Institute, Carolina Land and Lakes RC&D, Catawba River Keepers Association, the Caldwell Green Commission and the Western Piedmont Council of Governments. Others group's individuals not mentioned are periodically represented and membership is open to all who are interested.

Recommendations and priority areas from the Plan were presented to the Lower Creek Advisory Committee (LCAT) on September 12, 2012. Those present at the final meeting were satisfied with the final recommendations and priority areas as presented.

3.3 – Water Resources Committee

The *Lower Creek Source Water Protection Plan* has been reviewed by the Water Resource Committee, which is the key interface that the Western Piedmont Council of Governments (WPCOG) uses to interact with local governments on the issue of water resources. Formed in 1986, this Committee is staffed by the WPCOG serves in an advisory role for 30 local governments within the Greater Hickory Metro on issues including water quality, water supply, water safety and recreation, and watershed issues within the Upper Catawba River Basin. The Catawba River Study Committee consists of individuals representing local governments, nonprofit organizations, educational institutions and businesses from Alexander, Burke, Caldwell, Catawba and McDowell Counties in Western North Carolina.

Recommendations and priority areas from the Plan were presented to the Water Resource Committee on September 19, 2012. The Water Resources Committee was satisfied with the final recommendations and priority areas as presented and voted to approve the draft plan. Staff from the NC Ecosystem Enhancement Program were also present at the meeting to discuss fecal coliform hot spots in the Lower Creek Watershed, which ultimately became the priority areas for this plan.

3.4 – Outreach

The *Lower Creek Source Water Protection Plan* will be presented to all local governments within the watershed in late winter of 2012 by staff at the Western Piedmont Council of Governments. The local governments will be asked to voluntarily adopt the recommendations and begin implementing the plan in areas for which they have authority.

The *Lower Creek Source Water Protection Plan* is intended to be an evolving document, revised on a regular basis or as policies and economic conditions change. This is a plan encompassing a smaller geographic area, but opens the door for developing a larger plan and developing a long-term strategy for developing further plans in the region for entire water supply watersheds. A key element of the plan involves developing plans for larger areas. The parties responsible for implementing the plan should review the document periodically to determine its effectiveness and the need for revisions.

4 – Summary of the Lower Creek Watershed Management Plan

4.1 – Background of the LCWMP

In 1998, the Western Piedmont Council of Governments published the Lower Creek Watershed Project, which documented water quality problems and named watershed protection recommendations and urban stormwater recommendations. This effort included a study of fecal coliform bacteria levels, stormwater outfall mapping, and benthic macroinvertebrate monitoring. Stakeholders were involved in early stages of identifying problem areas and potential management strategies.

In 2003, the North Carolina Ecosystem Enhancement Program (EEP) started follow-up planning in the Lower Creek watershed. The plan expanded on the efforts of the previous work, developing more information on the health of streams in the watershed and identifying causes of degradation. Its goals were to: (1) to assess stream quality in the watershed, identifying key sources of degradation and pollution, and (2) to develop a comprehensive strategy to address watershed needs. The plan is the result of three years of effort involving in-stream data collection on water quality, habitat, and channel stability, Geographic Information System (GIS) data analysis, and development of ecologically and locally relevant management strategies to restore and preserve stream health. A Technical Advisory Committee (TAC) aided the planning team in reviewing data, identifying plan recommendations, and developing implementation priorities. The TAC, comprised of natural resource and planning staff from Lenoir, Caldwell and Burke Counties, non-profit organizations, and regional and state government entities, was essential to the development of a watershed plan that incorporates priorities of the local community.

(This summary is taken from the Lower Creek Watershed Management Plan – See Appendix A)

4.2 – Prioritization in the LCWMP

The LCWMP prioritized subwatersheds for restoration, preservation, or stormwater BMP activities based on functional integrity, degree of imperviousness, number of possible projects, and TAC recommendations. A set of 38 primary projects were identified within priority subwatersheds and include:

- 4 **Stream Preservation** sites, totaling 81,500 linear feet, or 15.4 miles
- 22 **Stream Restoration** sites, totaling 73,000 linear feet (post-construction), or 13.8 miles
- 2 **Wetland Preservation** sites, totaling 74 acres
- 3 **Wetland Restoration** sites, totaling 135 acres
- 3 combined **Wetland/Stream Restoration** sites, totaling 97 acres and 4,980 linear feet
- 4 **Stormwater BMP** sites, totaling 56 acres of BMP structures (ponds/basins; constructed wetlands; bioretention areas; permeable pavement)

4.3 – Strategies of the LCWMP

Institutional measures. Ordinances, regulations, codes, and other instruments should be revised or developed by Lenoir, Gamewell, and Burke and Caldwell Counties to minimize negative impacts of development and other land use activities. The following measures are highly recommended:

1. Adopt the Lower Creek *Watershed Management Plan* as a supplement to comprehensive plans.
2. Develop comprehensive stormwater management ordinances
3. Amend subdivision ordinances to promote Low Impact Development and other measures that limit development impacts
4. Adopt and enforce more comprehensive riparian buffer ordinances
5. Monitor compliance with and enforcement of erosion and sedimentation control ordinances
6. Develop steep slope ordinances
7. Amend ordinances to prohibit development in the 100 year floodplain
8. Develop a robust public education program
9. Adopt a comprehensive watershed-based land use plan for the Lower Creek watershed to protect Lake Rhodhiss

5 - Potential Contamination Sources (PCS)

5.1 – Source Water Assessment Program Report

The North Carolina Division of Environmental Health, Public Water Supply (PWS) Section is responsible for implementing the Source Water Assessment Program (SWAP) and completing assessments for all public drinking water supplies in the state. A source water assessment is a qualitative evaluation of the potential of a drinking water source to become contaminated by the identified potential contaminant sources (PCS) within the delineated area.

Surface water sources can be threatened by many potential contaminant sources, including permitted wastewater discharges, urban storm water runoff, or other types of non-point source contamination such as runoff produced by agricultural activities and land clearing for development. Map 6 shows all of the PCSs located in the Lower Creek Watershed, and Table 1 lists them all. A complete list of all of the PCSs located in the water supply watershed as well as the entire SWAP report for the City of Lenoir can be found at <http://www.ncwater.org/pws/swap/>.

A list of just those PCS that are in the Lower Creek Watershed are listed in the table below. Types of PCS's include: animal operations (AO), superfund sites (CERCLIS), Hazardous Waste Transporter/Generators (HWGT), National Pollution Discharge and elimination System permit holders (NPDES), petroleum contaminated soils (PCBS), prior pollution incidents (PIRF), Tier II

hazardous chemical inventory (TII), treatment storage and disposal (TSD), Old Landfill Sites (UDS), underground injection control wells (UIC), and underground storage tanks (UST).

Map 6: Potential Contaminant Sources in the Lower Creek Watershed

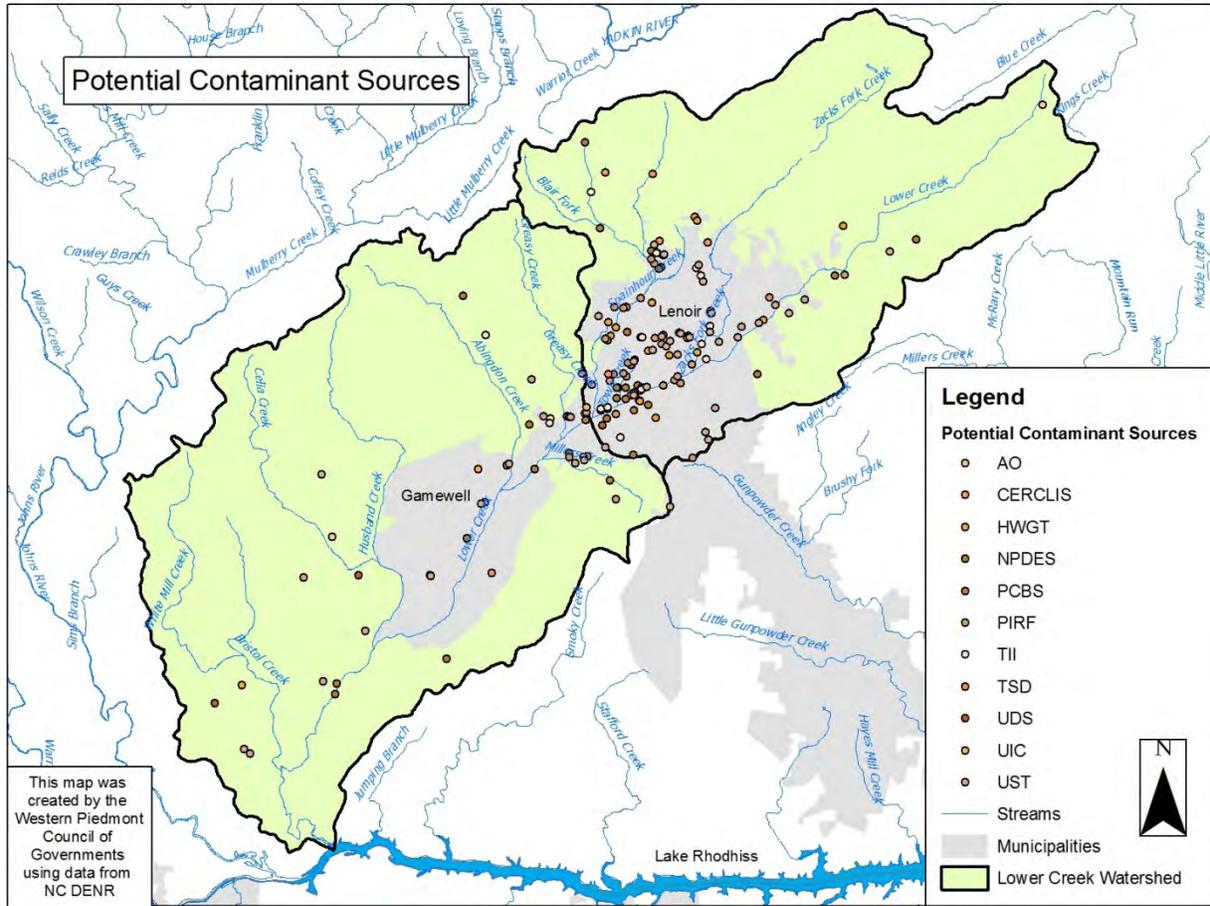


Table 1: Potential Contaminant Sources in the Lower Creek Watershed

PCS_ID	PCS_NAME	ADDRESS	CITY	STATE	ZIP	COUNTY	PCSTYPE
AWC140007	Clay's Dairy	4415 Celia Creek Road	Lenoir	NC	28645	Caldwell	AO
NCD986204758	GAMEWELL DRUM SITE	CRAIG MOUNTAIN RD	GAMEWELL	NC	28645	Caldwell	CERCLIS
NCD991278466	BROYHILL FURNITURE MILLER HILL COMP	MILLER HILL RD/NC 18 S	LENOIR	NC	28645	Caldwell	CERCLIS
NCD986231298	PUETT BODY SHOP	2200 BRISTOH CREEK AVE	MORGANTON	NC	28655	BURKE	HWGT
NC0000268094	RYDER TRUCK RENTAL INC	1305 VIRGINIA ST SW	LENOIR	NC	28645	Caldwell	HWGT
NCD089158323	NACCO MATERIALS HANDLING GROUP, INC.	2040 MORGANTON BOULEVARD	LENOIR	NC		Caldwell	HWGT
NCD982134249	D R KINCAID CHAIR CO	SHEELY RD RT 11 BOX 109	LENOIR	NC	28645	Caldwell	HWGT
NC0048755	Monte Carlo Trailer Park	1606 Poplar St	Lenoir	NC	28645	Burke	NPDES
NC0023981	Lower Creek WWTP	NCSR 1149	Lenoir	NC	28645	Caldwell	NPDES
NCG020039	Martin Marietta-Hudson	Sw Loop Blvd bradford m	Hudson	NC	28638	Caldwell	NPDES
NCG140097	Hamby Brothers Concrete Incorporated	2051 Morganton Blvd SW	Lenoir	NC	28645	Caldwell	NPDES
NCG120060	Republic Services Of NC LLC - Lenoir	2800 Cheraw Rd	Lenoir	NC	28645	Caldwell	NPDES
NCG180082	Broyhill Furniture Ind-Caldwel	Miller Hill Complex St	Lenoir	NC	28633	Caldwell	NPDES
NCG180111	Kincaid Furniture Co-Plant #8	Rocky Rd	Hudson	NC	28638	Caldwell	NPDES

NCG500178	Miller Hill Complex	Complex St	Lenoir	NC	28633	Caldwell	NPDES
NCG520090	Mabe Pit	1000 - 1209 Atioch	Morganton	NC	28655	Burke	NPDES
NCG520083	Calico Pit	4338 Calico Rd	Lenoir	NC	28645	Caldwell	NPDES
NCG080186	United Parcel Service-Lenoir	107 Industrial Ct	Lenoir	NC	28645	Caldwell	NPDES
24332	CROSSROAD MARKET	3135 MORGANTON BOULEVARD	LENOIR	NC	28645	Caldwell	PIRF
28005	WALKER STORE	1224 CONNELLY SPRINGS ROAD	LENOIR	NC		Caldwell	PIRF
28231	BROYHILL FURNITURE-MILLER HILL	802 COMPLEX STREET	LENOIR	NC	23424	Caldwell	PIRF
13295	LENOIR GAS HOUSE	UNKNOWN	UNKNOWN	NC		Caldwell	PIRF
B683A6F3BA2906 C685256FC1005FF57A	TRIGEN-BIOPOWER, INC - LENOIR	700 COMPLEX PLACE	LENOIR	NC	28645	Caldwell	TII
C87AA5660BC546AA8 52570FF005707DC	FOOTHILLS ENVIRONMENTAL	2800 CHERAW RD	LENOIR	NC	28645	Caldwell	TII
FB2D6D1C5456FDD38 525702600464C08	RYDER TRANS SERVICES #0362 LENOIR	1305 VIRGINIA ST	LENOIR	NC	28645	Caldwell	TII
085F2294AB8ACDC48 5257013004BDCC7	SCHWAN FOOD CO - LENOIR	2304 ICENHOUR CT NW	LENOIR	NC	28645	Caldwell	TII
1D835C2C9D31F24F85 25701B006C80A9	UNITED PARCEL SERVICE - LENOIR	107 INDUSTRIAL CT	LENOIR	NC	28645	Caldwell	TII
35FCD97E8600E48885 257052005772B9	MARLIN CO, INC	1333 VIRGINIA STREET	LENOIR	NC	28645	Caldwell	TII
NCD089158323	NACCO MATERIALS HANDLING GROUP INC	2040 MORGANTON BLVD NW	LENOIR	NC	28645	Caldwell	TSD
NONCD0000168	BRISTOL CREEK COMM. DUMP			NC		BURKE	UDS
NONCD0000192	ANDERSON REFUSE DUMP			NC		Caldwell	UDS
0-003863	THE COLONEL'S PANTRY 11/22304	HIGHWAY 18 NORTH	MORGANTON	NC	28655	BURKE	UST
0-000623	Q-EXPRESS II (587)	555 ABINGTON ROAD	LENOIR	NC	28645	Caldwell	UST
0-004698	HERMAN'S TIRE & AUTO	2807 MORGANTON BLVD	LENOIR	NC	28645	Caldwell	UST
0-004402	YALE MATERIALS HANDLING CORP.	2040 MORGANTON BLVD.	LENOIR	NC	28645	Caldwell	UST
0-004796	GAMEWELL SUPERETTE	2830 MORGANTON BOULEVARD	LENOIR	NC	28645	Caldwell	UST
0-004808	CROSSROADS MARKET (549)	3153 MORGANTON BOULEVARD	LENOIR	NC	28645	Caldwell	UST
0-007759	CONNELLY SPRINGS GAS HOUSE	1320 CONNELLY SPRINGS ROAD SW	LENOIR	NC	28645	Caldwell	UST
0-007766	LENOIR GAS HOUSE	2652 MORGANTON BOULEVARD	LENOIR	NC	28645	Caldwell	UST
0-029588	CHESTERFIELD ELEMENTARY SCHOO	2142 PAX HILL ROAD	MORGANTON	NC	28655	BURKE	UST
0-034600	B & J SUPERETTE	2940 NC 18 US 64	MORGANTON	NC	28655	BURKE	UST
0-029368	UNITED PARCEL SERVICE	107 INDUSTRIAL COURT	LENOIR	NC	28645	Caldwell	UST
0-031381	MARLIN COMPANY, INC.	1333 VIRGINIA STREET NW	LENOIR	NC	28645	Caldwell	UST
0-032980	FAST TRACK 136	2175 MORGANTON BLVD, SW	LENOIR	NC	28645	Caldwell	UST
0-034102	RYDER TRANSPORTATION 0362	1305 VIRGINIA ST SW	LENOIR	NC	28645	Caldwell	UST
0-035490	RUDISILL OIL & GROCERY	3296 PLAYMORE BEACH ROAD	MORGANTON	NC	28655	Caldwell	UST
0-035250	FLEMINGS CHAPEL BAPTIST CHURC	4420 HARTLAND RD	LENOIR	NC	28645	Caldwell	UST
0-003861	MIDWAY MARKET & DELI. INC.	3426 MORGANTON BLVD/NC HWY 18	LENOIR	NC	28645	Caldwell	UST
AWD140005	Bob Price Farm			NC		Caldwell	AO
NCD000604322	SINGER CO FURNITURE DIV PLTS 3 4 & MH	904 VIRGINIA ST	LENOIR	NC	28645	Caldwell	CERCLIS
NCD000604330	SINGER CO FURNITURE DIV PLT #1	1409 WEST COLLEGE AVE SW	LENOIR	NC	28645	Caldwell	CERCLIS
NCD003158979	BERNHARDT FURNITURE CO PLANT #2	VIRGINIA ST	LENOIR	NC	28645	Caldwell	CERCLIS
NCD045456134	BUSS AUTOMATION INC	511 CREEKWAY DR NW	LENOIR	NC	28645	Caldwell	CERCLIS
NCD046149019	HISTRAND CHEM INC	HWY 9	LENOIR	NC	28645	Caldwell	CERCLIS
NCD053009510	RELIANCE UNIVERSAL OF KY	1713 MAIN STREET NW	LENOIR	NC	28645	Caldwell	CERCLIS
NCD054290770	THOMASVILLE FURNITURE INDS	315 ELIZABETH ST NW	LENOIR	NC	28645	Caldwell	CERCLIS
NCD079068833	LENOIR REFINING CO	263 PENNTON AVE NW	LENOIR	NC	28645	Caldwell	CERCLIS
NCD980557888	LENOIR CITY LDFL	904 VIRGINIA ST	LENOIR	NC	28645	Caldwell	CERCLIS

NCD000829101	BERNHARDT FURNITURE PLANT 5	1904 MORGANTON BOULEVARD SW	LENOIR	NC	28645	Caldwell	HWGT
NCD000829119	BERNHARDT FURNITURE PLANT 7	1402 MORGANTON BLVD. S.W.	LENOIR	NC	28645	Caldwell	HWGT
NCD000829127	BERNHARDT FURNITURE PLANT 3	1502 MORGANTON BLVD. S.W.	LENOIR	NC	28645	Caldwell	HWGT
NCD001936699	BERNHARDT FURNITURE PLANT 1	1548 MORGANTON BLVD. S.W.	LENOIR	NC	28645	Caldwell	HWGT
NCD003158979	BERNHARDT FURNITURE PLANT 2	1828 MORGANTON BOULEVARD	LENOIR	NC	28645	Caldwell	HWGT
NCD003159126	FAIRFIELD CHAIR PLANT 1	1331 HARPER AVENUE SOUTHWEST	LENOIR	NC	28645	Caldwell	HWGT
NCD045456134	BUSS AUTOMATION INCORPORATED	511 CREEKWAY DR NW	LENOIR	NC	28645	Caldwell	HWGT
NCD054290770	THOMASVILLE FURNITURE IND INC	315 ELIZABETH STREET NORTH WEST	LENOIR	NC	28645	Caldwell	HWGT
NCD981025406	PAXAR PRINTED LABEL GROUP	950 GERMAN ST.	LENOIR	NC	28645	Caldwell	HWGT
NCD981862683	TOM BROOKS CHEVROLET-BUICK	515 WILKESBORO BLVD NE	LENOIR	NC	28645	Caldwell	HWGT
NCD982115289	CITY SERVICE CLEANERS AND LAUNDRY	1036 HARPERS AVENUE NORTH WEST	LENOIR	NC	28645	Caldwell	HWGT
NCD982131773	AIR POWER INC	724 HARRISBURG RD SW	LENOIR	NC	28645	Caldwell	HWGT
NCD982134207	CALVIN MADISON INCORPORATED	602 CREEKWAY DR	LENOIR	NC	28645	Caldwell	HWGT
NCD982140071	GRAND MANOR FURN	929 HARRISBURG DR SW	LENOIR	NC	28645	Caldwell	HWGT
NCD986215531	CYTOSOL OPHTHALMICS LENOIR	1325 WILLIAM WHITE PLACE NORTHEAST	LENOIR	NC	28645	Caldwell	HWGT
NCD986232619	GREER LABORATORIES INC	639 NUWAY CIR	LENOIR	NC	28645	Caldwell	HWGT
NCD054511860	MCCREARY CHAIR	2929 MORGANTON BLVD	LENOIR	NC	28645	Caldwell	HWGT
NCD982088767	BARLOWES LAUNDRY	325 HARPER AVE	LENOIR	NC	28645	Caldwell	HWGT
NCD981480858	JORDANS CLEANERS	220 MORGANTON BLVD SW	LENOIR	NC		Caldwell	HWGT
NCD981922545	TRI COUNTY FORD LINC MERC INC	HWY 321 S	HUDSON	NC		Caldwell	HWGT
NCD986175982	BLUE RIDGE LABS	PINE MOUNTAIN RD	LENOIR	NC	28645	Caldwell	HWGT
NCD986177400	BELLSOUTH TELECOMMUNICATIONS	1047 HARPER AVE	LENOIR	NC	28645	Caldwell	HWGT
NCD986182483	SANDERS ELECTRIC MOTOR SER INC	285 WILDWOOD RD	LENOIR	NC	28645	Caldwell	HWGT
NCD986213296	CALDWELL MEMORIAL HOSPITAL	321 MULBERRY ST	LENOIR	NC	28645	Caldwell	HWGT
NCD986230332	RYDER TRUCK RENTAL INC	734 HARRISBURG DR SW	LENOIR	NC	28645	Caldwell	HWGT
NCD991278342	BROYHILL FURNITURE INDS INC HARPER PLT	418 S PROSPECT ST	LENOIR	NC		Caldwell	HWGT
NC0043231	Cedar Rock Country Club	450 Cedar Rock Estates Dr	Lenoir	NC	28645	Caldwell	NPDES
NCG020026	Vulcan Construction Materials - Lenoir Quarry	2008 Wilkesboro Blvd SE	Lenoir	NC	28645	Caldwell	NPDES
NCG180169	Thomasville Furniture Ind., Inc. - Lenoir Plant	315 Elizabeth St NW	Lenoir	NC	28645	Caldwell	NPDES
NCG180190	Fairfield Chair Co-Plt #1	107 Beall St SW	Lenoir	NC	28645	Caldwell	NPDES
NCG170313	American & Efrid Incorporated-Nelson	619 Connelly Springs Rd	Lenoir	NC	28645	Caldwell	NPDES
NCG180152	Bernhardt Furniture Co-Cen Lum	714-B Lynn Haven Dr	Lenoir	NC	28645	Caldwell	NPDES
NCG180153	Bernhardt Furniture Co-Plt 5	1904 Morganton Blvd	Lenoir	NC	28645	Caldwell	NPDES
NCG180154	Bernhardt Furniture Co-Plt 7	1402 Morganton Blvd	Lenoir	NC	28645	Caldwell	NPDES
NCG180155	Bernhardt Furniture Co-Plt 3	1502 Morganton Blvd	Lenoir	NC	28645	Caldwell	NPDES
NCG180156	Bernhardt Furniture Co-Plt 2	1828 Murganton Blvd	Lenoir	NC	28645	Caldwell	NPDES
NCG180157	Bernhardt Furniture Co-Plt 1	1548 Morganton Blvd	Lenoir	NC	28645	Caldwell	NPDES
NCG500072	Lenoir Plant	315 Elizabeth St NW	Lenoir	NC	28645	Caldwell	NPDES
NCG500179	Virginia Street Complex	Virginia St	Lenoir	NC	28633	Caldwell	NPDES
NCG550801	Blessed Hope Church	US 321 N	Lenoir	NC	28645	Caldwell	NPDES
NCGNE0050	Hickory Springs Mfg. Co.-HS Converting Division	1418 Underdown Ave SE	Lenoir	NC	28645	Caldwell	NPDES
NCGNE0115	Bernhardt Furniture Company	904 Virginia St	Lenoir	NC	28645	Caldwell	NPDES
NCS000066	Neptune Inc	815d Virginia St	Lenoir	NC	28645	Caldwell	NPDES
NCG180084	Broyhill Furniture Ind Incorporated	Virginia St	Lenoir	NC	28633	Caldwell	NPDES
NCG210133	H. Parsons, Inc.	100 Parsons Park Dr	Lenoir	NC	28645	Caldwell	NPDES

NCG050229	Sealed Air Corporation	2075 Valway Rd	Lenoir	NC	28645	Caldwell	NPDES
NCD042270405	BLUE RIDGE EMC	1216 Blowing Rock Blvd	LENOIR	NC	28645	Caldwell	PCBS
6505	E-Z WAY AUTO SALES	1036 MORGANTON BLVD SW	LENOIR	NC	28645	Caldwell	PIRF
28201	SERVCO No. 01912 (former)	1507 Morganton Blvd. SW	Lenoir	NC	28645	Caldwell	PIRF
6404	LENOIR MUFFLER SHOP	681 CONNELLY SPRINGS ROAD	LENOIR	NC	28645	Caldwell	PIRF
6091	LENOIR GOLF CLUB	UNKNOWN	UNKNOWN	NC		Caldwell	PIRF
5476	ARNOLD'S MUFFLER SHOP	438 HARPER AVENUE NW	LENOIR	NC	28645	Caldwell	PIRF
28150	Economy Oil	1241 West Harper Avenue	Lenoir	NC	28645	Caldwell	PIRF
28102	CALDWELL CNTY SCHOOLS MAINTENANCE	214 CLARK DRIVE	LENOIR	NC	28645	Caldwell	PIRF
10202	ROGERS SELF SERVICE	UNKNOWN	UNKNOWN	NC		Caldwell	PIRF
9999	SINGER-METHANOL UST	1409 COLLEGE AVE	Lenoir	NC	28655	Caldwell	PIRF
9997	SINGER-UST #4 & UST #5	1409 COLLEGE AVE	Lenoir	NC	28655	Caldwell	PIRF
10747	HATCHERS AUTO & TRUCK	UNKNOWN	UNKNOWN	NC		Caldwell	PIRF
10910	NORTHSIDE BP STATION	1005 MAIN STREET	LENOIR	NC	28645	Caldwell	PIRF
9489	SINGER-NAPTHA UST	1409 college Ave	Lenoir	NC	28655	Caldwell	PIRF
13114	JAMIE WHITE PROPERTY	MAIN STREET AND HWY18	LENOIR	NC	28645	Caldwell	PIRF
17199	CALDWELL CO. SHERIFF'S OFFICE	212 MULBERRY STREET	LENOIR	NC	28645	Caldwell	PIRF
13052	BEALL OIL BULK STORAGE	505 CREEKWAY DRIVE	LENOIR	NC	28645	Caldwell	PIRF
28006	RAINEY'S GULF SERVICE	301 MAIN STREET	LENOIR	NC	28645	Caldwell	PIRF
11783	RUN-IN #719	UNKNOWN	UNKNOWN	NC		Caldwell	PIRF
21966	ZIP'S USED CARS	1334 MORGANTON BLVD	LENOIR	NC	28645	Caldwell	PIRF
3210	SINGER FURNITURE-PLANT NO. 1	1409 WEST COLLEGE AVE SW	LENOIR	NC	28645	Caldwell	PIRF
23360	SHOEMAKER OIL	1340 MORGANTON BLVD. SW	LENOIR	NC	28645	Caldwell	PIRF
28240	BERNHARDT-SEAGLE COMPANY	117 MAIN ST	LENOIR	NC	28645	Caldwell	PIRF
3544	BUSS AUTOMATION	511 CREEKWAY DRIVE	LENOIR	NC		Caldwell	PIRF
3193	SINGER FURNITURE DIV.	723 VIRGINIA ST.	LENOIR	NC		Caldwell	PIRF
7554	THOMASVILLE FURNITURE INDUS.	P. O. BOX 339	THOMASVILLE	NC	27361	Caldwell	PIRF
8918	AKZO (RELIANCE UNIVERSAL)	1713 MAIN ST. NW	LENOIR	NC		Caldwell	PIRF
22168	SOUTHEASTERN ADHESIVES	815D VIRGINIA ST., SW	LENOIR	NC	28645	Caldwell	PIRF
85604	ASPHALT PLANT-MIDSTATE CONTRACTORS	HIGHWAY 18	LENOIR	NC	28645	Caldwell	PIRF
21624	LENOIR QUARRY (AST)	HWY 18	LENOIR	NC	28645	Caldwell	PIRF
87010	NACCO Materials Handling Group	2040 Morganton Boulevard	Lenoir	NC	28645	Caldwell	PIRF
9F3161B2ABCBB0678 52571060054CFB9	DUKE ENERGY - MILLER HILL TIE & RETAIL	212 MULBERRY ST	LENOIR	NC	28645	Caldwell	TII
41AB6BA0AACBB848 8525705B005EC394	BELLSOUTH - 22919	1047 W HARPER AVE	LENOIR	NC	28645	Caldwell	TII
4FD48A8323DB7D13 852570210050AC6C	CASE GOODS - UPHOLSTER	1904 MORGANTON BLVD	LENOIR	NC	28645	Caldwell	TII
72F5DED1C979613 485256F97006657EA	BROYHILL FURNITURE - HARPER PLANT	418 PROSPECT STREET	LENOIR	NC	28633	Caldwell	TII
91B7426B675350E08 52570210050AC6A	CASE GOODS - HOUSEHOLD FURNITURE	1402 MORGANTON BLVD	LENOIR	NC	28645	Caldwell	TII
948CCBD1FF8EB16F 8525702000666D39	THOMASVILLE FURNITURE IND, INC - LENOIR	315 ELIZABETH STREET, NW	LENOIR	NC	28645	Caldwell	TII
988FD6076902759E85 2570210050AC6B	CASE GOODS - PLANT 2	1838 MORGANTON BLVD	LENOIR	NC	28645	Caldwell	TII
D0B09B11C9E31B0C 852570210050ABE9	BERNHARDT FURNITURE CO	1502 MORGANTON BLVD	LENOIR	NC		Caldwell	TII
FC54640C3F5847AF8 52570210050AC14	BLUE RIDGE ELECTRIC MEMBERSHIP CORP	1216 BLOWING ROCK BOULEVARD	LENOIR	NC	28645	Caldwell	TII
3F032C486AB9FD478 5256FF8004742AF	NEWS TOPIC	123 PENNTON AVENUE	LENOIR	NC	28645	Caldwell	TII
105B2C133F1D9CFE8 52570210050AC2B	BLUE RIDGE ENERGIES - LENOIR	110 NUWAY CIRCLE NE	LENOIR	NC	28645	Caldwell	TII

2579126AAF5EB51E8 525702D005B5464	SEALED AIR CORP - LENOIR	2075 VALWAY RD	LENOIR	NC	28645	Caldwell	TII
2D6874598420B6A385 25702B005DCDEA	NEPTCO, INC - 002	2012 HICKORY BLVD	LENOIR	NC	28645	Caldwell	TII
NCD980557888	LENOIR CITY LF		LENOIR	NC		Caldwell	UDS
WI0100039	Nacco Materials	2040 Morganton Blvd	Lenoir	NC	28645	Caldwell	UIC
0-001188	TIME SAVE (562)	1337 NORWOOD STREET SW	LENOIR	NC	28645	Caldwell	UST
0-002424	HARPER AVENUE BP	429 HARPER AVENUE	LENOIR	NC	28645	Caldwell	UST
0-004924	JACK B QUICK 9	162 WILKESBORO BOULEVARD SE	LENOIR	NC	28645	Caldwell	UST
0-004598	LENOIR ICE & FUEL	107 LIGHT STREET SW	LENOIR	NC	28645	Caldwell	UST
0-004625	GAS & GO (554)	1124 BLOWING ROCK ROAD	LENOIR	NC	28645	Caldwell	UST
0-004701	AJ'S EXPRESS	1302 MORGANTON BOULEVARD, S.W.	LENOIR	NC	28645	Caldwell	UST
0-004775	BELLSOUTH LENRNCMA 22919	1047 W HARPER AVE	LENOIR	NC	28645	Caldwell	UST
0-007321	CALDWELL COUNTY SCH BUS GARAG	113 TREMOUNT DRIVE	LENOIR	NC	28645	Caldwell	UST
0-007322	CALDWELL CO SCHOOL MAINT.SHOP	214 CLARK DRIVE	LENOIR	NC	28645	Caldwell	UST
0-007109	HOLIDAY FOODS 3	933 WILKESBORO BLVD	LENOIR	NC	28645	Caldwell	UST
0-007757	CUBBARD ESPRESS 10	510 BLOWING ROCK BOULEVARD	LENOIR	NC	28645	Caldwell	UST
0-007588	SERVICE 01912	1507 MORGANTON BLVD.,SW	LENOIR	NC	28645	Caldwell	UST
0-007994	BRUEX, INC.	312 LUTZ STREET	LENOIR	NC	28645	Caldwell	UST
0-007806	HOLIDAY FOODS 2	1718 MORGANTON BLVD.,S.W.	LENOIR	NC	28645	Caldwell	UST
0-007820	HOLIDAY SUPERETTE	1742 BLOWING ROCK BLVD	LENOIR	NC	28645	Caldwell	UST
0-011166	TOM BROOKS CHEVROLET- BUICK, I	515 WILKESBORO BOULEVARD N.E.	LENOIR	NC	28645	Caldwell	UST
0-021147	HOLIDAY FOODS 15/TOBACCO TO G	1136 HICKORY BLVD SW	LENOIR	NC	28645	Caldwell	UST
0-021138	RUN-IN FOOD STORE 731/22618	1251 NORWOOD DRIVE S.W.	LENOIR	NC	28645	Caldwell	UST
0-021623	BLUE RIDGE ENERGIES LLC	110 NUWAY CIRCLE	LENOIR	NC	28645	Caldwell	UST
0-024894	D & D MILLER HILL (550)	1101 VIRGINIA STREET SW	LENOIR	NC	28645	Caldwell	UST
0-025322	FOOTHILLS FOOD PLAZA	440 BLOWING ROCK BLVD NE PO BX 4	LENOIR	NC	28645	Caldwell	UST
0-025861	CALDWELL MEMORIAL HOSPITAL	321 MULBERRY STREET	LENOIR	NC	28645	Caldwell	UST
0-027535	HIBRITEN HIGH SCHOOL	550 EAST BLVD	LENOIR	NC	28645	Caldwell	UST
0-028234	CEDAR ROCK COUNTRY CLUB, INC	450 CEDAR ROCK DRIVE	LENOIR	NC	28645	Caldwell	UST
0-032480	ROSS & COMPANY (578)	1902 HARPER AVE NW	LENOIR	NC	28645	Caldwell	UST
0-033119	WILCO 353	502 WILKESBORO BLVD, SE	LENOIR	NC	28645	Caldwell	UST
0-033928	CALDWELL COUNTY SHERIFF'S OFF	212 MULBERRY STREET	LENOIR	NC	28645	Caldwell	UST
0-033929	FOOTHILLS AREA PROGRAMS	606 COLLEGE AVENUE	LENOIR	NC	28645	Caldwell	UST
0-034455	PAXAR PRINTED LABEL	950 GERMAN STREET	LENOIR	NC	28645	Caldwell	UST
0-035881	FASTOP FOOD MART 301	215 BLOWING ROCK BLVD, NW	LENOIR	NC	28645	Caldwell	UST
0-207653	THE TOBACCO CO INC (558)	353 S W HARPER AVENUE	LENOIR	NC	28645	Caldwell	UST
0-007421	MAX TAYLOR CONST. CO.	700 TAYLORSVILLE RD.	LENOIR	NC	28695	Caldwell	UST
0-033495	MUTUAL SAVINGS BANK	107 NORWOOD STREET	LENOIR	NC	28645	Caldwell	UST

All of the Potential Contamination Sources in the Lower Creek watershed are listed as high risk, so to prioritize the PCSs; a 500 foot buffer was used to determine all of those sources within 500 feet of a perennial stream. Map 7 shows the PCS within the 500 foot buffer and Table 2 is a summary of those PCS.

Map 7: Potential Contaminant Sources within 500 ft. of Perennial Streams

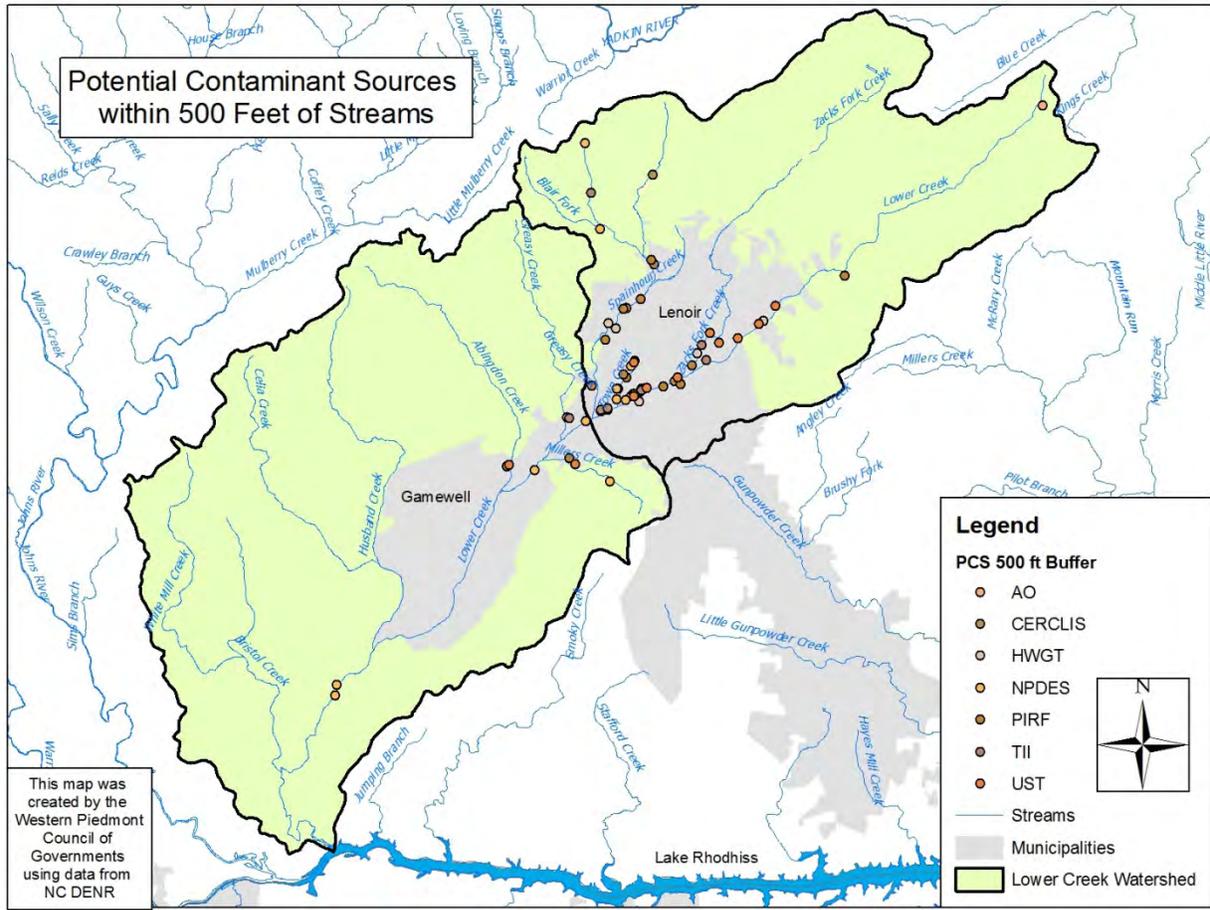


Table 2: Potential Contaminant Sources within 500 ft. of Perennial Streams

PCS_ID	PCS_NAME	ADDRESS	CITY	STATE	ZIP	COUNTY	PCSTYPE
NC0048755	Monte Carlo Trailer Park	1606 Poplar St	Lenoir	NC	28645	Burke	NPDES
NC0023981	Lower Creek WWTP	NCSR 1149	Lenoir	NC	28645	Caldwell	NPDES
NCG020039	Martin Marietta-Hudson	Sw Loop Blvd bradford m	Hudson	NC	28638	Caldwell	NPDES
NCG140097	Hamby Brothers Concrete Incorporated	2051 Morganton Blvd SW	Lenoir	NC	28645	Caldwell	NPDES
NCG500178	Miller Hill Complex	Complex St	Lenoir	NC	28633	Caldwell	NPDES
NCG520090	Mabe Pit	1000 - 1209 Atioch	Morganton	NC	28655	Burke	NPDES
28231	BROYHILL FURNITURE-MILLER HILL	802 COMPLEX STREET	LENOIR	NC	23424	Caldwell	PIRF
13295	LENOIR GAS HOUSE	UNKNOWN	UNKNOWN	NC		Caldwell	PIRF
B683A6F3BA2906 C685256FC1005FF57A	TRIGEN-BIOPOWER, INC - LENOIR	700 COMPLEX PLACE	LENOIR	NC	28645	Caldwell	TII
0-007766	LENOIR GAS HOUSE	2652 MORGANTON BOULEVARD	LENOIR	NC	28645	Caldwell	UST
0-031381	MARLIN COMPANY, INC.	1333 VIRGINIA STREET NW	LENOIR	NC	28645	Caldwell	UST
AWD140005	Bob Price Farm			NC		Caldwell	AO
NCD000604330	SINGER CO FURNITURE DIV PLT #1	1409 WEST COLLEGE AVE SW	LENOIR	NC	28645	Caldwell	CERCLIS
NCD003158979	BERNHARDT FURNITURE CO PLANT #2	VIRGINIA ST	LENOIR	NC	28645	Caldwell	CERCLIS
NCD053009510	RELIANCE UNIVERSAL OF KY	1713 MAIN STREET NW	LENOIR	NC	28645	Caldwell	CERCLIS
NCD000829101	BERNHARDT FURNITURE	1904 MORGANTON	LENOIR	NC	28645	Caldwell	HWGT

	PLANT 5	BOULEVARD SW					
NCD000829119	BERNHARDT FURNITURE PLANT 7	1402 MORGANTON BLVD. S.W.	LENOIR	NC	28645	Caldwell	HWGT
NCD000829127	BERNHARDT FURNITURE PLANT 3	1502 MORGANTON BLVD. S.W.	LENOIR	NC	28645	Caldwell	HWGT
NCD001936699	BERNHARDT FURNITURE PLANT 1	1548 MORGANTON BLVD. S.W.	LENOIR	NC	28645	Caldwell	HWGT
NCD003158979	BERNHARDT FURNITURE PLANT 2	1828 MORGANTON BOULEVARD	LENOIR	NC	28645	Caldwell	HWGT
NCD003159126	FAIRFIELD CHAIR PLANT 1	1331 HARPER AVENUE SOUTHWEST	LENOIR	NC	28645	Caldwell	HWGT
NCD981025406	PAXAR PRINTED LABEL GROUP	950 GERMAN ST.	LENOIR	NC	28645	Caldwell	HWGT
NCD981862683	TOM BROOKS CHEVROLET-BUICK	515 WILKESBORO BLVD NE	LENOIR	NC	28645	Caldwell	HWGT
NCD982131773	AIR POWER INC	724 HARRISBURG RD SW	LENOIR	NC	28645	Caldwell	HWGT
NCD982134207	CALVIN MADISON INCORPORATED	602 CREEKWAY DR	LENOIR	NC	28645	Caldwell	HWGT
NCD981480858	JORDANS CLEANERS	220 MORGANTON BLVD SW	LENOIR	NC		Caldwell	HWGT
NCG180190	Fairfield Chair Co-Plt #1	107 Beall St SW	Lenoir	NC	28645	Caldwell	NPDES
NCG180154	Bernhardt Furniture Co-Plt 7	1402 Morganton Blvd	Lenoir	NC	28645	Caldwell	NPDES
NCG180156	Bernhardt Furniture Co-Plt 2	1828 Murganton Blvd	Lenoir	NC	28645	Caldwell	NPDES
NCG500179	Virginia Street Complex	Virginia St	Lenoir	NC	28633	Caldwell	NPDES
NCG550801	Blessed Hope Church	US 321 N	Lenoir	NC	28645	Caldwell	NPDES
NCG180084	Broyhill Furniture Ind Incorporated	Virginia St	Lenoir	NC	28633	Caldwell	NPDES
NCG050229	Sealed Air Corporation	2075 Valway Rd	Lenoir	NC	28645	Caldwell	NPDES
6505	E-Z WAY AUTO SALES	1036 MORGANTON BLVD SW	LENOIR	NC	28645	Caldwell	PIRF
28201	SERVCO No. 01912 (former)	1507 Morganton Blvd. SW	Lenoir	NC	28645	Caldwell	PIRF
6091	LENOIR GOLF CLUB	UNKNOWN	UNKNOWN	NC		Caldwell	PIRF
9999	SINGER-METHANOL UST	1409 COLLEGE AVE	Lenoir	NC	28655	Caldwell	PIRF
9997	SINGER-UST #4 & UST #5	1409 COLLEGE AVE	Lenoir	NC	28655	Caldwell	PIRF
10747	HATCHERS AUTO & TRUCK	UNKNOWN	UNKNOWN	NC		Caldwell	PIRF
10910	NORTHSIDE BP STATION	1005 MAIN STREET	LENOIR	NC	28645	Caldwell	PIRF
9489	SINGER-NAPTHA UST	1409 college Ave	Lenoir	NC	28655	Caldwell	PIRF
13114	JAMIE WHITE PROPERTY	MAIN STREET AND HWY18	LENOIR	NC	28645	Caldwell	PIRF
21966	ZIP'S USED CARS	1334 MORGANTON BLVD	LENOIR	NC	28645	Caldwell	PIRF
3210	SINGER FURNITURE-PLANT NO. 1	1409 WEST COLLEGE AVE SW	LENOIR	NC	28645	Caldwell	PIRF
23360	SHOEMAKER OIL	1340 MORGANTON BLVD, SW	LENOIR	NC	28645	Caldwell	PIRF
3544	BUSS AUTOMATION	511 CREEKWAY DRIVE	LENOIR	NC		Caldwell	PIRF
7554	THOMASVILLE FURNITURE INDUS.	P. O. BOX 339	THOMASVILLE	NC	27361	Caldwell	PIRF
8918	AKZO (RELIANCE UNIVERSAL)	1713 MAIN ST. NW	LENOIR	NC		Caldwell	PIRF
22168	SOUTHEASTERN ADHESIVES	815D VIRGINIA ST., SW	LENOIR	NC	28645	Caldwell	PIRF
85604	ASPHALT PLANT-MIDSTATE CONTRACTORS	HIGHWAY 18	LENOIR	NC	28645	Caldwell	PIRF
21624	LENOIR QUARRY (AST)	HWY 18	LENOIR	NC	28645	Caldwell	PIRF
41AB6BA0AACBB848 8525705B005EC394 4FD48A8323DB7D13 852570210050AC6C	BELLSOUTH - 22919	1047 W HARPER AVE	LENOIR	NC	28645	Caldwell	TII
91B7426B675350E08 52570210050AC6A	CASE GOODS - UPHOLSTER FURNITURE	1904 MORGANTON BLVD	LENOIR	NC	28645	Caldwell	TII
988FD6076902759E85 2570210050AC6B	CASE GOODS - PLANT 2	1402 MORGANTON BLVD	LENOIR	NC	28645	Caldwell	TII
D0B09B11C9E31B0C 852570210050ABE9 2579126AAF5EB51E8 525702D005B5464	BERNHARDT FURNITURE CO	1838 MORGANTON BLVD	LENOIR	NC	28645	Caldwell	TII
2D6874598420B6A385 25702B005DCDEA	SEALED AIR CORP - LENOIR	2075 VALWAY RD	LENOIR	NC	28645	Caldwell	TII
0-004924	NEPTCO, INC - 002	2012 HICKORY BLVD	LENOIR	NC	28645	Caldwell	TII
	JACK B QUICK 9	162 WILKESBORO BOULEVARD SE	LENOIR	NC	28645	Caldwell	UST

0-004598	LENOIR ICE & FUEL	107 LIGHT STREET SW	LENOIR	NC	28645	Caldwell	UST
0-004701	AJ'S EXPRESS	1302 MORGANTON BOULEVARD, S.W.	LENOIR	NC	28645	Caldwell	UST
0-007321	CALDWELL COUNTY SCH BUS GARAG	113 TREMOUNT DRIVE	LENOIR	NC	28645	Caldwell	UST
0-007109	HOLIDAY FOODS 3	933 WILKESBORO BLVD	LENOIR	NC	28645	Caldwell	UST
0-007588	SERVICE 01912	1507 MORGANTON BLVD.,SW	LENOIR	NC	28645	Caldwell	UST
0-007806	HOLIDAY FOODS 2	1718 MORGANTON BLVD.,S.W.	LENOIR	NC	28645	Caldwell	UST
0-032480	ROSS & COMPANY (578)	1902 HARPER AVE NW	LENOIR	NC	28645	Caldwell	UST
0-033119	WILCO 353	502 WILKESBORO BLVD, SE	LENOIR	NC	28645	Caldwell	UST
0-035881	FASTOP FOOD MART 301	215 BLOWING ROCK BLVD, NW	LENOIR	NC	28645	Caldwell	UST

5.2 – Emergency Planning

Caldwell County

Caldwell County has taken a comprehensive emergency management approach to meeting the needs of the public before, during and after a disaster by utilizing the All-Hazards approach to all risks: natural disaster, man-caused, technological, domestic or international terrorism, energy and material shortages, and it is integrated into our ongoing management program. This comprehensive approach includes all four phases of disaster or emergency activity: mitigation, preparedness, response and recovery. Figure 1 shows the Caldwell County Hazard Response Plan.

Figure 1: Caldwell County Emergency Management Hazmat Response Plan

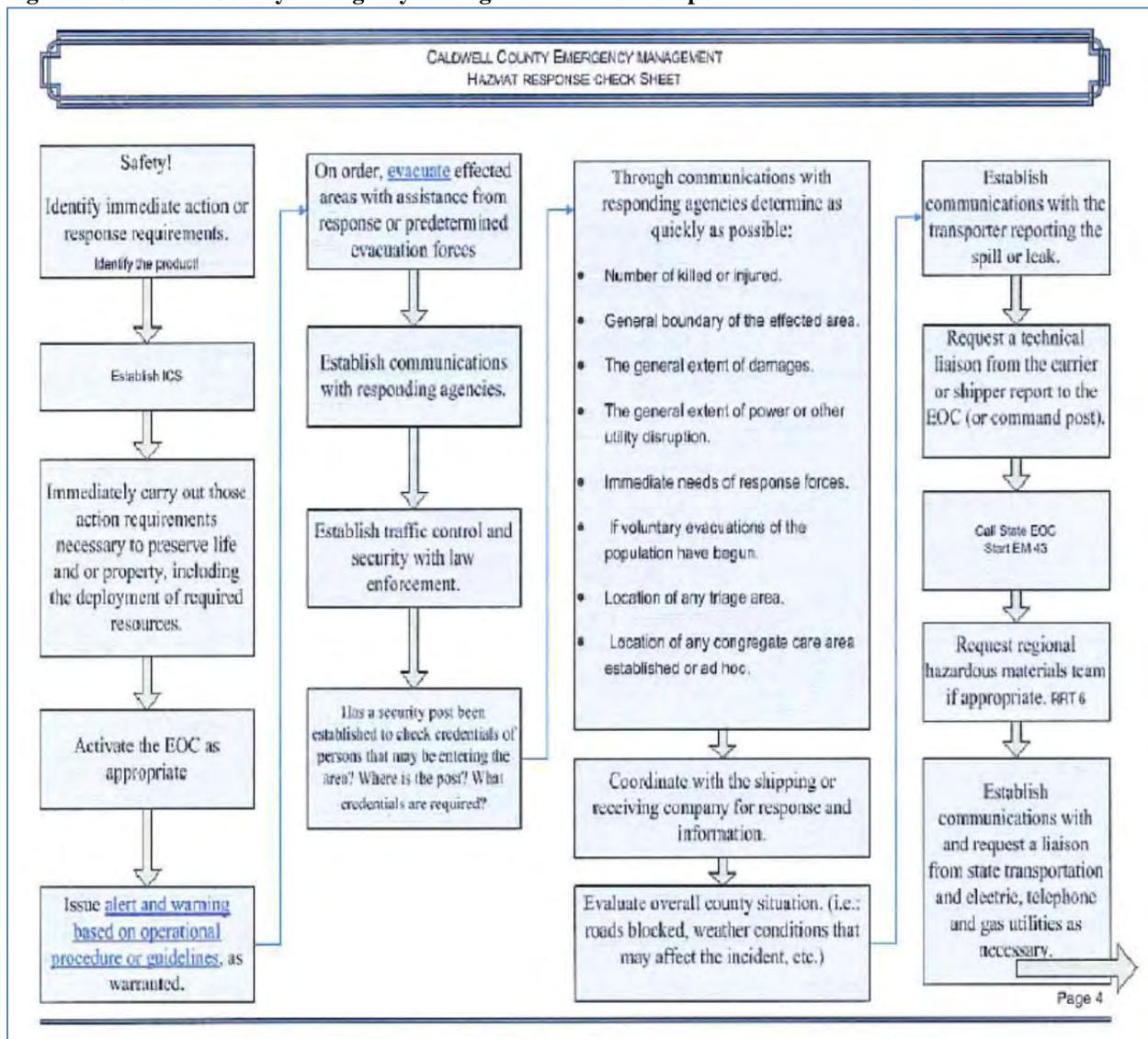
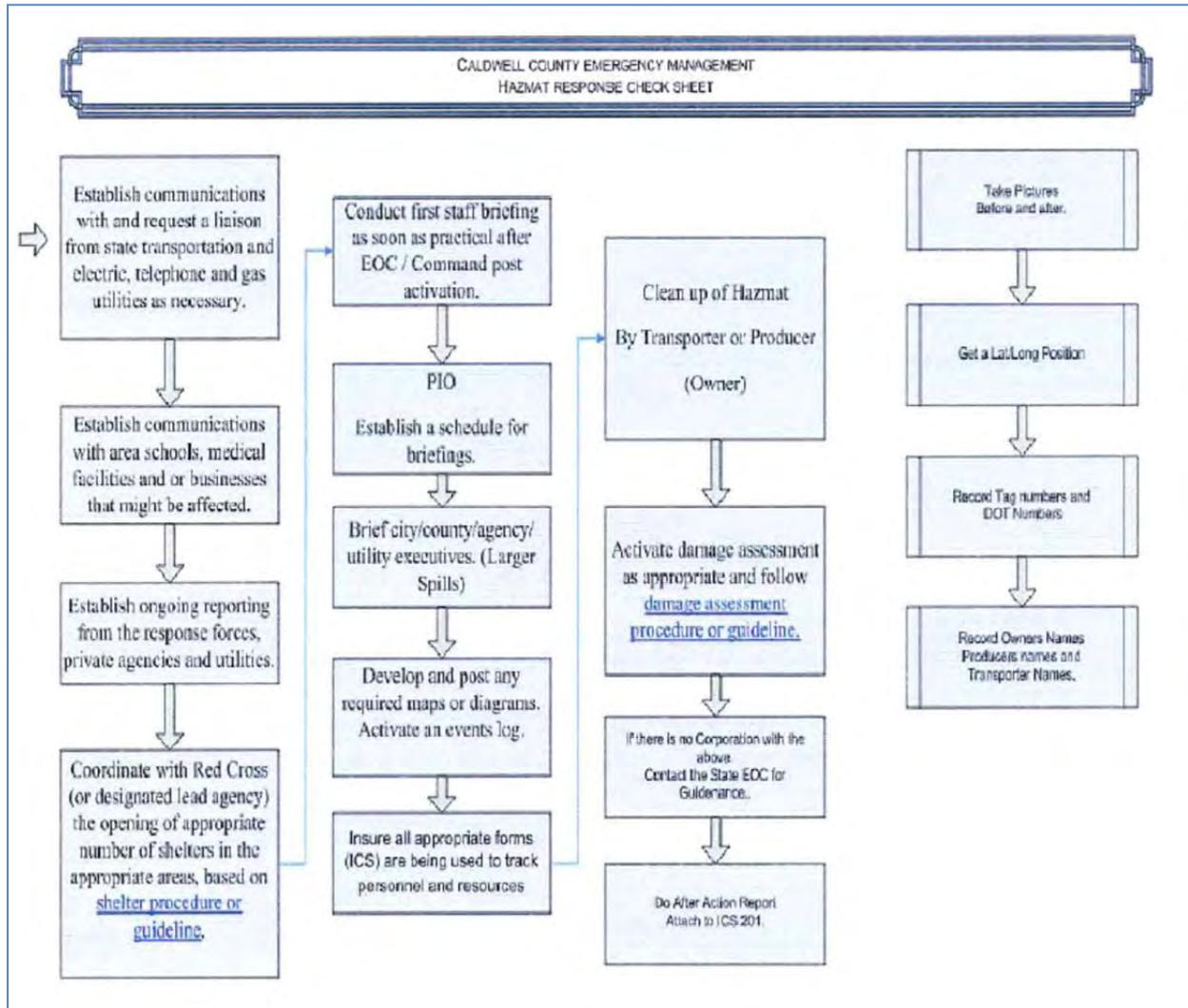
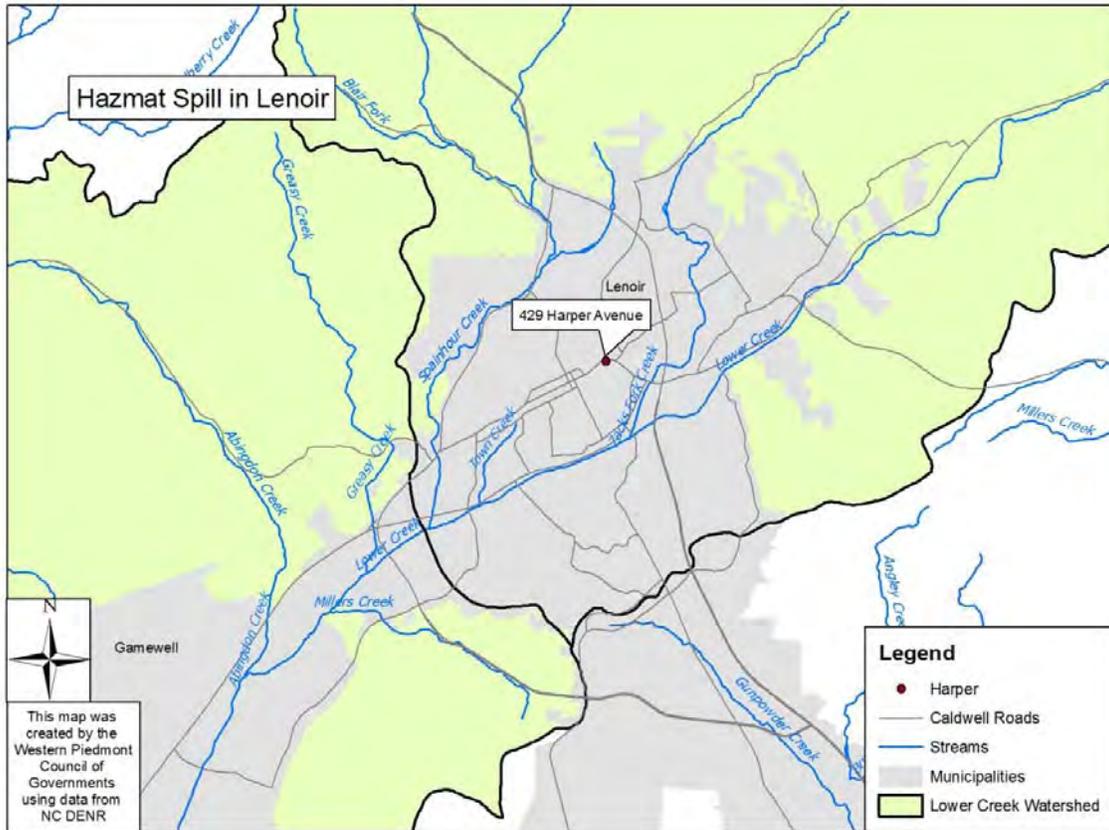


Figure 1: Caldwell County Emergency Management Hazmat Response (cont.)



At this time, there has only been one major spill that Caldwell emergency Management has had to respond to. On July 23, 2012 an underground creek is found leaking petroleum from under the U Save Mart at 429 Harper Avenue in Lenoir. The leak was traced to an underground storage tank that supplies fuel to the U Save Mart. Lenoir fire and Rescue lowered booms into the creek to contain the petroleum in the creek. Caldwell County worked with EPA and DAQ to get the petroleum out of the creek. As of August 8, 2012, the petroleum tank is still leaking, but the problem has been contained to the property from which it came.

Map 8: Hazmat Spill in Lenoir



Burke County

Burke County Emergency Medical Services offers numerous response services other than pre-hospital medicine and transports. EMS also operates a Special Operations Unit that responds to Wilderness Medical situations, and special situations with Law Enforcement and Fire Departments, specialized coverage for Mass Gatherings and Special Events, and Mass Decontamination along with the Burke County Hazardous Materials Team and State Medical Assistance Team.

The hazardous materials response service is a joint venture between the Fire Marshal's Office, other emergency agencies, and Morganton Department of Public Safety that came together to form a hazardous materials response team. The haz mat team was formed in 1988 and is available to respond to all areas of the County and municipalities. The team consists of twenty-one members and two response vehicles. Eleven members are state certified at the technician level that requires over two hundred hours of initial training and the remaining personnel are state certified at operations level. The team is capable to respond to a situation involving the release of a hazardous material from a fixed facility or a transportation incident for mitigation purposes that may require the use of special chemical protective clothing and respiratory protection. The hazardous materials team responds to approximately twenty-five calls per year. Figure 2 shows the Burke County Hazard Response Plan.

Figure 2: Burke County Emergency Management Hazmat Response Plan

<p style="text-align: center;">HAZARDOUS MATERIALS BASIC PLAN - APPENDIX 8 ATTACHMENT 3 GUIDELINES FOR RESPONSE TO HAZARDOUS MATERIALS INCIDENTS</p> <p>This is a suggested format. Actual implementation should be based upon training and the ability to perform the identified tasks. Source: Right-To-Know Planning Guide, the Bureau of National Affairs, Inc.</p> <p>This attachment may also contain suggested citizen instructions for major emergencies. These instructions can be used to expedite emergency public information measures. They contain general information for the threats.</p> <p>INITIAL RESPONDERS</p> <p>Size- Up/Identification</p> <ul style="list-style-type: none"> <input type="checkbox"/> Approach from upwind and upgrate. <input type="checkbox"/> Observe from safe distance. <input type="checkbox"/> Use binoculars if necessary. <input type="checkbox"/> Examine placards/labels. <input type="checkbox"/> Interview driver, conductors, facility operator, dock manager, etc. <input type="checkbox"/> Examine shipping papers or I.D numbers. <input type="checkbox"/> Refer to North American Guidebook or Firefighter's handbook of Hazardous Materials. <p>Isolate Area</p> <ul style="list-style-type: none"> <input type="checkbox"/> Avoid contact with materials, fumes, dust, etc. <input type="checkbox"/> Establish control line at safe distance. <input type="checkbox"/> Eliminate or avoid ignition sources. <input type="checkbox"/> Determine if larger evacuation is necessary to keep people away from chemicals. <p>Provide for Personnel Safety</p> <ul style="list-style-type: none"> <input type="checkbox"/> Use appropriate personal protective equipment. <input type="checkbox"/> Consciously avoid committing personnel and equipment to an unsafe situation. <p>Emergency response agencies tasked with responding to the hazards identified as threats to Burke County can use the hazard specific checklists contained in this attachment. These checklists are not all-inclusive, but they cover key points.</p> <p>Rescue injured persons if possible to do so in a safe manner</p> <ul style="list-style-type: none"> <input type="checkbox"/> Identify all people who might have been injured or exposed 	<p>Establish Incident Command System</p> <ul style="list-style-type: none"> <input type="checkbox"/> Determine who is the On-Scene Incident Coordinator. <input type="checkbox"/> Set up field command post at same location <input type="checkbox"/> Advise dispatcher exact location of command post <input type="checkbox"/> Establish communications with off-scene help <input type="checkbox"/> Brief commander(s) <p>Notification and Technical Assistance</p> <ul style="list-style-type: none"> <input type="checkbox"/> 9-1-1 (or Local Emergency Phone Number) <input type="checkbox"/> EM OPS Center 1-800-858-0368 <input type="checkbox"/> State Agencies: 1-800-662-7956 (State Warning Point) <input type="checkbox"/> Federal agencies: 1-800-452-8802 (National Response Center) <input type="checkbox"/> Industry: 1-800-424-9300 (CHEMTREC) <input type="checkbox"/> Emergency Medical Advice: 1-800-672-1697 (Poison Control Center) <p>PROVIDE THE FOLLOWING INFORMATION IF POSSIBLE:</p> <ul style="list-style-type: none"> - <input type="checkbox"/> Your name, agency, location and call back number - <input type="checkbox"/> Type of material involved, characteristics, physical state, physical effects - <input type="checkbox"/> Amount of material released, duration of release, total amount that may be released - <input type="checkbox"/> Whether significant amounts of substance appear to be entering the atmosphere, nearby waters, storm drains - <input type="checkbox"/> Direction, height, color, odor of vapor clouds or plume - <input type="checkbox"/> Weather conditions, local terrain conditions, wind direction - <input type="checkbox"/> Injuries, contamination, exposure - <input type="checkbox"/> Responsible party - <input type="checkbox"/> Personnel on scene <p>ON-SCENE INCIDENT COMMANDER (OIC)</p> <p>Determine the On Scene Incident Commander</p> <ul style="list-style-type: none"> <input type="checkbox"/> Clearly identify yourself as OIC
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Figure 2: Burke County Emergency Management Hazmat Response Plan (cont.)

<ul style="list-style-type: none"> <input type="checkbox"/> Make sure Command Post is at a safe location <input type="checkbox"/> Establish unified command, if appropriate, with agencies on scene <input type="checkbox"/> Identify lead state agency, if any <input type="checkbox"/> Establish staging areas for equipment, medical treatment <input type="checkbox"/> Assure notifications made <input type="checkbox"/> Determine assistance needed from other agencies <p>Determine the Hazard</p> <ul style="list-style-type: none"> <input type="checkbox"/> Check placards, shipping, etc. <input type="checkbox"/> Use reference books and off-scene help (i.e. Emergency Management, Fire Marshal, CHEMTREC, etc). <input type="checkbox"/> Identify hazardous material, estimate threat to the population and environment <input type="checkbox"/> Determine wind speed and direction <input type="checkbox"/> Determine downwind, downstream, and down slope exposures <input type="checkbox"/> Identify ignition sources <input type="checkbox"/> Use available detection equipment <p>Provide for Personnel Safety</p> <ul style="list-style-type: none"> <input type="checkbox"/> Ensure the use of proper personal protective equipment <input type="checkbox"/> Evaluate need for further evacuation <input type="checkbox"/> Document personnel exposure <input type="checkbox"/> Appoint a Safety Officer <p>Assign Personnel Responsibilities (as appropriate)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Staging _____ <input type="checkbox"/> Evacuation _____ <input type="checkbox"/> Rescue _____ <input type="checkbox"/> Traffic and crowd control _____ <input type="checkbox"/> Containment _____ <input type="checkbox"/> Fire suppression _____ <input type="checkbox"/> Public information _____ 	<ul style="list-style-type: none"> <input type="checkbox"/> Communications _____ <input type="checkbox"/> Safety _____ <input type="checkbox"/> Emergency Medical _____ <input type="checkbox"/> Documentation _____ <p>Evaluate Control Line and Revise (if necessary)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Use tape, rope, fire-hose, etc. <input type="checkbox"/> Leave a margin of error <p>Incident Management</p> <ul style="list-style-type: none"> <input type="checkbox"/> Develop incident action plan <input type="checkbox"/> Oversee incident operations <input type="checkbox"/> Coordinate activities with EOC, Communications Center, etc., as appropriate <p>Decontamination</p> <ul style="list-style-type: none"> <input type="checkbox"/> Assign decontamination area officer and team <input type="checkbox"/> Identify people and equipment possibly exposed <input type="checkbox"/> Set up decontamination area procedures <p>EVACUATION / SHELTER ACTIVITIES: (COMMAND POST)</p> <p>Determine Danger Area</p> <ul style="list-style-type: none"> <input type="checkbox"/> Identify people and facilities in danger area. <input type="checkbox"/> Decide between evacuation or shelter. (What will best reduce exposure). <input type="checkbox"/> Determine size of spill <input type="checkbox"/> Determine plume direction <input type="checkbox"/> Identify people and facilities in danger area <p>Decide between evacuation and / or shelter in place. (What will best reduce exposure.)</p> <p>Begin warning and/or evacuation procedures for those nearest the accident site. Work outward from the accident site.</p> <p>Notify necessary support agencies:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Law enforcement agencies <input type="checkbox"/> Local T.V., Radio, Cable and Newspaper through the PIO
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Figure 2: Burke County Emergency Management Hazmat Response Plan (cont.)

<ul style="list-style-type: none"> <input type="checkbox"/> Telecommunicators <input type="checkbox"/> Emergency Management (Red Cross, County Public Health Department, Transportation Coordinator, County Social Services when rest homes, family care homes, or special needs groups are involved) <p>EMERGENCY MEDICAL SERVICES (EMS)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Be aware of dangers <input type="checkbox"/> Take proper precautions to protect yourself when handling casualties <input type="checkbox"/> Coordinate actions with OIC (Command Post) <input type="checkbox"/> Identify medical risks to victims and emergency responders <input type="checkbox"/> Establish medical triage area, if necessary <input type="checkbox"/> Determine and establish appropriate treatment <input type="checkbox"/> Coordinate emergency transportation <input type="checkbox"/> Coordinate with hospital and medical personnel <input type="checkbox"/> Coordinate with Red Cross Mass Care Coordinator and/or EOC logistics regarding medical services required by evacuees <input type="checkbox"/> Decontaminate personnel - victims and equipment as needed <input type="checkbox"/> Help question/examine responding personnel on state of health and treat as required <input type="checkbox"/> Identify yourself to OIC as representing public health. <input type="checkbox"/> Coordinate with medical services <input type="checkbox"/> Confirm health hazard <input type="checkbox"/> Provide medical monitoring of emergency personnel as needed <p>PUBLIC HEALTH</p> <ul style="list-style-type: none"> <input type="checkbox"/> Investigate toxic levels of materials involved <input type="checkbox"/> Confirm evacuation area perimeters <input type="checkbox"/> Insure no biological agents involved (contact N.C. Division of Health if biological agents involved) <input type="checkbox"/> Work with State and Federal agencies to address environmental health/sanitation impacts <p>LAW ENFORCEMENT</p> <ul style="list-style-type: none"> <input type="checkbox"/> Determine with the Officer-in-Charge on the need for an exclusion perimeter, and the distances to establish traffic control 	<ul style="list-style-type: none"> <input type="checkbox"/> Establish perimeter-using rope, barricades, vehicles, etc. (Note: avoid flares if any indication that combustible or flammable chemicals are present) <input type="checkbox"/> Reroute pedestrians and vehicles around perimeter - keep onlookers, news media and others from excluded area <input type="checkbox"/> Request additional assistance as needed <input type="checkbox"/> Be prepared at the request of the OIC, to remove persons hindering emergency operations <input type="checkbox"/> Reopen evacuated areas at the determination of Command Post <p>PUBLIC WORKS/UTILITIES</p> <ul style="list-style-type: none"> <input type="checkbox"/> Coordinate activities with OIC <input type="checkbox"/> Be prepared to assist with traffic control, providing barricades, etc. <input type="checkbox"/> Be prepared to provide sand for absorption and diking <input type="checkbox"/> Be prepared to cut off power, gas, water, etc., as required <p>PUBLIC INFORMATION OFFICER</p> <p>Initial Actions</p> <ul style="list-style-type: none"> <input type="checkbox"/> Work with OIC on press releases <input type="checkbox"/> If necessary, contact local media and inform them of nature of the emergency and other pertinent information, as appropriate. <input type="checkbox"/> Set up press briefing area as close to the command post as possible, but in such a way that it does not interfere with the command post. <input type="checkbox"/> Establish both incoming and outgoing telephone communications at the press briefing area, if possible. <input type="checkbox"/> Be available to supply information to press, on request. <input type="checkbox"/> Periodically get status summary from OIC. <p>Long Term Actions (if required)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Coordinate press releases with involved agencies <input type="checkbox"/> Coordinate with State and Federal PIOs <input type="checkbox"/> Be the direct liaison with all the news media <input type="checkbox"/> Do follow-up after the emergency is over for evaluation purposes <input type="checkbox"/> Offer ongoing contact with media for wrap-up stories.
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6- Monitoring and Priority Areas

6.1 - Monitoring

The following is a summary of fecal coliform monitoring in the Lower Creek Watershed was provided by the NC Ecosystem Enhancement Program.

Lower Creek Fecal Coliform Bacteria Source Identification Study

Andrea Leslie, Watershed Planner, 18 April 2012

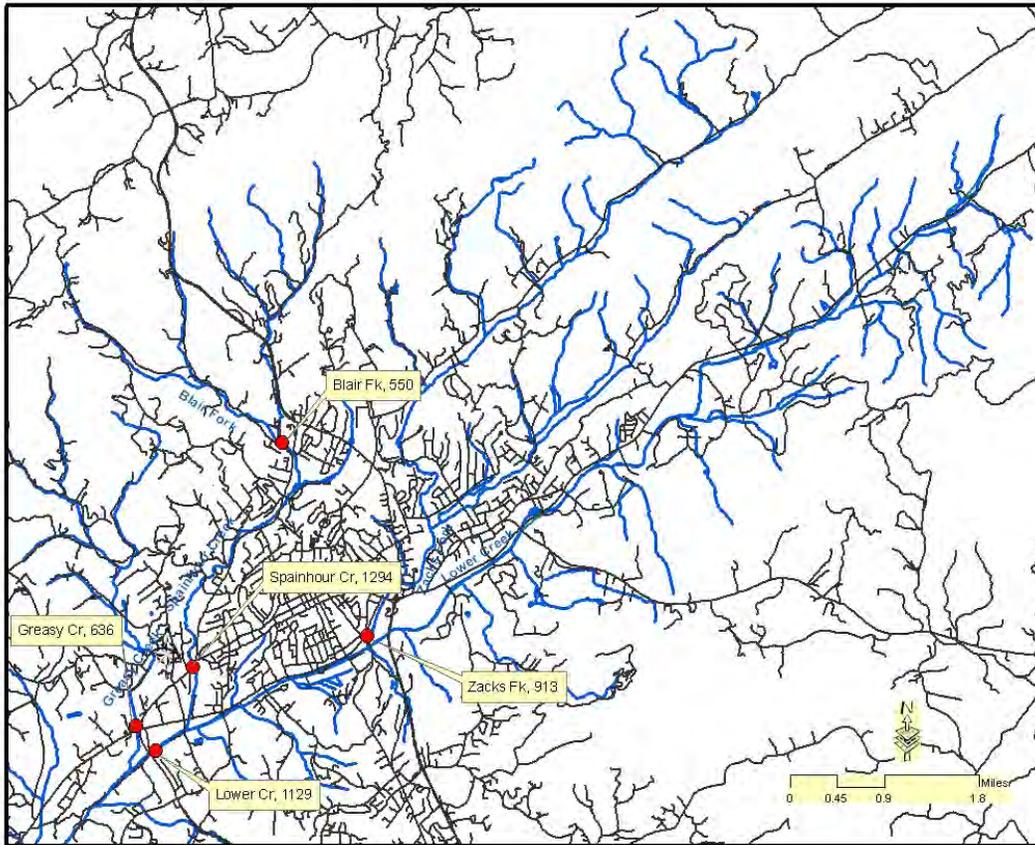
NC Division of Water Quality (DWQ) and the Lower Creek Advisory Team (LCAT) have been involved in efforts to characterize fecal coliform bacteria levels and sources since 2009. This document summarizes these efforts to now.

Assessment work performed in 2004 and 2005 for the Lower Creek Local Watershed Plan revealed that fecal coliform bacteria levels were high in Lower Creek and its tributaries in the Lenoir area. Fecal coliform bacteria were identified as a key stressor in the Lower Creek Watershed Management Plan in 2006, and the report stated that one source of these bacteria was the City of Lenoir's wastewater collection system, which had problems with sewer overflows and leaks (MACTEC et al, 2006).

In 2005, the City of Lenoir completed a sewer improvement project that was hoped would address some of the chronic fecal bacteria problems. In order to determine if there had been an improvement in bacteria levels, DWQ staff monitored fecal coliform bacteria in September 2009 in five streams (Lower Creek, Zacks Fork, Blair Fork, Spainhour Creek, and Greasy Creek) that had high levels during the initial 2004-2005 work (Map 8).

In order to directly apply the monitoring results the state standard of 200 colonies/100 mL, five samples were collected at baseflows during a 30-day period. All sites had fecal coliform bacteria levels above the state standard, and levels were generally just as high as those sampled in 2004-2005 (Tyndall, 2009). Due to the standard exceedences, all five streams are on NC's draft 2012 303(d) list of impaired streams (see http://portal.ncdenr.org/c/document_library/get_file?uuid=2dbffc77-1c7b-4979-9b60-4cd2a06094af&groupId=38364).

Map 9: 2009 Fecal Coliform Bacteria Geometric Means



Spainhour Creek and Blair Fork surveys

In 2010, LCAT decided to make tracking sources of these fecal bacteria levels a priority. Spainhour Creek and Blair Fork were selected to further investigate, since a majority of Spainhour Creek and some of Blair Fork are urban, and stream walking would be easiest here, as the LCAT determined that obtaining prior landowner permission in urban areas wouldn't be necessary. DWQ began by collecting three baseflow samples in the summer of 2010 throughout the watersheds of Spainhour Creek and Blair Fork in order to determine where levels were highest. Of note is that fecal coliform bacteria levels are often high in summer months, when water temperatures are warmer, and bacterial activity is high. The highest levels were found in lower Spainhour Creek and lower Blair Fork (Figure 2).

Streamwalking was then performed by LCAT members on Spainhour Creek between its confluence with Lower Creek and its confluence with Blair Fork. This stretch of stream is urban and landowners were not notified personally before the stream walks. Stream walking was performed in pairs, and staff GPSed sites of interest, including stormwater pipes, tributaries, and any possible hot spots, collecting water samples for fecal coliform bacteria analysis on tributaries and in suspicious areas. Data from this work are in a separate Excel spreadsheet, titled 'fecalsourcetrackingdata_sept2010.xlsx'.

Two specific hot spot areas were determined on Spainhour Creek, consisting of a stormwater pipe that smelled strongly of sewage and a possible leaking septic field. (see Figures 3, 4, and 5). Warren Depree, the Lenoir stormwater program lead, agreed to follow up on these areas, but he left his job soon after this and was not able to follow up.

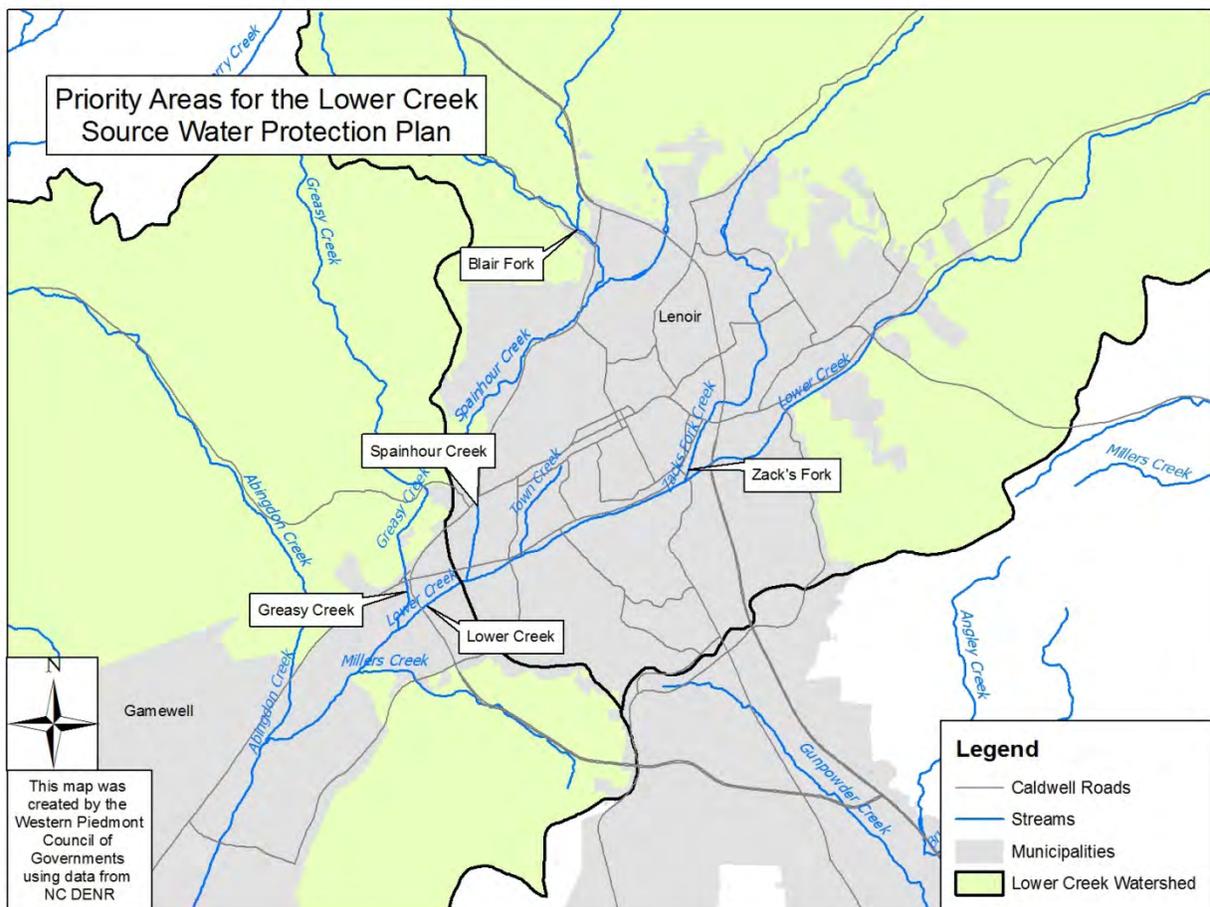
In addition, the stretch of UT to Spainhour Creek (which crosses US 321 and had a geometric mean of 810 colonies/100 mL in summer 2010—see Figure 2) was walked. Bacterial levels were still high upstream of US 321, where the stream originates in a densely populated neighborhood. It was recommended that door to door surveys for possible septic/straight pipe problems be performed in that neighborhood.

6.2 - Priority areas

Priority areas listed in the Lower Creek Watershed Management Plan are referenced in Section 4.2 of this document and outlined in full in the original plan in Appendix A. New priority areas for source water protection are based on the monitoring data provided in Section 6.1 by the Ecosystem Enhancement Program.

The priority areas for the Lower Creek Source Water Protection Plan will be used for the strategies that can be applied to specific locations, including further monitoring, Unifour Septic System Repair Program and further monitoring of fecal coliform sources.

Map 10: Priority Areas for the Lower Creek Source Water Protection Plan



EPP recommends that the following steps be taken in these priority areas:

- DWQ staff are currently sampling the Zacks Fork and Blair Fork watersheds to determine problem areas. Blair Fork is being resampled, as stream walking was not performed in 2010 and more recent data are needed to isolate problem areas. If problem areas are isolated in more urban portions of these subwatersheds, these streams should be stream walked by LCAT teams as in 2010.

- Hot spots in Spainhour Creek should be investigated.
- LCAT should brainstorm how to determine fecal coliform sources in Greasy Creek and Lower Creek. As mentioned above, Greasy Creek is primarily rural residential, and stream walking may be quite difficult, as landowner permission is advised in this sort of area. In addition, Lower Creek is large and deep, and sources may be isolated but may require the use of canoes or kayaks.

7 – Strategies

7.1- Existing Strategies

Staff from the Western Piedmont Council of Governments (WPCOG) and the NC Ecosystem Enhancement Program (EEP) presented the plan to all elected government boards in the Lower Creek Watershed in 2006. The Plan met with approval by all local governments. The level of acceptance varied but no outright rejection of the most controversial recommendations was noted. The degree of implementation also varied and has not been accurately ascertained.

1. Adopt the Lower Creek *Watershed Management Plan* as a supplement to comprehensive plans.

Land use refers to how a tract of land is utilized, whether it is designated residential, business, or for undeveloped uses like agriculture or open space. Local governments tend to categorize their developed uses in the zoning ordinance, with open space being up to the owners of the property. However, a local government can require open space be set aside, as long as a property owner has use of their property.

Much of the time, these restrictions can be outlined in a comprehensive plan and then set forth in a subdivision or zoning ordinance. A local government may require a new subdivision to have open space set aside, or may allow more clustered development for open space in return. Municipality, county, state and federal government all play a role in implementation of Ordinances, especially with respect to environmental concerns.

Long Range and Comprehensive plans are developed and updated periodically by local governments, either internally by existing staff under or contract with the WPCOG or a private consulting firm. As plans get updated it is hoped there will be more integration of these strategies.

2. Develop comprehensive stormwater management ordinances.

EPA's Stormwater Phase II Ordinance is intended to improve water quality by reducing the number of pollutants that are picked up by stormwater, carried into municipal separate storm sewer systems (MS4s), and ultimately discharged into local rivers streams without being treated. These pollutants can include oil and grease from roadways, pesticides from lawns, sediment from construction sites, and carelessly discarded trash, such as cigarette butts, paper wrappers, and plastic bottles. These pollutants can impair the waterways when deposited through MS4 discharges and discourage recreational use of the resource, contaminate drinking water supplies, and interfere with the habitat for fish, other aquatic organisms, and wildlife.

The following are the Six Minimum Measures of a Stormwater Phase II Ordinance as outlined by EPA:

- (1) **Public Education and Outreach** Distributing educational materials and performing outreach to inform citizens about the impacts polluted storm water runoff discharges can have on water quality.
- (2) **Public participation/Involvement** Providing opportunities for citizens to participate in program development and implementation, including effectively publicizing public hearings and/or encouraging citizen representatives on a storm water management panel.
- (3) **Illicit Discharge Detection and Elimination** Developing and implementing a plan to detect and eliminate illicit discharges to the storm sewer system (includes developing a system map and informing the community about hazards associated with illegal discharges and improper disposal of waste).
- (4) **Construction Site Runoff Control** Developing, implementing, and enforcing an erosion and sediment control program for construction activities that disturb one or more acres of land (controls could include silt fences and temporary storm water detention ponds).
- (5) **Post-Construction Runoff Control** Developing, implementing, and enforcing a program to address discharges of post-construction storm water runoff from new development and redevelopment areas. Applicable controls could include preventative actions such as protecting sensitive areas (e.g., wetlands) or the use of structural BMPs such as grassed swales or porous pavement.
- (6) **Pollution Prevention/Good Housekeeping** Developing and implementing a program with the goal of preventing or reducing pollutant runoff from municipal operations. The program must include municipal staff training on pollution prevention measures and techniques (e.g., regular street sweeping, reduction in the use of pesticides or street salt, or frequent catch-basin cleaning).

Some municipalities in Burke and Caldwell have been required to adopt the ordinances based on North Carolina's Model Ordinance, which can be found at http://h2o.enr.state.nc.us/su/phase_2_mod_ord.htm. The Water Resource Committee has appointed a Stormwater Working Group (SWWG), which has been voluntarily assisting Phase II Stormwater communities in the region for nearly a decade. The City of Lenoir has staff for stormwater who fulfills the stormwater requirements for the towns of Gamewell and Lenoir.

The Stormwater Working Group (SWWG), an active subcommittee of the Western Piedmont Water Resources Committee, was formed in 2009 to work cooperatively and synergistically to assure consistent implementation of program components throughout our region and to share expertise and other resources. This staff level group supported by the WPCOG has worked without project specific funding to support this endeavor, through: facilitating meetings; assistance in preparing annual reports; developing workshops; arranging speakers and seminars;

preparing outreach materials and presenting to various groups and at events. The SWWG has been voluntarily assisting Phase II Stormwater communities in the region for nearly a decade.

In order to better fully implement stormwater permits and management plans throughout the region in conjunction with current Phase II Programs it is recommended that there be better coordination between ongoing projects and resources in the Rhodhiss watershed. In order to do this, it is important to develop an organizational structure that works best to achieve collaboration and allows coalition members to remain independent organizations.

No Stormwater utility is currently found in the region. Caldwell County has rescinded their permit in 2009 and is not currently implementing a stormwater program. The Stormwater Programs that are functioning are not adequately funded and staffed, so ongoing training for Stormwater Staff and Public Service personnel is needed.

3. Amend subdivision ordinances to promote Low Impact Development and other measures that limit development impacts.

Development activities that slow the flow of water and replicate natural hydrologic systems are referred to as “Low Impact Development” (LID) measures. This includes activities that minimize impervious cover, incorporate stormwater management BMPs and have less impact upon the natural environment.

LID utilizes techniques such as

- Cluster development to maximize open spaces,
- Stormwater management measures that control and/or treat the runoff produced by urbanization include:
 - Grassed swales,
 - Bio-retention cells
 - Permeable pavement.
 - Narrower pavement width on subdivision streets
 - Use of grass swales, rather than traditional curb and gutter

For more information on LID techniques and strategies and learning opportunities, visit the NC State University site on Low Impact Development at: <http://www.bae.ncsu.edu/topic/lid/>.

These techniques can conflict with current subdivision standards, requiring some changes in ordinances to accommodate this type of development. Some jurisdictions have mandated that LID measures be utilized in the development of particularly sensitive areas. Local governments should also examine current regulations to ensure that they do not encourage impervious cover.

Caldwell County has had minimal Planning staff since 2009, so working on amendments may have to take place down the road. Staff at the Western Piedmont Council of Governments has been certified in LID and have had LID training sessions at the WPCOG. Additionally, staff at the WPCOG have been certified in using a LID audit tool developed by the Center for Watershed Protection, but have yet to have a local government request an audit.

Both Caldwell and Burke Counties have promoted the protection of environmentally sensitive areas in certain instances, such as in the Lake James small planning area in Burke County and any area proposed as a “planned unit development” in Caldwell County. Both counties should amend their subdivision ordinances to specify LID and to require open space, setting aside sensitive areas, including floodplains and steep slopes, from development. For examples of Ordinances that have a Low Impact Development component see Appendix C in this Plan.

4. Adopt and enforce more comprehensive riparian buffer ordinances.

It is recommended that each local government having jurisdiction over the Lower Creek local watershed adopt and enforce ordinances that extend the Catawba River main stem protection of 50-foot vegetative buffers to the perennial and intermittent streams that comprise the watershed, and to encourage more streamside areas left undeveloped or restored with functioning buffers. It is also important to develop and promote incentives for non-agricultural, smaller property owners who voluntarily establish and maintain buffers along streams within the watershed and to educate landowners on the environmental and tax benefits of establishing riparian buffer.

Burke and Caldwell County, as well as the Town Governments within their boundaries, have adopted land use ordinances that affect water quality. Both Counties taken over monitoring and permitting for Sedimentation and Erosion from the State, as well as adopting a Buffer Requirement Ordinance that requires a minimum 60 foot buffer along riparian waterways. Other ordinances adopted by the local governments include Water Supply Watershed Ordinances (WS-I, WS-II, WS-III, and WS-IV), a Stormwater Phase II Ordinance, and the Flood Damage Prevention Ordinance (FDPO).

Greenways are useful for recreational, educational, wildlife, and transportation purposes, but they can also be used to establish much needed riparian buffer along waterways in the Lower Creek Watershed. An additional benefit is increased public access to the waterways which in turn provide more eyes to report potential problems and an increased public awareness. Often easements or fee-simple purchase of riparian buffers on waterways can be turned into greenways, and can sometimes be the catalyst for protection of the waterways. There is one major Greenway project in the watershed in Lenoir.

City of Lenoir Greenways. The Lenoir Greenway includes a 7.3 mile system of paved trails that allow for walking, biking, jogging, skating, and more on 25 acres. A major section of the trail is the Town Creek Greenway which consisted of two phases. The first phase was a ½ mile walking and bike trail located on Broadway (Highway 11) that connects to Rock Spring Park.

Phase II of the Town Creek Greenway system was completed in 2006. The additional trail will began at the Rock Springs Park area, run along the creek through the Wampler Keith Park and commence at the Lenoir City Middle School property. It ends adjacent to the new Lenoir City Swimming Pool Complex. Phase II added approximately 1.25 miles of trail to the greenway which made the total length 1.75 miles one way.

5. Monitor compliance with and enforcement of erosion and sedimentation control ordinances.

In order to determine if Sedimentation and Erosion Control Ordinances are being effectively enforced, there needs to be a review of current policies related to sedimentation and erosion control regulatory and oversight processes and a plan implemented to promote corrective action for deficiencies.

Caldwell County developed a local sediment and erosion control ordinance in compliance with the State's Sedimentation Pollution Control Act of 1973 (SPCA) and assumed responsibility for implementation of the requirements of the SPCA within all of Caldwell County in October 2007. In early 2009, in an effort to reduce costs by eliminating staff necessary to operate the program, Caldwell County returned administration of the Sediment and Erosion Control Program to the DENR Division of Land Resources, Asheville Regional Office.

Currently, Burke County does not intend to assume a local sediment and erosion control program and depends on the State's program to enforce sedimentation and erosion control regulations.

6. Develop steep slope ordinances.

Development on steep slopes is of particular concern in Caldwell and Burke Counties. Counties should consider a steep slope ordinance, which would prohibit or limit development on steep slopes. Boone adopted a Steep Slope Ordinance on October 2, 2006.

A brochure describing their program can be found at this link:

http://www.townofboone.net/departments/development/pdfs/TOB_Steep_Slope_Brochure.pdf

The Land of Sky has prepared a document called "Mountain Ridge and Steep Slope Protection Strategies" at the following link:

<http://www.climatechange.nc.gov/PDFs/LandofSky-MRSSPS-report%205-28-08.pdf>

For examples of Ordinances that have a steep slope component, see Appendix C in this Plan.

Efforts to develop State level regulations failed when a bill was introduced by the Senate in 2009 (HB 1870) that was not adopted.

7. Amend ordinances to prohibit development in the 100 year floodplain.

FEMA has required that all local governments adopt a Flood Damage Prevention Ordinance (FDPO) if they want to be eligible for the National Flood Insurance Program. The purpose of the FDPO is to promote public health, safety, and general welfare and to minimize public and private losses due to flood conditions within flood prone areas.

Within the Lower Creek watershed, the floodplain has been utilized for commercial or industrial development. The City of Lenoir, Gamewell, and Burke and Caldwell Counties have adopted floodplain management ordinances, but restrictions of the floodplain are permitted as long as structures are constructed at a specified level above the flood elevation.

Revised floodplain maps from the Federal Emergency Management Agency have been developed in 2010 and adopted with new remote sensing imagery. County and municipal jurisdictions should reevaluate floodplain areas based on these new maps and allow no development or filling in the 100 year floodplain.

WPCOG staff was certified as Flood Plain Administrators by FEMA in 2011.

8. Develop a robust public education program.

In 2007, the Lower Creek Technical Advisory Committee recommended the following four elements for a public education program in the subwatershed (As written in the Lower Creek Watershed Management Plan in Appendix A):

Establish a Clear Water Contractor Program. Clear Water Contractor programs have been applied to a number of areas in western North Carolina. RiverLink (<http://www.riverlink.org/>), a watershed group that seeks to revitalize the French Broad River watershed, provides Clear Water Contractor workshops to contractors on appropriate sedimentation and erosion control measures to apply during site preparation and development. Caldwell and Burke Counties could each establish its own Clear Water Contractor program. Once Clear Water Contractor Programs are in place it could offer developers reduced erosion control permit fees if their staff attended the training. County's could offer incentives for participation, providing quicker review of development plans (e.g., subdivision plats) for those who complete the course. NCSU

Identify and quantify the economic effects of poor water quality in the watershed. Economic effects of poor water quality should be quantified and shared with decision-makers and citizen groups. The Western Piedmont Council of Government (WPCOG) has developed presentations that cover drinking water, wastewater, property loss/degradation and other costs.

Develop print material outlining steps citizens can take to protect water quality in the watershed. The WPCOG has developed a brochure that will be used by local governments in Burke and Caldwell Counties to assist them with meeting the new NPDES Phase II stormwater requirements. This should be made available with area citizens.

Establish a local watershed council. A watershed council could serve as a local voice for issues affecting the Rhodhiss watershed. However, this will only be effective if it is staffed and developed with local citizens. Local government or resource agency staff could potentially play a vital role in supporting such a council from a technical standpoint

once a citizen-based group with a leader is established. This council could oversee a watershed stewardship program, which can be a very effective tool for gaining stakeholder consensus, engaging interested parties to keep “watch” over activities affecting the lake, and identifying a champion for various watershed improvement projects. The NCDENR supports such an organized watershed stewardship approach through its Stream Watch Program. A leadership team was formed as part of the Lake Rhodhiss Planning Project, that could somewhat fulfill the role.

The Lower Creek Advisory Team, especially the NCSU Science House, stormwater Programs, Caldwell Cooperative Extension, WPCOG and Burke/Caldwell County Soil and Water have taken the lead in promoting educational activities with the Lower Creek Watershed. The Lower Creek Coordinator was a funded position for the first three years after the plan. Improved outreach and education would benefit from a budget and funding for a coordinator.

Activities accomplished with respect to outreach and education can be found in the Lower Creek Watershed Management Plan final report found in Appendix B. This includes presentations to various groups as well as printed materials. A grant for outreach and education and updated planning has been on LCATS 2012 agenda.

9. Adopt a comprehensive watershed-based land use plan for the Lower Creek watershed to protect Lake Rhodhiss.

Long Range and Comprehensive plans are developed and updated periodically by local governments, either internally by existing staff under or contract with the WPCOG or a private consulting firm. As plans get updated there may be more integration of these strategies.

Some local governments in Burke, Caldwell and McDowell Counties have recently or are developing or revising their comprehensive land use plans. In addition, Caldwell County is developing its stormwater program in response to EPA’s Phase II Stormwater Management Permit requirements. It is therefore an opportune time to reexamine the institutional measures regulating land development aspects that have an impact on stream health. Additionally, the WPCOG has applied for additional watershed planning grants.

7.2- Lower Creek Watershed Management Plan Projects Update

10. Continue to support and seek funding for preservation, restoration and BMP projects outlined in the Lower Creek Watershed Management Plan.

The Lower Creek Watershed Management Plan prioritized subwatersheds were for restoration, preservation, or stormwater BMP activities based on functional integrity, degree of imperviousness, number of possible projects, and TAC recommendations. A set of 38 primary projects were identified within priority subwatersheds and include:

- 4 **Stream Preservation** sites, totaling 81,500 linear feet, or 15.4 miles
- 22 **Stream Restoration** sites, totaling 73,000 linear feet (post-construction), or 13.8 miles
- 2 **Wetland Preservation** sites, totaling 74 acres
- 3 **Wetland Restoration** sites, totaling 135 acres
- 3 combined **Wetland/Stream Restoration** sites, totaling 97 acres and 4,980 linear feet
- 4 **Stormwater BMP** sites, totaling 56 acres of BMP structures (ponds/basins; constructed wetlands; bioretention areas; permeable pavement)

Zack's Fork Stream Restoration

The Zack's Fork Stream Restoration was a EEP-funded project in the Lower Creek watershed. It was a 3,900 linear foot stream restoration/enhancement project on Zack's Fork creek (implemented using a Full Delivery provider). The project site was located in Caldwell County, just north of Lenoir, near Zack's Fork (see Map__). Due to the results of urban development, the stream had begun to incise, and would have continued to do so until it lowered form it's floodplain, causing higher energy flows. Improvements to the stream addressed deficiencies in dimension, pattern, profile, biological/chemical and sediment transport. The project was completed by EEP in September, 2005. The full report can be found at :

<http://portal.ncdenr.org/web/eep/interactive-mapping>

Zacks Fork Creek



BMPs installed in the Lower Creek Watershed

The following information comes from the Lower Creek Watershed Management Plan final report located in Appendix B.

Caldwell Soil and Water Conservation District and the Burke Soil and Water Conservation District implemented water quality Best Management Practices (BMPs) in the Lower Creek watershed to address water quality issues raised from the Lower Creek Watershed Management Plan (Ecosystem Enhancement Program, 2006) and the TMDL for turbidity in the Lower Creek Watershed. The overall goal of this project was to restore uses to at least two tributaries to Lower Creek. Lower Creek is impaired because of high turbidity levels. The following tributaries of Lower Creek including Lower Creek are 303(d) listed due to Impaired Biological Integrity: Greasy Creek, Spainhour Creek, and Zack's Fork Creek in Caldwell County and Bristol Creek in Burke County. Erosion and sedimentation from agriculture has been identified as a potential source of pollution to Lower Creek.

The Districts with this grant continued on-going efforts of working in the Lower Creek watershed to install best management practices (BMPs) according to the USDA's Natural

Resources Conservation Service technical standards that improved riparian zones and limited livestock access to the streams, for improved water quality. The Districts expanded efforts in the Lower Creek watershed with installation of storm water BMPs that decreased storm water runoff and thereby protected stream banks from erosive storms.

Below is a summary of the BMPs installed and grant dollars expended in the Lower Creek Watershed (2008-2012) with assistance from the 319 Grant:

Table 3 is a summary of the Best Management Practices that were prioritized in the Lower Creek Watershed Management Plan (Appendix A) and what was installed. Map 11 shows the locations of the BMPs.

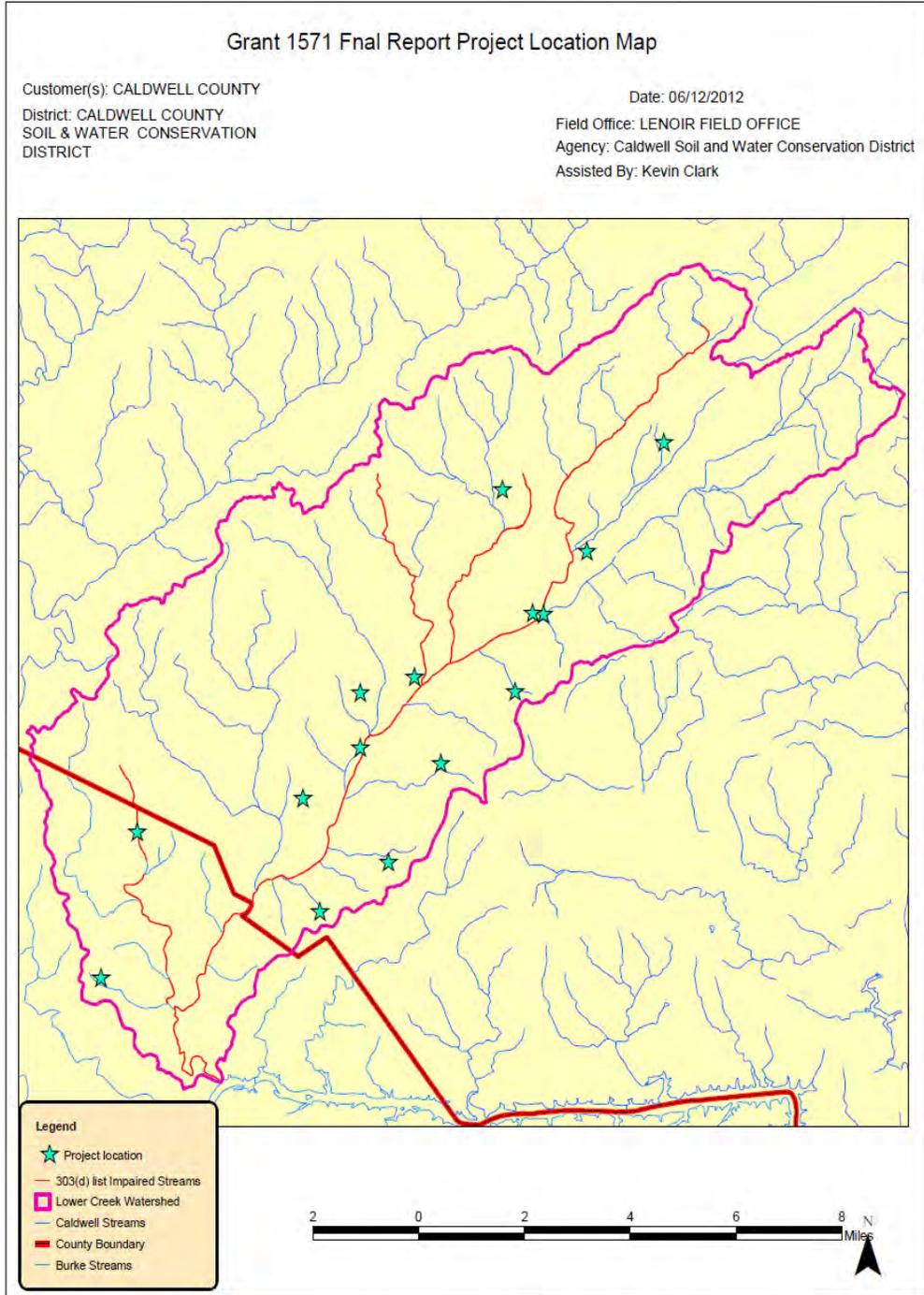
Table 3: Final Report BMPs installed

BMPs installed (#, Size, area treated):	
• Abandoned Well Closure	2 each
• Watering Facility	1 each
• Livestock Exclusion Fencing	3 @ 5,133 linear ft
• Filter Strip Repair	1 @ 8.9 acres
• Animal Trails and Walkways	1 @ 73 linear ft
• Pasture and Hay Planting	2 @ 34 acres
• Streambank Stabilization	2 @ 1,630 linear ft
• Stream Restoration	3 @ 614 linear ft
• Rain Garden	1 @ 375 square ft
• Critical Area Planting	1 @ 1.3 acres
• Stormwater Wetland	1 @ 12,000 square ft
• Cistern	1 @ 1,500 gallons

This work could not have been accomplished without a full-time watershed coordinator to oversee the project which was supported by grant funding for two years. Additional funding for a watershed coordinator was denied. The EPA and DENR want local support for staff to implement BMP program, but due to economic hardships local funding is not foreseeable in the near future. Work will have to be accomplished with reduced staffing levels.

To continue to implement the projects designated by the Lower Creek Watershed Management Plan, more funding will be required. Funding sources are found in Appendix D of this plan. Steps in acquiring funding include identifying funding sources most appropriate for each recommendation in the Plan, identifying project partners, developing pre-proposals for grant applications, and obtaining letters of support from partners as needed.

Map 11: Final Report Project Location Map



7.3- Source Water Protection Strategies

11. Continue and increase support for projects to identify and correct onsite residential sewage treatment systems.

Continue to operate and adequately fund the Unifour Septic Tank Repair Program. Work with local and state environmental health professionals to identify and correct failing systems.

Water quality in Western North Carolina is threatened by the discharge of untreated residential wastewater into streams, either through leaking septic tank systems or straight piping. Often, the homes identified as having wastewater disposal problems are located in low-income areas of the state and citizens cannot afford to make the necessary repairs. The WPCOG organized a program that targeted straight piping situations or faulty septic tanks by providing a grant or a loan to repair the home so that it meets compliance with NC environmental standards. The money lent out to fix septic tanks was supplied by grants in 1997 and 2004 from the NC Clean Water Management Trust Fund. The low-interest loans are repaid over five years and designed to perpetuate the repair program and thus, help NC citizen make repairs to their home they would have been unable to afford otherwise. Approximately, 300 home systems were repaired or replaced through this program, approximately 50% in the Lake Rhodhiss watershed. There is obviously a need for a program of this nature, as attested to by the regular calls for assistance from homeowners and the local environmental health inspectors. Unfortunately only 15% of the loans were recovered and the program ceased in early 2007.

The WPCOG has continued to operate and try to acquire adequate funding for the Unifour Septic System Program, and the WPCOG has restructured the prior program to more efficiently distribute funding and administer the program. A new grant was recieved in October 2011 and will begin repairs in late 2012. The program will be more highly concentrated in the priority areas listed in Section 6.2.

12. Continue water quality monitoring to identify problem areas and document improvements. Incorporate a volunteer monitoring component and alternative monitoring methods.

Collection of water quality data should occur periodically within priority areas listed in Section 6.2. A cost effective way to accomplish the monitoring would be to incorporate a volunteer monitoring component, though training, coordination and quality control of volunteers would be needed. A couple of possibilities include the Catawba River Foundation Covekeeper and Lenoir Rhyne University's Reese Institute for the Conservation of Natural Resources has some student macro invertebrate sites that can be utilized for monitoring water quality as well.

Efforts to establish a water monitoring consortium for the Upper Catawba have met with resistance due to increased cost to NPDES Permit Holders.

13. Create education and outreach program in the agricultural industry to promote use of BMP's.

Conservation assistance is provided by Soil and Water Conservation District (SWCD) Offices. Burke and Caldwell Counties have an office in each county with individual Elected Boards but are covered by the same shared staff.

Significant conservation work has been done through USDA programs. The Natural Resources Conservation Service (NRCS) provides technical assistance and program administration for the Environmental Quality Incentives Program (EQIP), Wildlife Habitat Incentives Program (WHIP) and Wetlands Restoration Program, while the Farm Services Agency administers the Conservation Reserve Program. The Land and Lakes Resources Conservation and Development (RC&D) Council, which works as a non-profit organization in association with the NRCS and SWCD programs, has also worked with the agricultural industry, but since losing funding for the directors position, they have had less activity.

Concerns about new logging operations to be in the GLOBE area of Caldwell county in the near future are of concern. The timber removal itself may become a source of additional soil erosion in the Upper Johns subwatershed. However, of potentially greater concern is the cutting of new roads in the steep terrain that may also contribute to increased soil erosion in this very undeveloped watershed. We recommend local groups stay informed and work with the Division of Forest Resources insure proper BMPs are employed to minimize any water quality impacts from this logging activity.

The NCSU Cooperative Extension Service should continue to work with the ornamental nursery industry to promote use of BMP's (drip irrigation, cover crops, soil testing, No till techniques), identify ornamental nursery owners interested in projects that involve installation of BMP's for data and monitoring, educate property owners on tax incentives and their rights as landowners for establishing conservation easements on their property, develop and promote incentives for property owners who establish and maintain buffers along streams with intensive agriculture activity and purchase conservation easement or fee-simple acquisition along waterways within the watershed.

Examples of Agricultural BMPs can be found in the Lower Creek Watershed Management Plan found in Appendix A.

14. Improve monitoring and detection of potential leaks in sewage collection systems.

The review of affected collection lines would involve review of cleaning, inspections, and SSO records and reports. Sanitary sewers were designed and built to carry wastewater from domestic, industrial and commercial sources, but not to carry storm water. Nonetheless, some storm water enters sanitary sewers through cracks, particularly in older lines, and through roof and basement drains. Alternately, leaks in the lines could potentially drain into and contaminate water sources within the Lower Creek Watershed.

Sewer lines that are in operation with the priority areas listed in Section 6.2. These areas should be monitored to determine if any sewer line leaks are responsible for fecal coliform hot spots.

15. Work with local governments and other relevant organizations to begin county wide Hazardous Waste Drop-off program.

A household hazardous waste drop-off program can be instrumental in reducing the amount of these hazardous materials that can end up in drinking water sources. This can include giving residents the ability to easily drop off these materials on just a few scheduled days a year or at convenience centers with appropriate collection systems.

NC DENR Division of Waste Management provides guidance and provides an application for municipalities to begin a county-wide Household Hazardous Waste Drop-off day. This information can be found at: <http://portal.ncdenr.org/web/wm/sw/hhw>.

Catawba County and the City of Hickory have had a successful program, allowing drop-offs twice a year at alternating locations in the county. For more information on this program, contact:

Amanda Kain
Waste Reduction Coordinator
Phone: 828-465-8217
AmandaK@catawbacountync.gov

16. Work with local health department and other relevant organizations to begin a prescription drug drop-off program.

Prescription medications have been showing up in drinking water sources in trace amounts as so-called “emerging contaminants.” In order to prevent this, it is recommended that counties and local government help advertise programs already in place, as well as expand the current program.

The Lenoir Police Department currently has a Drop Box for medications that can be used year round. The intent of the program is to provide citizens with a convenient way of disposing of unneeded medications, thereby reducing the possibility for accidental or intentional misuse and providing an environmentally safe alternative to disposing of medications in community landfills and sewer systems. The program only accepts medications from home, and not from businesses or pharmacies. The drop box is currently located at:

1035 West Avenue NW, Lenoir NC
Monday - Friday (except holidays)
7:30 AM - 5 PM
828-757-2121

Prescription drug drop off can also be done in conjunction with a household hazardous waste drop-off day. Catawba County currently does this.

17. Increase awareness and encourage participation in local stream clean-up programs.

This voluntary program involves members of the community in a hands on activity to clean up surface waters. Local citizen groups adopt a waterway, or a portion of one, and become informed stewards, learning how to react to the changing stream conditions. There are more than 200 existing Stream Watch groups in North Carolina, however, non are active in our region. They are composed of elementary school students, scout troops, businesses, and retirement groups. Stream Watch groups can be started from scratch or existing organizations can adopt streams; they are asked to conduct two visual monitoring and litter clean up sessions per year. They also are encouraged to become the local experts on their streams' dimensions, history and wildlife, and act on behalf of the streams' best interests. For more information, go to http://www.ncwater.org/Education_and_Technical_Assistance/Stream_Watch or contact the N.C. Division of Water Resources at (919) 715-5433.

The WPCOG and Cooperative Extension 4-H have sponsored groups in the past. NC Big Sweep takes place annually on the Catawba River and NC DOT Litter Sweep Week takes place bi-annually along roadways.

Stream clean-ups should also be focused on Lower Creek and its feeder streams located in the Lower Creek watershed. There aren't currently any programs or activities that take place in these areas.

18. Abandonment requirements/Brownfield programs for Potential Contaminant Sources.

Most underground storage tanks (USTs) are regulated, which means they must be monitored for leaks, be protected from corrosion, and have spill and overfill prevention equipment. When regulated tanks are no longer being used, a site assessment must be performed and the tank must be either removed from the ground or permanently closed in place. However, there are a few notable exceptions to these regulations.

The State of North Carolina does not require that non-regulated USTs be removed from the ground once they are no longer in operation. Additionally, soil samples are not required unless it is obvious that a release has occurred. However, a tank owner is advised to empty a nonregulated tank once it is no longer being used to limit the chances of a release.

Local governments in the Lower Creek watershed should explore programs that set requirements for closing facilities and clean up, especially for sites housing potential pollutants. Attention should also be paid to proper sealing of abandoned wells.

Funding for petroleum brownfields can also be obtained for clean up and reuse of old gas stations. More information can be found at: <http://www.epa.gov/oust/petroleumbrownfields/index.htm>.

8 – Recommendation Tables

The following pages summarize the recommendations in tabular form. The recommendation tables are meant as a reference for the strategies that should be implemented in the Lower Creek Watershed.

The information in the recommendation tables contains additional information that may not appear in narrative sections of the plan, such as: costs estimates, potential partners and roles, performance indicators and estimated load reductions.

Lower Creek Drinking Water Source Protection Plan RECOMMENDATION 1*

Strategy:	Adopt the Lower Creek <i>Watershed Management Plan</i> as a supplement to comprehensive plans.		
Strategy Narrative:	Local governments should adopt the Lower Creek Watershed Management Plan, as well as it's supplement, the Drinking Water Source Water Protection Plan into their comprehensive/master plans, and base future policy and land use planning decisions on the strategies in the plan.		
Key Actions:		Project Initiator(s):	
Review of local government comprehensive and land-use plans. Note needed changes. Review Changes with local government Staff. Present to local government board for adoption.		Local Governments LCAT WPCOG EEP	
Potential Partners:	Resources/Technical Assistance Needed:	Additional Benefits	
DENR/DWQ WPCOG LCAT City of Lenoir Town of Gamewell Caldwell County Burke County	Local government staff to review, update and present needed changes to comprehensive and land-use plans, and make corresponding recommendations to other ordinances.	<ul style="list-style-type: none"> • Water quality Improvements • Increased awareness of current and future conditions of drinking water supply • Encouragement and justification for policy changes. • Increase Community Awareness of Actions that impact drinking water 	
Public Involvement:	Cost Estimate:	Potential Funding:	Timeframe:
Participation through Public meetings	Varies depending upon aggressiveness of integration into existing plans and level of implementation desired.	Local Governments Grants	Year 1 for consideration and adoption Ongoing for implementation
Measureable Performance Indicators:		Various levels of plan integration into local policies: <ul style="list-style-type: none"> • Acknowledgment of plans existence • Consideration of plan elements • Utilization of selective plans recommendations • Adoption of some of recommendations • Adoption of all recommendations • Action Plan for implementation of recommendations 	
Status:	Long Range and Comprehensive plans are developed and updated periodically by local governments, either internally by existing staff under or contract with the WPCOG or a private consulting firm. As plans get updated there may be more integration of these strategies.		

*Recommendation based on from Lower Creek Watershed Management Plan, 2006 minor modifications may have been incorporated for purpose of clarifying and updating information.

Lower Creek Drinking Water Source Protection Plan RECOMMENDATION 2*

Practice Title:		Develop comprehensive stormwater management ordinances	
Practice Narrative:		Fully implement stormwater permits and management plans throughout the region in conjunction with current Phase II Programs.	
Key Actions:		Project Initiator(s):	
Identify stormwater administrator. Review current stormwater activities along with the responsibilities outlined in the permit. Permit holders in DWSP area.		Local Governments Stormwater Administrators	
Potential Partners:	Resources/Technical Assistance Needed:	Additional Benefits	
DENR/DWQ WPCOG	Stormwater Working Group (SWWG) Ongoing training for Stormwater Staff and Public Service personnel Adequate funding and staffing	Consistent application across jurisdiction.	
Public Involvement:	Cost Estimate:	Potential Funding:	Timeframe:
Stormwater Advisory Boards formed	\$2 million annually to operate programs in the Burks Caldwell Counties (estimated by SWWG 7/9/09)	General fund local governments, grants Stormwater Utility Fees	Compliant with current new permits issued in 2011
Measureable Performance Indicators:		Ordinances in place in Municipalities with DWSP area. Annual Reports will include relevant program implementation information.	
Status:	<p>Municipalities in Burke and Caldwell have adopted the ordinances based on North Carolina's Model Ordinance. The Water Resource Committee has appointed a Stormwater Working Group (SWWG), which has been voluntarily assisting Phase II Stormwater communities in the region for nearly a decade. The City of Lenoir has staff for stormwater who fulfills the stormwater requirements for the towns of Gamewell and Lenoir.</p> <p>In order to better fully implement stormwater permits and management plans throughout the region in conjunction with current Phase II Programs it is recommended that there be better coordination between ongoing projects and resources in the Rhodhiss watershed. In order to do this, it is important to develop an organizational structure that works best to achieve collaboration and allows coalition members to remain independent organizations.</p> <p>No Stormwater utility is currently found in the region. Caldwell County has rescinded their permit in 2009 and is not currently implementing a stormwater program.</p>		

Lower Creek Drinking Water Source Protection Plan RECOMMENDATION 3*

Strategy:	Amend subdivision ordinances to promote Low Impact Development and other measures that limit development impacts		
Strategy Narrative:	Review Ordinances for possible amendments that can be made that would promote the use of Low Impact Development and other measures that limit the impact of development. Garner local support for such initiatives and encourage their implementation.		
Key Actions:		Project Initiator(s):	
Develop a comprehensive list of green policies. Review local government land-use ordinances and town policies. Review Ordinances with local government Staff to determine need and possibilities. Present to local government board and recommend for adoption.		Local Governments WPCOG Planning Staff	
Potential Partners:	Resources/Technical Assistance Needed:		Additional Benefits
DENR/DWQ WPCOG Cooperative Extension	Staff to review, update and present recommended changes to land-use ordinances.		Local Government Awareness Potential for cost savings in new development
Public Involvement:	Cost Estimate:	Potential Funding:	Timeframe:
Participation	\$5,000-\$15,000		By 2015
Measureable Performance Indicators:		Number of new policies adopted by local governments	
Status:	<p>Caldwell County has had minimal Planning staff since 2009, so working on amendments may have to take place down the road. Staff at the Western Piedmont Council of Governments has staff trained in LID, and have had LID training sessions at the WPCOG.</p> <p>Both Caldwell and Burke Counties have promoted the protection of environmentally sensitive areas in certain instances, such as in the Lake James small planning area in Burke County and any area proposed as a “planned unit development” in Caldwell County. Both counties should amend their subdivision ordinances to specify LID and to require open space, setting aside sensitive areas, including floodplains and steep slopes, from development.</p>		

Lower Creek Drinking Water Source Protection Plan RECOMMENDATION 4*

Strategy:		Adopt and enforce more comprehensive riparian buffer ordinances	
Strategy Narrative:		Each of the local governments having jurisdiction over the Lower Creek local watershed adopt and enforce ordinances that extend the protection of 50-foot vegetative buffers to the perennial and intermittent streams that comprise the watershed.	
Key Actions:		Project Initiator(s):	
Map intermittent and perennial streams in the local governments jurisdiction Adopt and enforce an ordinance that protect 50 feet of vegetative buffer on the streams. Rework		Local Governments WPCOG	
Potential Partners:	Resources/Technical Assistance Needed:	Additional Benefits	
DENR/DWQ WPCOG WRCS/ Cooperative Extension Foothills Land Conservancy WRC Duke Energy	State and Federal Regulations Examples of Exemplary Programs	Habitat protection	
Public Involvement:	Cost Estimate:	Potential Funding:	Timeframe:
Participation in advisory role	Staff time	Local governments	2 – 4 Years
Measureable Performance Indicators:		Number of local governments to adopt riparian buffer ordinances.	
Status:	Burke and Caldwell County, as well as the Town Governments within their boundaries, have adopted land use ordinances that affect water quality. Both Counties taken over monitoring and permitting for Sedimentation and Erosion from the State, as well as adopting a Buffer Requirement Ordinance that requires a minimum 60 foot buffer along riparian waterways. Other ordinances adopted by the local governments include Water Supply Watershed Ordinances (WS-I, WS-II, WS-III, and WS-IV), a Stormwater Phase II Ordinance, and the Flood Damage Prevention Ordinance (FDPO).		

**Lower Creek
Drinking Water Source Protection Plan
RECOMMENDATION 5***

Strategy:		Monitor compliance with and enforcement of erosion and sedimentation control ordinances	
Strategy Narrative:		Review current policies related to sedimentation and erosion control regulatory and oversight processes and implement corrective action for deficiencies.	
Key Actions:		Project Initiator(s):	
Gather current policies, interview appropriate personnel Identify deficiencies and recommend corrective actions Educate Grading Contractors and Heavy Equipment Operators on regulations		Local Governments WPCOG	
Potential Partners:	Resources/Technical Assistance Needed:	Additional Benefits	
DENR/DWQ WPCOG EXT	State and Federal Regulations Examples of Exemplary Programs	Decrease in construction runoff	
Public Involvement:	Cost Estimate:	Potential Funding:	Timeframe:
Participation in advisory role	Staff time	Local governments	2 – 4 Years
Measureable Performance Indicators:		Number of inspections of land disturbing activity. NOV's issues, corrective actions taken.	
Status:	<p>Caldwell County developed a local sediment and erosion control ordinance in compliance with the State's Sedimentation Pollution Control Act of 1973 (SPCA) and assumed responsibility for implementation of the requirements of the SPCA within all of Caldwell County in October 2007. In early 2009, in an effort to reduce costs by eliminating staff necessary to operate the program, Caldwell County returned administration of the Sediment and Erosion Control Program to the state.</p> <p>Currently, Burke County does not intend to assume a local sediment and erosion control program and depends on the State's Division of Land Resources program to enforce state regulations.</p>		

Lower Creek Drinking Water Source Protection Plan RECOMMENDATION 6*

Strategy:		Develop steep slope ordinances	
Strategy Narrative:		Counties should consider a steep slope ordinance, which would establish policies and control practices for development on steep slopes.	
Key Actions:		Project Initiator(s):	
Gather current policies, interview appropriate personnel Study land use effects GIS evaluation of Steep Slopes Adopt and enforce steep slope ordinance		Local Governments WPCOG Planning and GIS	
Potential Partners:	Resources/Technical Assistance Needed:	Additional Benefits	
DENR/DWQ WPCOG EXT	State and Federal Regulations Examples of Exemplary Programs	Decrease in construction stormwater runoff. Decrease in sedimentation	
Public Involvement:	Cost Estimate:	Potential Funding:	Timeframe:
Participation in advisory role	Staff time	Local governments Grants	Ongoing
Measureable Performance Indicators:		Number of local governments to adopt steep slope ordinances.	
Status:	<p>Development on steep slopes is of particular concern in Caldwell and Burke Counties. Counties should consider a steep slope ordinance, which would prohibit or limit development on steep slopes. Boone adopted a Steep Slope Ordinance on October 2, 2006.</p> <p>A brochure describing their program can be found at this link: http://www.townofboone.net/departments/development/pdfs/TOB_Steep_Slope_Brochure.pdf</p> <p>The Land of Sky has prepared a document called “Mountain Ridge and Steep Slope Protection Strategies” at the following link: http://www.climatechange.nc.gov/PDFs/LandofSky-MRSSPS-report%205-28-08.pdf</p>		

Lower Creek Drinking Water Source Protection Plan RECOMMENDATION 7*

Strategy:	Amend ordinances to prohibit development in the 100 year floodplain		
Strategy Narrative:	County and municipal jurisdictions should reevaluate floodplain areas based on these new maps and allow no development or filling in the 100 year floodplain.		
Key Actions:		Project Initiator(s):	
Inventory current structures in floodplain Amend Model Floodplain Ordinance		Local Governments	
Potential Partners:	Resources/Technical Assistance Needed:	Additional Benefits	
DENR/DWQ WPCOG Cooperative Extension FEMA	Local Model Ordinances Examples of Exemplary Programs	May encourage adequate staffing and funding levels	
Public Involvement:	Cost Estimate:	Potential Funding:	Timeframe:
Participation in advisory role	Staff time	Local governments	2 – 4 years
Measureable Performance Indicators:		Number of local governments to adopt ordinances.	
Status:	<p>Within the Lower Creek watershed, the floodplain has been utilized for commercial or industrial development. The City of Lenoir, Gamewell, and Burke and Caldwell Counties have adopted floodplain management ordinances, but restrictions of the floodplain are permitted as long as structures are constructed at a specified level above the flood elevation.</p> <p>Revised floodplain maps from the Federal Emergency Management Agency have been developed and adopted with new remote sensing imagery. County and municipal jurisdictions should reevaluate floodplain areas based on these new maps and allow no development or filling in the 100 year floodplain.</p>		

**Lower Creek
Drinking Water Source Protection Plan
RECOMMENDATION 8***

Strategy Title:		Develop a robust public education program	
Strategy Narrative:		Increase awareness and concern for water resource issues in the region through comprehensive education and outreach efforts. Encourage adoption of BMP's. Utilize Environmental Education practices and principles	
Key Actions:		Project Initiator(s):	
Collect and develop resource materials Work with and in schools Collaborate with existing programs Present at community events		LCAT/Phase II permittees	
Potential Partners:	Resources/Technical Assistance Needed:	Additional Benefit	
DENR/DWQ LCAT WPCOG Cooperative Extension Schools NC Science House	Lead implementer team to help develop Education/Outreach Plan	Citizen involvement. Multi-Jurisdictional cooperation School educational value Serves multiple purposes	
Public Involvement:	Cost Estimate:	Potential Funding:	Timeframe:
Volunteers	Varies based on extent of program	Foundations, 205j, local government contribution	Ongoing
Measureable Performance Indicators:		Local Watershed Website, Number and type of written resources available; # of students/school reached	
Status:	<p>The Lower Creek Advisory Team and Caldwell County Soil and Water have taken the lead in promoting educational activities with the Lower Creek Watershed. The Lower Creek Coordinator was a funded position for the first three years after the plan. Further outreach and education will require more funding for a coordinator.</p> <p>Activities accomplished with respect to outreach and education can be found in the Lower Creek Watershed Management Plan final report found in Appendix B. This includes presentations to various groups as well as printed materials.</p>		

Lower Creek Drinking Water Source Protection Plan RECOMMENDATION 9*

Strategy Title:	Adopt a comprehensive watershed-based land use plan for the Lower Creek watershed to protect Lake Rhodhiss		
Strategy Narrative:	Regular update of existing comprehensive land-use plans should include and integrate steps that include watershed based concepts and strategies.		
Key Actions:		Project Initiator(s):	
Review of local government comprehensive and land-use plans. Note needed changes. Review Changes with local government Staff. Present additional recommendations to local government board for adoption.		Local Governments WPCOG	
Potential Partners:	Resources/Technical Assistance Needed:	Additional Benefits	
DENR/DWQ WPCOG LCAT	Staff to review, update and present needed changes to comprehensive and land-use plans.	Local Government Awareness. Improve DWQ Improve Water Quality Removal from impairment list	
Public Involvement:	Cost Estimate:	Potential Funding:	Timeframe:
Participation in Advisory Capacity and Public meetings	\$5,000-\$15,000/plan singular update	CWMTF, 205j, 319h, local government contribution	Every 2 years
Measureable Performance Indicators:		Number of changes adopted by local governments.	
Status:	Some local governments in Burke, Caldwell and McDowell Counties have recently or are developing or revising their comprehensive land use plans. In addition, Caldwell County is developing its stormwater program in response to EPA's Phase II Stormwater Management Permit requirements. It is therefore an opportune time to reexamine the institutional measures regulating land development aspects that have an impact on stream health.		

**Lower Creek
Drinking Water Source Protection Plan
RECOMMENDATION 10***

Strategy Title:	Continue to support and seek funding for preservation, restoration and BMP projects outlined in the Lower Creek Watershed Management Plan.		
Strategy Narrative:	Educate property owners on tax incentives and their rights as landowners for establishing conservation easements on their property. Develop and promote incentives for property owners who establish and maintain buffers along streams with intensive agriculture activity. Purchase conservation easement or fee-simple acquisition along waterways within the watershed focusing on priority subwatersheds. Encourage the use of appropriate Non-Point Source BMPs within the watershed that are the most beneficial in removing nutrients.		
Key Actions:			Project Initiator(s):
Identify funding sources most appropriate for each recommendation in the plan Identify project partners Apply for funding sources			Local Partners
Potential Partners:	Resources/Technical Assistance Needed:		Additional Benefits
DENR/DWQ WPCOG NRCS Burke/Caldwell SWCD Cooperative Extension Landtrust/Conservancy EEP Municipalities	Technical Advisory Committee (LCAT) Citizens Advisory Committee Funding for Lower Creek Coordinator		Greenways Blueways Water Quality impacts Habitat improvement Decreases sedimentation
Public Involvement:	Cost Estimate:	Potential Funding:	Timeframe:
Participation	Varies depending on size of easement	CWMTF, 319h, local government contribution	Ongoing
Measureable Performance Indicators:		Landowners identified; easements/riparian buffer obtained. Types and #'s of BMPs installed and/or implemented	
Status:	See Lower Creek Watershed Management Plan final report in Appendix B.		

Lower Creek Drinking Water Source Protection Plan RECOMMENDATION 11

Strategy:	Continue and increase support for projects to identify and correct onsite residential sewage treatment systems		
Strategy Narrative:	Work with local and state environmental health professionals to identify and correct failing systems.		
Key Actions:		Project Initiator(s):	
Restructure existing Unifour Septic System Repair Program to more efficiently distribute funding and administer program. Coordinate with Environmental Health Specialists in County and State		County Environmental Health Onsite wastewater WPCOG	
Potential Partners:	Resources/Technical Assistance Needed:		Additional Benefits
DENR/DWQ EXT Lenoir Rhyne University Caldwell County GIS Environmental Health	Assistance from County Environmental Health Specialists DENR assistance from Onsite Wastewater		Remove health hazards
Public Involvement:	Cost Estimate:	Potential Funding:	Timeframe:
Reporting failing systems. Participating with WaDE neighborhood surveys	\$500,000 to \$750,000 Average residential septic system repair \$5,000	Can sometimes incorporated into some grants as part of project management. Time to develop grant is not recoverable	Ongoing
Measureable Performance Indicators:		Annually, number of residential loan applied for and received; amount of grant funding applied for and received	
Status:	<p>The WPCOG will continue to operate and try to acquire adequate funding for the Unifour Septic Tank Repair Program, and will plan to restructure the existing program to more efficiently distribute funding and administer the program. The program will be more highly concentrated in the priority areas listed in Section 6.2.</p> <p>There have been no new loans or grants since November 2007. WPCOG Staff is currently managing outstanding loans for the project.</p>		

**Lower Creek
Drinking Water Source Protection Plan
RECOMMENDATION 12**

Strategy:	Continue water quality monitoring to identify problem areas and document improvements. Incorporate a volunteer monitoring component and alternative monitoring methods.		
Strategy Narrative:	Continue water quality monitoring to identify problem areas and document improvements. Incorporate a volunteer monitoring component.		
Key Actions:		Project Initiator(s):	
Utilize previous monitoring locations Add new monitoring sites as needs occur Periodic collection of water quality data Pre and Post monitoring at restoration and BMP sites		DENR	
Potential Partners:	Resources/Technical Assistance Needed:	Additional Benefit	
DENR/DWQ Land and Lakes RC&D WPCOG Cooperative Extension Lenoir Rhyne University Reece Institute River Keeper	Varies based on extent of study. Field Monitoring equipment, lab analysis Training, Coordination and Quality Control of volunteers needed	Citizen and student involvement possible. Early detection of problem	
Public Involvement:	Cost Estimate:	Potential Funding:	Timeframe:
Voluntary Citizen/Student Monitoring (MacroInvertbrates)	Varies based on extent of study	CWMTF, 205j, 319h, local government contribution	Ongoing
Measureable Performance Indicators:		Current Loading information from tributaries of most concern. Number of sites sampled on yearly basis	
Status:	Collection of water quality data should occur periodically within priority areas listed in Section 6.2. A cost effective way to accomplish the monitoring would be to incorporate a volunteer monitoring component, though training, coordination and quality control of volunteers would be needed. Lenoir Rhyne University's Reese Institute for the Conservation of Natural Resources has some student macro invertebrate sites that can be utilized for monitoring water quality as well.		

Lower Creek Drinking Water Source Protection Plan RECOMMENDATION 13

Strategy:	Create education and outreach program in the agricultural industry to promote use of BMP's		
Strategy Narrative:	Establish a partnership to promote green industry practices in the watershed.. and market products as green. Continue to work with ornamental nursery industry to promote use of BMP's (drip irrigation, cover crops, soil testing, No till techniques		
Key Actions:		Project Initiator(s):	
Work with the ornamental nursery industry to promote use of BMP's Identify ornamental nursery owners interested in projects that involve installation of BMPs Educate property owners on tax incentives and their rights as landowners for establishing conservation easements on their property Develop and promote incentives for property owners who establish and maintain buffers along streams		Cooperative Extension	
Potential Partners:	Resources/Technical Assistance Needed:		Additional Benefits
DENR/DWQ NRCS WPCOG EXT SWCS	Oversight Cooperative Extension Service Identify property owners interested in projects that involve installation of BMP's		Better projects. Maintain continuity of projects.
Public Involvement:	Cost Estimate:	Potential Funding:	Timeframe:
Private sector participation in projects and promotion	Varies depending on type and size of project		Ongoing
Measureable Performance Indicators:		Annually, number of projects	
Status:	Cooperative Extension Soil and Water Conservation Service and NRCS should continue to work with the ornamental nursery industry to promote use of BMP's (drip irrigation, cover crops, soil testing, No till techniques), identify ornamental nursery owners interested in projects that involve installation of BMP's for data and monitoring, educate property owners on tax incentives and their rights as landowners for establishing conservation easements on their property, develop and promote incentives for property owners who establish and maintain buffers along streams with intensive agriculture activity and purchase conservation easement or fee-simple acquisition along waterways within the watershed.		

Lower Creek Drinking Water Source Protection Plan RECOMMENDATION 14

Strategy Title:		Improve monitoring and detection of potential leaks in sewage distribution systems	
Strategy Narrative:		Improve monitoring and detection of potential leaks in sewage distribution systems.	
Key Actions:		Project Initiator(s):	
Appropriate map system Walk system lines GPS system Develop regular system check		WWTP operators Public Utility City of Lenoir, Gamewell	
Watershed Planning Tool Category:		Non Stormwater Discharges	
Potential Partners:	Resources/Technical Assistance Needed:	Additional Benefit	
DENR/DWQ NC Science House LCAT Phase II SW Permit Holders Reese Institute	Staff time GIS Assistance GPS equipment	Savings in potential clean-up cost. Permit compliance	
Public Involvement:	Cost Estimate:	Potential Funding:	Timeframe:
Reporting overflows through hotline	Varies based on extent of effort	local government contribution	Ongoing
Measureable Performance Indicators:		Inspection plan developed. Inspection reports	
Status:	Sewer lines that are in operation with the priority areas listed in Section 6.2. These areas should be monitored to determine if any sewer line leaks are responsible for fecal coliform hot spots. Sporadic inspection of system currently, complaint driven rather than prevention driven		

**Lower Creek
Drinking Water Source Protection Plan
RECOMMENDATION 15**

Strategy Title:	Work with local governments and other relevant organizations to begin county wide Hazardous Waste Drop-off program.		
Strategy Narrative:	A household hazardous waste drop-off program can be instrumental in reducing the amount of these hazardous materials that can end up in drinking water sources. This can include giving residents the ability to easily drop off these materials on just a few scheduled days a year or at convenience centers with appropriate collection systems.		
Key Actions:	Gather resources from existing programs Develop marketing plan		Project Initiator(s): WPCOG
Potential Partners:	Resources/Technical Assistance Needed:	Additional Benefit	
DENR/DWQ CRC WPCOG EXT SH SWCS	Staff- Program Coordinator Advisory Team to help set program priorities	Citizen involvement. Multi-Jurisdictional cooperation	
Public Involvement:	Cost Estimate:	Potential Funding:	Timeframe:
Volunteers	Varies based on extent of program	CWMTF, 205j, 319h, local government contribution	Ongoing
Measureable Performance Indicators:		Local Watershed Website, Number and type of written resources available; # of students/school reached	
Status:	NC DENR Division of Waste Management provides guidance and provides an application for municipalities to begin a county-wide Hazardous Waste Drop-off day. This information can be found at: http://portal.ncdenr.org/web/wm/sw/hhw . Catawba County has had a successful program, allowing drop-offs twice a year at different locations in the county.		

**Lower Creek
Drinking Water Source Protection Plan
RECOMMENDATION 16**

Strategy Title:	Work with local health department and other relevant organizations to begin a prescription drug drop-off program.		
Strategy Narrative:	Prescription medications have been showing up in drinking water sources in trace amounts. In order to prevent this, it is recommended that counties and local government help advertise programs already in place, as well as expand the current program.		
Key Actions:	Gather resources from existing programs Develop marketing plan Collaborate with existing programs		Project Initiator(s): WPCOG
Potential Partners:	Resources/Technical Assistance Needed:	Additional Benefit	
DENR/DWQ CRC WPCOG EXT SH SWCS	Staff- Program Coordinator Advisory Team to help set program priorities	Citizen involvement. Multi-Jurisdictional cooperation	
Public Involvement:	Cost Estimate:	Potential Funding:	Timeframe:
Volunteers	Varies based on extent of program	CWMTF, 205j, 319h, local government contribution	Ongoing
Measureable Performance Indicators:		Local Watershed Website, Number and type of written resources available;	
Status:	Prescription drug drop off can also be done in conjunction with a hazardous water drop-off day. Catawba County currently does this. The Lenoir Police Department currently has a Drop Box for medications that can be used year round.		

Lower Creek Drinking Water Source Protection Plan RECOMMENDATION 17

Strategy Title:	Increase awareness and encourage participation in local stream clean-up programs.		
Strategy Narrative:	This voluntary program involves members of the community in a hands on activity to clean up surface waters. Local citizen groups adopt a waterway, or a portion of one, and become informed stewards, learning how to react to the changing stream conditions.		
Key Actions:		Project Initiator(s):	
Collect and develop resource materials Collaborate with existing programs		Local Governments WPCOG	
Potential Partners:	Resources/Technical Assistance Needed:	Additional Benefit	
DENR/DWQ WPCOG Cooperative Extension LCAT Municipalities	Contact with Program Coordinator	Citizen involvement. Water Quality	
Public Involvement:	Cost Estimate:	Potential Funding:	Timeframe:
Volunteers	Varies based on extent of program	local government contribution	Ongoing
Measureable Performance Indicators:		Number of volunteers, number of times program coordinates clean-up	
Status:	<p>There are more than 200 existing Stream Watch groups in North Carolina, however, non are active in our region. They are composed of elementary school students, scout troops, businesses, and retirement groups.</p> <p>The WPCOG and Cooperative Extension 4-H have sponsored groups in the past. NC Big Sweep takes place annually on the Catawba River and NC DOT Litter Sweep Week takes place bi-annually along roadways.</p> <p>Stream clean-ups should also be focused on Lower Creek and its feeder streams located in the Lower Creek watershed. There aren't currently any programs or activities that take place in these areas.</p>		

Lower Creek Drinking Water Source Protection Plan RECOMMENDATION 18

Strategy Title:	Abandonment requirements/Brownfield programs for Potential Contaminant Sources.		
Strategy Narrative:	Local governments in the Lower Creek watershed should explore programs that set requirements for closing facilities and clean up, especially for sites housing potential pollutants. Attention should also be paid to proper sealing of abandoned wells.		
Key Actions:		Project Initiator(s):	
Gather resources from existing programs Develop marketing plan		WPCOG	
Potential Partners:	Resources/Technical Assistance Needed:	Additional Benefit	
DENR/DWQ CRC WPCOG EXT SH SWCS	Staff- Program Coordinator Advisory Team to help set program priorities	Citizen involvement. Multi-Jurisdictional cooperation	
Public Involvement:	Cost Estimate:	Potential Funding:	Timeframe:
	Varies based on extent of program	EPA Brownfield Program	Ongoing
Measureable Performance Indicators:		Funding obtained, abandoned USTs removed, properties with USTs mitigated	
Status:	<p>The State of North Carolina does not require that non-regulated USTs be removed from the ground once they are no longer in operation. Additionally, soil samples are not required unless it is obvious that a release has occurred. However, a tank owner is advised to empty a nonregulated tank once it is no longer being used to limit the chances of a release.</p> <p>Funding for petroleum brownfields can also be obtained for clean up and reuse of old gas stations. More information can be found at: http://www.epa.gov/oust/petroleumbrownfields/index.htm.</p>		

9 – Long Term Planning Strategy

One of the goals of the Lower Creek Source Water Protection Plan was to prepare a comprehensive protection plan, using what has already been prepared, that can be used by local governments and agencies as roadmap for improving source water quality conditions within the watershed.

As noted within the Plan, the Source water area is much larger than just the Lower Creek Watershed, and a true Source Water Protection Plan would take into account the entire area that drains into the intake. However, due to the time and financial constraints under which this plan needed to be completed, the project was to update an existing plan.

Staff chose the Lower Creek Watershed Plan as a basis from which to begin the plan for a few reasons:

- 1) A stakeholder group (LCAT) already existed
- 2) Existing strategies were already in place that also has an effect on Source Water Protection
- 3) There were resources and political will already in place.
- 4) The Lower Creek does drain directly into Lake Rhodhiss, which houses the water intake for the City of Lenoir.

Future efforts should and will concentrate on the entire source water area for multiple intakes in our region. WPCOG staff has been involved with the National Drinking Water Source Protection Consortium stakeholder process and most recently have been participants and signatories to the NC Drinking Water Consortium which was an outgrowth of those efforts. Developing Drinking Water Source Protection Plans that blanket our region has been recognized by the Western Piedmont Water Resources Committee in their priority project list for the past 3 years.

The 205j grant funded this effort also included building our agencies GIS capacity to support further planning efforts of this nature. The WPCOG plans to submit a proposal to the NC Clean Water Management Trust Fund first round of funding Source Water Protection Plan development. The potential geographic scope may cover the Source Watershed that supplies the City of Hickory intake on the Catawba River and therefore all municipal water intakes in our region, (if we include City of Newton's intake in the Upper South Fork Catawba watershed near the confluence of Henry River and Jacob's Fork).

The major drinking water supply reservoir in the region is classified as impaired for nutrients, and concerns about over-allocation of available surface water are on the minds of many our agency will continue to encourage local action to protect our region's water resources.

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Appendix

- A – Lower Creek Watershed Management Plan
- B – Lower Creek Watershed Management Plan Final Report
- C – Sample Ordinances
- D – Funding Sources

Appendix A

Lower Creek Watershed Management Plan

LOWER CREEK
WATERSHED MANAGEMENT PLAN
CATAWBA RIVER BASIN
CALDWELL AND BURKE COUNTIES
NORTH CAROLINA

Prepared For:

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JULY 2006

MACTEC Project 6470-05-0953

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1.0 EXECUTIVE SUMMARY

In 2003, the North Carolina Ecosystem Enhancement Program (EEP) began its local watershed planning effort in the Lower Creek watershed, which drains 98 square miles in Caldwell and Burke Counties. Its objectives were to (1) perform a detailed assessment of watershed conditions, identifying key stressors for stream health, and (2) develop a comprehensive strategy to restore and preserve stream integrity. In order to make the plan useful to the local community, EEP worked with a Technical Advisory Committee, made up of local planning and natural resource staff, who reviewed detailed watershed assessment work and helped to develop management recommendations.

The Lower Creek watershed was divided into 29 subwatersheds. It is characterized by three distinct areas—a rural northern area, typified by agricultural activities, low density residential use, and steep, forested headwaters; a central urban area of Lenoir, characterized by high impervious cover and a mix of industrial, commercial, and residential use; and a rural southern area, which has a mix of agricultural, low density residential, and forested land uses. Lower Creek itself and four of its tributaries—Zacks Fork, Spainhour Creek, Greasy Creek, and Bristol Creek—are on the 303(d) list of impaired waters. In addition, Lower Creek’s receiving water, Lake Rhodhiss, is on the draft 2006 303(d) list due to issues related to high nutrient levels.

Watershed assessment activities included biological, chemical, and toxicological monitoring of water quality for 303(d) listed streams and their degraded tributaries, assessment of channel stability and habitat, and Geographic Information System (GIS) data development and analysis. These data were analyzed to (1) characterize 303(d) listed streams and their degraded tributaries, (2) summarize functional integrity (or health) of streams on a subwatershed scale, and (3) determine key stressors for watershed streams.

Key stressors for streams in the Lower Creek watershed and management strategies to address them are listed in the Table 1.

Table 1: Key Stressors for Watershed Streams and Applicable Management Strategies

Stressor	Management Strategy
Stream bank erosion	Stream restoration, riparian buffers, livestock exclusion, sand dredging BMPs
Lack of adequate forested buffer	Stream restoration, riparian buffers
Stream channelization	Stream restoration
Impervious cover	Stormwater BMPs, stormwater ordinance, low impact development
Upland erosion	Agriculture & forestry BMPs, erosion and sedimentation control ordinance, subdivision ordinance modifications, steep slope ordinance, public education
Livestock access to streams	Livestock exclusion
Floodplain development	Floodplain development ordinance
Urban toxicants	Illicit discharge program, landfill strategy, watershed education program, stormwater BMPs
Nutrients	Illicit discharge program, ag BMPs, riparian buffers, watershed education program, stormwater BMPs, additional studies
Fecal coliform bacteria	Retrofit wastewater collection system, agricultural BMPs, illicit discharge program, watershed education program, stormwater BMPs

These management strategies address known stressors for the Lower Creek watershed using a combination of stream and wetland restoration, institutional measures, best management practices (BMPs), and stressor-specific solutions. In order to improve degraded streams and reduce the Lower Creek watershed's impacts on Lake Rhodhiss, it is essential for multiple stakeholders—State, County, and local governments, natural resource programs, land trusts, and local citizens—to participate in a coordinated strategy for watershed restoration.

Institutional measures. Ordinances, regulations, codes, and other instruments should be revised or developed by Lenoir, Gamewell, and Burke and Caldwell Counties to minimize negative impacts of development and other land use activities. The following measures are highly recommended:

1. Adopt the Lower Creek *Watershed Management Plan* as a supplement to comprehensive plans.
2. Develop comprehensive stormwater management ordinances
3. Amend subdivision ordinances to promote Low Impact Development and other measures that limit development impacts
4. Adopt and enforce more comprehensive riparian buffer ordinances
5. Monitor compliance with and enforcement of erosion and sedimentation control ordinances
6. Develop steep slope ordinances
7. Amend ordinances to prohibit development in the 100 year floodplain
8. Develop a robust public education program
9. Adopt a comprehensive watershed-based land use plan for the Lower Creek watershed to protect Lake Rhodhiss

Best management practices (BMPs). BMPs are essential to reduce the impacts from a number of existing land use activities. Of special concern for the Lower Creek watershed are stormwater impacts from development, sedimentation impacts from logging, and pollution and stream bank erosion from agricultural uses. This Plan lists specific BMPs to control these impacts.

Stream and wetland restoration, preservation, and stormwater BMP projects. This Plan prioritized subwatersheds were for restoration, preservation, or stormwater BMP activities based on functional integrity, degree of imperviousness, number of possible projects, and TAC recommendations. A set of 38 primary projects were identified within priority subwatersheds and include:

- 4 **Stream Preservation** sites, totaling 81,500 linear feet, or 15.4 miles
- 22 **Stream Restoration** sites, totaling 73,000 linear feet (post-construction), or 13.8 miles
- 2 **Wetland Preservation** sites, totaling 74 acres
- 3 **Wetland Restoration** sites, totaling 135 acres
- 3 combined **Wetland/Stream Restoration** sites, totaling 97 acres and 4,980 linear feet
- 4 **Stormwater BMP** sites, totaling 56 acres of BMP structures (ponds/basins; constructed wetlands; bioretention areas; permeable pavement)

These primary projects are described in detail in Appendix A, the *Project Atlas*. EEP will pursue the restoration projects to fulfill its mitigation targets; stormwater BMP and preservation projects may be pursued by EEP in the future. However, EEP cannot implement all projects (whether prioritized or not) needed to address stream degradation in the Lower Creek watershed; local groups and governmental entities are encouraged to pursue restoration, preservation, and stormwater BMP projects, as well.

2.0 INTRODUCTION

This chapter provides an overview of the Ecosystem Enhancement Program and its local watershed planning initiatives. It also provides a summary of the watershed assessment and plan development efforts conducted in the Lower Creek study area. The results of the plan development stage [Phase III] of this effort are reported in this document – the *Watershed Management Plan* (WMP). Major elements of the WMP are summarized in section 2.4 below.

2.1 MISSION OF THE ECOSYSTEM ENHANCEMENT PROGRAM

The North Carolina Ecosystem Enhancement Program (EEP) was created in July of 2003 through a Memorandum of Agreement between the NC Department of Environment & Natural Resources (DENR), the NC Department of Transportation (DOT) and the U.S. Army Corps of Engineers (USACE). The EEP essentially incorporates and expands the work of the former NC Wetlands Restoration Program, which operated from 1997 to 2003 as an in lieu fee program for the compensatory mitigation requirements associated with impacts to streams, riparian buffers and wetlands allowed under the Clean Water Act's 404/401 permitting system.

The primary mission of the Ecosystem Enhancement Program is to institute a program of *ecologically effective compensatory mitigation in advance of permitted environmental impacts* associated with transportation and other development-related projects across the state. The guiding principle behind EEP's efforts is that a *watershed planning approach* to the identification and implementation of mitigation projects – designed to *restore, enhance and protect key watershed functions* – is the most economically and ecologically effective way to achieve this mission.

2.2 EEP LOCAL WATERSHED PLANNING OBJECTIVES

Within EEP, a team of watershed planners periodically identifies high-priority local watersheds [14-digit Hydrologic Units or HUs] in which intensive watershed assessment and planning tasks will be conducted to help meet mitigation goals in certain areas of the state. The basic criteria used in selecting certain 14-digit HUs to be the focus of EEP Local Watershed Planning (LWP) initiatives include: clear evidence of degraded or impaired watershed functions (e.g., declining water quality and habitat indicators); the presence of high-quality local habitat or aquatic resources worthy of special protection measures; the opportunity to partner with local resource agency professionals, municipalities, land trusts and other local stakeholders interested in watershed restoration and protection; and projected need for compensatory mitigation efforts in the larger watershed units [8-digit Cataloging Units or CUs]. The HUs that become the focus of LWP efforts by EEP typically range in area from approximately 20 to 100 square miles, typically include at least one stream segment designated as “impaired” by the NC Division of Water Quality (DWQ), and often represent areas where road-building and development pressures are increasing rapidly.

The EEP local watershed planning initiatives usually take place over an 18- to 24-month timeframe and include three major tasks (or “phases”): (1) preliminary watershed characterization based on compilation and analysis of available information & GIS data; (2) detailed assessment of field conditions at high-priority sites or reaches within representative subwatersheds; and (3) development of final local watershed planning documents, including the identification & prioritization of watershed project sites and recommendations regarding management strategies/policies for the restoration and protection of key watershed functions. Concurrent with the technical assessment of watershed conditions and development of final plan recommendations, EEP works collaboratively with a team of local watershed stakeholders (or “technical advisory committee”) – consisting primarily of local resource professionals, including

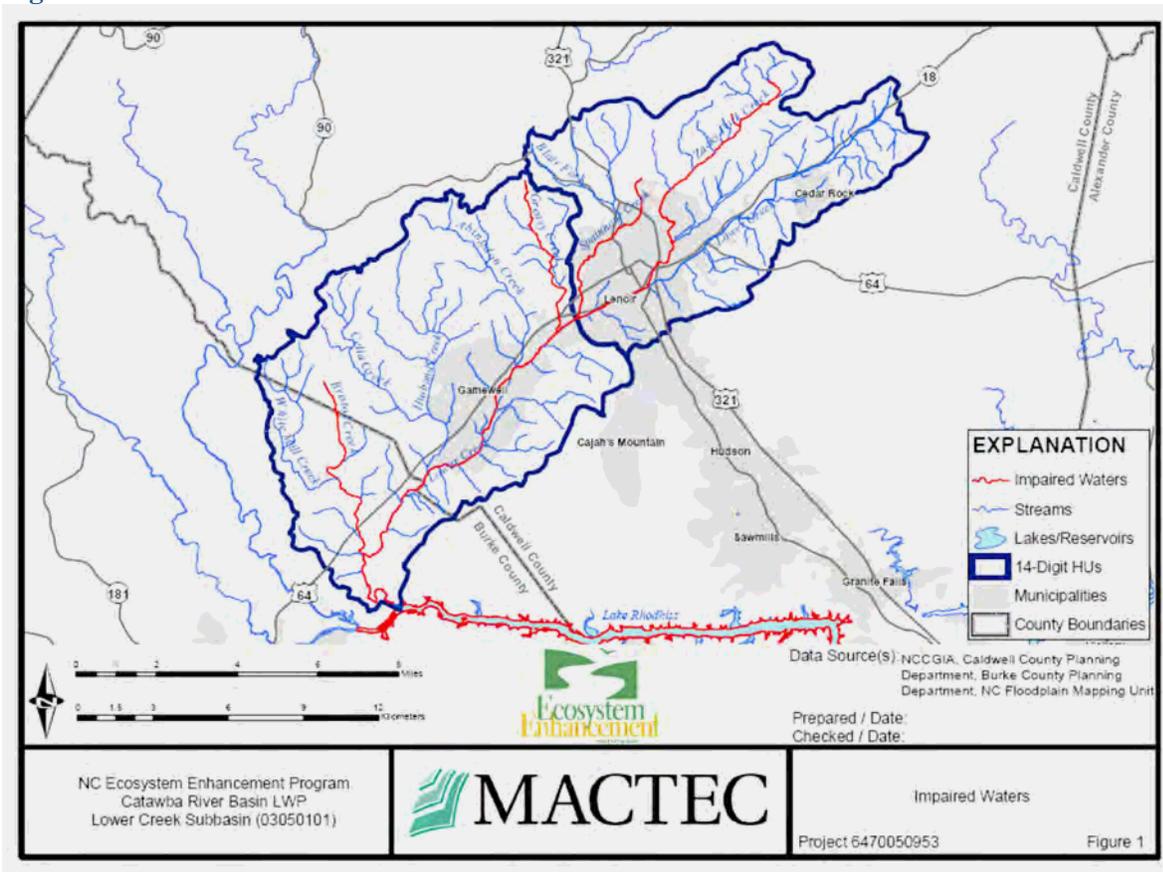
county and municipal stormwater and/or planning staff, staff of the Natural Resources Conservation Service (NRCS) and local Soil & Water Conservation Districts, the NC DWQ, the NC Wildlife Resources Commission, regional land trust representatives, and other interested parties – to ensure that local knowledge and local priorities are being adequately considered throughout the process.

Additional information regarding EEP’s local watershed planning efforts across the state can be found at <http://www.nceep.net/pages/lwplanning.htm> .

2.3 BACKGROUND FOR THIS LWP PROCESS

The focus of this particular LWP effort is the Lower Creek watershed, consisting of two 14-digit hydrologic units (HUs) -- 03050101080020 (upper Lower Creek) and 03050101080010 (lower Lower Creek) -- located in Caldwell and Burke Counties, with a total drainage area of approximately 98 square miles (Figure 1). The watershed includes the communities of Lenoir, Gamewell, Cedar Rock, and a portion of Cahaj’s Mountain. Major tributaries in the watershed include: Zacks Fork Creek, Blair Creek, Spainhour Creek, Abingdon Creek, Husband Creek, Celia Creek, Bristol Creek, and White Mill Creek. The watershed drains into Lake Rhodhiss, the water supply source for Lenoir, Gamewell and portions of Caldwell and Burke Counties.

Figure 1: The Lower Creek Watershed



Phase I of the LWP, initiated in the summer of 2003 and completed in spring 2004, evaluated existing data regarding the hydrology, habitat and water quality functions within the watershed and identified areas for additional analysis. The Phase I tasks included a compilation and review of historical and current data related to local watershed conditions. Phase I data sources included available GIS coverages,

local ordinances related to land use and watershed protection, DWQ water quality monitoring reports, interviews with local resource professionals, and an initial visual assessment of stream and riparian buffer conditions at 22 field sites. Additional activities accomplished during Phase I were the delineation and initial prioritization of subwatersheds in the study area, a general inventory of major functional stressors, and the preliminary identification of potential restoration/enhancement project opportunities. The results of the Phase I work are presented in the *Findings and Recommendations* report, completed in May 2004.

Phase II, initiated in January 2005, developed additional data related to the three major functions through GIS analyses (sinuosity, stream gradient, riparian buffer and impervious cover), field investigations of 82 sites throughout the watershed, and water quality sampling at 31 points. The location of these investigations and sampling points are shown in Figure 2 (Section 3.1). Based on these additional data, functional ratings were determined for each of the 9 tributary subwatersheds comprising the Lower Creek watershed, along with the upper and lower Lower Creek (mainstem) subwatersheds. The Phase II work culminated in the production of the *Watershed Assessment Report* (WAR) in February 2006. The Phase II detailed assessment results form the foundation for the development of this *Watershed Management Plan*, including the recommendation of specific sites for restoration, enhancement and preservation projects.

This document presents the final *Watershed Management Plan* developed for the two contiguous HUs, consisting of 29 subwatersheds comprising the Lower Creek watershed. *MACTEC Engineering & Consulting* (MACTEC), based in Raleigh, NC, was selected as the consulting firm to assist EEP in conducting the three major phases of LWP work. The *Western Piedmont Council of Governments* (WPCOG) contracted with EEP to manage the stakeholder involvement aspects of this effort, which began in January of 2004 and finished in June 2006.

The *Watershed Management Plan* represents the last of three major deliverables produced by MACTEC during this nearly 3-year effort. As noted above, the two earlier MACTEC documents are the *Findings & Recommendations* report, dated May 2004, and the *Watershed Assessment Report* (WAR), dated February 2006. All three of the Lower Creek LWP documents will be available on the EEP website by fall of 2006: <http://www.nceep.net/pages/lwplanning.htm>. They can be downloaded as *PDF* files.

2.4 MAJOR ELEMENTS OF THE WATERSHED MANAGEMENT PLAN

Following this introductory section, the major Sections of the document are:

- 3.0 Watershed Characterization** – summarizes the detailed assessment performed during Phase II, describing stream health, major stream stressors and overall functionality of subwatersheds;
- 4.0 Stakeholder Input Process**- provides details of the stakeholder participation strategy and meetings, as managed by WPCOG, including major points of input from the assembled advisory group and the public meeting held during the process;
- 5.0 Watershed Restoration Framework** – identifies all major stressors contributing to stream degradation within the Lower Creek watershed and summarizes the management strategies/solutions for addressing these stressors;
- 6.0 Watershed Improvement Projects** – describes the process used to prioritize subwatersheds and identify recommended (“primary”) watershed improvement projects;
- 7.0 Institutional Measures** – presents recommendations related to local ordinances for land development, erosion and sedimentation control, stormwater management, and riparian buffers, in conjunction with education, in reducing and controlling watershed degradation;

8.0 Best Management Practices - describes potential technical strategies for controlling pollution associated with industrial, urban, forestry and agricultural activities;

References – presents references for all sources of data/information cited in the document.

Appendix A – contains the atlas of recommended watershed improvement projects.

Appendix B – contains a listing of potential funding sources for local watershed projects.

Appendix C – contains a listing of technical resources, with website addresses.

Appendix D – contains a map and master listing of all potential project sites identified within the Lower Creek watershed.

2.5 GLOSSARY OF KEY TERMS

The following is a glossary of key terms and acronyms used in this document.

Biological Monitoring – refers to the collection and assessment of benthic macroinvertebrates and fish by staff of the Biological Assessment Unit within DWQ’s Environmental Sciences Section. Data on the number and types of taxa of benthic species are used as indicators of stream reach health per standard Bioclassification criteria [excellent; good; good/fair; fair; poor]. Fish sampling and fish tissue analyses are used to assess aquatic ecological integrity and as indicators of possible surface water and stream sediment contamination. For more information on biological monitoring efforts (and protocols), go to <http://h2o.enr.state.nc.us/esb/BAU.html>

Buffer – an area adjacent to a stream, wetland, or shoreline where development activities (e.g., buildings, logging) are typically restricted or prohibited; may be managed as streamside (riparian) zones where undisturbed vegetation and soils act as filters of pollutants in stormwater runoff. Buffer zone widths vary depending on state and local rules, but are typically a minimum of 25 to 50 feet on each side of perennial streams. In NC, buffer rules have been established for all, or portions of, the upper Cape Fear, lower Catawba, Neuse and Tar-Pamlico river basins.

BMPs – Best Management Practices. Any land or stormwater management practice or structure used to mitigate flooding, reduce erosion & sedimentation, or otherwise control water pollution from runoff; includes urban stormwater management BMPs and agriculture/forestry BMPs

CGIA – North Carolina’s Center for Geographic Information & Analysis. Visit <http://cgia.cgia.state.nc.us/cgia/>

Channelization – the manmade alteration of natural stream & river channels, typically resulting in the deepening, straightening and/or realignment of natural waterways. Done historically to improve land drainage, increase agricultural production and reduce losses from flooding, channel modifications usually result in stream channel instability, increased bank erosion, altered sediment dynamics (bed degradation or aggradation), adverse effects downstream (e.g., increased incidence of flooding, channel scour), damage to riparian buffer zones and general esthetic degradation of streams, wetlands and riparian vegetation.

CWMTF – refers to North Carolina’s Clean Water Management Trust Fund program, a funding agency for water quality protection & improvement projects. For additional info, go to <http://www.cwmtf.net>

Degradation – term usually associated with physical degradation of aquatic habitat and declining biological indicators of stream health due to various watershed stressors, e.g., channel scour from

excessive storm water flows, unstable/eroding stream banks due to channel incision and/or lack of adequate riparian vegetative cover, embedded (sediment-buried) riffle zones. Not to be confused with *impairment*, which relates specifically to a decline in water quality use support ratings for a given stream or stream reach as measured by physical/chemical parameters (e.g., dissolved oxygen, metals, turbidity, fecal coliform).

Detailed Assessment – the second major phase of EEP Local Watershed Planning, which generally includes in-depth field evaluation of watershed conditions along representative stream/buffer reaches and within high-priority subwatersheds, including application of visual assessment protocols for stream habitat and riparian buffers, measurements of channel stability & bank erosion hazards indices (BEHI), collection of water quality and biological monitoring data, and (sometimes) the use of computer models to predict future hydrologic and water quality conditions under different watershed management scenarios.

DWQ – the NC Division of Water Quality, a division within NC DENR. See <http://h2o.enr.state.nc.us/>

EEP (or NC EEP) – NC Ecosystem Enhancement Program; created by three-agency Memorandum of Agreement (between NC DENR, NC DOT and US Army Corps of Engineers) – or “Tri-Party MOA” -- in July of 2003 to develop a comprehensive approach to watershed protection in the state, to increase the ecological effectiveness of compensatory mitigation projects, and to provide mitigation projects & strategies in advance of permitted impacts based on a watershed planning approach. The EEP program essentially absorbed and expanded the resources and staff of the former Wetlands Restoration Program, which had been established within DENR by statute in 1996, including the addition of certain compensatory mitigation & environmental analysis staff of the NC DOT. For more info, go to: <http://www.nceep.net/>

Floodplain – a low plain adjacent to a river that is formed chiefly of river sediment (alluvial deposits) and which is subject to periodic flooding. Floodplains perform several key functions within river and stream ecosystems, including the storage, transport and deposition of water and eroded sediments during overbank (flooding) stormflow events. A 100-year floodplain is the area along a stream or river that is normally dry, but has a one percent change of being flooded in any given year.

Functions; Functional Assessment – the major functional and ecological components of a watershed (and the focus of restoration, enhancement and protection efforts by the NC EEP) include streams, streamside (riparian) buffer zones, wetlands, and runoff-contributing uplands. The important landscape functions served by these watershed components, when they are not degraded, include: water quality protection (pollutant removal); fish & wildlife habitat; hydrologic balance (e.g., floodwater conveyance & storage); and direct human value (e.g., timber production, recreation, education). Functional assessment refers to the process whereby the status or quality of important watershed functions is determined at various scales of study/measurement.

GIS - geographic information system consisting of computer hardware, software and data designed for capturing, storing, updating, manipulating, analyzing and displaying all forms of geographically reference information; in EEP, desktop GIS is an important tool used in the assessment of various sets of watershed-related information (specific themes or coverages, e.g., land cover, property parcels, roads, municipal boundaries, streams, designated natural heritage areas, wetlands, soils, etc.) used in identifying the best locations for watershed project sites and management strategies

Hydrologic Unit (HU) – refers to the 14-digit Hydrologic Unit Codes used by the Natural Resources Conservation Service (NRCS) to identify local watersheds typically ranging from 10 to 100 square miles in total drainage area; used by NC EEP as synonymous with “local watershed”

Impairment – used by NC DWQ to describe any impairment of the use support classification of a given stream; basically, impairment indicates a stream (or stream reach) with decreased water quality to the degree that it is “not supporting” its designated uses (e.g., swimming, fishing, shellfishing, water supply, secondary recreation) because of point source or nonpoint source pollution and/or aquatic habitat degradation. For additional information about NC DWQ’s use support ratings methodology, see the Appendices to any of DWQ’s Basinwide Water Quality Plans;
http://h2o.enr.state.nc.us/basinwide/basinwide_wq_planning.htm

Impervious Cover (IC) - a human-created or –modified surface (e.g., concrete, asphalt) that does not allow water to percolate (or infiltrate) through it; examples include parking lots, rooftops, roadways, driveways, sidewalks, compacted soils or lawns with compacted subsoils. Urbanization and development are typically associated with significant increases in the impervious cover of a given area, which result in increased rates of stormwater runoff and inputs of non-point source pollutants into local streams.

NPDES - The National Pollutant Discharge Elimination System (NPDES) is the federally established program for controlling point-source discharges of pollution. The NPDES Unit of North Carolina's Division of Water Quality (DWQ) is responsible for administering the program for the state, from which both individual and general wastewater discharge permits are issued. For additional info, visit <http://h2o.enr.state.nc.us/NPDES/>

NRCS – the Natural Resources Conservation Service, within the U.S. Department of Agriculture. Go to <http://www.nrcs.usda.gov/>

NWI – the National Wetlands Inventory, an ongoing project by the U.S. Fish and Wildlife Services to classify and map the remaining wetland areas throughout the Continental United States. For additional information, visit <http://wetlandsfws.er.usgs.gov/> or <http://www.nwi.fws.gov/>.

Phase II stormwater rules –

From http://h2o.enr.state.nc.us/su/NPDES_Phase_II_Stormwater_Program.htm: Phase II of the NPDES Stormwater program was signed into law in December 1999. This regulation builds upon the existing Phase I program by requiring smaller communities and public entities that own and operate a municipal separate storm sewer system (MS4) to apply and obtain an NPDES permit for stormwater discharges. The program was first implemented in the State by temporary rulemaking. During the process to make permanent rules, both the temporary rules and the permanent rules were rejected by the Rules Review Commission in early 2004. In response to the legal issues surrounding Phase II implementation, the NC State Legislature passed [Senate Bill 1210](#) in July of 2004. The Bill now provides the Environmental Management Commission (EMC) the authority and guidelines for implementing the Phase II program in NC. A [summary](#) of the Bill has been provided by NC DENR. EPA regulation ([40CFR 122.34](#)) requires permittees at a minimum to develop, implement, and enforce a stormwater program designed to reduce the discharge of pollutants from the MS4 to the maximum extent practicable. The stormwater management program must include these six minimum control measures:

1. Public education and outreach on stormwater impacts
2. Public involvement/participation
3. Illicit discharge detection and elimination
4. Construction site stormwater runoff control
5. Post-construction stormwater management in new development and redevelopment

6. Pollution prevention/good housekeeping for municipal operations

Preservation – the long term protection of an area with high habitat value (e.g., wetlands, riparian buffers, identified habitat corridors for key species), generally effected through the purchase or donation of a conservation easement by/to a government agency or non-profit group (e.g., Land Trust); such areas are left in their natural state, with minimal human disturbance or management activities. EEP-funded preservation projects may be considered as “restoration equivalents” for the mitigation of impacts within a given CU, but at a lower credit ratio than for restoration projects [i.e., 5:1 or higher].

Restoration – the re-establishment of wetlands or stream hydrology and wetlands vegetation into an area where wetland conditions (or stable streambank and stream channel conditions) have been lost; examples include: stream restoration using natural channel design methods coupled with re-vegetation of the riparian buffer; riparian wetlands restoration through the plugging of ditches, re-connection of adjacent stream channel to the floodplain, and planting of native wetland species; this type of compensatory mitigation project receives the greatest mitigation credit under the 401/404 regulatory framework

Riparian – relating to the strip of land adjacent to streams and rivers, including streambanks and adjoining floodplain area; see also *Buffer*; important streamside zones of natural vegetation that, when disturbed or removed, can have serious negative consequences for water quality in streams & rivers

SWCDs – acronym for the 96 local Soil & Water Conservation Districts in North Carolina, which operate in partnership with the federal Natural Resources Conservation Service (NRCS; formerly the Soil Conservation Service) and the Division of Soil & Water Conservation within NC DENR to protect and conserve the state’s soil and water resources. For additional information, go to <http://www.enr.state.nc.us/DSWC/> and/or to <http://www.ncawcd.org/>

Stakeholder – any agency, organization, or individual involved in or affected by the decisions made in the development of a watershed plan; typically includes: *primary stakeholders* such as watershed residents, farmers, developers, local government or resource agency staff with a direct say in the planning process; and *secondary stakeholders* such as state or regional resource agency staff who can serve as technical resources/advisors to the local planning process

Stressor – broadly defined, a watershed stressor is any physical, chemical or biological agent or process that induces an adverse response in watershed functioning. Examples range from broad watershed processes such as stormwater runoff from areas with high impervious cover to water quality pollutants (nutrients, sediment, fecal coliform) affecting a specific stream reach. Stressors are often reflective of the cumulative effects of geographically widespread *sources* or causes of functional problems. For instance, chronically low dissolved oxygen in a stream [the stressor] may be caused by a specific activity [the source] such as poor animal waste management practices and/or unrestrained livestock access on farmland located within a specific sub-watershed.

Sub-watershed (or subwatershed) – a component drainage area within a local watershed (14-digit NRCS hydrologic unit); typically about one to 5 square miles in area, these areas are considered the most appropriate and effective geographic scale for local watershed planning & management (e.g., for detailed watershed characterizations, urban stream classification and watershed-based zoning); they are sometimes delineated as the land area draining to a point where two second-order streams combine to form a third-order stream (see definitions of *stream order* by A.N. Strahler). They may be delineated based also on the dominant land use(s) and/or zoning classifications they encompass, as determined by the controlling jurisdictions within whose boundaries they are located.

3.0 WATERSHED CHARACTERIZATION

Phase I of the Local Watershed Plan, completed in May 2004, evaluated existing data regarding the **hydrology, habitat, and water quality functions** within the watershed and identified areas for additional analyses. Phase II, initiated in January 2005, developed additional data relating to these three functions through GIS analyses, field investigations, and water quality sampling. This section of the Plan presents a summary of the findings of the more detailed assessment of Phase II, describing stream integrity, major stream stressors, and functional integrity of the 29 subwatersheds of the Lower Creek watershed.

The Lower Creek watershed is approximately 98 square miles and is comprised of two 14-digit hydrologic units—03050101080020 (upper Lower Creek) and 03050101080010 (lower Lower Creek). Lower Creek drains sections of both Caldwell and Burke Counties and empties into Lake Rhodhiss, the water supply source for Lenoir, Gamewell, and portions of Caldwell and Burke Counties. For planning purposes, the watershed was divided into 29 subwatersheds, ranging from approximately two to six square miles in size (Figure 2).

3.1 DATA SOURCES

Data gathered during the detailed assessment phase of this project include biological community data, physical/chemical water quality data, field assessment information, and GIS data.

NC Division of Water Quality Monitoring. North Carolina's draft 2006 303(d) list of impaired waterbodies includes Lake Rhodhiss and several streams in the Lower Creek watershed—Lower Creek, Spainhour Creek, Zacks Fork, and Bristol Creek (Figure 1). All of these streams are on the 303(d) list due to impaired biological integrity; Lower Creek is also listed due to high turbidity values. During the Lower Creek watershed planning effort, the NC Division of Water Quality (DWQ) primarily focused water quality monitoring efforts on these impaired streams to determine causes of impairment (Figure 2). Bristol Creek was not studied, as further analysis of the biological data leading to its 303(d) listing revealed that the biological community is likely not impaired. During 2002 and 2004-2005, DWQ staff monitored biological communities using benthic macroinvertebrates and physical/chemical water quality parameters such as nutrients, metals, and fecal coliform bacteria, and water column toxicity.

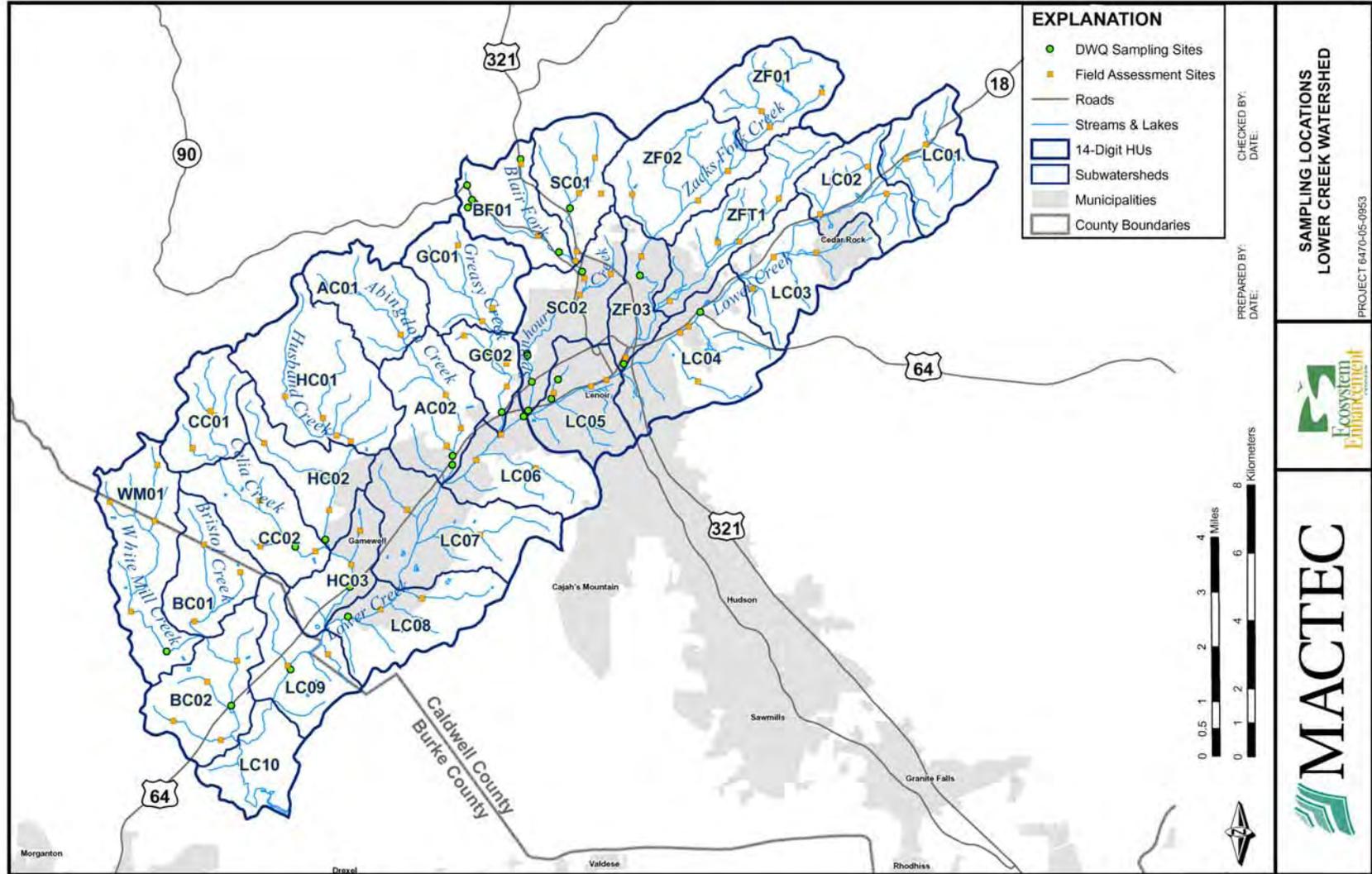
Additional Field Investigations. Additional field assessment was performed at 82 sites throughout the watershed in order to determine stream stability, habitat condition, obvious water quality problems, and pollution sources (Figure 2). Since a primary purpose of this assessment was to identify the stressors that were affecting the hydrologic, habitat, and water quality functions within the Lower Creek watershed, the site selection was biased towards degraded sites. In particular, sites were selected from stream reaches:

- having a sinuosity <1.2 – indicating a high probability of channelization; and
- lacking an adequate 30-foot forested riparian buffer – indicating potential for bank erosion and impaired habitat.

Since another objective of this project was to identify viable mitigation sites, an additional site selection criterion was to focus on stream reaches that were characterized by a few property owners, rather than many, in order to identify sites with a high potential for restoration projects.

GIS Assessment. GIS datasets were developed to identify watershed stressors, aid in assessment site choice, and to determine the best restoration and preservation project sites. Primary datasets included sinuosity, stream gradient, riparian buffer, and impervious cover.

Figure 2: Sampling and Assessment Sites



3.2 STREAM-SPECIFIC ISSUES: 303(D)-LISTED AND OTHER DEGRADED STREAMS

NC Division of Water Quality (DWQ) monitoring provided some specific information on stream integrity and stressors for 303(d) listed and other degraded streams. This section describes the biological integrity and key stressors (causes of degradation) for four urban streams (Zacks Fork, Blair Fork, Spainhour Creek, and an unnamed tributary to Lower Creek), a largely rural stream on the edge of Lenoir (Greasy Creek), and Lower Creek, which drains both rural and urban areas.

3.2.1 Common causes of degradation and their sources

All of these streams are impacted by **habitat degradation** of three types—sedimentation, a lack of wood and leaf habitats, and a lack of riffles and pools. The sources of this habitat degradation are channelization, lack of forested riparian buffer, and sediment from stream bank erosion and upland sources.

These streams are characterized by **turbid** water during storms, with levels that exceeded the state standard. This turbidity is caused by fine sediments from streambank erosion and upland sources.

Nutrients, including nitrogen and phosphorous, were also high during storms in all of these streams. Possible nutrient sources in urban streams are fertilizers and sewer system leaks and backups. In rural streams, agricultural sources are more likely, such as livestock and fertilizers. Horticultural operations can also be sources of nutrients, and are possible sources of high nutrients in both Spainhour Creek and Greasy Creek.

Fecal coliform bacteria levels were high in both baseflows and stormflows in all streams. High baseflow levels of fecal coliform bacteria indicate a dry weather source, such as a problematic sewer system, leaking septic systems, straight-piped waste, and livestock access to streams. Sewer system leaks and overflows were observed in several locations in Lenoir.

High levels of **copper, zinc, and lead** were found in most streams during storm events. These trace metals are common in urban streams (USGS, 2001), and possible sources are numerous, including vehicle exhaust and impervious surfaces themselves (Center for Watershed Protection, 1995).

3.2.2 Stream descriptions

Note: As noted above, habitat degradation was common to all streams described and is therefore not described below. Instead, biological condition, water quality, and stormflow scour issues are described.

Zacks Fork. 303(d) listed Zacks Fork begins in a rural watershed characterized by a mix of forest, agricultural, and residential land uses and then passes through heavily residential and commercial northeastern Lenoir at its downstream end. Benthic macroinvertebrates are severely impacted in the downstream urban portion of Zacks Fork but are much less impacted (rated Not Impaired by DWQ) in the upstream rural portion of Zacks Fork. Water quality issues in the downstream section include high nutrient, turbidity, fecal coliform bacteria, zinc, and copper concentrations. Stormflow scour is also a problem in the urban downstream section, scouring habitats and organisms from stream substrates during storm events.

Biological Community Ratings

NC Division of Water Quality rates biological communities in order to characterize stream integrity. Biological community ratings include Excellent, Good, Good-Fair, and Not Impaired, which are all considered “not impaired” ratings, and Fair and Poor, which are “impaired” ratings.

Blair Fork. Blair Fork is a tributary to 303(d) listed Spainhour Creek, but is not currently on the 303(d) list. It drains an area of residential, industrial, and commercial land uses. The benthic macroinvertebrate community is extremely degraded, characterized by a set of organisms that indicate toxicity. The stream has failed multiple toxicity tests, and a likely source of toxicity is a closed unlined landfill on NC 90 (see Figure 6, Section 5.0). Fecal coliform bacteria, copper, turbidity, and nutrients were also high in Blair Fork. Stormflow scour is also a cause of degradation for Blair Fork.

Spainhour Creek. Spainhour Creek drains a large part of Lenoir, including residential, commercial, and industrial areas. The benthic macroinvertebrate community of Spainhour Creek was rated Fair (impaired), by DWQ. Spainhour Creek is impacted by high levels of fecal coliform bacteria, nutrients, turbidity, zinc, copper, and possible toxicity. Stormflow scour is also a problem for this urban stream.

Unnamed tributary to Lower Creek. This tributary drains an almost totally impervious area in the heart of Lenoir's industrial and commercial area. This stream is routed under buildings and channelized where in the open; problems with stormwater scour and lack of appropriate habitat are evident. It was also characterized by possible toxicity and carries high copper, zinc, and lead levels and organic pollutants, including heptanones, methoxy propyl acetate, chloroform, and gasoline-range petroleum hydrocarbons. It carries high levels of nutrients, turbidity, and fecal coliform bacteria. These pollutants may be entering the stream through illicit connections to the stream, the sewer system, or stormwater runoff.

Greasy Creek. This stream drains a largely rural area, characterized by forest, residential, and agricultural land uses. The benthic macroinvertebrate community was rated Fair (impaired) near its confluence with Lower Creek at NC 18, but improved to Good-Fair (not impaired) just two miles upstream, where it has a forested buffer and much better stream habitat. The downstream site was also characterized by high turbidity, nutrients, fecal coliform bacteria, copper, zinc, lead, and possible toxicity.

Lower Creek. This 23 mile stream drains both rural and urban areas, receiving impacts from its tributary streams. Benthic macroinvertebrates have been sampled at many sites on its length, and all sites are highly degraded or impaired, with the exception of the uppermost site at NC 90, which is upstream of much of the urbanized area of Lenoir. This stream suffers from stormwater scour and high concentrations of a number of pollutants, including fecal coliform bacteria, turbidity, nutrients, copper, and zinc.

3.3 FUNCTIONAL ASSESSMENT

A functional framework was used to characterize the integrity of the Lower Creek watershed as a whole. Data used include GIS datasets, biological community data, physical/chemical data, and field assessment information.

For each major functional area (hydrology, habitat, and water quality), specific parameters were selected from the Phase II data sources (GIS, field investigation, and water quality sampling) to indicate the functional integrity of streams within each subwatershed (Table 1). Values were established for each particular parameter to designate level of function and an aggregate score was developed for the groups of parameters representing a particular watershed function. This aggregate score was then used to assess whether that function was Functioning, Functioning at Risk, or Not Functioning, according to the following definitions:

- **Functioning [F]:** The subject watershed function is performing naturally, without evidence of significant degradation or a stressed condition.
- **Functioning at Risk [FR]:** The subject watershed function is currently moderately degraded, but shows evidence of stress such that, without intervention, it could over time become Not Functioning.
- **Not Functioning [NF]:** The subject watershed function is currently stressed to the level of being highly degraded.

Table 1: Parameters Used for Functional Assessment

Function	PARAMETERS				
Hydrology	Sinuosity	Impervious Cover	Stream Gradient	Site Investigations (Hydrology)	
Habitat	Riparian Buffer	Site Investigations (Habitat)			
Water Quality	Riparian Buffer	Impervious Cover	Site Investigations (Water Quality)	DWQ Phys/Chem Monitoring	DWQ Benthic Monitoring

Table 2 presents the overall results of the functional analyses of hydrology, habitat, and water quality at the subwatershed level. This information is also shown graphically on subwatershed maps for each watershed function in Figures 3, 4, and 5. Based upon this analysis, only White Mill Creek, a stream of moderate length (<10 miles) in a relatively small (<5 square mile), predominantly rural, undeveloped subwatershed and the upper portion of Abingdon Creek (AC01), a similar but slightly smaller subwatershed, are fully functional across all three watershed functions. In contrast, the lower reach of Spainhour Creek (SC02), a stream/subwatershed of similar scale to ACO1 but in a subwatershed that is highly urbanized, is not functioning for all three watershed functions. Similarly, Blair Fork (BF01), the lower reach of Greasy Creek (GC02), and the middle of Lower Creek (LC05) are not functioning on the basis of both habitat and water quality due to the urbanized nature of these subwatersheds. Overall, most of the other subwatersheds are functioning at risk, several tending toward not functioning on one or more of the three watershed functions.

Table 2: Summary of Functionality by Subwatershed

Subwatershed	Subwatershed Code	Overall Functionality		
		Hydrology	Habitat	Water Quality
Zacks Fork 01	ZF01	FR	F	F
Zacks Fork 02	ZF02	FR	FR	FR
Zacks Fork 03	ZF03	FR	FR	NF
Tributary to Zacks Fork	ZFT1	FR	FR	FR
Spainhour Creek 01	SC01	FR	FR	FR
Spainhour Creek 02	SC02	NF	NF	NF
Blair Fork	BF01	FR	NF	NF
Greasy Creek 01	GC01	FR	F	FR
Greasy Creek 02	GC02	FR	NF	NF
Lower Creek 01	LC01	FR	F	F
Lower Creek 02	LC02	FR	FR	FR
Lower Creek 03	LC03	FR	FR	FR
Lower Creek 04	LC04	FR	FR	FR
Lower Creek 05	LC05	FR	NF	NF
Abingdon Creek 01	AC01	F	F	F
Abingdon Creek 02	AC02	FR	FR	FR
Husband Creek 01	HC01	FR	FR	FR
Husband Creek 02	HC02	F	F	FR
Husband Creek 03	HC03	FR	F	FR
Celia Creek 01	CC01	F	F	FR
Celia Creek 02	CC02	FR	NF	FR
Bristol Creek 01	BC01	F	FR	FR
Bristol Creek 02	BC02	FR	NF	FR
White Mill Creek	WM01	F	F	F
Lower Creek 06	LC06	NF	FR	FR
Lower Creek 07	LC07	FR	FR	FR
Lower Creek 08	LC08	FR	FR	F
Lower Creek 09	LC09	FR	NF	FR
Lower Creek 10	LC10	FR	F	FR

upper Lower Creek area

lower Lower Creek area

Figure 3: Overall Hydrology Functionality

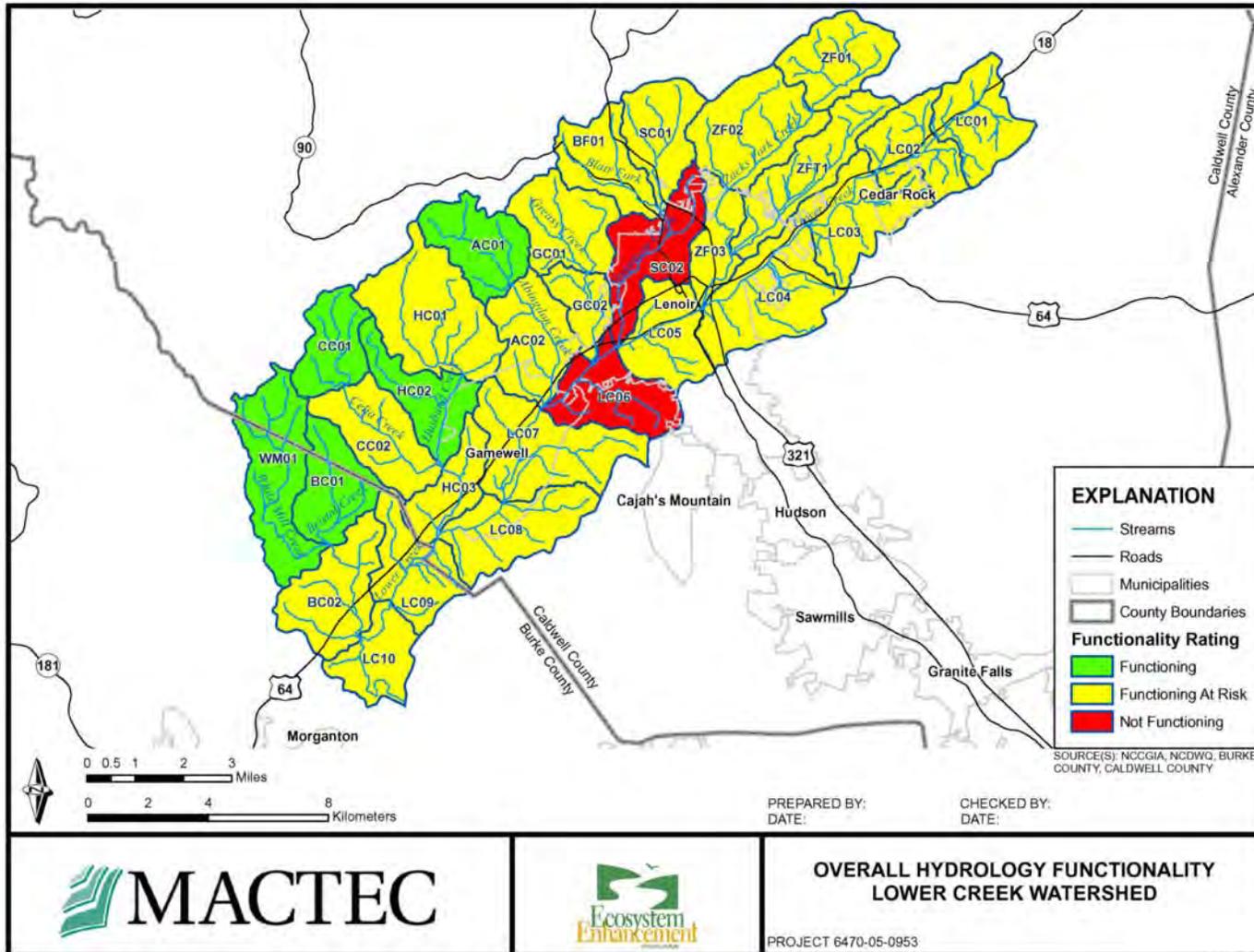


Figure 4: Overall Habitat Functionality

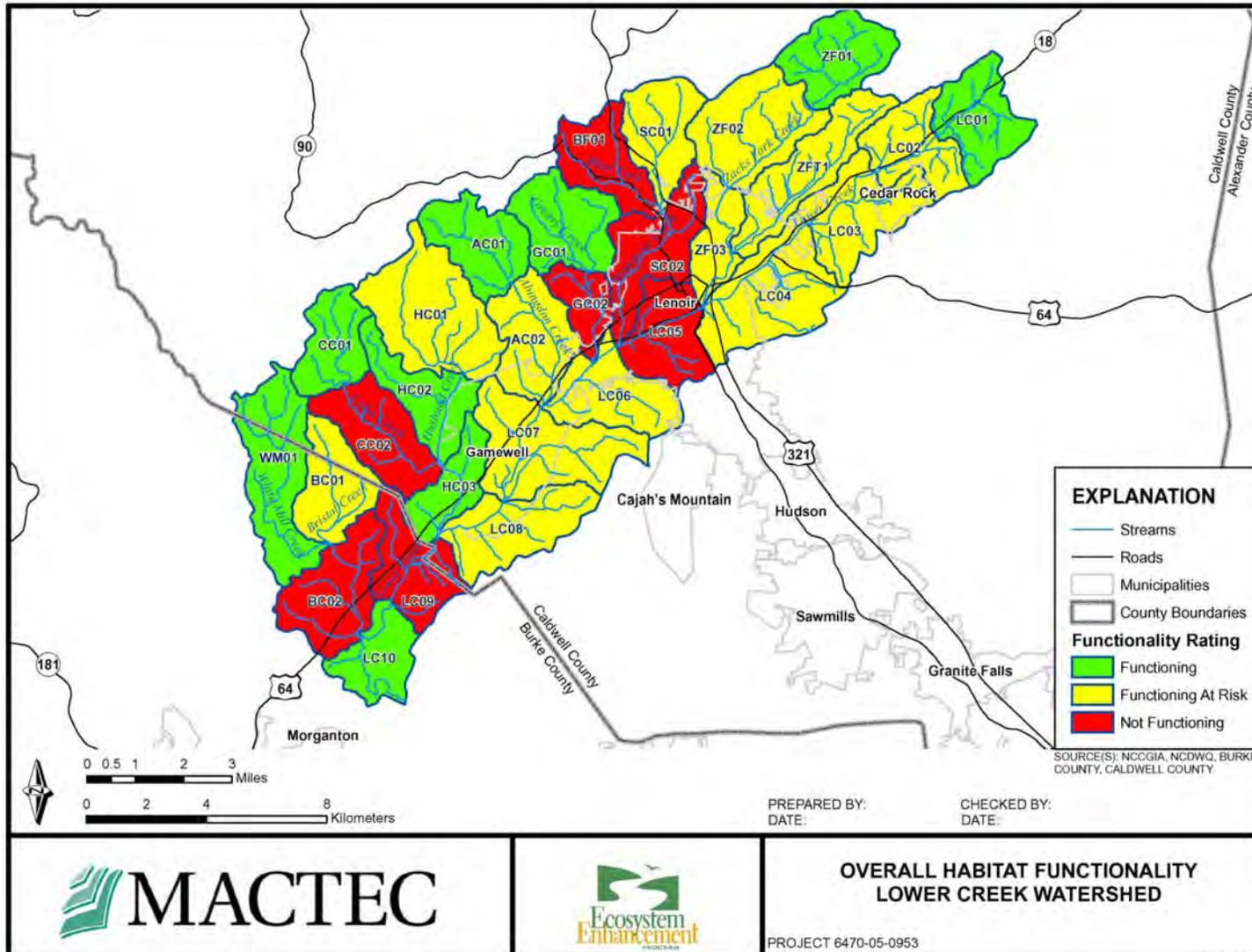
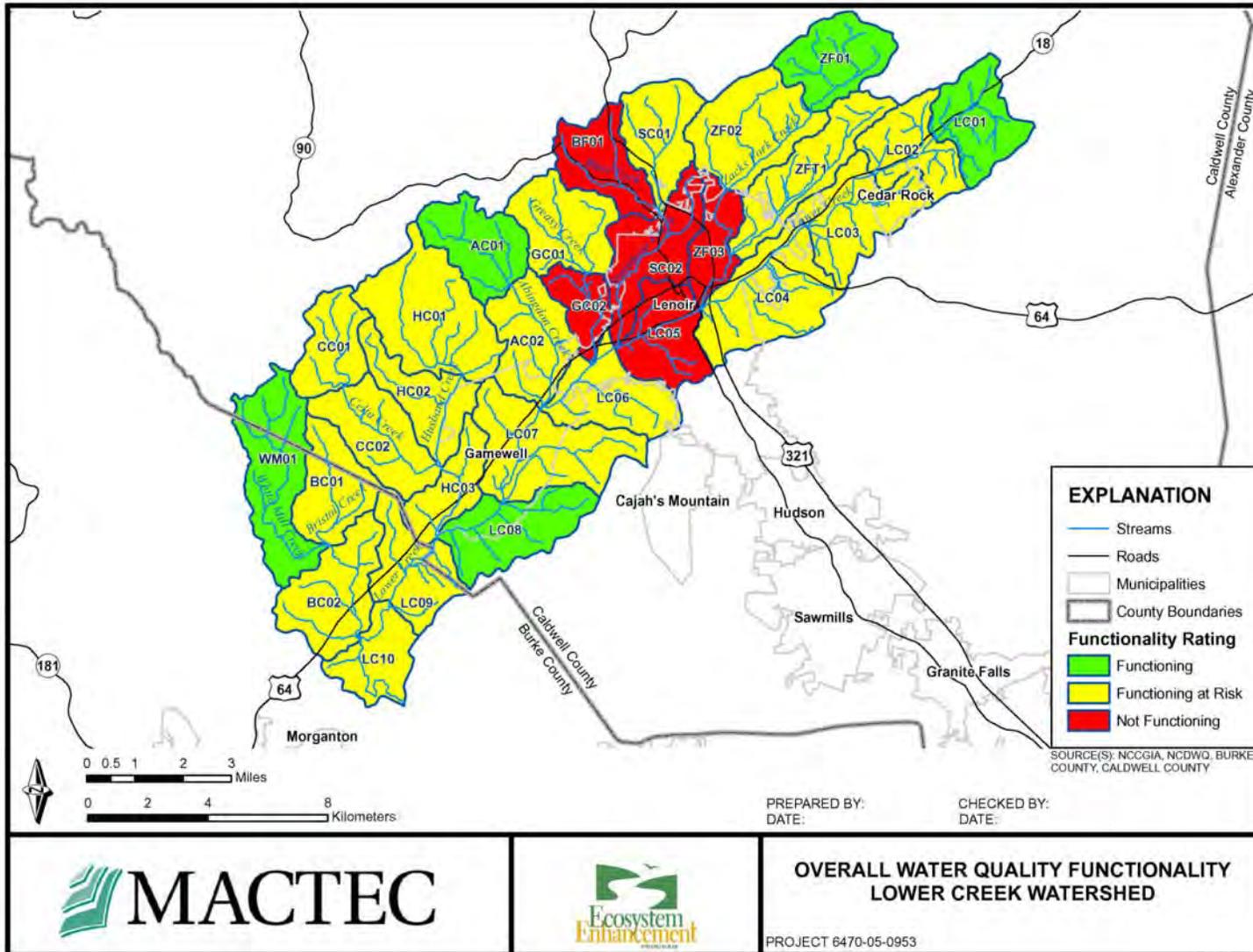


Figure 5: Overall Water Quality Functionality



3.4 WATERSHED-WIDE STRESSORS

Table 3 provides a listing of the major stressors impacting the functionality of hydrology, habitat, and water quality within the Lower Creek watershed. These contributing factors do not impact the entire watershed uniformly. Table 3 provides a partial listing of subwatersheds impacted by each stressor; only those stressors for which GIS analysis could determine problem locations are listed with affected subwatersheds. More intensive on-the-ground monitoring is needed to determine the extent of other stressors, and due to resource constraints, monitoring studies for this project did not include enough sites to fully represent all subwatersheds.

On a macro level, the Lower Creek watershed can be described as having three distinct parts:

1. A northern rural, mostly forested region, characterized by steeply sloped headwater areas with highly-erodible soils (ZF01, ZF02, ZFT1, SC01, LC01, LC02, LC03). This area also has some agricultural land use and is beginning to develop with single family homes on moderate to large lots.

Significant stressors in this area include:

- channelization from agricultural and development activity;
- sediment from upland and streambank erosion;
- inadequate forested buffer from agricultural and development activity; and
- fecal coliform bacteria from livestock and other rural sources.

2. A central urbanized area, characterized by high percentages of impervious cover, floodplain encroachment and many industrial facilities (LC04, LC05, LC06, LC07, ZF03, SC02, BF01, GC01, GC02).

Significant stressors in this area include:

- channelization from development activity;
- stormwater flow from impervious cover;
- floodplain encroachment from development activity;
- inadequate forested buffer from agricultural and development activity;
- toxicity from illicit connections and old landfill;
- fecal coliform bacteria from sewer overflows;
- nutrients from agricultural and landscaping activities; and
- sediment from instream mining activities, streambank erosion, and upland erosion.

3. A relatively flatter, southern rural area with a variety of agricultural activities and forested cover (LC08, LC09, LC10, AC01, AC02, HC01, HC02, HC03, CC01, CC02, BC01, BC02, WM01). This area is also beginning to develop into residential use.

Significant stressors in this area include:

- channelization from agricultural and development activity;
- sediment from streambank and upland erosion;
- inadequate forested buffer from agricultural and development activity; and
- stormwater flow from impervious cover.

Table 3: Stressors Impacting Watershed Functions

Note: Bolded subwatersheds indicate “not functioning” for at least one function. The column “Subwatersheds Affected” is an incomplete list of subwatersheds actually affected by stressors—only those stressors for which GIS analysis could determine problem locations are listed with affected subwatersheds.

Stressor	Source	Function Impacted	Impact	Subwatersheds Affected (through GIS analysis)
Channelization	Alteration from agricultural or land development activities	Hydrology Habitat	<ul style="list-style-type: none"> – Flooding – Streambank erosion – Streambed scour – Loss of instream habitat – riffles, pools, edge habitat 	LC01, LC02, LC03, LC04, LC05 , LC06, LC07, LC08 , LC09, LC10, ZF02 , ZFT1 , SC01 , SC02 , BF01, GC01, GC02, AC01, AC02 , HC01 , HC02, HC03, CC01, CC02, BC01, BC02 , WM01
Stormwater Flow	Impervious cover	Hydrology Habitat	<ul style="list-style-type: none"> – Flooding from increased peak flows – Streambank erosion – Streambed scour 	LC03, LC04, LC05 , LC06 , LC07, LC09, ZF03 , ZFT1, SC01, SC02 , BF01 , GC02, AC02, HC01, HC03, CC02
Floodplain Encroachment	Land development activities	Hydrology	<ul style="list-style-type: none"> – Flooding – Downstream erosion 	LC04, LC05, LC06, ZF03, SC02
Inadequate Forested Buffer	Agricultural and land development activities	Habitat Water Quality	<ul style="list-style-type: none"> – Loss of aquatic organic habitat (wood, leaves) – Loss of terrestrial habitat – Sediment from streambank erosion – Non-point source pollution 	LC02, LC03, LC04, LC05, LC06, LC07, LC09, ZF02, ZF03, ZFT1, SC01, SC02, BF01 , GC01, GC02, HC01, HC02, CC01, CC02, BC01, BC02
Sediment	Upland erosion	Water Quality Habitat	<ul style="list-style-type: none"> – Suspended solids – Homogeneous and embedded substrate 	not determined through GIS
Sediment	Bank erosion	Water Quality Habitat	<ul style="list-style-type: none"> – Suspended solids – Homogeneous and embedded substrate 	not determined through GIS
Sediment	In-stream mining	Water Quality Habitat	<ul style="list-style-type: none"> – Suspended solids – Homogeneous and embedded substrate 	not determined through GIS
Fecal Coliform Bacteria	Cattle	Water Quality	– Impacted water quality	not determined through GIS
Fecal Coliform Bacteria	Sewer overflows, illicit connections	Water Quality	– Impacted water quality	See Section 3.2
Toxicity	Illicit connections, legacy issues	Water Quality	<ul style="list-style-type: none"> – Loss of aquatic life – Impacted water quality 	See Section 3.2
Nutrients	Agricultural activity, lawns	Water Quality	<ul style="list-style-type: none"> – Loss of aquatic life – Algal growth 	See Section 3.2

4.0 STAKEHOLDER INPUT PROCESS

4.1 FORMATION OF STAKEHOLDER TEAM

From the beginning of the EEP project in the Lower Creek watershed, the involvement of local stakeholders was viewed as a vital part of the watershed planning process. In fact, staff from the Planning Department at the Western Piedmont Council of Governments (WPCOG) was hired to develop, in conjunction with EEP staff and MACTEC, a list of local stakeholders necessary to ensure the success of the planning process. WPCOG’s awareness of key water quality and environmental stakeholders greatly assisted in developing a list of stakeholders. These individuals became the basis for the stakeholders group, in this planning process called the Technical Advisory Committee (TAC). The individual members of the TAC and the organizations they represent are listed in Table 4.

Table 4: Members of the Lower Creek Technical Advisory Committee (TAC)

<i>Organization</i>	<i>Representatives</i>
Burke County	Judy Francis, Planning Director Marc Collins, Interim Planning Director
Caldwell County	Bill Duquette, County Environmental Engineer Eric Woolridge, Senior Planner
City of Lenoir	Charles Beck, Utilities Director
National Resource Conservation Service, Burke and Caldwell Counties	Rusty Lyday, District Conservationist
NC Cooperative Extension Division of Forestry	Allen Caldwell, County Director Roger Miller, Water Quality Forester
Carolina Land & Lakes Resource Conservation & Development	Dan McClure, Executive Director
Foothills Conservancy	Tom Kenney, Land Protection Director
Duke Power	Bill Fortis, Scientist
NC Wildlife Resources Commission	Jim Borawa
Burke County Soil and Water	Jack Huss
Lenoir-Rhyne College	Marsha Fanning, Professor of Biology
NC Division of Water Quality	Dave Toms and Mary Stone
Town of Gamewell	Ron Hancock, Planner
Caldwell County Pathways/Lenoir City Council	Merlin Perry

It was important to secure the participation of persons knowledgeable about the Lower Creek watershed, aware of key local issues and any current projects that might be underway or under consideration in the watershed. Information on the progress of on-going projects was shared with the TAC as a whole near the conclusion of each TAC meeting. This provided valuable input for other TAC members and provided EEP and MACTEC a fuller awareness of community concerns about the Lower Creek watershed.

The four primary roles of the TAC were:

- Provide local perspective,
- Prioritize issues for watershed planning,
- Prioritize areas for implementation, and
- Serve as a link to the larger local community.

4.2 MAJOR ISSUES OF CONCERN IDENTIFIED BY THE LOWER CREEK TAC

4.2.1 Initial Concerns and Goals

At the opening meeting (March 2005) of the Technical Advisory Committee, members described an initial set of local concerns they would like to see addressed in the *Lower Creek Watershed Management Plan*. These 12 issues -- many of which overlap in terms of their root causes or required strategies for implementation -- became the “first cut” at developing a list of community goals for the Lower Creek watershed:

1. Obtain right-of-way easements along streams to build paths and greenways.
2. Improve water quality conditions in streams; improve conditions in Lake Rhodhiss.
3. Improve the public’s understanding of the functions of floodplains; including education, erosion control measures and developing appropriate regulations.
4. Develop alternatives to impervious parking areas.
5. Manage stormwater more effectively.
6. Promote a better understanding of how cultural/historic resources relate to natural resources.
7. Provide better explanations to the public on why changes in zoning ordinances are needed; for example, what are the benefits associated with low density development along streams?
8. Maintain/protect wildlife habitat.
9. Consider effective sediment transport and deposition by local watercourses.
10. Protect public water supply.
11. Ensure the plan is transferable to other watersheds.
12. Educate the public about local watershed issues and potential solutions.

4.2.2 Additional Concerns and Goals

During discussion of the *Lower Creek Watershed Assessment Report* at the TAC meeting in December 2005, additional items and a higher degree of technical focus were added to the initial list of TAC concerns. These additional items included:

General Issues:

- Tie in projects with utility work projections
- Pursue restoration/remediation strategies for old furniture sites

Northern Lower Creek:

- Seek preservation options at headwaters in the Zacks Fork and Lower Creek subwatersheds
- Develop strategy for the old Lenoir reservoir site in the Zacks Fork 02 subwatershed
- Implement land development policies to encourage lower density development for second homes
- Address issues of stream channelization/straightening
- Prioritize headwater properties for acquisition; some are currently for sale

Central Lower Creek:

- Address water quality issues
- Develop solutions within the constraint that most urban areas are already built-out
- Work to restore/enhance or stabilize sections of Lower Creek below the city, as sewer expands southward to the airport

Southern Lower Creek:

- Address the issue of in-stream sand mining – is it likely to continue?
- Work with the Foothills Conservancy—mitigation option through partnership with County in Abingdon Creek01 subwatershed, in vicinity of “new” landfill (conservation easement)
- Within the Lower Creek 10 subwatershed —Foothills is discussing purchasing option at the mouth of Lower Creek, for wetlands preservation.

4.3 TAC MEETING MILESTONES

- **Meeting 1: March 1, 2005**
The initial meeting of the Technical Advisory Committee (TAC) introduced members to the Ecosystem Enhancement Program (EEP) and its goals, and described the ways the TAC can assist in developing the Lower Creek *Watershed Management Plan*. WPCOG staff reviewed a previous planning effort, and MACTEC staff summarized data collected for the Phase I Report. EEP staff emphasized the benefits of participation in this planning process for the Lower Creek watershed. Phases II and III of the watershed management planning process were described by MACTEC staff.
- **Meeting 2: May 3, 2005**
The second TAC meeting identified local needs in developing a Lower Creek *Watershed Management Plan*. DWQ staff helped the TAC understand the role of the Lower Creek watershed in the larger Lake Rhodhiss watershed and explained why Lake Rhodhiss was considered “impaired” by state officials. Excessive sediment in the Lower Creek watershed contributes to the poor aquatic life in those streams, as a recent Total Maximum Daily Load (TMDL) study demonstrated. A community meeting was scheduled for late June 2005 to seek input from local citizens about their concerns for the Lower Creek watershed.
- **Meeting 3: December 13, 2005**
The next TAC meeting included a synopsis of the recently published DWQ report (“Summary of Monitoring Results in Lower Creek Watershed and Tributaries – Catawba

River Basin: February 2004—April 2005”), which includes data on a benthic macroinvertebrate study conducted during 2002-04 and an impaired streams stressor study completed in 2005. [Details of this study are reported in the *Watershed Assessment Report* (WAR) and summarized in Section 3.0 of this Plan.]

Findings of the Lower Creek *Watershed Assessment Report*, prepared by MATEC, were another important component of this TAC meeting. MACTEC staff reported general findings for the northern, central and southern portions of the watershed, which are summarized in section 3.4 of this Plan.

- **Meeting 4: January 10, 2006**

The fourth TAC meeting focused on identifying potential project sites and incorporating community priorities and watershed needs into the *Watershed Management Plan* (WMP). The WMP will be composed of strategies to address both watershed-wide stressors and stream-specific stressors, including site-specific mitigation projects. The sites identified by TAC members at this meeting will also be incorporated into a *Watershed Project Atlas* [Appendix A of this Plan]. TAC members viewed maps showing 82 potential project sites and provided information about additional candidates for project consideration.

TAC comments on specific sites and issues for broad management recommendations proposed for implementation by various local government agencies were also summarized at the meeting. Other issues identified by the TAC as needing to be addressed in the recommendations include the “legacy landfill,” forming a public education workgroup within the TAC, floodplain encroachment and sand mining operations.

- **Meeting 5: June 20, 2006**

The fifth and final meeting of the Technical Advisory Committee centered on the completed Lower Creek *Watershed Management Plan* and reviewed the process which resulted in the recommendations proposed in the *Plan*. During the meeting EEP and MACTEC staff reviewed key watershed stressors and strategies to address them, the final projects recommended for implementation, and measures local governments can take to implement important components of the *Plan*. The TAC also discussed in detail ways to implement a “Watershed Council” to educate the public about the importance of watershed issues and to assist in implementing the recommended projects in the Lower Creek watershed. The TAC agreed to continue meeting even though its formal assignment has been accomplished.

4.4 TAC FEEDBACK AND FINAL RECOMMENDATIONS

At the January 2006 meeting, TAC members were given additional opportunities to identify projects on detailed maps provided by MACTEC and to propose their ideas for the prioritization of subwatersheds for project selection. Subwatershed prioritization facilitates the clustering of multiple projects in close proximity, thereby improving the likelihood of achieving measurable improvements to water quality, hydrology and habitat within a particular catchment. An initial classification of priority subwatersheds for preservation, restoration and stormwater BMPs was presented by MACTEC. TAC members recommended additional priority areas be designated, including Bristol Creek subwatersheds 01 and 02. The subwatershed prioritization/classification methodology was subsequently refined (the results of which are included in Section 6.0 of this Plan).

The TAC also spent some time at this meeting considering which broad land management policies local governments could use to further the implementation of recommendations in the Watershed Management Plan. The following eight institutional measures were discussed with the TAC. Specific comments offered by the TAC are included under each of these measures.

1. **Comprehensive land use planning** – Burke County’s comprehensive plan was last revised in 1993. The County is using the small area planning process to update and revise its land use regulations. Caldwell County’s land use plan is being revised. Lenoir’s current comprehensive plan was developed in 1975, and the City has established a planning process using local citizens to make recommendations for revising the plan.
2. **Subdivision/land development ordinances** – Burke County relies heavily on the state’s erosion control regulations. The County’s zoning ordinance addresses development on steep slopes and erosion control but not in the Lower Creek area. Caldwell County has adopted a watershed protection ordinance based on the state’s model ordinance. This ordinance only applies to a relatively small percentage of the project area. Caldwell County is planning on implementing a local sediment erosion control program. Municipalities within the County will be covered. The County will apply for grant funds from the state this December and plans to implement the program in about one year. Lenoir does not address stormwater or slopes in its current regulations. Impervious surfaces are regulated to a lesser degree.
3. **Erosion & sedimentation control ordinances**
4. **Stormwater management ordinances** – Burke County has stormwater requirements for lake-front development. Caldwell County has received a NPDES Phase II Permit from the state. The County is co-permitting with municipalities and is currently developing a stormwater ordinance.
5. **Floodplain management ordinances**
6. **Riparian buffer ordinances** – Burke County has more stringent buffer rules for development along the Catawba River than the state does. Buffers are not required along streams county-wide. Caldwell County’s current draft stormwater ordinance requires buffers along perennial streams.
7. **Public education programs**
8. **Watershed stewardship programs** – Both Counties have activities that fall under this heading. Burke County has an Environmental Affairs Board that makes recommendations to the Planning Board and Board of Commissioners about environmental issues. An active advocacy group, the Lake James Environmental Association, has members living in Burke County and participates in the Volunteer Watershed Information Network (VWIN) Program. Caldwell County Cooperative Extension is active in working with a variety of partners in the County. Examples of activities include special workshops, master gardener program, stormwater stenciling by 4H members, and the use of newsletters and local TV for public education purposes. Caldwell County Pathways is an advocacy group interested in promoting trail opportunities in the County. Both Burke and Caldwell County Soil and Water Conservation Districts annually host Big Sweep, a volunteer program to pick up trash from streams.

Each of these institutional measures, and associated recommendations, are addressed in greater detail within Section 7.0 of this Plan.

4.5 ADDITIONAL OUTREACH/EDUCATION EFFORTS AND COMMUNITY INPUT

4.5.1 Publicity for the Lower Creek Watershed Project

Special efforts were made by WPCOG staff to inform the public of the Community Meeting scheduled for June 21, 2005 at the Caldwell County Public Library in Lenoir. News releases were written by WPCOG staff, distributed to the two daily newspapers in Lenoir and Morganton, as well as in the regional *Catawba Valley Neighbors* section of the *Charlotte Observer*, and published in local “event calendars.” A feature story on the EEP/Lower Creek watershed project was published in the *Lenoir News Topic*.

Staff from EEP, WPCOG, MACTEC and the Caldwell County Planning Department joined together to create a special TV program focusing on the issues facing Lower Creek and its impact on Lake Rhodhiss. This special show was broadcast on the Caldwell County-owned cable TV station several times during the week before the Community meeting as part of the “Caldwell County Today” show.

4.5.2 Community Meeting – June 21, 2005

Seven local citizens met with project staff and several members of the Technical Advisory Committee to gather community opinions and concerns about Lower Creek in June 2005. Citizen-stakeholders at the community meeting joined together in a small group discussion setting and responded to the following three questions:

1. What are the **assets** of the Lower Creek watershed?
2. What **concerns** do you have regarding the Lower Creek watershed?
3. What is your long-term (10-15 year) **vision** for the Lower Creek watershed?

Following their responses to the above questions, the citizens were allocated three votes each for the “concerns” and “vision” responses. Stakeholders were instructed to vote on the statements they considered most important. Individuals could vote once for each of three separate responses or chose to vote two or three times on a single response, as long as they did not vote more than three times overall within the “concerns” and “vision” categories. Voting did not occur for statements within the “assets” category.

ASSETS (non-voting category)

1. Takes away stormwater
2. Carries a large quantity of water
3. Still largely rural
4. Provides examples of what happens when we do no exercise care
5. With land usage/impervious cover does not have time to recover
6. Presents a good opportunity for restoration
7. Large portion of usable land
8. Provides source of drinking water at relatively low cost

CONCERNS

1. Development is occurring without adequate controls (5 votes)
2. Drinking water quality (4)
3. Lack of buffer areas (3)
4. A growing amount of impervious cover (1)

5. A lot of stuff in Lower Creek that shouldn't be there...some you can see and some you can't (1)
6. Development has encroached on the creek (e.g. Lenoir Mall) (1)
7. You can tell it has rained because of the sediment (1)
8. Wildlife and insect dying/leaving due to loss of habitat (1)
9. Occasional sewage overflows into the Creek (1)
10. Chlorine put in Creek kills wildlife (1)
11. Industries located along tributaries may be stressing stream (1)
12. Erosion – road building, development (1)
13. Streambank erosion (1)
14. Effect of water quality on property value (e.g. addition to the 303(d) list) (1)
15. Nutrients (golf course, homes) (1)
16. Some (not major) cattle & horse access (1)
17. Flooding due to increased runoff (1)
18. Floodwaters are contaminated (sewage, toxins) (1)
19. Trash and debris finds its way into creek – impedes flow (1)
20. Some “straight pipe” discharges of grey water (1)

VISION

1. Adequate enforcement of erosion and sedimentation control regulations (5 votes)
2. Comprehensive plan for watershed management with all local governments supporting (e.g. 321 overlay plan) (4)
3. Get Lower Creek and other water bodies off the impaired list (3)
4. Conservation easements/preservation of natural areas (e.g. wetlands) (2)
5. Greenway System – walking, biking, provide a buffer, attract people, source of pride (1)
6. A “Clean Stream” – no bank erosion, no trash in stream, no “spraying with Roundup” (1)
7. Commercial/Industrial property owners clean up their property around stream (1)
8. Better drainage system to control flows – reduce flooding, reduce erosion (1)
9. Area-wide understanding of the value of watershed management (1)
10. Provide recognition/incentive for participation by companies (e.g. “clean water award”)
11. “Green” programs (e.g. reuse of water) (1)
12. Use of Stormwater BMP's (e.g. settling basins) (1)

Despite the low public turnout, project staff and TAC members felt the group's expressions of “concerns” and “vision” for Lower Creek focused on viable ways to remedy the current situation in Lower Creek. The input from the community meeting was valuable, staff and TAC members felt, because the public showed an understanding of options for providing remedies for water quality issues in Lower Creek.

4.5.3 Progress Reports to Local Governments

WPCOG and EEP staff met with elected boards from Caldwell and Burke Counties and from Lenoir and Gamewell in August and September 2005. These summary presentations gave local elected officials an overview of the Lower Creek watershed project and offered them the opportunity to ask questions or seek additional information about the project.

An additional progress report was also planned by WPCOG and EEP staff in late summer or fall of 2006, updating local officials from these same local governments on the recommendations proposed in the *Watershed Management Plan* and on implementation efforts. Staff stressed the

importance of local commitment to implement Plan recommendations and the Technical Advisory Committee's role in developing recommendations of importance to local communities.

4.5.4 TAC Education Subcommittee

An *ad hoc* subcommittee to develop educational options to be included in the Lower Creek *Watershed Management Plan* held two meetings in March and April 2006. The group aimed to develop ways to educate citizens and local officials on the need for improving the water quality in Lower Creek. It also discussed ways that the implementation strategies described in the *Watershed Management Plan* could be put into action. A variety of existing programs for use at the state, regional and local levels were identified during the initial discussion.

At the first meeting subcommittee members identified four initial topics with education implications. During the second meeting subcommittee members decided to formally recommend three of the four ideas discussed at the first meeting:

- The Clean Water Contractor Program was recommended for inclusion in the Plan's education recommendations;
- Information on the effects of poor water quality on economic development was proposed for presentation to local officials in a detailed data sheet or brochure; and
- A recently published brochure [*The Catawba River and You: Actions You Can Take to Protect Your Drinking Water Source, the Catawba River*] is available for distribution to citizens. It outlines practical steps that folks in Caldwell and Burke Counties can take to protect water quality in the watershed. Copies of the brochure can be obtained from the WPCOG Water Quality Administrator at (828) 322-9191.
- The establishment of a local watershed council, the fourth proposal, is addressed in Section 8.5 of this Plan.

4.5.5 Lower Creek Watershed Website

A website devoted to the Lower Creek watershed project was launched by the WPCOG before the public input meeting in mid-June 2005. This site provides periodic updates on the Lower Creek Local Watershed Planning effort, highlighting meeting summaries, PowerPoint presentations and major reports as completed by DWQ staff and MACTEC. The website was designed to provide TAC members easy access to detailed reports and updates from DWQ and EEP staff and project consultants: <http://204.211.224.29/lowercreek/>

5.0 WATERSHED RESTORATION FRAMEWORK

This Plan attempts to address watershed stressors, or problems, identified through the watershed assessment process (described in Section 3) with a number of approaches, including stream and wetland restoration, land preservation, institutional measures such as ordinances and regulations, best management practices, and pollutant-specific strategies. These strategies are described in detail in Sections 5, 6, 7, and 8. Management strategies were developed with the input of the Lower Creek Technical Advisory Committee, which prioritized stressors, identified priority areas, and named key restoration projects (see Section 4).

Major issues/stressors contributing to stream degradation within the Lower Creek watershed and where they are addressed in this plan are listed in Table 5 and below.

Table 5: Watershed Stressors and Management Strategies

Stressor	Management Strategy	Strategy Location
Stream bank erosion	Stream restoration, riparian buffers, livestock exclusion, sand dredging BMPs	Sections 5, 6.4, 7.4, 8.4
Lack of adequate forested buffer	Stream restoration, riparian buffers	Sections 5, 6.4, 7.4
Stream channelization	Stream restoration	Section 6.4
Impervious cover	Stormwater BMPs, stormwater ordinance, low impact development	Sections 6.4, 7.2, 7.3, 8.2
Upland erosion	Ag & forestry BMPs, erosion and sedimentation control ordinance, subdivision ordinance modifications, steep slope ordinance, public education	Sections 7.2, 7.3, 7.5, 7.7, 8.3, 8.4
Livestock access to streams	Livestock exclusion	Section 8.4
Floodplain development	Floodplain development ordinance	Section 7.6
Urban toxicants	Illicit discharge program, landfill strategy, watershed education program, stormwater BMPs	Sections 5, 7.2, 7.7, 8.2
Nutrients	Illicit discharge program, ag BMPs, riparian buffers, watershed education program, stormwater BMPs, additional studies	Sections 5, 7.2, 7.4, 7.7, 8.4
Fecal coliform bacteria	Retrofit wastewater collection system, ag BMPs, illicit discharge program, watershed education program, stormwater BMPs	Sections 5, 7.2, 7.8, 8.2, 8.4

1. Stream bank erosion

Impact: Habitat degradation (sedimentation), turbidity

Management strategy: stream restoration or enhancement, riparian buffer planting, livestock exclusion from streams

Strategy location: Sections 5 (this section), 6.4, 7.4, 8.4

Eroding stream banks are found throughout the watershed and are a primary source of sediment in watershed streams and Lake Rhodhiss. Strategies to address stream bank erosion depend on

site-specific issues, such as the magnitude of degradation, stream size, watershed character, and causative factors. Small-scale bank stabilization projects can be done to address localized stream bank failures, but full-scale **stream restoration** projects are required to restore stable stream morphology where streams have become highly channelized and/or incised. Some streams simply need livestock fenced out and/or a buffer planted.

Section 6 identifies the most feasible stream restoration projects in priority subwatersheds of the Lower Creek watershed. These projects were identified using EEP's feasibility criteria, which include project size (e.g., stream length), drainage area size, and number of landowners. There are many other areas in the Lower Creek watershed that have eroding stream banks; of special note is Lower Creek itself, which is characterized by severe erosion in many areas, especially along its downstream half. Some of these areas can be addressed through other programs, such as NRCS and SWCD.

Lower Creek has one permitted sand dredging operation, and there are pending permits for three more operations. Lower Creek Technical Advisory Committee members have noted that this activity can cause systematic and local channel instability as well as turbidity. These operations are allowed through general permits assigned by the NC Division of Water Quality (DWQ), and they do not fall under Clean Water Act Section 401/404 permitting as dredging activities. DWQ can specify best management practices (BMPs) that minimize the impacts of sand dredging in its general permits; DWQ should monitor present activities and their impacts and determine a set of BMPs that are applicable to these operations.

2. Lack of adequate forested riparian buffer

Impact: Habitat degradation (lack of wood and leaf habitats), stream bank erosion

Management strategy: stream restoration or enhancement, riparian buffer planting

Strategy location: Sections 5, 6.4, 7.4

Many streams in the Lower Creek watershed lack an adequate forested buffer, which is essential to stream bank stability, aquatic habitat, canopy cover to maintain cool temperatures needed by aquatic organisms, and a filter for pollutants that run off adjacent lands. The Mountain Stream Buffer Technical Advisory Committee to the Upper Catawba River Basin Buffer Advisory Committee (2000) recommended at least 30 to 50 ft of woody vegetation along streams to maintain many buffer functions. For streams that are relatively stable, planting an adequate buffer can be sufficient to improve stream function; however, where streams are unstable, stream bank stabilization activities should also be implemented in addition to buffer planting.

3. Stream channelization

Impact: habitat degradation, increase in stormflow discharge rates and flow velocities, flooding, streambed scour, stream bank erosion

Management strategy: stream restoration or enhancement

Strategy location: Section 6.4

Lower Creek and many of its tributaries have been channelized, or straightened, in the past. This causes channel instability and consequent erosion and reduces stream habitat quality. It can also increase stream flow velocity, which during storms can scour stream habitats, cause more stream bank erosion, and increase flooding. Channelization can be corrected with stream restoration.

4. Impervious cover resulting from development activity

Impact: increase in stormflow discharge rates and flow velocities, flooding, streambed scour, stream bank erosion, pollutants

Management strategy: stormwater best management practice (BMP) retrofits, stormwater management ordinance, low impact development

Strategy location: Sections 6.4, 7.2, 7.3, 8.2

Impervious cover, such as parking lots, roads, and buildings, is a significant cause of degradation in the developed portions of the Lower Creek watershed. It increases the amount of runoff during storm events, carrying pollutants and increasing stream flow volume and velocity. As with channelization, this increase in flow can scour stream habitats, cause more stream bank erosion, and increase flooding. These impacts can be reduced with stormwater BMPs. Existing impervious cover can be retrofitted with stormwater BMPs, although this may be cost-prohibitive to perform on many existing areas. Future development should be encouraged to apply building and site design practices that minimize impervious surfaces and their impacts to streams (e.g., low impact development).

5. Upland erosion

Impact: Habitat degradation (sedimentation), turbidity

Management strategy: agriculture and forestry BMPs, erosion and sedimentation control measures, stormwater management ordinances, modifications in subdivision ordinances, public education, steep slope ordinance

Strategy location: Sections 7.2, 7.3, 7.5, 7.7, 8.3, 8.4

Erosion from unstabilized development sites, unvegetated slopes on residential and commercial land, and unpaved roads and driveways are sources of sediment for streams. Agricultural and forestry BMPs should be encouraged, and the public should be educated on upland erosion and measures to minimize its impacts. Sediment from development can be controlled with the development and/or enforcement of appropriate ordinances. Subdivision ordinances should be modified to protect steep slopes from development and/or a steep slope ordinance should be adopted.

6. Livestock access to streams

Impact: Bank erosion, habitat degradation (sedimentation), nutrient and fecal bacteria inputs

Management strategy: Fence out livestock and provide alternative watering

Strategy location: Section 8.4

Livestock operations exist throughout the rural portions of the Lower Creek watershed. Some of these allow livestock access to streams for watering, damaging stream banks and buffer vegetation and increasing nutrient and fecal coliform bacteria levels. Livestock should be fenced out of streams and provided alternative watering sources.

7. Floodplain development

Impact: Reduction in stream and floodplain capacity to transport flow, flooding

Management strategy: Floodplain development ordinance

Strategy location: Section 7.6

Development in floodplains reduces the capacity of floodplains to store and transport flood waters, increasing flooding downstream. A floodplain development ordinance should be enacted and enforced by local and county governments to restrict development in the floodplain.

8. Urban toxicants—metals, organic pollutants

Impact: Toxicity to aquatic organisms

Management strategy: Illicit discharge detection and elimination program, plan to address landfill pollutants, watershed education program, stormwater BMPs

Strategy location: Sections 5, 7.2, 7.7, 8.2

Evidence of toxicity was found in a number of streams that drain Lenoir. Toxicants detected included lead, copper, zinc, and organic pollutants (petroleum-based hydrocarbons). These toxicants can be carried to streams from impervious surfaces during storms and can be directly input via illicit or unknown connections to the stormwater system. Better education of watershed residents and businesses on reducing sources is needed. In addition, an illicit detection and elimination program, proposed in Caldwell County's Phase II stormwater permit, should be effective in reducing sources



Figure 6: Landfill on Blair Fork

Of special note is toxicity in Blair Fork, which is likely due, at least in part, to a closed **unlined landfill** off NC 90. NC Division of Waste Management and NC Division of Water Quality should coordinate to perform further testing on impacts from the landfill and determine a strategy to mitigate impacts.

9. Nutrients

Impact: Impacts to aquatic organisms, increased algal activity in Lake Rhodhiss

Management strategy: Illicit discharge detection and elimination program, agricultural best management practices, riparian buffers, watershed education program, stormwater BMPs additional studies

Strategy location: Sections 5, 7.2, 7.4, 7.7, 8.2, 8.4

High nutrient levels were found in most streams sampled (including Lower Creek, an urban unnamed tributary to Lower Creek, Zacks Fork, Spainhour Creek, Blair Fork, and Greasy Creek); elevated nutrients are of special concern in Lake Rhodhiss, which is on the draft 2006 303(d) list. A combination of watershed education for residents, farmers, and business owners, agricultural BMPs for livestock, horticulture, and crop growers, and an illicit discharge detection and elimination program is needed.

The Lenoir wastewater treatment plant is also a significant source of nitrogen and phosphorus in Lower Creek and Lake Rhodhiss (USGS, 1997).

Further study is needed to quantify nutrient impacts and sources for Lake Rhodhiss. Duke Energy is in the process of renewing its license from the Federal Energy Regulatory Commission to operate its dams on the Catawba River, one of which forms Lake Rhodhiss. Plans to monitor nutrient inputs to Lake Rhodhiss are outlined in the draft relicensing agreement. The Division of Water Quality awarded a 319 grant to the Carolina Land and Lakes Resource Conservation and Development Council to monitor tributaries to the lake and develop a Lake

Rhodhiss Watershed Restoration Plan. Both of these efforts may be incorporated into TMDL monitoring and modeling efforts DWQ may perform to address impairment in the lake.

10. Fecal coliform bacteria

Impact: Increased health risk with wading, swimming, fishing

Management strategy: Retrofit public wastewater collection system, livestock best management practices, illicit discharge detection and elimination program, watershed education program, stormwater BMPs

Strategy location: Sections 5, 7.2, 7.8, 8.2, 8.4

High concentrations of fecal coliform bacteria were found throughout the watershed, and inputs have a diverse set of sources. The City of Lenoir's **wastewater collection system** has had problems with sewer overflows and leaks. To address this, it is upgrading a large section of its main sewer interceptor along NC 18, which has had chronic issues with overflows. To comply with its sewer system permit, which was issued in 2004, Lenoir will perform extensive inspections, maintenance, and rehabilitation on its sewer lines. It is expected that these actions will result in quantifiable improvement in sewer line function (Jim Reid, NC Division of Water Quality, personal communication).

Straight pipes and malfunctioning septic systems are also possible sources of fecal inputs; these can be pinpointed through an illicit detection and elimination program and their incidence decreased through watershed education. Livestock inputs of fecal waste can be eliminated by fencing cattle out of streams, locating concentrated feeding areas away from streams, and maintaining an adequate forested buffer.

6.0 WATERSHED IMPROVEMENT PROJECTS

This Section includes

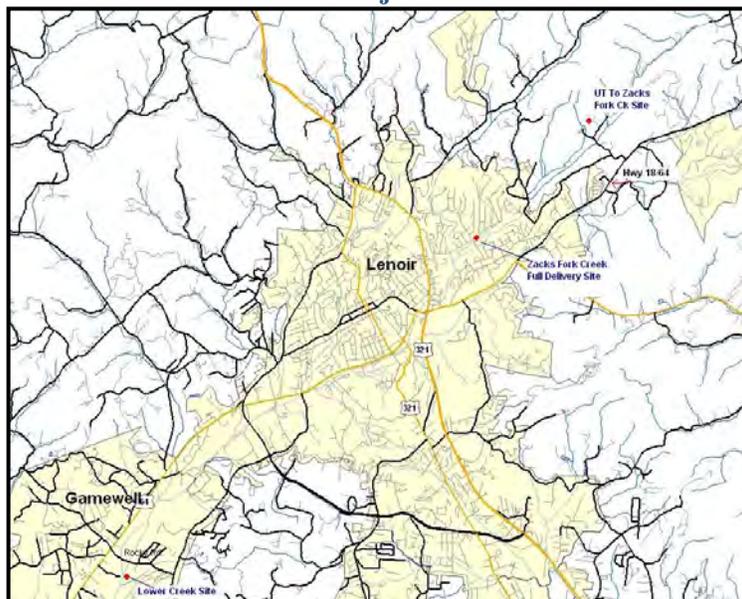
- A summary of current EEP restoration projects within the Lower Creek watershed (section 6.1);
- An overview of the general strategy for “project synergy” recommended to maximize functional restoration at the subwatershed scale (section 6.2);
- A description of the subwatershed classification and prioritization methodology used to identify the best project types and locations for addressing the major functional problems in individual subwatersheds (section 6.3); and
- A summary of the primary project sites (38 total) recommended to address the major functional problems identified across the LWP study area, and how they were selected (section 6.4).

Appendix A of the WMP presents the Project Atlas for the 38 primary project sites recommended for implementation, including a detailed site map, a summary of major functional issues addressed by the project, and cost estimates for each project. **Appendix D** provides a master list and map of all 187 potential project sites identified from the Phase II GIS screening exercise and from local stakeholder recommendations (see Section 6.4 below).

6.1 CURRENT PROJECTS IN THE WATERSHED

EEP is currently working on three projects within the Lower Creek watershed (see Figure 7 below). These include a recently completed stream restoration project [approx. 3,900 linear feet] on Zacks Fork Creek near the soccer complex in subwatershed ZF03, implemented as part of EEP’s Full Delivery program. A second project, currently being designed, is located on Lower Creek on the Cardwell and Kincaid Furniture parcels on Rocky Road (LC07) and will involve approximately 3,000 feet of streambank stabilization and installation of stormwater management BMPs. A third site is currently being assessed as a potential stream restoration project (approximately 1,500 linear feet) on an unnamed tributary to Zacks Fork Creek in subwatershed ZFT1.

Figure 7: EEP Stream Restoration Project Sites in the Lower Creek Watershed



In addition to these EEP projects, the NRCS has worked with several horticultural and livestock operations on the implementation of agricultural BMPs and streambank stabilization on their farms. The Foothills Conservancy (FC) has submitted an application to the CWMTF for the acquisition of a tract of Crescent Resources land that covers the downstream portions of Lower Creek, Bristol Creek, and the Johns River near Lake Rhodhiss. This project would protect all streams in subwatershed LC10. The FC is also working with Caldwell County on a preservation project near the county's active landfill in AC01 (upper Abingdon Creek) to mitigate for landfill impacts.

6.2 PROJECT SYNERGY OBJECTIVES

The Lower Creek watershed contains approximately 208 total miles of stream channel. Given the size of the Lower Creek watershed, the best approach to influencing or producing a positive effect on the hydrology, habitat, and water quality of the watershed is the clustering of restoration projects at the subwatershed scale. By implementing multiple projects in close proximity to one another (within the same subwatershed), a cumulative benefit will theoretically be gained for the most important functional indicators. This clustering (or "project synergy") strategy is encouraged by EEP's Watershed Needs Assessment Team in their report to the Mitigation Coordination Group (October 2003) – see <http://www.nceep.net/news/reports/WNAT%20Mit%20Group%20Final.pdf>.

The EEP Monitoring and Research section is presently engaged in research designed to (1) determine the optimal scale and proximity of project clusters to achieve functional benefit; and (2) identify the functional indicators (monitoring parameters) and values most appropriate for long-term project success criteria.

The practical recommendation that follows from this general goal of project synergy is simply to implement multiple projects in close proximity to each other within high-priority subwatersheds whenever possible.

6.3 SUBWATERSHED PRIORITIZATION

This Section describes the subwatershed classification and prioritization process employed by MACTEC within the Lower Creek watershed. The 29 subwatersheds have been classified utilizing GIS analysis in conjunction with the subwatershed's functional rating (see Section 3.3) and stakeholder input.

Four subwatersheds were initially omitted from the subwatershed prioritization due to large channel dimensions, minor functional benefit, or poor water quality from an associated landfill (Table 6). The remaining twenty-five subwatersheds that comprise the Lower Creek watershed were grouped into three general categories of mitigation potential: **preservation, restoration and stormwater BMPs** (Figure 8). In general, subwatersheds in more rural areas with relatively low values for impervious cover (IC) and high values for riparian cover were considered to be better suited for preservation. Subwatersheds situated in areas with large tracts of cleared land with past or present agricultural production are often ideal candidates for restoration. Subwatersheds in urbanized areas with relatively high values for impervious cover and low values for riparian cover were considered to be better suited for stormwater BMP measures.

Figure 8: Subwatershed Prioritization Flowchart

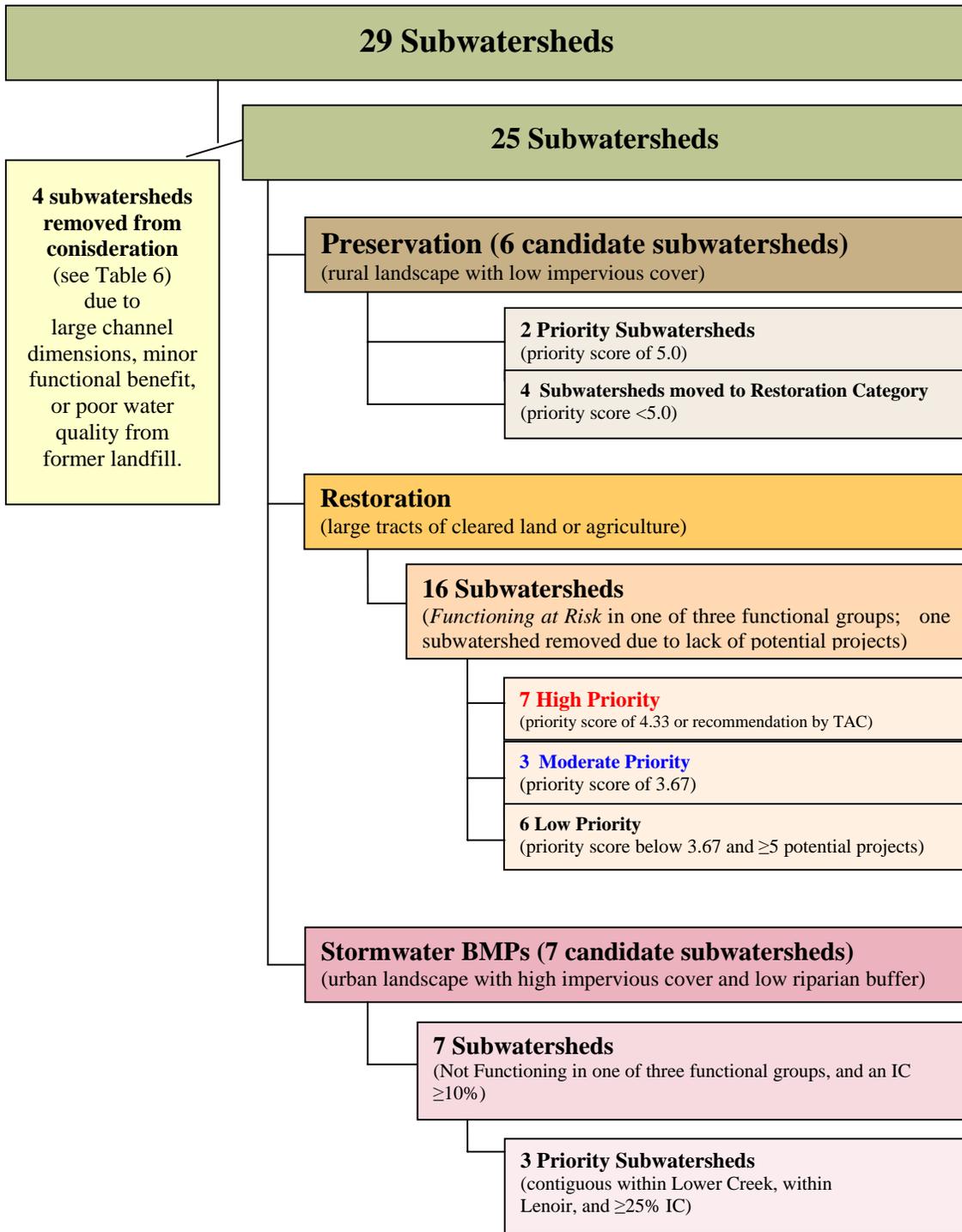


Table 6: Subwatersheds Omitted From Prioritization

NAME		JUSTIFICATION
BF01 (Blair Fork)		Poor water quality due to leachate from former landfill
LC08		Lower Creek channel dimensions too large
LC09	lower reaches of Lower Creek mainstem	Lower Creek channel dimensions too large
LC10		Intact riparian buffers; all streams already slated for protection by Foothills Conservancy (CWMTF acquisition); the Lower Creek-Johns River-Lake Rhodhiss tract.

In the *Watershed Assessment Report (WAR)* each subwatershed received a functionality rating for habitat, hydrology, and water quality (see page 24 of the WAR, *Overall Functionality Scoring* and Section 3.3 of this Plan). A rating of **Functioning** was assigned to the subwatershed function provided the function was performing naturally, without evidence of significant degradation or a stressed condition. A rating of **Functioning at Risk** was assigned to the subwatershed function if the function was moderately degraded and showed evidence of stress such that, without intervention, it could over time become not functioning. A rating of **Not Functioning** was assigned to the subwatershed function if the function was stressed to the level of being highly degraded. Based on these functional ratings, the following rationale was used to develop a subwatershed priority rating: a subwatershed function with a rating of *Functioning* should maintain its functionality through the mitigation strategy of preservation; a subwatershed function with a rating of *Functioning at Risk* could see the functionality rating improved through restoration strategies; a subwatershed function with a rating of *Not Functioning* most likely would not respond to preservation or restoration strategies; however, the function may respond positively to management opportunities over time.

Given the aforementioned rationale, prioritization commenced by assigning a priority score to each subwatershed based on its associated functionality rating for habitat, hydrology, and water quality (as presented in the WAR). Subwatershed ratings of *Functioning*, *Functioning at Risk*, and *Not Functioning* were assigned a value of 5, 3 and 0, respectively. A **composite priority score** for each subwatershed was calculated based on the average score of these three parameters (water quality; hydrology; habitat).

6.3.1 Preservation Subwatersheds

A subwatershed was selected for **preservation** strategies if it had been assigned a functional rating of *Functioning* for at least two out of three functionality parameters (habitat, hydrology, and water quality) and had not been assigned any functionality rating of *Not Functioning*. Table 7 below provides a summary of the six subwatersheds that fit these criteria. Subwatersheds **AC01** and **WM01** (bolded in table) were selected as the two priority subwatersheds for preservation strategies because both were assigned the highest priority scores (5.00) of all Lower Creek subwatersheds. The remaining four subwatersheds in Table 7 below were then considered for **restoration** strategies, as they each have a *Functioning at Risk* component that could benefit from restoration/enhancement efforts.

Table 7: Subwatersheds Selected For Preservation Strategies
[Bold indicates selection as a priority subwatershed for this mitigation category]

Name	Habitat	Hydrology	Water Quality	Priority Score
AC01	F	F	F	5.00
CC01	F	F	FR	4.33
HC02	F	F	FR	4.33
LC01	F	FR	F	4.33
WM01	F	F	F	5.00
ZF01	F	FR	F	4.33

6.3.2 Restoration Subwatersheds

A subwatershed was selected for **restoration** strategies if it had been assigned a functional rating of *Functioning at Risk* for at least one out of three functionality parameters (habitat, hydrology and water quality) and had not been assigned a functionality rating of *Not Functioning*. Table 8 below provides a summary of the 17 subwatersheds that fit these criteria. [Note: the upper half of ZF03 was also selected for restoration strategies—despite an overall subwatershed rating of NF in water quality—because of a relatively high percentage of wooded riparian buffers and recommendations from the Lower Creek TAC.]

Subwatersheds considered for **restoration** strategies were *further* classified into three priority groups based on their functional priority score and the total number of existing and potential mitigation project sites identified within their boundaries. In Table 8, “MACTEC projects” are those potential project sites that were identified through GIS analysis by MACTEC. “Stakeholder projects” are potential projects sites recommended by stakeholders participating in the Lower Creek Local Watershed Planning process. “Existing/past projects” are watershed improvement projects that have been or are currently being funded by the Clean Water Management Trust Fund, or mitigation projects that have been or are currently being funded by the Ecosystem Enhancement Program.

Subwatersheds designated for High Priority restoration (highlighted in **red** in Table 8) were those that received a priority score of 4.33 or were recommended by the Lower Creek TAC. The TAC recommended that subwatersheds LC01, ZF01, ZF02 and ZFT1 be given top consideration for restoration projects due to the predominance of agricultural land uses and farm properties that could benefit from stream restoration efforts and/or agricultural BMPs. Subwatersheds that were designated as Moderate Priority for restoration (highlighted in **blue** in Table 8) were those that received a priority score of 3.67. Lastly, subwatersheds that received a score below 3.67 (yet had at least five existing or potential projects) were designated as Low Priority for restoration. Subwatershed LC02 (upper Lower Creek) was omitted from consideration due to fewer than five potential projects within its boundaries. This left 16 subwatersheds remaining as priority subwatersheds for restoration projects.

Table 8: Subwatersheds Selected For Restoration Strategies

[Asterisks indicate subwatersheds recommended as priorities for restoration projects by the Lower Creek Technical Advisory Committee (TAC), regardless of their functional priority scores.]

Name	Habitat	Hydrology	Water Quality	Priority Score	Projects (MACTEC)	Project (Stake-Holders)	Projects (Existing/Past)	Project (Total)
AC02	FR	FR	FR	3	4	1	0	5
BC01	FR	F	FR	3.67	3	1	0	4
CC01	F	F	FR	4.33	3	1	0	4
GC01	F	FR	FR	3.67	4	2	0	6
HC01	FR	FR	FR	3	5	0	0	5
HC02	F	F	FR	4.33	5	0	0	5
HC03	F	FR	FR	3.67	2	0	0	2
LC01*	F	FR	F	4.33	4	2	0	6
LC02	FR	FR	FR	3	3	0	0	3
LC03	FR	FR	FR	3	4	1	0	5
LC04	FR	FR	FR	3	5	3	0	8
LC07	FR	FR	FR	3	9	2	0	11
SC01	FR	FR	FR	3	4	1	0	5
ZF01*	F	FR	F	4.33	4	3	0	7
ZF02*	FR	FR	FR	3	4	1	0	5
ZF03 (upper)	FR	FR	NF	2	2	2	1	5
ZFT1*	FR	FR	FR	3	4	0	2	6

6.3.3 Stormwater BMP Subwatersheds

A subwatershed was selected for **stormwater BMP** strategies if it had been assigned a functional rating of *Not Functioning* for at least one out of three functionality parameters (habitat, hydrology, and water quality) and had an impervious cover (IC) value $\geq 10\%$. Table 9 below provides a summary of the seven subwatersheds that fit these criteria. **LC05**, **SC02** and the lower half of **ZF03** (bolded) were selected as the highest priority subwatersheds for stormwater BMP strategies because they had IC values $\geq 25\%$, were situated within the urbanized Lenoir municipal area, and were contiguous within the Lower Creek watershed (allowing maximum potential for functional improvement through project synergy).

Table 9: Subwatersheds Selected For Stormwater BMP Strategies
[Bold indicates selection as a priority subwatershed for this mitigation category]

Name	Habitat	Hydrology	Water Quality	Priority Score	% IC
BC02	NF	FR	FR	2.00	10.1
CC02	NF	FR	FR	2.00	10.8
GC02	NF	FR	NF	1.00	14.2
LC05	NF	FR	NF	1.00	28.7
LC06	FR	NF	FR	2.00	19
SC02	NF	NF	NF	0.00	28
ZF03 (lower half)	FR	FR	NF	2.00	29.6

6.4 IDENTIFIED PROJECTS

MACTEC reviewed the 153 stream reach sites that had been identified through GIS analysis during the watershed assessment (Phase II) and an additional 34 sites suggested by the Lower Creek TAC for the purpose of identifying potential stream and wetland improvement project for the Lower Creek watershed. The list of all 187 sites reviewed (the master site data set) and site location map are presented in Appendix D. This master site data set was reviewed for potential stream and wetland **restoration**, and stream and wetland **preservation** sites. Candidate sites for **stormwater BMP projects** are also identified as potential mitigation sites in this section of the *Watershed Management Plan*.

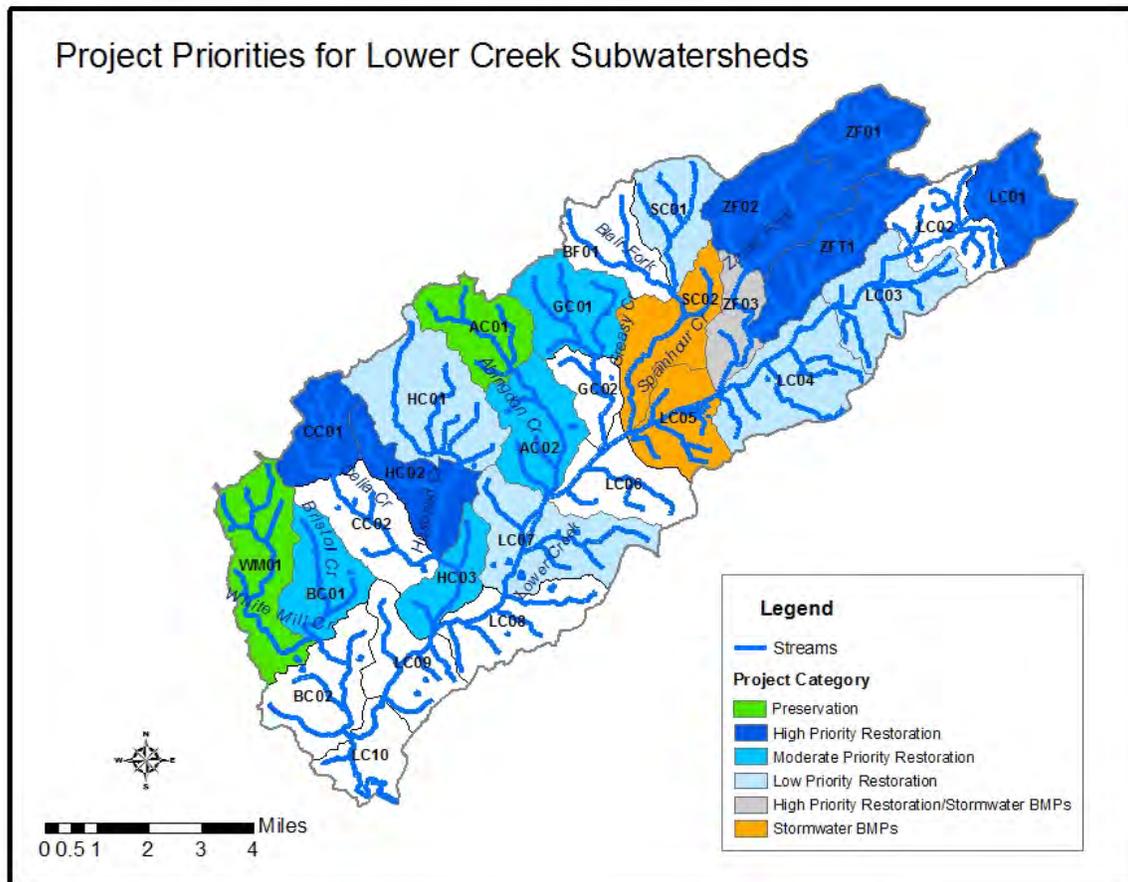
Figure 10 in this section presents an overview of the site screening and selection process used to identify the highest priority (or **primary**) project sites recommended in three major mitigation categories: stream restoration, stream preservation and wetlands restoration/preservation.

Table 10: Final Priority Subwatersheds & Mitigation Categories

NAME	MITIGATION CATEGORY
AC01	Preservation
WM01	Preservation
ZF02	Restoration (High Priority)
ZF03 (upper)	Restoration (High Priority)
ZFT1	Restoration (High Priority)
CC01	Restoration (High Priority)
HC02	Restoration (High Priority)
LC01	Restoration (High Priority)
ZF01	Restoration (High Priority)
BC01	Restoration (Moderate Priority)
GC01	Restoration (Moderate Priority)

NAME	MITIGATION CATEGORY
HC03	Restoration (Moderate Priority)
AC02	Restoration (Moderate Priority)
HC01	Restoration (Low Priority)
LC03	Restoration (Low Priority)
LC04	Restoration (Low Priority)
LC07	Restoration (Low Priority)
SC01	Restoration (Low Priority)
ZF03 (lower)	Stormwater BMP
LC05	Stormwater BMP
SC02	Stormwater BMP

Figure 9: Project Priorities for Lower Creek Subwatersheds



6.4.1 Stream Restoration

The minimum stream length that is generally considered cost-effective for EEP restoration projects is 2,000 linear feet (ln ft). Using an assumed post-restoration sinuosity factor of 1.2, the minimum stream length for a channelized stream has to be approximately 1,650 ln ft. Therefore, initial stream restoration site selection was based on a site having a sinuosity of less than 1.2 and a minimum length of $\geq 1,650$ linear feet (ln ft). This initial screening resulted in 43 stream restoration sites being identified based on the criteria listed above (Figure 10).

The 43 potential stream restoration sites were then reviewed to determine their locations relative to the prioritized subwatersheds (Section 6.3 above) and the number of land owners associated with proposed project parcels. Twenty-two of the 43 candidate stream sites are deemed to be **primary** sites for restoration because they are located in a priority subwatershed and have two or fewer land owners (Table 11). Locations of the primary stream restoration sites are included in Figures 11 through 13. Specific site information and a color digital aerial photography view for each of the 22 primary sites are in Appendix A.

The 21 sites (of the 43 that met basic project screening criteria) not selected as primary sites are listed in Table 14 and should be considered **secondary** stream sites worthy of project implementation only if the primary sites fail to be acquired.

Figure 10: Site Selection Flowchart

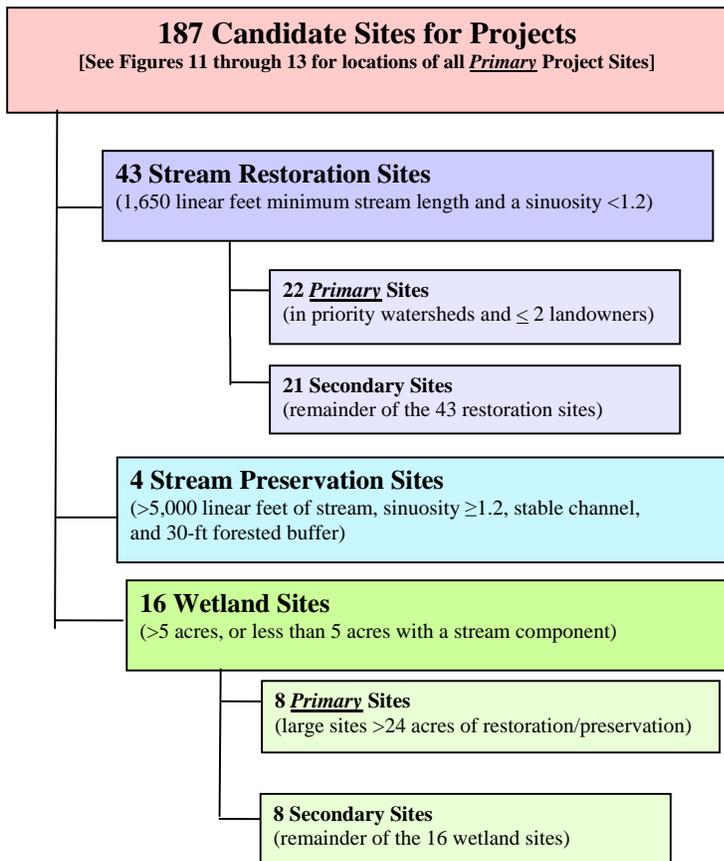


Table 11: Primary Sites Recommended for Mitigation Projects
[See Figures 11 through 13 for Site Locations]

Site Name	Site ID Code	Landowner Name	Existing Stream Length (ft)	Mitigated Stream Length (ft)	Wetland Acreage	Project Type
Beach Tract	SR-15	Horace Beach Heirs	3,230	3,876	NA	Stream Restoration
Harper Morganton #108	SR-16	Lenoir Golf Club Inc.	2,575	3,090	NA	Stream Restoration
		Caldwell Community College				
K&B Farms Tract	SR-17	K & B Famrs Partnership	2,990	3,588	NA	Stream Restoration
Lenoir Aviation #78	SR-18	Lenoir Aviation Club Inc.	1,755	2,106	NA	Stream Restoration
North Wilkesboro #21	SR-19	Jane C Broyhill	4,010	4,812	NA	Stream Restoration
North Wilkesboro #22	SR-20	Fred L And Ethel Price	2,000	2,400	NA	Stream Restoration
Poteet #115	SR-21	Jack R And Emily J Poteet	3,350	4,020	NA	Stream Restoration
Powell #67	SR-22	City Of Lenoir	4,420	5,304	NA	Stream Restoration
Storey Frances #75	SR-23	Frances Mabe Story	3,115	3,738	NA	Stream Restoration
Truesdale #51	SR-24	D James D Miller	2,505	3,006	NA	Stream Restoration
Zacks Fork #403	SR-25	Maurice Grady Barlowe	2,675	3,210	NA	Stream Restoration
Crisp Tract	SR-26	Crisp, A B	2,070	2,484	NA	Stream Restoration
		Bolick Toy Thurston & Troy				
		Crisp Howard E & Shirley				
Lyndsey #328	SR-27	William W Jr. and Judy Mikeal	1,580	1,896	NA	Stream Restoration
Old Farmhouse Rd #329	SR-28	Barney D And Myrtle Laws	2,780	3,336	NA	Stream Restoration
		Ray Loranzy Laws				
Throneburg Tract	SR-29	C H Throneburg	3,665	4,398	NA	Stream Restoration
Bumgarner Tract	SR-30	Dorothy Bumgarner	2,275	2,730	NA	Stream Restoration
Cedar #209	SR-31	Hibriten Development Crop	3,790	4,548	NA	Stream Restoration
Lenoir Golf Club Tract	SR-32	Lenoir Golf Club Inc.	3,585	4,302	NA	Stream Restoration
Lenoir Golf Course Tract	SR-33	Lenoir Golf Club Inc	2,010	2,412	NA	Stream Restoration
		Landowner Unknown				
R Cardwell Tract	SR-34	Ranson M & Reba Cardwell	2,980	3,576	NA	Stream Restoration
Rocky Road #40	SR-35	Moore, Hazel A	1,830	2,196	NA	Stream Restoration
		Jones, Ola Mae E				

Site Name	Site ID Code	Landowner Name	Existing Stream Length (ft)	Mitigated Stream Length (ft)	Wetland Acreage	Project Type
Rocky Road #401	SR-36	Beaver-Helton Prop Inc.	1,900	2,280	NA	Stream Restoration
Rader #336	SP-12	Carolina Center (Crescent) Burke County	18,910	18,910	NA	Stream Preservation
Watson Tract	SP-14	Watson, Tony D & Pamela H Landowner Unknown	5,280	5,280	NA	Stream Preservation
Dimmette #62	SP-11	Bullek Croperation Of NC Jetts Investment Llc	10,560	10,560	NA	Stream Preservation
Timber #400	SP-13	Rocky Road Inc. Landowner Unknown	47,220	47,220	NA	Stream Preservation
B&C Griffin Tract	WP-37	Ben & Clay Bollinger Griffin	3,985	4,782	46	Wetland Preservation
Hallyburton Tracts	WP-38	Hallyburton Geo	3,220	3,864	28	Wetland Preservation
Cardwell KH Tract	WR-39	Kathleen H Cardwell	1,000	1,200	42	Wetland Restoration
Cardwell KH2W Tract	WR-40	Cardwell, Kathleen H	NA	NA	38	Wetland Restoration
W&J Clay Tract	WR-41	William E & Johnnie R Clay	2,350	2,820	55	Wetland Restoration
Aldridge Tract	WR-42	Aldridge & Sons Nursery	1,250	1,500	25	Wetland/Stream Restoration
B&J Griffin Tract	WR-43	Ben D & Jackie Griffin	1,450	1,740	48	Wetland/Stream Restoration
Gragg Tract	WR-44	Jeffery & Sherry Gragg	1,450	1,740	24	Wetland/Stream Restoration
Brownfield Site (Bernhardt Furniture)	BMP-45	Bernhardt Furniture Company	NA	NA	NA	Stormwater BMP
Industrial Site (below Broyhill Furniture)	BMP-46	Bentley Larkin Cowles	NA	NA	NA	Stormwater BMP
Mall Site (former Lenoir Mall)	BMP-47	Tri City Inc.	NA	NA	NA	Stormwater BMP
Middle School (Hibriten HS)	BMP-48	Caldwell County	NA	NA	NA	Stormwater BMP

6.4.2 Stream Preservation

In order to identify feasible and cost-effective EEP Project sites for stream preservation, the following criteria were applied: a stream reach $\geq 5,000$ ln ft with a sinuosity of ≥ 1.2 , stable channel form, and a minimum 30-ft forested buffer along both banks of the stream. Four sites from the master data set were identified based on these criteria and are included in the Table 11 list of Primary sites recommended as mitigation projects. None of these sites are located within preservation priority subwatersheds (Section

6.3.1); however the sites range in size from 5,280 to 33,000 ln ft and their size alone makes them worthy of consideration as priority (primary) preservation sites. In addition, three of the four sites are located in restoration priority subwatersheds. Locations of these primary preservation sites are included in Figures 11 through 13. Specific site information and a color digital aerial photography view for each of these four preservation sites are provided in Appendix A, the Lower Creek Project Atlas.

Regardless of whether a subwatershed is prioritized for restoration or preservation, it may contain sites worthy of protection (preservation). However, some of the potential preservation sites may fall below the basic EEP screening criteria noted above. Such sites may be still good candidates for consideration by a land conservancy group such as the Foothills Conservancy. Table 12 shows four examples of stream preservation sites suitable for acquisition by a land conservancy.

Table 12: Potential Land Conservancy Projects

Site Name	Landowner Name	Subwatershed Location	Existing Stream Length (ft)	Project Type
P&P Holdings	P & P Holdings, LLC	WM01	3,800	Stream Preservation
Simmons	Simmons, Gregory & Rita H	ZF02	1,710	Stream Preservation
Church M&B	Church, Mark & Bruce & Bruce	ZF02	2,305	Stream Preservation
Shaw H	Shaw, Howard C E	WM01	1,210	Stream Preservation

6.4.3 Wetlands Restoration and Preservation

Locating potential wetland restoration and preservation sites in the upper Piedmont physiographic province of North Carolina is difficult. Therefore, the entire Lower Creek watershed was screened for wetlands mitigation sites without regard to subwatershed prioritization. For a site to be considered as a potential wetland restoration/enhancement/preservation project in the upper Piedmont, EEP generally uses five acres (ac) as the minimum cost-effective area. If a wetland site is less than five acres in size, then the site has to have a contiguous stream reach that meets the stream restoration criteria. Sixteen sites were selected based on these criteria. Only two of the sites had multiple land owners, with the 14 remaining sites having a single landowner. The size of the wetland sites range from six to 55 ac. The eight largest sites (greater than or equal to 24 acres) were selected as **primary** sites for wetland projects (Table 11). Note that the 8 wetland sites include two preservation, three restoration and three combined stream/wetland restoration sites.

Locations of the eight primary wetland sites are shown in Figures 11 through 13. Specific site information and a color digital aerial photography view for each of these sites are detailed in Appendix A. The remaining eight potential wetland sites range in size from 6 to 16 ac and are listed in Table 14 as Secondary project sites.

6.4.4 Stormwater BMP Candidate Sites

As stated in Section 6.3, subwatersheds ZF03, LC05, and SC02 were selected as the priority subwatersheds for stormwater BMP strategies because they had IC values $\geq 25\%$, were situated within the urbanized Lenoir municipal area, and were contiguous within the Lower Creek watershed. Traditional stream improvement projects within such highly urbanized (high IC) subwatersheds have limited potential

for significant stream quality improvement, as other issues, such as stormflow scour and storm-carried pollutants can limit biological communities. Projects designed to hold and treat stormwater runoff or which allow stormwater to diffuse through buffers prior to entering a water body offer the greatest potential benefits.

Although many potential locations for stormwater BMP projects exist within these subwatersheds, four projects were chosen to exemplify the type of sites where stormwater BMPs can be best implemented. Each project should be taken as an example of how and where stormwater BMPs can be used in an urban setting to reduce flooding potential and improve water quality, often in concert with other objectives. These four projects are listed in Table 13, along with the rationale for their choice. Locations of the BMP sites are included in Figure 12. Detailed descriptions, along with color aerial photographs of their locations, can be found in Appendix A.

Table 13: Example Stormwater BMP Projects

Site Name	Landowner Name	Subwatershed	Reason for Selection
Brownfield Site	Bernhardt Furniture	LC05	Existing industrial building providing the potential for redevelopment and the opportunity to reduce impervious cover and eliminate illicit discharge connections
Mall Site	Multiple owners	LC05	Large paved parking lot to serve of shopping center & office complex. Current status of the property provides the potential to eliminate significant expanses of paving and redirect runoff to BMPs prior to discharging into the adjacent Lower Creek
Industrial Site	Broyhill Furniture and others	LC05	Existing operating industrial building at headwaters to stream, providing potential for BMPs to treat stormwater prior to entering the stream channel as well as the opportunity to identify and eliminate direct drainage connections from industrial activities
School Site	Caldwell County Board of Education	LC04	Large, publicly owned property with plans for Middle School providing the opportunity for greenfield stormwater BMP techniques

Figure 11: Priority Mitigation Sites – Upper Lower Creek Watershed

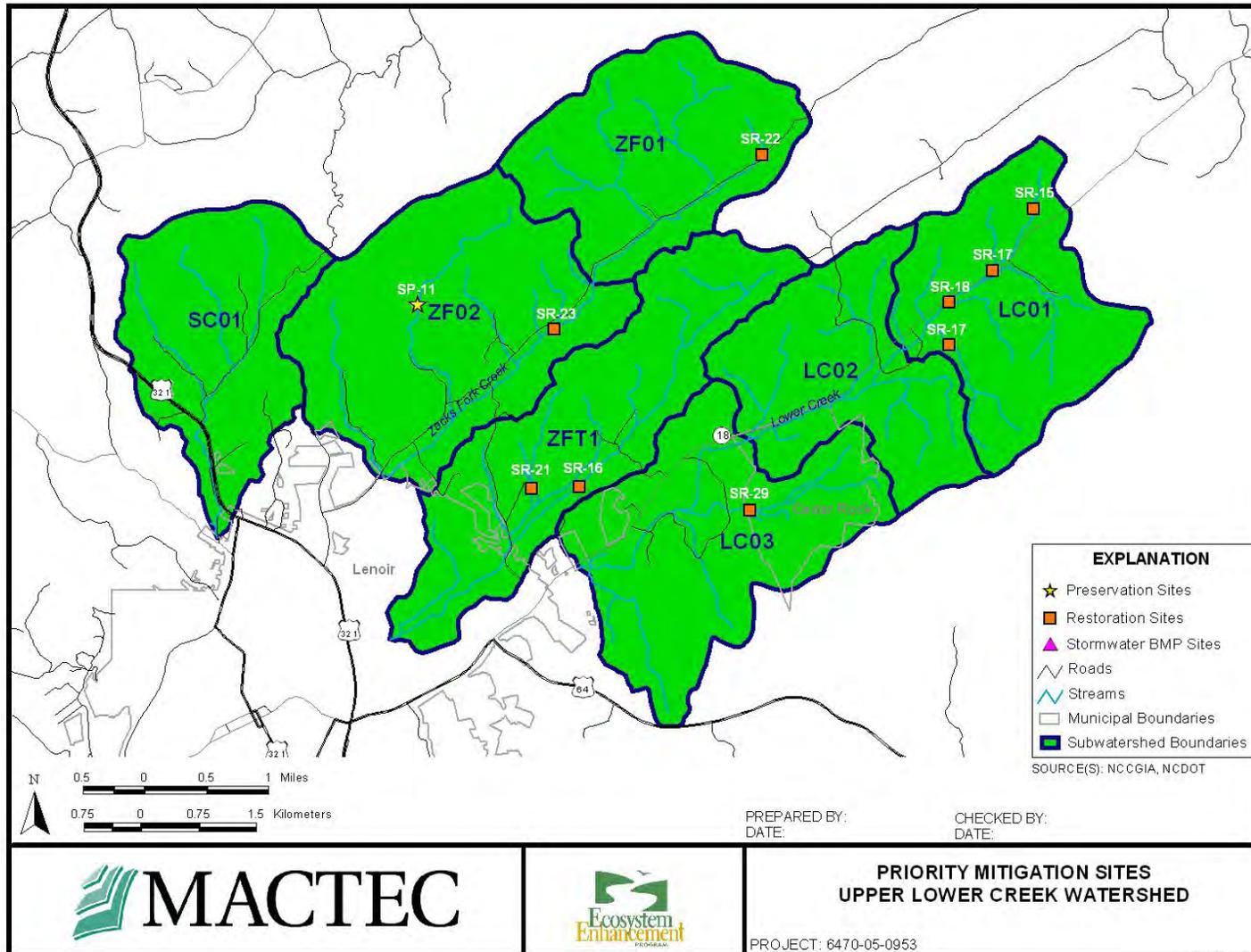


Figure 12: Priority Mitigation Sites – Middle Lower Creek Watershed

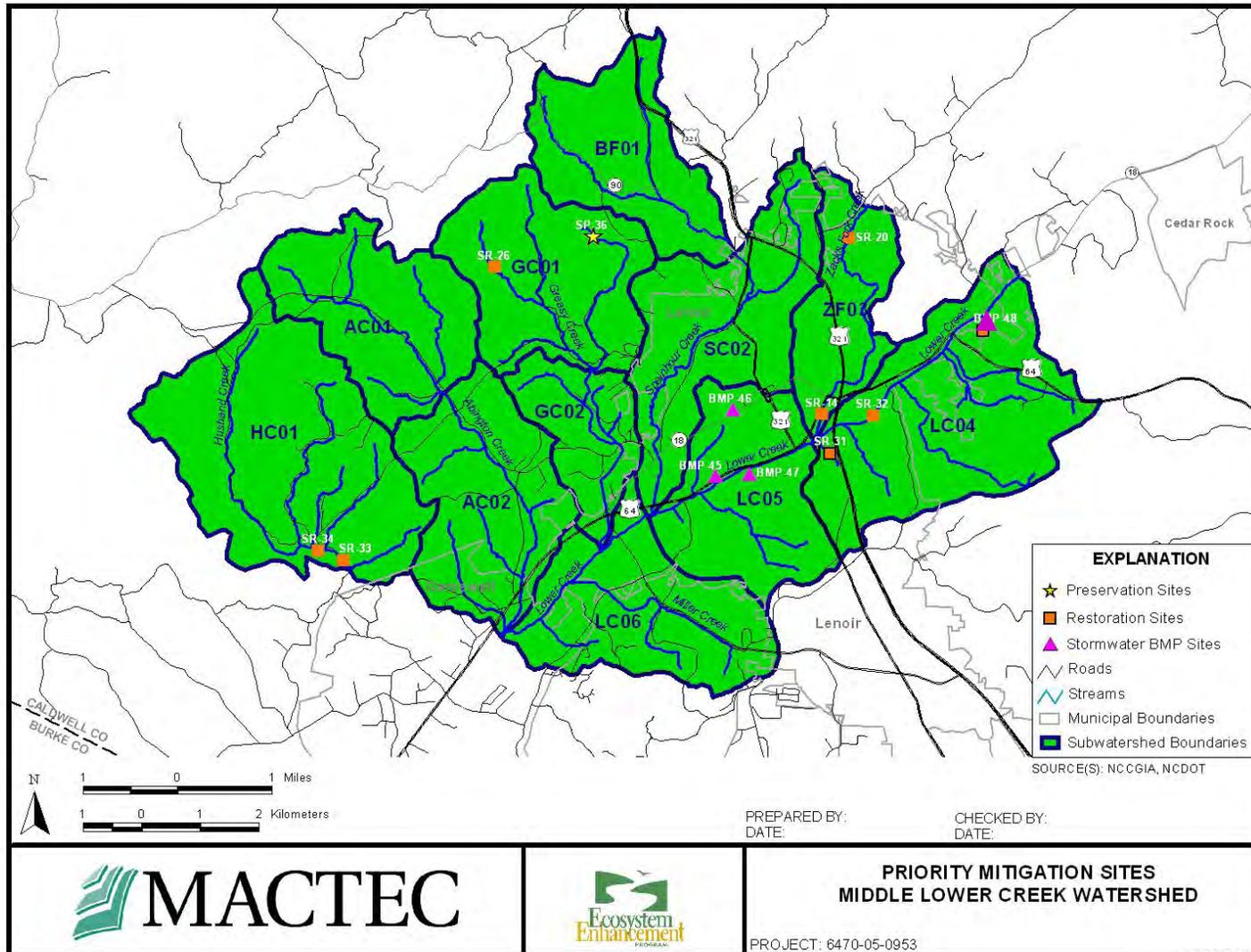


Figure 13: Priority Mitigation Sites – Lower Lower Creek Watershed

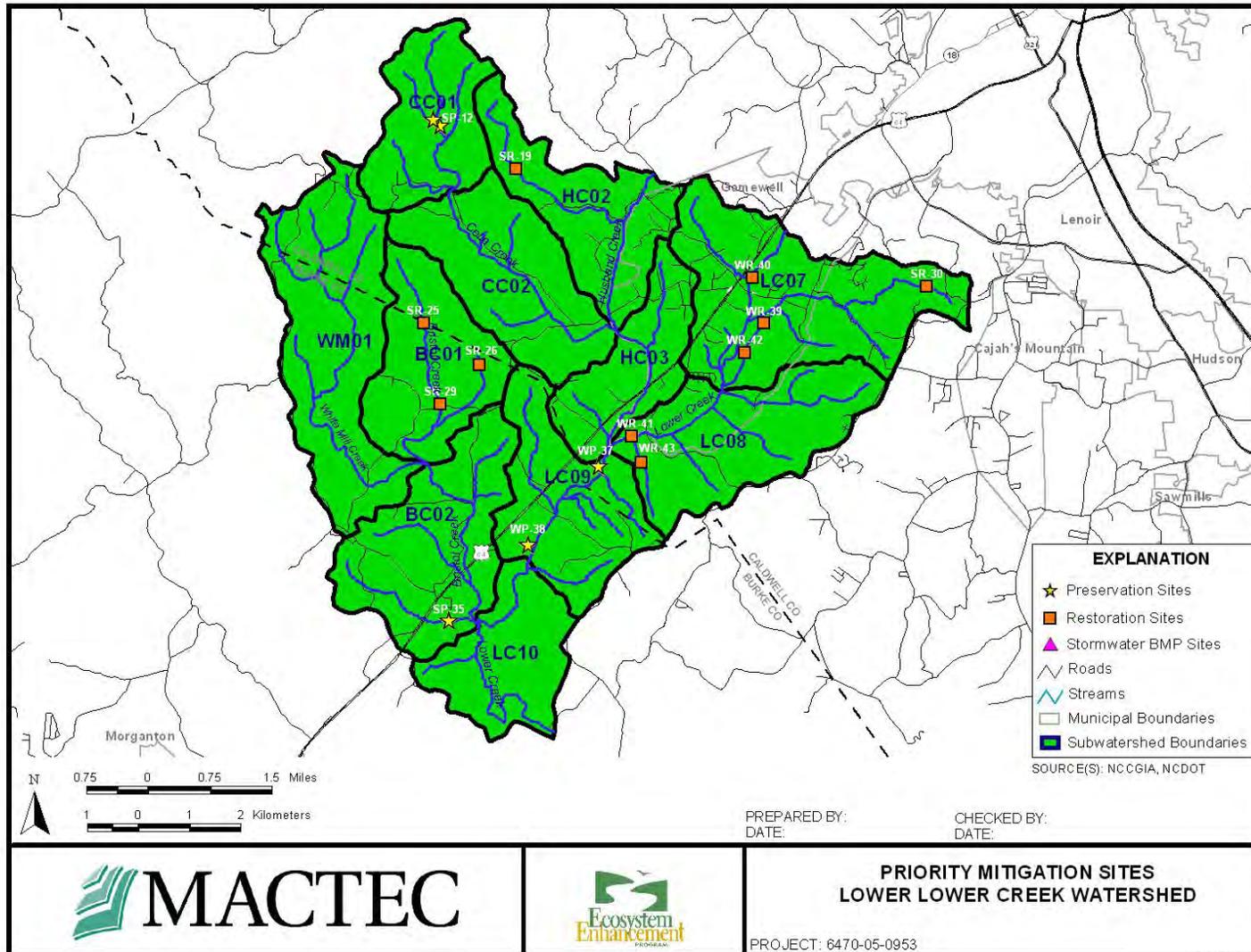


Table 14: Secondary Project Sites

Site Name	Landowner Name	PIN	Existing Stream Length (ft)	Mitigated Stream Length (ft)	Wetland Acreage	Potential Project Type
Barlowe Tract	Barlowe, Richard & Marshall &	2862228937	4,800	4,800	NA	Stream Restoration/ Preservation
Broyhill Timber	Broyhill Timber Resources Inc	2881228768	3,220	3,220	NA	Stream Restoration/ Preservation
Carolina Center	Carolina Center	271500252294	4,425	4,425	NA	Stream Restoration/ Preservation
Broyhill Furniture #14	Landowner Unknown	2738895056	2,680	3,216	NA	Stream Restoration
Cassavaugh Tract	Cassavaugh, John H And Jessie	2737611913	4,335	5,202	NA	Stream Restoration
Celia Creek #106	Landowner Unknown	2718529282	2,056	2,467	NA	Stream Restoration
City of Lenoir #1	Landowner Unknown	2738679061	1,770	2,124	NA	Stream Restoration
Craig Mountain #306	Corpening, Mary Ellen Et Al	2737126828	4,610	5,532	NA	Stream Restoration
Curtis	Landowner Unknown	270700430864	3,200	3,840	NA	Stream Restoration
Denton	Denton Ronald C	Unknown	1,625	1,950	NA	Stream Restoration
Dirt Tract	Caroway, Rickie	271600246792	1,695	2,034	NA	Stream Restoration
Hartland #104	Tuttle, Catherine P	2727163377	1,980	2,376	NA	Stream Restoration
Helton Farms #213	Moore, John H II & Amy	2871728200	4,445	5,334	NA	Stream Restoration
Keyes	Keyes Joseph R Estate	2841647391	1,735	2,082	NA	Stream Restoration
	Miller Joan K	2841647775				
Powell Brickyard #224	Shatley Markus Wayne & Georgi	2739585408	1,665	1,998	NA	Stream Restoration
Racetrack #300	Foothills Promotions LLC	2726274552	1,770	2,124	NA	Stream Restoration
Smith	Smith, Viola A	2841212655	2,000	2,400	NA	Stream Restoration
Spencer	Spencer, Lillie H	2739752928	2,000	2,400	NA	Stream Restoration
Virginia Street #18	Landowner Unknown	2749421165	1,995	2,394	NA	Stream Restoration
SE Watson	Watson Stuart Edward & Eu	2820226497	2,300	2,760	NA	Stream Restoration
Wilkie	Wilkie, Dean E	2871026344	3,510	4,212	NA	Stream Restoration
Caldwell County Board of Education	Caldwell County Board of Education	2860019971	NA	NA	6	Wetland Restoration
Crump	Crump Dewey Vergil & Grace	2728834854	NA	NA	14	Wetland Restoration
Jensen	Jensen Donald D	286450000	NA	NA	6	Wetland Restoration
Kent	Kent Horatio M Sr & Mary M	286456051	NA	NA	9	Wetland Restoration
Mikeal	Mikeal Anthony Paul & Theresa	286458199	NA	NA	15	Wetland Restoration
Hoffman	Hoffman James David & Martha	2840376554	1,100	1,320	15	Wetland/Stream Restoration
Kingston #37	Taylor Dean & Ruby	2728033976	880	1,056	16	Wetland/Stream Restoration
	Phipps Joe Xenifea III & Alisa	2728211198				
Macguire	Macguire Osborne R & Mary	2871160535	1,595	1,914	13	Wetland/Stream Restoration

7.0 INSTITUTIONAL MEASURES

Institutional measures include ordinances, codes, regulations, and other instruments adopted by political jurisdictions in order to minimize the negative impacts that developmental activities have upon hydrology, water quality, and aquatic habitat, or which serve to protect or even improve these attributes within the watershed.

Gamewell, the City of Lenoir and both Burke and Caldwell Counties are developing or revising their comprehensive land use plans. In addition, Caldwell County is developing its stormwater management ordinance in response to EPA's Phase II Stormwater Management Permit requirements. It is therefore an opportune time to reexamine the institutional measures regulating land development aspects that have an impact on stream health.

Caldwell County is revising their 1995 comprehensive plan, with a draft due in the fall of 2006. This plan will describe guidelines for the entire County as well as special guidelines for five small planning areas. Only small portions of the Lower Creek watershed overlap with these small planning areas. Burke County revised its strategic plan in 2002, which calls for the development of nine small area plans over time. These small area plans will serve as comprehensive plans, incorporating guidelines and regulations for many planning issues. A small area plan has not yet been developed for the Lower Creek watershed area, which falls in the Chesterfield small planning area; currently, most of this area is zoned as "rural mixed use", which allows for most commercial, industrial, and residential uses. Lenoir is developing a new comprehensive plan, and a draft is scheduled to be complete by December, 2006. Various topics are being examined by committees, including land use, transportation, natural resources and open space, and more. Gamewell is developing their first land use plan, which should be approved in the fall of 2006.

The following recommended actions, if implemented by local governments within the watershed, can have a positive effect upon the preservation or enhancement of this watershed's vital functions.

7.1 LENOIR AND GAMEWELL AND COUNTIES OF BURKE AND CALDWELL SHOULD CONSIDER FORMAL ADOPTION OF THE LOWER CREEK WATERSHED MANAGEMENT PLAN AS A SUPPLEMENT TO THEIR RESPECTIVE COMPREHENSIVE PLANS.

This watershed management plan is based upon a relatively comprehensive study of the hydrology, water quality and aquatic habitat within the Lower Creek Local Watershed. This study – comprised of a *Findings and Recommendations Report*, the *Watershed Assessment Report* and this final *Watershed Management Plan* (WMP) – identifies the most important local watershed functions and functional deficits, and makes recommendations to alleviate or mitigate these problems. As such, the recommendations of the WMP are complementary to and have impact upon the Comprehensive Plans of each of the constituent political jurisdictions.

7.2 DEVELOP COMPREHENSIVE STORMWATER MANAGEMENT ORDINANCES TO LIMIT THE IMPACT OF DEVELOPMENT UPON DOWNSTREAM HYDROLOGY, WATER QUALITY, AND HABITAT.

Effective stormwater management is essential for the protection of streams and Lake Rhodhiss. The City of Lenoir has been highly developed both commercially and industrially over many decades. As the surrounding area continues to experience growth, some of the agricultural and forested areas in the Lower Creek watershed will be developed over the next several decades.

Caldwell County is developing a stormwater management ordinance to comply with the Environmental Protection Agency's NPDES Phase II Stormwater regulations (EPA, 1999). This ordinance will apply to all areas of the County, including Lenoir and Gamewell, and its adoption is planned for October, 2006. These Phase II regulations specify six minimum elements for a stormwater management program:

1. Public education and outreach on stormwater impacts
2. Public involvement/participation
3. Illicit discharge detection and elimination
4. Construction site stormwater runoff control
5. Post-construction stormwater management in new development and redevelopment
6. Pollution prevention/good housekeeping for municipal operations

Caldwell County's draft stormwater ordinance combines elements of the North Carolina's model ordinance (http://h2o.enr.state.nc.us/su/phase_2_mod_ord.htm) and its Environmental Assessment for the Upper Yadkin reservoir. The ordinance specifies post-construction stormwater management measures and an illicit discharge detection and elimination program, according to Phase II specifications. It also requires the protection of 50 ft buffers along perennial streams and 30 ft buffers along intermittent streams for development or redevelopment. Developers are not required, however, to *establish* vegetated buffers if there are none on site; Caldwell County should require the establishment of vegetated buffers in these cases.

Burke County is currently not pursuing a county-wide stormwater ordinance. As stormwater management is essential to the protection of aquatic resources, including Lake Rhodhiss, the County should develop a stormwater management program that addresses the six elements listed above. Part of this program should be an ordinance which addresses post-construction stormwater management and illicit discharges. North Carolina's model stormwater ordinance is an excellent resource.

BMPs that increase stormwater retention time, promote infiltration and provide filtration should all be incorporated into the compliance strategy for post-construction stormwater management regulations. Site plan review for new developments should address storm water quality as well as storm water quantity issues.

7.3 AMEND SUBDIVISION ORDINANCES TO PROMOTE LOW IMPACT DEVELOPMENT AND OTHER MEASURES THAT LIMIT DEVELOPMENT IMPACTS

Developmental activities that minimize impervious cover, reduce the utilization of closed stormwater conveyance systems and incorporate stormwater management BMPs have less impact upon the natural environment and are referred to as "Low Impact Development" (LID) measures. LID measures are designed to more closely replicate the natural hydrologic system, including infiltration, storage, recharge, and evapotranspiration, thereby allowing development while minimizing the impact upon hydrology, water quality, and aquatic habitat.

LID measures have been successfully implemented in areas undergoing rapid urbanization such as Prince George's County, MD, Boston, MA and the Puget Sound Region, WA (see technical resources on LID in

Appendix C). In addition to utilizing techniques such as cluster development to maximize open spaces, LID incorporates stormwater management measures like grassed swales, bio-retention cells, and permeable pavement to control and/or treat the runoff produced by urbanization. Given the amount of rural area currently within the Lower Creek watershed and the current pace of development, the incorporation of LID measures in this development can appreciably mitigate the impact upon resources within the watershed.

Many LID measures – such as narrower pavement width on subdivision streets and the use of grass swales, rather than traditional curb and gutter – conflict with current subdivision standards (NCDOT, 2000), requiring some changes in ordinances to accommodate this type of development. In addition, since the incorporation of LID measures often results in greater development expense (either in construction cost, fewer lots per acre, or both) many jurisdictions have utilized incentives (such as greater overall density allowances) to promote this type of development. Other jurisdictions have mandated that LID measures be utilized in the development of particularly sensitive areas. Since LID can result minimize impacts to hydrology, water quality, and habitat, the cost of promoting these measures is justified by their environmental benefits (EPA, 2004).

Local and county governments should also examine current regulations to insure that they do not encourage impervious cover. For example, development regulations sometimes specify a large amount of parking lot for commercial and residential facilities that can be minimized with creative methods, such as shared parking.

Both Caldwell and Burke Counties promote the protection of environmentally sensitive in certain instances, such as in the Lake James small planning area in Burke County and any area submitted as a “planned unit development” in Caldwell County. Both counties should amend their subdivision ordinances to specify LID and to require open space, setting aside sensitive areas, including floodplains and steep slopes, from development.

7.4 ADOPT AND ENFORCE MORE COMPREHENSIVE RIPARIAN BUFFER ORDINANCES.

Riparian buffers have been shown to improve water quality and protect stream banks from erosion. The State of North Carolina has adopted Riparian Buffer Rules (15A NCAC 02B.0243) which require a 50 foot vegetated buffer along the Catawba River (below Lake James) and along the mainstem lakes within the Catawba River Basin, which includes Lake Rhodhiss. Burke County has adopted a buffer ordinance that requires all woody vegetation within 65 feet of Lake Rhodhiss be protected. Caldwell County’s draft stormwater management ordinance specifies the preservation of 50 ft buffers on perennial streams and 30 ft buffers on intermittent stream for land under development.

As areas of agricultural usage are developed, it is important that attention be given to the preservation or re-establishment of vegetated buffer areas. In the interim, while agricultural activities continue to be significant in these areas, agricultural best management practices (BMP’s) should be encouraged (See Section 8.4).

Significant threats to both water quality and aquatic habitat were identified in the *Watershed Assessment Report*. These threats can be mitigated, in part, through the extension of the requirement for vegetated buffer strips along perennial and intermittent streams within the watershed. It is recommended that each of the local governments having jurisdiction over the Lower Creek local watershed adopt and enforce ordinances that extend the protection of 50-foot vegetative buffers to the perennial and intermittent streams that comprise the watershed.

7.5 AGGRESSIVELY MONITOR COMPLIANCE WITH AND ENFORCEMENT OF EROSION AND SEDIMENTATION CONTROL ORDINANCES AND DEVELOP A STEEP SLOPE ORDINANCE.

Caldwell County has developed a draft local sediment and erosion control ordinance in compliance with the State's Sedimentation Pollution Control Act of 1973 (SPCA) and intends to assume responsibility for implementation of the requirements of the SPCA within all of Caldwell County by October 2007. Currently, Burke County has no intention on assuming a local sediment and erosion control program and depends on the State's Division of Land Resources program to enforce state regulations.

These programs provide legal basis for the regulation of construction activities to ensure that sedimentation and erosion is minimized. However, this regulatory control is only as effective as is the associated monitoring of construction and enforcement of the ordinance. The challenge faced by many local governments, particularly those experiencing rapid development, is providing an adequate level of construction monitoring with a modest staff of erosion and sediment control (E&SC) inspectors. In fact, during the field investigations conducted as part of this planning process, numerous examples of sediment-laden waters downstream of construction activities were observed.

Some local governments have increased development review and processing fees to fund additional field resources for E&SC monitoring. In addition, when the public becomes aware of the cause and effect of construction-related erosion and sedimentation problems (see Recommendation 7.8.), they will be more likely to become involved in identifying construction sites that are the source of such problems, thus enforcement actions may be taken. It is recommended that each jurisdiction establishes an E&SC "hot-line" where calls can be taken from the public. In this way, the monitoring resources of the state and local jurisdictions can be more effectively leveraged into action.

Development on steep slopes is of particular concern in Caldwell and Burke Counties. Counties should consider a steep slope ordinance, which would prohibit or limit development on steep slopes. Boone is considering a steep slope ordinance, and can serve as an example for the Counties.

7.6 AMEND ORDINANCES TO PROHIBIT DEVELOPMENT IN THE FLOODPLAIN.

Throughout the Lower Creek watershed, the floodplain has been filled to accommodate industrial or commercial development. This filling of the floodplain, even where conduits are placed to allow passage of floodwaters, generally results in hydraulic restrictions that produce upstream flooding during severe rain events (i.e., impairment of the hydrologic function). Anecdotal evidence of such flooding was presented at several of the TAC meetings and individual discussions with the local resource professionals and governmental officials. City of Lenoir and Burke and Caldwell Counties have adopted floodplain management ordinances, but restrictions of the floodplain are permitted as long as structures are constructed at a specified level above the flood elevation.

Revised floodplain maps from the Federal Emergency Management Agency are being developed with new remote sensing imagery. County and municipal jurisdictions should reevaluate floodplain areas based on these new maps and allow no development or filling in the 100 year floodplain.

7.7 DEVELOP AND IMPLEMENT A ROBUST PUBLIC EDUCATION PROGRAM ON WATERSHED ISSUES.

As part of the EPA's NPDES Phase II Stormwater Regulations (EPA, 1999), a public education and outreach program is required that will help citizens understand the impact their actions (and the actions of others, such as developers and contractors) have upon the watershed (see text box). The EPA recommends that such a program inform individuals and groups how to become involved in local stream restoration activities and give guidelines for minimum measures to accomplish this requirement (EPA, 2000).

Public Education and Outreach on Stormwater Impacts

You must implement a public education program to distribute educational materials to the community or conduct equivalent outreach activities about the impacts of storm water discharges on water bodies and the steps that the public can take to reduce pollutants in storm water runoff.

[40CFR 122.34 (b)(1)(i)]

A defined public education program is essential to the development of a responsible public attitude toward watershed management. As citizens understand the importance of hydrology, water quality, and aquatic habitat to their quality of life, as well as the consequences of their actions upon these attributes, they will pay greater attention to activities that might have detrimental consequences. Many of the major municipalities in NC (e.g. City of Charlotte, Town of Chapel Hill, and Town of Cary) have established successful stormwater public education programs and can be contacted regarding the details of their programs. In addition, the Land-of-Sky Regional Council has developed a series of stormwater fact sheets under contract to the NC Division of Water Quality (NCDENR, 2002c). Links to these and other resources can be found in the technical resources provided in Appendix C.

There are two new efforts that will educate the public on watershed impacts and solutions. As part of its Phase II stormwater program, Caldwell County will implement a public education effort on stormwater impacts and steps that citizens can take to reduce their own impacts. A public education effort is also part of the 319 grant awarded to the Carolina Land and Lakes Resource Conservation and Development Council to develop a Lake Rhodhiss Watershed Restoration Plan. These two efforts should be built upon to develop a more comprehensive watershed education program.

The Lower Creek Technical Advisory Committee recommends that a public education program include the following elements:

1. Establish a Clear Water Contractor Program

Clear Water Contractor programs have been applied to a number of areas in western North Carolina. RiverLink (<http://www.riverlink.org/>), a watershed group that seeks to revitalize the French Broad River watershed, provides Clear Water Contractor workshops to contractors on appropriate sedimentation and erosion control measures to apply during site preparation and development.. Caldwell and Burke Counties should establish its own Clear Water Contractor program. Once Caldwell County has assumed an erosion and sedimentation control program, it could offer developers reduced erosion control permit fees if their staff attended the training. Burke County could offer incentives for participation, providing quicker review of development plans (e.g., subdivision plats) for those who take the course.

2. Identify and quantify the economic effects of poor water quality in the watershed.

Economic effects of of poor water quality should be quantified and shared with decision-makers and citizen groups. The Western Piedmont Council of Government (WPCOG) has developed slides that cover drinking water, wastewater, property loss/degradation and other costs.

3. Develop a brochure outlining steps citizens can take to protect water quality in the watershed.

The WPCOG has developed a brochure that will be used by local governments in Burke and Caldwell Counties for assisting them with meeting the new NPDES Phase II stormwater requirements. The emphasis of the brochure focuses on steps citizens can take to protect Lake Rhodhiss as a drinking water source. This should be shared with area citizens.

4. Establish a local watershed council.

A watershed council could serve as a local voice for issues affecting the Lower Creek watershed. However, this will only be effective if it is staffed and developed with local citizens. Local government or resource agency staff could potentially play a vital role in supporting such a council from a technical standpoint once a citizen-based group with leader is established. This council could oversee a watershed stewardship program, which can be a very effective tool for gaining stakeholder consensus, engaging interested parties to keep “watch” over activities affecting the stream, and identifying a champion for various watershed improvement projects. The NCDENR supports such an organized watershed stewardship approach through its Stream Watch program as stated below:

NC General Statutes § 143-215.74F. The Department of Environment, Health, and Natural Resources may establish a Stream Watch Program to recognize and assist civic, environmental, educational, and other volunteer groups interested in good water resources management and protection. The goals of the Stream Watch Program are to encourage volunteer groups to adopt streams and other water bodies and to work toward their good management and protection; to increase public awareness of and involvement in water resources management; and to promote cooperative activities among volunteer groups, local government, industry, the Department of Environment, Health, and Natural Resources, and other agencies and entities for improved protection and management of water resources.

A Lower Creek watershed council could, in addition to keeping watch over current activities within the watershed, serve as the catalyst for ensuring that the recommendations made in this *Watershed Management Plan* are followed through and serve as an essential part of a coordinated watershed management strategy—see Section 8.5. Contact information for several good examples of viable stream watch programs are given in the technical resources in Appendix C.

7.8 ADOPT A COMPREHENSIVE WATERSHED-BASED LAND USE PLAN FOR THE LOWER CREEK WATERSHED IN ORDER TO PROTECT LAKE RHODHISS (A WATER SUPPLY RESERVOIR) FROM CONTAMINATION.

Because of the importance of the Lower Creek watershed to water supply from Lake Rhodhiss and the agricultural, industrial and commercial activities occurring within this watershed, the development of a comprehensive land plan for this area – a plan which prioritizes wise management of the quantity and quality of local water resources – is an essential tool for preserving drinking water quality. The EPA includes watershed-based zoning in its guidance on Post-Construction Storm Water Management (EPA, 2003). In that guidance material, Watershed-Based Zoning is defined to include a mixture of land use and zoning options with the following nine steps:

1. Conduct a comprehensive stream inventory.
2. Measure current levels of impervious cover.
3. Verify impervious cover/stream quality relationships.
4. Project future levels of impervious cover.
5. Classify subwatersheds based on stream management "templates" and current impervious cover.
6. Modify master plans/zoning to correspond to subwatershed impervious cover targets and other management strategies identified in Subwatershed Management Templates.
7. Incorporate management priorities from larger watershed management units such as river basins or larger watersheds.
8. Adopt specific watershed protection strategies for each subwatershed.
9. Conduct long-term monitoring over a prescribed cycle to assess watershed status.

Most of the work in the first five steps has been completed as a part of this planning process. GIS files have been established with attributes such as impervious cover, land use, and zoning layers for each of the 29 subwatersheds that comprise the Lower Creek watershed (WAR, 2005). Steps 6 through 8 could be spearheaded by a local stakeholder group including representatives from the planning departments of Caldwell and Burke Counties and the towns of Lenoir and Gamewell. Monitoring of development within the watershed (step 9) is vital to keeping the plan up-to-date and relevant.

8.0 BEST MANAGEMENT PRACTICES

A best management practice (BMP) is a practice or combination of practices providing the most effective and practicable (including technological, economic, and institutional considerations) means of controlling point or non-point source pollutants at levels compatible with environmental quality goals. A stormwater BMP is a technique, measure, or structural control used to manage the quantity and improve the quality of stormwater runoff in the most cost-effective manner. These stormwater BMPs may provide flow control, pollutant removal or pollution source reduction, either individually or in combination. The following sections address recommendations related to five basic categories of watershed management practices: general land use and development, stormwater, floodplains, forestry, and agricultural activities. Appendix C includes website links where additional technical and cost information about these management practices may be found.

8.1 LAND MANAGEMENT

Land management BMPs impact both the quantity of stormwater runoff and the amount of pollution entering water bodies as a result of land development activities. Improvements in land management are necessary to reduce the delivery of pollutants to water resources and prevent flooding and stress of channels downstream of the development. In general, these practices serve to promote infiltration of rainwater, slow runoff velocities and filter out particulate matter and other pollutants in stormwater runoff. Minimization of impervious surfaces and the protection of natural riparian buffers are two core strategies within this category of management practices.

A. Low-Impact Development (LID)

As already mentioned in Section 7.3, developmental activities that minimize impervious cover, reduce the utilization of closed stormwater conveyance systems, and incorporate stormwater management BMPs have less impact upon the natural environment and are referred to as “Low Impact Development” (LID) measures. LID measures are designed to more closely replicate the natural hydrologic system, including infiltration, storage, recharge, and evapotranspiration, thereby allowing development while minimizing the impact upon hydrology, water quality, and aquatic habitat.

B. General Considerations for Water Resources Protection

In the EPA’s January 2001 report *Our Built and Natural Environments*, habitat loss and fragmentation as well as water quality degradation, primarily due to stormwater, were identified as the two most significant consequences of land development. This report goes on to identify planning techniques, such as infill and cluster development that can mitigate these negative impacts, while accommodating growth. In its 2004 publication *Protecting Water Resources with SMART GROWTH*, the EPA makes 75 policy recommendations (46 at the watershed or regional level, 29 at the individual development level) which are designed to facilitate growth and development in a manner that preserves and even enhances the water resources critical to supporting this growth. [In November 2004, the EPA recognized the Town of Davidson, NC with its 2004 Award for Overall Excellence in Smart Growth for its approach to land planning (EPA, 2004b). For additional information, see http://www.epa.gov/livability/sg_awards_publication_2004.htm and http://www.smartgrowth.org/pdf/cs_006_DavidsonNC.pdf .]

Two conclusions can be drawn from this background material:

1. Development without specific guidance/boundaries around water resources will almost certainly result in negative impact upon hydrology, water quality, and aquatic habitat; and
2. Protection of water resources and growth are not necessarily mutually exclusive.

Consequently, a successful strategy for future land use and watershed management should include the following elements:

- A public education program which stresses the value of water resources and their sensitivity to developmental activities;
- Comprehensive regional planning which identifies and preserves sensitive areas, while encouraging growth in areas with infrastructure and resources to support it;
- The encouragement of planning techniques such as Low Impact Development and Smart Growth to minimize the impact of growth upon hydrology, water quality and aquatic habitat;
- Preservation of sensitive areas such as high-quality wetlands and water supply sources to ensure they continue to function in a manner that will sustain future growth;
- Planning and management of stormwater on a watershed-wide basis, considering the impact of development upon the overall watershed;
- The adoption of Stormwater Management BMPs, such as grassed swales, bio-retention areas and porous pavement into subdivision codes;
- Incorporation of a comprehensive review of the impact that all proposed developments will have upon hydrology, water quality, and aquatic habitat within the watershed; and
- Assessment of the incremental cost of water resources management (including comprehensive site plan review) to the entity that stands to gain economically from the development.

C. Other Tools for Watershed Protection

An excellent resource for information on the various tools available for land use planning and watershed protection is the Center for Watershed Protection. The following website highlights eight major tools for watershed protection: http://www.cwp.org/tools_protection.htm .

8.2 STORMWATER MANAGEMENT

An urban stormwater management BMP is designed to limit the hydrologic (increased runoff) and water quality impacts of changed land uses, primarily from residential or commercial development. These practices utilize measures such as detention, settling, infiltration, and filtration to decrease the peak stormwater flow rate (thereby reducing downstream erosion and flooding) and remove pollutants (e.g. oil and grease, metals, nutrients, sediment) from the stormwater.

A. A. Wet Detention Ponds

Stormwater detention ponds excavated below the normal groundwater table contain water at nearly all times. Storage area is available above this normal water level where, during storm events, stormwater is temporarily detained and released downstream at controlled rates to limit downstream flow. The detention time within the wet pond facilitates the settling of sediments (along with other pollutants that attach to these sediments). Such facilities are 70%

or more effective in the removal of suspended solids (NC Cooperative Extension Service, 1999). Larger, more regional, ponds are generally more effective and maintainable than small ponds designed to handle stormwater from small (<20 acre) sites.

B. Bio-Retention Areas

Bio-retention areas combine stormwater management with landscaping to retain stormwater (particularly from small, more frequent rain events) in order to enable infiltration and evapotranspiration by plants within the area. These types of facilities are well-suited to parking lots, where traditionally drainage is collected in a closed system and conveyed offsite. Utilization of a bio-retention area provides a means to control runoff to pre-development levels by retaining runoff from impervious areas in a facility designed to replace the function of the vegetation and soil areas that have been rendered impervious through development.

C. Reinforced Grass Swales

The historic function of drainage design was to collect and convey stormwater runoff downstream as quickly as possible, resulting in both increased flow rates and velocities, and reduced infiltration and evapotranspiration of runoff. Historically, drainage systems minimized the amount of overland flow, quickly channeled runoff into closed systems for conveyance away from the site and were dominated by curbs, gutters, inlets and piped systems. The utilization of grassed swales for the collection and conveyance of stormwater runoff enables overland flow to enter the swale along its entire length, promotes infiltration through the channel walls and provides a degree of filtration through the grass media, removing sediments and other pollutants. Turf Reinforcement Matting (TRM) enables the grass to become established and protects the channel walls from erosion. From the standpoint of managing both stormwater quality and quantity, open channels are superior to a closed system.

D. Level Spreaders in conjunction with Riparian Buffers

Forested or grassed vegetated buffers along streams provide a combination of filtration, depression storage, infiltration, and evapotranspiration, which both reduces the quantity of runoff (as compared to a closed channelized system) and removes many pollutants, including sediments and nutrients. Care must be exercised in grading these buffer areas to maintain overland (sheet) flow of runoff and minimize the potential for runoff to become channelized. Channelized flow is prone to develop erosive velocities and minimizes the filtering effect provided by sheet flow through the buffer area. Maintaining slopes of 2% or less and ensuring that an established bed of ground vegetation is maintained will serve to prevent such channelization within buffer areas.

E. Constructed Wetlands

Constructed stormwater wetlands are designed for temporarily storing stormwater runoff in shallow pools that create growing conditions suitable for emergent and riparian wetland plants. The runoff storage, complex microtopography and emergent plants in the constructed wetland together form an ideal matrix for the removal of urban pollutants. In North Carolina, constructed stormwater wetlands include two basic designs: extended detention wetlands; and, for smaller sites and in combination with other BMPs, pocket wetlands. When designed and constructed to the NC DENR guidelines (NC DENR, 1999), these structural BMPs are assumed to achieve 85% removal of total suspended solids (TSS).

These five stormwater management practices are examples of BMPs that have general application throughout the areas of this local watershed undergoing development, as well as in those areas where redevelopment is occurring. More detail on these BMPs can be found in the technical resources listed in Appendix C, including the NC DENR *Stormwater BMPs Manual* (April, 1999). A good starting point for additional information on urban stormwater BMPs is the website of Dr. Bill Hunt (N.C. State University, Stormwater Engineering Group): <http://www.bae.ncsu.edu/people/faculty/hunt/>. For information on the Phase II stormwater rules for local government, visit <http://www.ncphase2sw.org/>. Stormwater-related fact sheets and other useful links can be found at http://h2o.enr.state.nc.us/su/Manuals_Factsheets.htm.

8.3 FORESTRY PRACTICES

8.3.1 Forestry BMPS

Controlling sediment export from forestry operations is very important. The relative infrequency of harvesting operations (25 or 50 year rotations for pine pulpwood or sawtimber, 60- to 80-year rotations for hardwood sawtimber) makes sediment export from this activity less of an immediate concern in terms of overall functional degradation factors, but when harvesting does occur it can be a significant source of sediment. The often large extent of the area affected can require an extensive network of roads and skid trails, which are the most significant source of sediment from timber harvesting operations. There is the potential for large amounts of sediment from these sites to enter streams, especially when the *Forest Practices Guidelines*, as promulgated in 15A NCAC II.0100-.0209, are not followed.

Sediment is the most common pollutant produced from timber harvests. Harvesting equipment and trees are dragged over the ground, which loosens the soil, and the equipment may also spill gas and oil on the ground. Canopy cover is reduced from timber harvesting, increasing the amount of rainfall reaching the ground surface and in turn increasing runoff. Several common BMPs that help minimize sediment yield from forest harvesting operations are listed below. Details on these and other forestry BMPs can be obtained from the NC Division of Forest Resources (NCDNR) *Best Management Practices Manual* (NCDNR, 1989) and the NCDNR website: http://www.dfr.state.nc.us/water_quality/wq_bmpmenu.htm.

- **Streamside management zones** maintain or enhance a forested corridor along a stream channel so that it acts as a filter for sediment and nutrients released from upslope harvested areas.
- **Water bars or diversions, turnouts, and timely seeding of critical cuts and fills** control sediment yield from forest roads.
- **Stream crossing stabilization** is accomplished by orienting the crossing perpendicular to the stream. The use of stone, erosion control fabric, or other materials further stabilize stream banks and bed at sites that are frequently crossed with heavy equipment. The use of portable bridges (bridgemats) is the preferred method of crossing most streams.

Removing the furthest timber first, using water bars on trails, establishing trails on the contour, avoiding wet weather logging, and reshaping and vegetating trails after use are other practices that, if used appropriately and extensively, can minimize sediment yield from silviculture operations. An established program, administered by the NCDNR, is in place to provide assistance to landowners in the use of these BMPs. The NCDNR is responsible for enforcing the *Forest Practice Guidelines* (http://www.dfr.state.nc.us/water_quality/pdf/fpg.pdf), which are necessary to maintain the forestry exemption from state sediment and erosion control regulations.

8.3.2 Sustainable Forestry

Landowners who want to more actively manage their forestlands while still meeting some conservation objectives can practice sustainable forestry management. Appalachian Voices in Boone, NC has produced a sustainable forestry guidebook, well-respected by a variety of forestry professionals, entitled *Managing Your Woodlands, A Guide for Southern Appalachian Landowners* (Goslee, 2004).

The NC Division of Forest Resources (NCDFR) provides on-site forestry planning and consultation, free of charge, to forestland owners. The NCDFR administers the non-binding *Forest Stewardship Program* to provide landowners with cost-effective resource management planning. Participants in this program are eligible for cost-share assistance from NCDFR that can help with reforestation and timber stand improvements. Participants also receive recognition with a sign to post on their forestland. Resource management advice given through this program often can help boost long-term economic returns for the landowner. NCDFR also maintains a list of consulting foresters who can help woodland landowners with forest management plans and road and access designs to minimize impact on streams and riparian areas (http://www.dfr.state.nc.us/tending/tending_consulting.htm). The private consulting foresters charge for their services.

8.4 AGRICULTURAL MANAGEMENT

Livestock with direct access to streams were observed at several locations in rural portions of the Lower Creek watershed. Runoff containing sediment, chemicals and excess nutrients from crop fields may also contribute to the degradation of water quality and habitat. Agricultural BMPs that have proven effective in addressing such problems are promoted by the Natural Resources Conservation Service (see technical resources in Appendix C), which provides technical advice as well as limited financial assistance. Applicable BMPs include:

A. Controlled Livestock Watering

Direct contact of pastured animals with surface water results in direct deposition of animal waste, stream bank erosion, and re-suspension of sediments and associated nutrients held in streambeds. The most effective means to separate livestock from contact with the stream is to utilize a combination of fencing off the riparian area and the provision of alternate watering locations (troughs or tanks) at least 100 feet away from the riparian area to provide a buffer between waste deposition and the watercourse.

B. Grazing Controls

Allowing livestock to graze up to the edge of stream banks promotes stream bank erosion, with attendant sedimentation. In addition, the proximity of livestock to the streambed opens the watercourse to pollution from nearby animal waste. As in the case of controlled watering, the most effective means to control grazing is through the installation of fencing along the riparian area, creating a vegetated buffer of at least 20 feet between the fence and the stream bank.

C. Stream bank Stabilization

Where stream banks have been eroded due to livestock activity, generally they can be stabilized to prevent further erosion utilizing bioengineering techniques, such as turf reinforcement matting and live staking. Where inadequate space is available to allow the stream bank slope to be reduced, “hard” measures utilizing rip-rap may be necessary. “Spot” repairs of eroded stream bank within agricultural areas should be recognized as a temporary fix to stop erosion and not as a substitute for a more comprehensive stream restoration in which aquatic habitat is also re-established.

D. Residue and Tillage Management, No Till/Strip Till/Direct Seed

Minimal cultivation of the soil leads to increased stubble and plant residue on the soil surface. No-till promotes a greater soil water-holding capacity, more efficient use of water by crops, and reduced loss of water from runoff and evaporation. It can be very effective in reducing loss of soil and nutrients from the field, which may reduce the amount of sediment and nutrients entering a stream.

E. Drip Irrigation

Conventional irrigation practices can cause high amounts of soil, carrying nutrients and other pollutants, to erode from fields and be transported into stream networks. Drip irrigation provides a more efficient use of water by reducing runoff, evaporation, and deep percolation. Drip irrigation may also reduce nitrogen loss from leaching.

F. Nutrient Management

Nutrient leaching through soil and the subsequent runoff of excess nutrients is an issue at many agricultural operations, including horticulture, row crops, and grasslands. The most significant BMP to address agricultural nutrient loss to streams is Nutrient Management – managing the amount, source, placement, form, and timing of nutrient application. Supporting practices vary by land use and include adequate ground cover from cover crops, conservation cover, residue and tillage management, and pasture/hayland planting; adequate filtration of surface water runoff from filter strips and forested riparian buffers; and irrigation water management.

G. BMPs for Pesticides/Herbicides

The improper storage, handling, application and disposal of agricultural chemicals (pesticides, herbicides, fungicides) has the potential to contaminate groundwater, wetlands, ponds, lakes and streams within a local watershed setting. Water quality impairment and toxic impacts to aquatic habitat can be prevented, or at least minimized, through the use of well-established BMPs for agrichemicals, or through the adoption of Integrated Pest Management (IPM) methods. For additional information, visit the following websites: <http://www.ces.ncsu.edu/copubs/env/water/023/> and <http://ipm.ncsu.edu/getsubs2.cfm?TopicID=9> .

H. Ornamental Plant Production

General recommendations for ornamental plant production include:

- Conservation Cover – permanent plant cover of the soil surface for the length of the crop cycle.
- Filter Strip – a strip of grass (that can include trees) between the crop and any surface water source.
- Nutrient Management - managing the amount, source, placement, form, and timing of nutrient application
- Pest Management – utilizing environmentally sensitive prevention, avoidance, monitoring and suppression strategies to manage weeds, insects, diseases and other organisms.
- Critical Area Planting – establishment of plant cover on any severely eroding site, including ditch banks, access roads shoulders and banks, loading areas, etc.

Many other conservation practices or BMPs can be used to address site specific needs

8.5 COORDINATED WATERSHED MANAGEMENT STRATEGY

The Center for Watershed Protection's (www.cwp.org) manual entitled *An Integrated Framework to Restore Small Urban Watersheds* (March 2004) provides an excellent blueprint for restoration of small watersheds like Lower Creek. The need for a coordinated strategy is stressed in this manual, which states that: "aligning the efforts and resources of stakeholders towards common goals is critical to the adoption and implementation of any restoration plan." An overarching, coordinated strategy is critical to both the correction of existing problems and the prevention of further degradation of hydrology, water quality, and aquatic habitat. This strategy should include the following elements:

- A. An active Stakeholder Group (e.g., *Stream Watch* group, "creek-keepers" group, Local Watershed Advisory Group, etc.) with representation from each local government to provide coordinated, consensus-based management for the process;
- B. Incorporation of this *Watershed Management Plan* into the comprehensive planning initiatives of each local government;
- C. Establishment of annual quantifiable watershed improvement goals by the Stakeholder Group;
- D. Prioritization of projects, based upon the annual watershed improvement goals; and
- E. Identification of a "Champion" (lead agency and/or small team of local resource professionals) who will take responsibility for overseeing the implementation of each priority project, or for interfacing with the Ecosystem Enhancement Program's Implementation and Property Acquisition staff as they attempt to recruit willing landowners for permanent easements and begin design/construction of some of the watershed improvement projects identified in this plan.

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Appendix B

Lower Creek Watershed Management Plan Final Report

Lower Creek Watershed Restoration Implementation Plan

Sponsor: Caldwell Soil and Water Conservation District
and Burke Soil and Water Conservation District

Fiscal Year of Grant: 2008
NC-DENR Contract #1571,
Contract Period: September 1, 2008 – August 31, 2012,
Federal Dollar Amount: \$225,010

Project Coordinator: Kevin Clark

Date of Final Report: 8/27/2012

Project URL address: <http://www.caldwellcountync.org/caldwell-county-nc-departments/soil-and-water-conservation/lower-creek-watershed-restoration-implementation-plan>

The Lower Creek Watershed Restoration Implementation Plan was
funded under an EPA Section 319 Grant.

PROJECT PARTNERS

Division of Soil & Water Conservation - Julie Henshaw, Michelle Lovejoy, Jeff Young, David Harrison, Ken Parks, Shelly Beard

Division of Water Quality – Linda Wiggs, Cathy Tyndall

North Carolina Ecosystem Enhancement Program - Andrea Leslie, Julie Cahill, Hal Bryson

Burke County Government – Burke County Commissioners

Caldwell County Government, Finance, Board of Commissioners

USDA-NRCS, Cecil Haynes, Russell Lyday, William Faulkner, Elton Barber

Burke Soil & Water Conservation District Supervisors and staff

Caldwell Soil & Water Conservation District Supervisors and Staff

City of Lenoir – Charles Beck

Caldwell Pathways – Merlin Perry, Tony Deal

Caldwell County Extension Service – Craig Adkins, Seth Nagy

Town of Gamewell – Mary Carter

Western Piedmont Council of Governments – Tony Gallegos, Sam Erwin

Gamewell Fire Department – Keith Owens, Kevin Story

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ABBREVIATIONS

BMPs = Best Management Practices

Ut = Unnamed tributary

GIS = Geographic Information System

CREP = Conservation Reserve Enhancement Program

CRP = Conservation Reserve Program

EQIP = Environmental Quality Incentives Program

NCACSP = North Carolina Agricultural Cost Share Program

NPS = Non Point Source

LCWRIP = Lower Creek Watershed Restoration Implementation Plan

PI = Principal Investigator

SWCD =Soil and Water Conservation District

303(d) list = Under section **303(d)** of the 1972 Clean Water Act, states, territories, and authorized tribes are required to develop **lists** of impaired waters.

USDA-NRCS = United States Department of Agriculture- Natural Resources Conservation Service

EEP = Ecosystem Enhancement Program

EPA = Environmental Protection Agency

ENR = Department of Environment and Natural Resources

Executive Summary

Caldwell Soil and Water Conservation District and Burke Soil and Water Conservation District implemented water quality Best Management Practices (BMPs) in the Lower Creek watershed to address water quality issues raised from the Lower Creek Watershed Management Plan (Ecosystem Enhancement Program, 2006) and the TMDL for turbidity in the Lower Creek Watershed. The overall goal of this project was to restore uses to at least two tributaries to Lower Creek. Lower Creek is impaired because of high turbidity levels. The following tributaries of Lower Creek including Lower Creek are 303(d) listed due to Impaired Biological Integrity: Greasy Creek, Spainhour Creek, and Zack’s Fork Creek in Caldwell County and Bristol Creek in Burke County. Erosion and sedimentation from agriculture has been identified as a potential source of pollution to Lower Creek. The Districts with this grant continued on-going efforts of working in the Lower Creek watershed to install best management practices (BMPs) according to the USDA’s Natural Resources Conservation Service technical standards that improved riparian zones and limited livestock access to the streams, for improved water quality. The Districts expanded efforts in the Lower Creek watershed with installation of storm water BMPs that decreased storm water runoff and thereby protected stream banks from erosive storms.

Below is a summary of the BMPs installed and grant dollars expended in the Lower Creek Watershed (2008-2012) with assistance from the 319 Grant:

- Abandoned Well Closure 2 each
- Watering Facility 1 each
- Livestock Exclusion Fencing 5,133 linear ft
- Filter Strip Repair 8.9 acres
- Animal Trails and Walkways 73 linear ft
- Pasture and Hay Planting 34 acres
- Streambank Stabilization 1,630 linear ft
- Stream Restoration 614 linear ft
- Rain Garden 375 square ft
- Critical Area Planting 1.3 acres
- Stormwater Wetland 12,000 square ft
- Cistern 1,500 gallons

Table 1, Grant 1571 Contractual (Construction) Budget Table approved vs. Budget Table applied

Grant 1571 Contractual (Construction) Budget Table approved vs. Budget Table applied					
Description	Approved Federal budget table 2008	Approved Federal budget table amended 8/30/11	Federal budget expenditures applied	Approved matching budget table	Match budget expenditures applied
Contractual (Construction)	\$84,900.00	\$117,454.00	\$100,152.20	\$168,300.00	\$140,069.12

The goal of restoring uses for two tributaries of Lower Creek proved to be a formidable job. We did not accomplish this task, but in the process we were able to put on the ground several water quality improvement projects that have improved water quality in various parts of the Lower Creek watershed. The overall success of the project is realized by an increased awareness of water quality issues in the watershed from both educational opportunities and implementing BMPs afforded by the 319 Grant. Applications for new projects and/or proposed expansion of existing projects are a direct result of the grant.

Introduction /Background

The Lower Creek watershed is 99 square miles and is located in Burke and Caldwell Counties, and includes the towns of Lenoir and Gamewell. This watershed is in the foothills of the Southern Appalachians and is characterized by both rural and urban landscapes. Agriculture, residential development, and the furniture industry are major economic drivers of the area. Lower Creek and its receiving body, Lake Rhodhiss, are on North Carolina's 2006 303(d) list of impaired waters. Zack's Fork, Greasy Creek, Spainhour Creek and Bristol Creek are major tributaries within the Lower Creek watershed, and are also on the 303(d) list (NC Ecosystem Enhancement Program, Lower Creek Local Watershed Plan Fact Sheet).

The Lower Creek watershed drains into Lake Rhodhiss, which serves as the water supply for approximately 80,000 people. The Soil and Water Conservation Districts (SWCDs) and the United States Department of Agriculture Natural Resources Conservation Service (USDA-NRCS) staff has and continues to provide technical information, engineering assistance, and oversight of BMP installation. The Division of Soil and Water Conservation (DSWC) also continues to work with the districts providing BMP funding for both Agricultural and urban land uses.

Caldwell and Burke Soil SWCDs knew that additional staffing would be required to put together a comprehensive plan that would begin to address the water quality concerns in the Lower Creek Watershed. By researching different avenues on how this could be accomplished, the district's decided that pursuing a water quality grant from the NC Division of Water Quality seemed most feasible. The districts knew that only asking for additional BMP funding could have been an option, but without someone that could champion the cause, that idea was not considered. Along with technical and BMP financial assistance through the grant, educational components were incorporated into the plan as well.

Purpose and Goals

- Inform elected officials, local leaders, committees, and councils about project
- Post Watershed Coordinator Position and hire
- Training of Watershed Coordinator
- Contracting and installing BMP's
- Certifying and monitoring BMPs
- Identify water quality benefits
- Conduct education and outreach meeting/workshops to governmental groups, local businesses, farmers, landowners, activity groups and schools
- Develop Educational Brochures

Deliverables

Table 2, Best Management Practices Planned and Installed

<u>Sites/farms/homes/business</u>	<u>Best Management Practice Planned</u>	<u>Units Amount Planned</u>	<u>Cost Estimate</u>	<u>Sites/farms/homes/business</u>	<u>Units Amount Installed</u>	<u>319</u>	<u>match</u>	<u>Total Cost</u>
(Lower Creek North)Target one livestock operation	Feed/Waste Storage Structure	2	\$50,000	N/A	0	\$0	\$0	\$0
(Lower Creek North) Target as a complimentary practice to a Feed/Waste Storage Structure	Heavy Use Protection Area	2,490 Sq ft	\$14,110	N/A	0	\$0	\$0	\$0
(Lower Creek North)Target one livestock farm, two streams	Stream Crossing	2 Each	\$10,133	N/A	0	\$0	\$0	\$0
(Lower Creek North, Zacks Fork)Target 3 livestock farms, 1322'/farm	Livestock Exclusion Fencing	3,967 Lift	\$10,115	(Bristol Creek and two Uts to Lower Creek) 3 livestock farms	5,133 Lin ft	\$3,530	\$9,334	\$12,864
(Lower Creek North, Zacks Fork)Target 3 livestock farms	Water Facilities	6 Each	\$12,658	(Ut to Lower Creek) 1 livestock farm	1 Each	\$1,962	\$219	\$2,181
(Lower Creek North)Target two livestock farms	Wells	2 Each	\$11,800	N/A	0	\$0	\$0	\$0
(Lower Creek North)Target 3 to 4 ornamental farms	Conservation Cover	100 Acres	\$22,133	N/A	0	\$0	\$0	\$0
(Lower Creek South)Target 3 to 4 ornamental farms	Field Borders	10 Acres	\$7,200	N/A	0	\$0	\$0	\$0
(Lower Creek Lenoir, North)Target 1 ornamental farm or as a complimentary practice to a storm water project	*Grassed Waterways/swales	300 Lift	\$1,200	N/A	0	\$0	\$0	\$0
(Lower Creek North)Target 2 ornamental farms and 3 to 4 non-agricultural sites	*Critical Area Planting	4 Acres	\$11,800	(Abington Creek) 1 public entity	1.3acres	\$448	\$6,588	\$7,036
(Greasy Creek, Spainhour Creek)Target 10 small acreages with cropland	Cropland Conversion – grass/trees	10	\$3,300	N/A	0	\$0	\$0	\$0
(Lower Creek South)Target one ornamental crop field	Rock Lined Outlet	60 Lift	\$2,146	N/A	0	\$0	\$0	\$0

(Lower Creek Lenoir, Zacks Fork) Target two private homeowners and 3 businesses or public entities	*Cisterns	5 Each @ 5,000 Gallons	\$13,333	(Zacks Fork Creek) one private homeowner	1,500 gallons	\$777	\$1,570	\$2,347
(Lower Creek Watershed) Target 3 private individual properties	*Abandoned Well Closures	3 Each	\$6,000	(Ut to Blair Fork Creek and Husband Creek) Two private individual properties	2 Each	\$2,052	\$684	\$2,736
(Lower Creek Lenoir, Zacks Fork) Target one private homeowner and/or 2 public entities or 2 small businesses	*Bioretention area or backyard rain garden	2 Each	\$15,400	(Ut to Lower Creek one private homeowner	1 Each @ 375 sqft	\$3,501	\$892.69	\$4,393.69
(Lower Creek Lenoir, Zacks Fork) Target one private homeowner or public entity or one small business	*Storm water Wetland or Backyard Wetland	1 Each	\$6,908	(Lower Creek) One public entity	1 @ 12,000 sq ft	\$39303.70	\$21,594.12	\$60,897.82
(Lower Creek North, Lenoir, South) Target 3,111'length x 70'wide (Both sides) of stream bank agricultural or non-agricultural	*Riparian Buffer	5 Acres	\$1,380	N/A	0	\$0	\$0	\$0
(Lower Creek Lenoir) Target 1 public or private entity	*Stream Restoration	300 Lift	\$40,480	(Lower Creek and Ut to Lower Creek) Two homeowners and Two public entities	614 lin ft 1,566 not installed	\$16,292	\$20,957 \$15,444	\$37,249 \$15,444
(Lower Creek, Lenoir) Target 2 public or private entity	*Stream bank and Shoreline Protection	300 Lift	\$13,104	(Lower Creek and Ut to Lower Creek) One agricultural landowner and one private business	1630 lin ft	\$32,287	\$50,902	\$83,189
N/A	Filter Strip	0	0	(Bristol Creek) Agricultural operation	8.9 acres	\$0	\$2,671	\$2,671
N/A	Animal Trails and Walkways	0	0	(Bristol Creek) Agricultural operation	73 ft	\$0	\$1,434	\$1,434
N/A	Pasture and Hay Planting	0	0	(Lower Creek and Ut to Lower Creek) Agricultural operation Two agricultural landowners	34 acres	\$0	\$7,780	\$7,780
	Total		\$253,200		Calculated from above	\$100,152.70	\$140,069.81	\$240,222.51
					Actual	\$100,152.20	\$140,069.12	\$240,221.32
					Difference	\$0.50	\$0.69	\$1.19

Deliverables:

<p>Personnel/Salary The Watershed coordinator position was filled as planned. This position was the corner stone of implementing the grant properly. However, with only a year left in the original grant timeline, the Watershed Coordinator vacated the position for a permanent position in the same field. The remaining salary/benefits were used with the permission to extend the grant one additional year for contractual installing conservation practices.</p>
<p>Fringe Benefits: These benefits were essential for allowing the conservation District to hire a quality person for the watershed coordinator position</p>
<p>Supplies: The supply line item was adequate.</p>
<p>Equipment: The equipment line item was adequate. One reason is that the Natural Resources Conservation Service supplied the Watershed Coordinator with most of the necessary computing equipment</p>
<p>Travel: We utilized our district truck as part of the travel matching.</p>
<p>Contractual: (See Table 2 on pages 7/8). Many of the anticipated practices were not implemented; however some of the practices were installed at greater amounts than predicted.</p>
<p>Training: All pertinent training was taken by the watershed coordinator which enabled the installation of conservation practices to move forward on schedule.</p>

Methodology/Execution

The PI developed the plan of action based on prior experience with implementing conservation practices in the watershed or nearby areas. The advantage and need to hire a person to manage the grant was of utmost importance. Without the option of the second pair of boots on the ground, staffing resources would have limited the grant's success.

- Explain the methodology in detail

The methodology was straight forward. First, acquire funding for both technical assistance and supplemental funding for implementing conservation practices. Then, through training, bring the watershed coordinator up to speed with contracting, certifying and monitoring practices, develop and disseminate educational material, and promote the program to various target audiences.

- Tell the story of what you did; describe how you planned and implemented the project work and the activities it involved. Include any problems or issues that arose and how you handled them, so readers can learn from your experience

The grant was awarded in the fall of 2008. The Caldwell District Board of Supervisors immediately advertised for the watershed coordinator position. The position was filled and work began. It was important that the training begin immediately to provide the watershed coordinator ample time to carry out the goals of the grant. We learned that three years is a relatively short amount of time with respect to implementing a watershed plan. The districts anticipated this and began lobbying the local Boards of Commissioners to pick up the watershed coordinators position as the grant funds expired. However, the economic situation that had developed beginning in 2008 was most undesirable for county governments and adding the watershed coordinator positions to the county budget was an extremely low priority and most understandable with the given economic situation. In retrospect, it would be desirable to have continued funding at least promised post grant period.

Outputs and Results

The results of the grant implementation are positive. Many projects were installed and the grant seemed to have formed a base layer for potential projects in the future, which the districts desire.

NC DWQ/US EPA Reporting Requirements

Table 3, BMPs installed (#, Size, area treated):

BMPs installed (#, Size, area treated):	
• Abandoned Well Closure	2 each
• Watering Facility	1 each
• Livestock Exclusion Fencing	3 @ 5,133 linear ft
• Filter Strip Repair	1 @ 8.9 acres
• Animal Trails and Walkways	1 @ 73 linear ft
• Pasture and Hay Planting	2 @ 34 acres
• Streambank Stabilization	2 @ 1,630 linear ft
• Stream Restoration	3 @ 614 linear ft
• Rain Garden	1 @ 375 square ft
• Critical Area Planting	1 @ 1.3 acres
• Stormwater Wetland	1 @ 12,000 square ft
• Cistern	1 @ 1,500 gallons

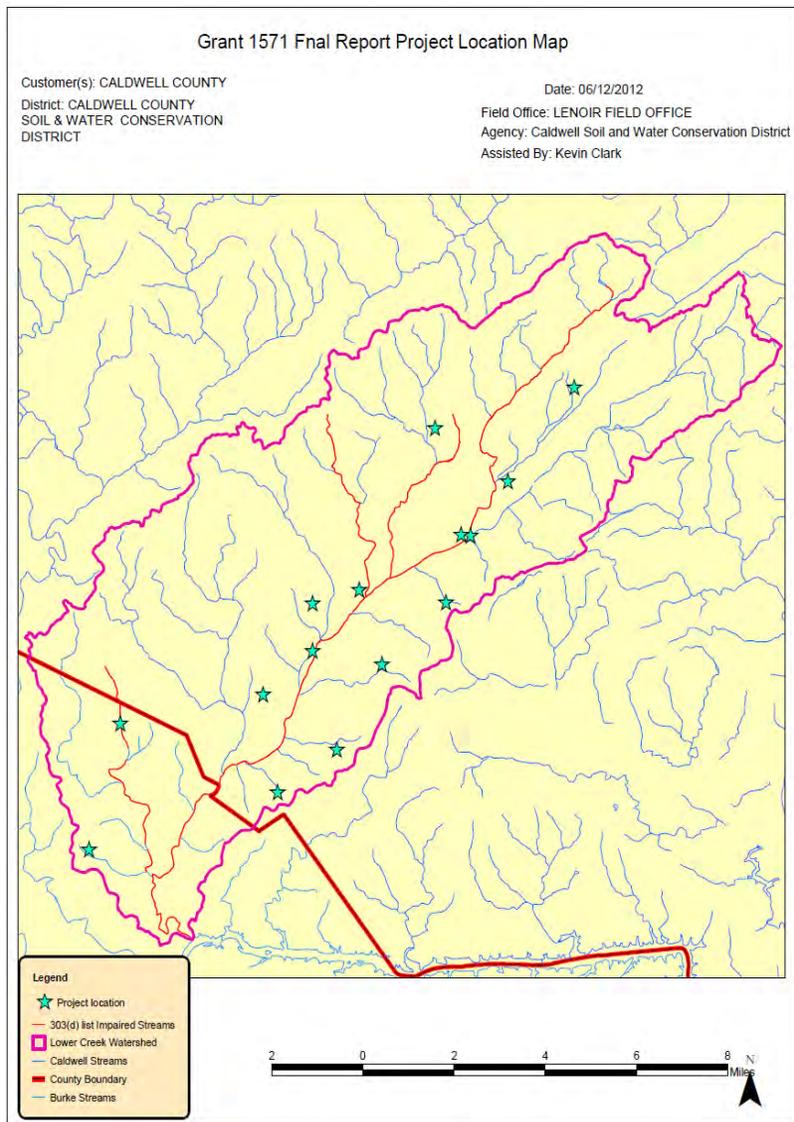
Table 4, Latitude/Longitude all BMPs in project area:

• Caldwell Senior Center – 81° 31' 58.87", 35° 54' 30.48"
• Caldwell County Health Department – 81° 34' 20.36", 35° 53' 25.88"
• Homer miller - 35° 49' 44.13" N, 81° 35' 53.89" W (watering facility/fencing)
• Nancy Ross - 35° 48' 59" N, 81° 40' 34" W (filter strip repair, animal trails and walkways ACSP – matching)
• John Casavaugh - 35° 50' 27" N, 81° 34' 38" W (pasture and hay planting, ACSP - matching)
• Dorthy Mungrage - 35° 51' 31.68" N, 81° 39' 57.40" W (pasture and hay planting, ACSP - matching)
• Lenoir Golf – 81° 31' 45.58" W, 35° 54' 27.96" N
• Town of Gamewell - 81° 35' 21.88" W, 35° 52' 24.5" N
• David Waechter - 81° 33' 49" W, 35° 52' 12" N
• Thomas Greer - 81° 32' 16.81" W, 35° 53' 18.22" N
• Bill Hirsch - 81° 30' 51.5" W, 35° 55' 25.4" N
• Jack Adams - 81° 29' 18.63" W, 35° 57' 8.51" N
• West Caldwell – 81° 35' 24" W, 35° 53' 17" N
• Joy Cole – 81° 36' 32.79" W, 35° 51' 37.39" N

Table 5, Load reductions associated with BMPs:

<p>Total Soil Loss Reduction</p> <ul style="list-style-type: none">• Caldwell Senior Center – 3.4• Homer Miller 0.89 tons/year• Nancy Ross 31 tons/year (ACSP)• John Cassavaugh (41 tons per year)• Dorothy Mugrage (35 tons/year)• Lenoir Golf – 225 tons/year, Town of Gamewell – 743 tons/year• Thomas Greer – 108 tons per year, David Waechter – 13.6 lbs per year• West Caldwell Total Soil Loss Reduction -- 24 tons per year• Caldwell County Health Department – 3.2 tons/year• Jack Adams 51.81 tons/year reduction• Bill Hirsch Gallons of storm water managed (BMPs installed x number of gallons captured and treated from first 1" of storm water runoff or gallons stored in a cistern system) –Cistern project 1253.3 gallons/storm event (first 1" of storm water runoff)• Bill Hirsch Total Nitrogen Loss Reduction — Cistern, Annual Nitrogen removed = 0.24 lbs (Rainwater Harvester 1.5)• Caldwell County Health Department Total Nitrogen Loss Reduction — 15.29 lbs./year• Caldwell County Health Department Total Phosphorus Loss Reduction —1.30 lbs./year• David Waechter Total Nitrogen Loss Reduction - 0.29 lbs per year• David Waechter Total Phosphorus Loss Reduction — 0.03 lbs per year

- Map of BMPs in watershed
Figure 1, Grant 1571 Project Location Map



Outcomes and Conclusions

If based on the statement written in the grant application “to restore uses to at least two tributaries to Lower Creek”, the project does not meet the goals, but looking at the overall accomplishments, the grant was highly successful.

- Comment on project’s outcomes and their impact on water quality issues and environmental protection
All the practices installed lessened the negative impacts on the Lower Creek Watershed. The BMPs developed and implemented reached a variety of many customers in the watershed community. This in turn spread the message and awareness of water quality issues.

- Assess the overall value of the project; that will benefit from the work, how and why

The overall value of the project increased the awareness of water quality (both poor and good) in the Lower Creek Watershed and through educational opportunities and BMP installation water quality has been improved. With continued work in the watershed, additional water quality improvements may be realized.

- Summarize what was learned and whether the methodology worked and what readers can learn from your experience

It was learned that when getting down to the smaller watershed level, that word of mouth is a positive benefit when promoting water quality work and education.

- Summarize any conclusions/implications that can be drawn from the project, including consideration of the future implications of your work and how others can build on it

We have made new alliances and strengthened older ones with the delivery of this grant to the watershed.

If funding continues from one or many sources, more problems facing the watershed can be addressed and with diligence, realize the goal of restoring uses to the streams of the watershed.

Budget

Table 6, Grant 1571 Budget Table approved vs. Budget Table applied

Grant 1571 Budget Table approved vs. Budget Table applied					
Description	Approved Federal budget table	Approved Federal budget table amended 8/30/11	Federal budget expenditures applied	Approved matching budget table	Match budget expenditures applied
Salary and Benefits	\$120,642.00	\$94,376.00	\$94,375.87	\$51,988.00	\$69,502.48
Travel - Mileage	\$11,520.00	\$6,162.00	\$3,818.42	\$0.00	\$581.90
Equipment	\$0.00	\$0.00		\$1,938.00	\$772.95
Supplies	\$2,650.00	\$2,461.00	\$2,461.22	\$0.00	
Training	\$4,350.00	\$4,244.00	\$4,243.59	\$0.00	
Construction	\$84,900.00	\$117,454.00	\$100,152.20	\$168,300.00	\$140,069.12
Other - Workstation (Indirect)	\$948.00	\$313.00	\$312.65	\$4,680.00	\$3,770.00
Total Expenditures	\$225,010.00	\$225,010.00	\$205,363.95	\$226,906.00	\$219,646.45

References

- Cite any references to the work of others you used.

References and Literature Cited

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<http://h2o.enr.state.nc.us/tmdl/LowerCKTurbidityTMDLEPAFinal.pdf.pdf>

1. Please see attached power point presentation for an overview of the project grant.

2. We all live in a Watershed!!

Lower Creek Watershed

**Encompasses 99 square miles (Lenoir and Gamewell and portions of
Burke County)**

Lower Creek is impaired for Sediment

We ALL affect the watershed for good or bad

**Lower Creek Watershed drains into Lake Rhodhiss (our drinking water
source)**

Lake Rhodhiss is also impaired

**For more information concerning practices to improve the water
quality of Lower Creek Watershed, please contact:**

Caldwell Soil & Water Conservation District

120 Hospital Avenue Suite 2

Lenoir, NC 28645

828.758.1111

828.758.7257 fax

Pamela Bowman

Watershed Coordinator

3. Lower Creek Watershed Restoration Implementation Plan

The Lower Creek Watershed drains 99 square miles in Caldwell and Burke Counties. The watershed includes the towns of Gamewell and Lenoir. The state of North Carolina considers Lower Creek and its receiving body, Lake Rhodhiss, to be impaired waters. Several tributaries to Lower Creek are also listed as impaired. They are Zack's Fork, Spainhour Creek, Greasy Creek, and Bristol Creek (NC Ecosystem Enhancement Program, Lower Creek Local Watershed Plan Fact Sheet). Other tributaries to Lower Creek include Blair Fork, Abington Creek, Husband Creek, Celia Creek, and White Mill Creek.

Why is the Lower Creek Watershed impaired?

Soil erosion is a major contributor to the degradation of streams. Erosion and sedimentation from agriculture has been identified as a potential source of pollution to Lower Creek. Erosion, or weathering away of soil, more readily occurs in areas that lack sufficient vegetation. Without an adequate vegetative cover to hold the soil in place, natural processes like wind and rain can easily transport sediment and soil to nearby streams.

Storm water runoff is also a contributor to the degradation of Lower Creek. Runoff from impervious surfaces (pavement, roofs, etc.) carries oil, gas, antifreeze, etc. from vehicles. In many cases, this storm water outlets directly into streams.

What can we do about it?

The Lower Creek Watershed Restoration Implementation Plan (LCWRIP) is a program of the Caldwell and Burke Soil & Water Conservation Districts designed to improve the water quality of Lower Creek through the installation of Best Management Practices (BMPs) within the watershed to reduce Non Point Source (NPS) pollution.

BMPs are measures or structures that protect, maintain, and restore water quality. Structural BMPs reduce erosion, slow storm water, filter storm water, provide wildlife habitat, etc. (BMP descriptions taken from NCACSP Manual September 2007 and NC CCAP Manual June 2007.)

List of potential BMPs:

Heavy Use Area Protection, Stream Crossing, Wells, Abandoned Well Closures, Livestock Exclusion Fencing, Watering Facilities, Grassed Waterways/Swales, Conservation Cover, Bioretention Area, Backyard Rain Garden, Critical Area Planting, Cropland Conversion, Cisterns, Rock Lined Outlet, Stormwater Wetland, Backyard Wetland, Riparian Buffer, Field Borders, Stream Restoration, and Stream Bank and Shoreline Protection. (See brochure for BMP descriptions.)

The LCWRIP is funded by a Section 319 NPS Pollution Control Grant administered by the NC Department

of Environment & Natural Resources. Grant resources available may pay 75-97% of the average cost. Cost-share percentage is dependent on the type of practice.

Please contact Pamela Bowman, Watershed Coordinator for Lower Creek, at pamela.bowman@nc.nacdnet.net with any questions.



4. BURKE SOIL AND WATER CONSERVATION DISTRICT (BURKE SWCD)

130 Ammons Drive • Morganton, NC 28655 • (828)-439-9727

CALDWELL SOIL AND WATER CONSERVATION DISTRICT (CALDWELL SWCD)

120 Hospital Avenue, NE • Lenoir, NC 28645 • (828)-758-1111

Invite you to attend the:

Stormwater and Sediment Control Field Day

February 23, 2009

8:00 am – 2:45 pm

Sponsored by the:

Clean Water Neighbors

“Protecting Our Common Resource”

And

Lower Creek Watershed Restoration Implementation Plan

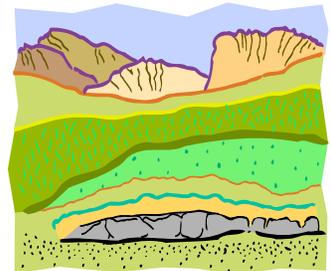
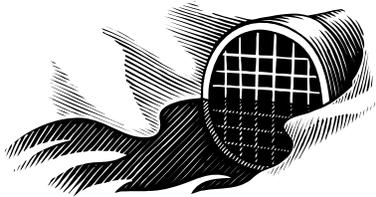
Tentative Schedule:

8:00 am - Caldwell Group to meet at Caldwell SWCD and depart for Burke SWCD

8:30 am - Registration at Burke SWCD

9:00 am -10:30 am - Presentations at Burke SWCD

10:30 am – 2:15 pm - Presentations in Caldwell County and Lunch (Provided)



2:15 pm – 2:45 pm - Burke Group to return to Burke SWCD

Please RSVP to the Burke SWCD Office (439-9727 ext. 3) or the Caldwell SWCD Office (758-1111) by February 16, 2009 to ensure that we provide enough food and transportation. Please leave a message with your name, telephone number, and number attending if there is no answer. Transportation between the SWCD Offices will only be guaranteed for those that RSVP by February 16, 2009.

For directions to either the Burke or Caldwell SWCD Offices or any additional questions, please call the corresponding office number listed above.

Please join us for this exciting field day where we will learn about rain water harvesting, critical area planting, sediment control, and much more. We will also view a constructed wetland, rain garden, and public, as well as, private cistern system. Knowledgeable field staff will be present and will provide information on how you can receive cost-share assistance to install any of these practices on your site.



5. Stormwater and Sediment Control Field Day

The Burke and Caldwell Soil & Water Conservation Districts held a Stormwater and Sediment Control Field Day on February 23, 2009. The event was sponsored and funded by two Section 319 Non-point Source Pollution Control Grants: the Clean Water Neighbors “Protecting Our Common Resource” Grant and the Lower Creek Watershed Restoration Implementation Plan. Approximately 31 people participated. Activities included a tour of existing sites with various stormwater and sediment control best management practices (BMPs) in Burke and Caldwell Counties. Presentations were given on public and private rain water harvesting systems (cisterns), critical area planting, sediment control, constructed wetlands, rain gardens, and assistance programs (technical and financial). Staff from the Burke and Caldwell Cooperative Extension Offices and the Natural Resource Conservation Service assisted with this event. For more information about the best management practices mentioned above or others, please contact either the Burke SWCD at 439-9727 ext. 3 or the Caldwell SWCD at 758-1111. Photo Caption: Field Day participants viewed the newly planted bank at the Burke Agriculture Building and listened to Rusty Lyday (NRCS) and Pete Minter (Burke County Planning) give a presentation on critical area planting and sediment control. The bank planting was done especially for the field day and was funded by the

Clean Water Neighbors Grant.

6. Lower Creek Watershed Fecal Bacteria Source Study

In 2009 and 2010, high levels of fecal coliform bacteria were found in Lower Creek, Spainhour Creek, Blair Fork, Greasy Creek, and Zacks Fork. Fecal bacteria can originate from leaky sewers, poorly functioning septic systems, straight pipes, livestock operations, and wildlife. Fecal coliform bacteria can indicate the presence of harmful bacteria in streams or lakes that make them unsafe to swim or wade in.

In order to identify and hopefully fix the sources of fecal bacteria, a team of trained staff are walking these streams and some of their feeder streams in the fall of 2010. They are taking notes and collecting water samples. These staff is a part of the Lower Creek Advisory Team, a group of technical and planning staff who have been working to implement education and restoration projects in the Lower Creek watershed.

For more information, call--

Warren Depree, City of Lenoir, at 757-2186 OR

Andrea Leslie, NC Ecosystem Enhancement Program at 337-3455

Stream study team:

Charles Beck, City of Lenoir

Pamela Bowman, Burke/Caldwell County Soil & Water Conservation District

Hal Bryson, NC Ecosystem Enhancement Program

Julie Cahill, NC Ecosystem Enhancement Program

Kevin Clark, Burke/Caldwell Soil & Water Conservation District

Warren Depree, City of Lenoir

Sam Erwin, Western Piedmont Council of Government

Andrea Leslie, NC Ecosystem Enhancement Program

Carrie Mahoney, Catawba Riverkeeper

Seth Nagy, Caldwell County Cooperative Extension

Merlin Perry, City of Lenoir

Cathy Tyndall, NC Division of Water Quality

7. List of Available Programs Technical and Financial Assistance

Cost-Share Programs Administered by Caldwell SWCD

North Carolina Agriculture Cost Share Program
Community Conservation Assistance Program
Drought Response Program
Lower Creek Watershed Restoration Implementation Plan
Upper Yadkin River Watershed Conservation Initiative
Impaired and Impacted Streams Initiative

Federal Cost-Share Programs Administered by NRCS

Environmental Quality Incentives Program (EQIP)
Emergency Watershed Protection Program (EWP)
– As funded for natural disasters (ex. 2004 flooding)
Conservation Reserve Program (CRP)
Conservation Reserve Enhancement Program (CREP)

Other Programs

Big Sweep Waterway Cleanup

Education

- 4th, 5th, and 6th Grade Poster Contest
- 7th and 8th Grade Speech Contest
- 6th Grade Essay Contest
- Field Days

Voluntary Agricultural District

No-Till Drill Rental Program

Conservation Technical Assistance

PUBLIC INVOLVEMENT

Presentations and updates to various groups

Caldwell County Board of Commissioners program: 2/2/09, 5/17/10, 12/6/10

Burke County Board of Commissioners program: 11/3/08, 12/15/09

Caldwell Soil and Water Conservation District: Monthly, 2008-2012

Burke Soil and Water Conservation District: Monthly, 2008-2012

Lower Creek Advisory Team: Quarterly, 2008-1012

Carolina Land and Lakes RC & D Council: 11/19/08, 11/10/09, 11/10/10

City of Lenoir, Committee of the Whole: 10/28/08, 4/12/10, 12/13/10, 5/22/12

Town of Gamewell: 12/8/08, 4/12/10, 12/13/10

Burke Cattlemen's Association: 1/23/09

Caldwell Cattlemen's Association: 11/2/09

Caldwell County Nursery Association: 5/13/10

The News Herald: 10/6/08

Newstopic: 10/10/08

WJRI-am radio: 10/1/08

WMNC-am radio: 10/1/08

Lower Creek Elementary School: 2/1/10

Hibriten High School: 2/6/08

West Caldwell High School: 10/7/08

Davenport Elementary School: 10/23/08

William Lenoir Middle School: 10/23/08

Gamewell Elementary/Middle School: 10/2010

Whitnel Elementary School: 10/2010

Chesterfield Elementary School: 10/23/09

Developed educational brochure 06/09

Nurseryman's Field Day Presentation 08/10/12

TRAINING

Sediment and Erosion Control workshop: 10/21-22/08

Water harvesting workshop: 11/12/08

RUSLE/PLAT workshop: 1/26-27/09

Soil and Water Conservation Area II Fall meeting: 10/9/08

NC Soil and Water Conservation Annual meeting: 1/4-6/09

Soil and Water Conservation Area II Spring meeting: 3/12/09

Bioretention Design Workshop: 3/19-20/09

NRCS, Warm season grass establishment training: 6/10/09

Cultural Resource Training: 7/22-23/09

Conservation District Issues meeting: 7/28/09

Conservation District Employees Workshop: 8/18-20/09

Stream Restoration River Course: 9/22-24/09

Basics of Conservation Planning: 10/5-9/09 and 10/19-23/09

NC Soil and Water Conservation Annual meeting: 1/3-6/10

Forced Air Composter Field Day: 1/8/10

Nutrient Management Software: 3/18/10

Soil and Water Conservation Area II Spring meeting: 3/11/10

Nutrient Management Training: 6/8-10/10

Forage Field Day: 7/20/10

Appendix C

Sample Local Government Regulations

Local Government	Phone	Website and Ordinance	Notes
Asheville	828-259-5830	www.ashevillenc.gov Unified Development Ordinance (Sec.7-12-4 Steep Slope and Ridgetop Development)	Applies to areas above 2220' in elevation and existing grade >= 15% and designated ridges. Regulates amount of disturbance, road design, building height, density and vegetation removal. Incentives for building on less steep/sensitive areas.
Black Mountain	828-669-9784	www.townofblackmountain.org Subdivision Regulations Land Disturbance and Slope Protection Ordinance	Subdivision and Land Disturbance and Slope Protection ordinances regulate disturbance, road design, vegetation, public safety and require low-impact design (LID) and conservation subdivision design in some cases.
Boone	828-268-6200	www.townofboone.net Steep Slope Protection Ordinance; Viewshed Protection Ordinance	Regulations focus on public safety and viewshed protection. Land disturbance is limited in viewshed areas. Developers are encouraged to minimize visual impact on ridges and steep slopes.
Brevard	828-883-8580	www.cityofbrevard.com Unified Development Ordinance (Chapter 6. Environmental Protection)	Regulations focus on minimizing land disturbance and ensuring safe construction. Creative designs are encouraged and development potential may be transferred from steep areas to less-steep areas of parcel.
Buncombe County	828-250-4830	www.buncombecounty.org Subdivision Regulations and Zoning Ordinance	Regulates amount of land disturbance, impervious surfaces, density, road design and building height for subdivisions and multi-family dwellings. Emphasis is on limiting disturbance and impervious surfaces on steep slopes; encourages clustering development in less-steep areas of parcel in return for a density bonus.
Haywood County	828-452-6632	www.haywoodnc.net Slope Ordinance	Regulates slope height, cut and fill slopes, compaction and placement of utilities with a focus on safe construction. Established an Engineering Review Board for policy recommendations and enforcement.
Henderson County	828-697-4819	www.hcplanning.org Land Development Code	County follows state ridge law, but allows for conservation subdivisions which encourage conserving steep slopes as open space through a density bonus.
Jackson County	828-631-2281	http://planning.jacksonnc.org Mountain and Hillside Development Ordinance	Regulates all types of development and land disturbing activity in the Mountain and Hillside Development District. Limits grading, height, density, and vegetation removal. Requires compliance with BMPs in ordinance.
Waynesville	828-456-2004	www.townofwaynesville.org Hillside Protection Ordinance	Regulates amount of grading and density based on slope. Construction on mountain ridges governed by Haywood County and State regulations.
Transylvania County	828-884-3205	www.transylvaniacounty.org Mountain Ridge Protection Ordinance, Subdivision Ordinance	Ridges covered include all ridges that are at least 500 feet above the elevation of an adjacent valley floor, regardless of elevation. Project approval dependent upon adequate water supply, safe waste water disposal, adequate fire protection and preservation of natural beauty.

(Land of Sky Regional Council, 2008)

Appendix D
Funding Sources

Financial Assistance Resources

Grant, Loans and Cost Share

Agriculture Cost Share Program - Division of Soil and Water Conservation

Financial incentives are provided through North Carolina's Agriculture Cost Share Program. This program is administered by the Division of Soil and Water Conservation (Division) in the Department of Environment and Natural Resources. Due to the program's success, it has been extended to all 96 Soil and Water Conservation Districts (Districts) that includes all 100 counties. 10-25%. Farmers

<http://www.enr.state.nc.us/DSWC/pages/agcostshareprogram.html>

Aquatic Weed Problems – Division of Water Resources

Staff assists local governments by providing free evaluation of aquatic weed problems affecting public waters and **cost sharing** when control efforts are needed.

<http://www.dwr.ehnr.state.nc.us/wrps/weeds.htm>

Aquatic Restoration Grants

Army Corps of Engineers - Section 206. Aquatic ecosystem restoration and protection projects. 35%.
Non-federal public agencies

<http://www.saw.usace.army.mil/Floodplain/Section%20206.htm>

Clean Water Management Trust Fund

CWMTF will fund projects that (1) enhance or restore degraded waters, (2) protect unpolluted waters, and/or (3) contribute toward a network of riparian buffers and greenways for environmental, educational, and recreational benefits.

<http://www.cwmtf.net/>

Clean Water Partners Infrastructure Program

Rural Center - Congress provides states with grant funds to establish revolving loan programs to assist funding of wastewater treatment facilities and estuary and nonpoint programs. Local Government

<http://www.ncruralcenter.org/grants/water.htm>

Clean Water State Revolving Fund and the NC Clean Water Revolving Loan and Grant Program

Wastewater System Expansion and Improvements - Division of Water Quality – Construction Grants and Loans Section. The section administers two major programs that assist local governments, the federally funded. These programs can provide both low interest loan and grant funds for wastewater treatment projects.

<http://www.nccgl.net/fap/cwsrf/index.html>

Community Development Block Grant Program

All North Carolina small cities in Lake Rhodhiss Watershed are eligible to apply for funds from the [U.S. Department of Housing and Urban Development \(HUD\)](#).

<http://www.ncdca.org/cdbg/>

Conservation Community Cost Share Program

NC DENR - Soil and Water Conservation Districts. Jointly funds water resources projects Local Governments

http://www.enr.state.nc.us/DSWC/pages/ccap_program.html

Conservation Reserve Program

USDA – NRCS, Convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover. Cost Sharing. Farmers, Ranchers

<http://www.nrcs.usda.gov/programs/crp>

Conservation Reserve Enhancement

NCDENR – DSWC. Seeks to protect land along water sources that is in agricultural production. Up to 75% Cost Share. Farmers, Ranchers

<http://www.enr.state.nc.us/DSWC/pages/crep.html>

Cooperative Water Program

USGS – Projects associated with estuary and NonPoint Source Programs. Local Governments

<http://water.usgs.gov/coop/>

Ecosystem Enhancement Program (EEP)

NCDENR- Conduct watershed assessment, planning, and restoration implementation. EEP offers. Public and Private Entities

<http://www.nceep.net/business/landowner/landowner.htm>

Environmental Education Model Library Grants

The Project Tomorrow program provides financial and other support to develop and enhance model environmental education library collections and promote the integration of environmental education in the teaching of North Carolina's competency-based curriculum.

<http://www.ee.enr.state.nc.us/pt/ptoc.htm>

Erosion and Sediment Control Awards, Division of Land Resources, Land Quality Section

The North Carolina Sedimentation Control Commission (SCC) accepts and encourages proposals for research and/or educational projects related to erosion and sedimentation control. For more information, you may contact Caroline Medlin at (919) 733-4574 or at caroline.medlin@ncmail.net

<http://www.dlr.enr.state.nc.us/eroprop.html>

Environmental Quality Incentives Program (EQIP)

Farmers, Ranchers, and Eligible Civic Groups involved in Resource Planning

A voluntary program whereby eligible candidates who own or control land on which crops or livestock are produced in an identified priority area or have a State identified priority natural resource concern develop a conservation plan to manage one's valuable natural resources.

<http://www.nc.nrcs.usda.gov/Programs/eqip.htm>

Farmland Preservation Trust Fund -Dept of Agriculture and Consumer Services (NCDA) –

NCDA contracted with The Conservation Trust for North Carolina (CTNC) to accept farmland easement applications, and to administer state-appropriated funds.

<http://www.enr.state.nc.us/DSWC/files/ncfpp.htm>

Farm Bill Programs

Funds agricultural management and grassland, wetlands and wildlife preserve programs. Varies. Farmers, Ranchers

<http://offices.sc.egov.usda.gov/locator/app>

**Federal Program Multiple Assistance Types – Water, Wastewater
United States Dept. of Agriculture – Rural Business-Cooperative Service**

Programs provide loans and grants for rural community water, sewage disposal, solid waste disposal, storm drain systems, telecommunications, computer networks and related technology. Eligible applicants include municipal and county governments, public service authorities, Indian tribal organizations and broadly based community nonprofit corporations.

<http://www.rurdev.usda.gov/nc/rus.htm>

Habitat Enhancement Program (HEP)

Duke Energy

Nonpoint Source Management Program Funding - 319 Grant Program

Division of Water Quality – Water Quality Section. The Clean Water Act - Section 319(h) allows EPA to provide funds to states (such as NC) who distribute the money to eligible candidates in a competitive process for innovative nonpoint source management strategies meant to be a demonstration for others.

<http://h2o.enr.state.nc.us/nps/319.htm>

Parks and Recreation Grant Programs-Division of Parks and Recreation

Grants to provided money to environmental organizations, and groups and state and local governments for park and recreation purposes, trail related needs and to acquire and protect important natural areas, preserve the state's ecological diversity and cultural heritage, and to inventory natural heritage resources of the state.

<http://ils.unc.edu/parkproject/prkgrants.html>

Parks and Recreation Trust Fund (PARTF)

PARTF is the primary source of funding to build and renovate facilities in the state parks as well as to buy land for new and existing parks. A local government can request a maximum of \$500,000 with each grant application.

<http://www.partf.net/apply.html>

NC Rural and Economic Development Center Water and Sewer Grant Program

The program is intended to help NC units of governments by funding up to \$10,000 per job created, for up to one half of water and sewer infrastructure costs, or a maximum of \$500,000, in projects that result in the creation of private sector jobs. Jobs must be full time, and must pay at least minimum wage. A local match of 5% of the total cost of the infrastructure is required.

For grant requirements, deadlines, and further information on the program, visit

<http://www.ncruralcenter.org/grants/water.htm>

For information on other economic development grants, visit

<http://www.ncruralcenter.org/research/grants.htm>

NC Division of Pollution and Prevention

The Solid Waste Management Trust Fund is used to make grants in support of waste reduction efforts. Programs can fall into two areas if eligibility: recycling business or community waste reduction and recycling.

<http://www.p2pays.org/localgov/assistance/financial.asp>

North Carolina Trails Program

The NC Adopt-A-Trail Grant program awards funds totaling \$135,000 annually to government agencies, non-profit organizations, and private trail groups for such projects as trail building, trail signage and facilities, trail maintenance, and trail information brochures and maps.

<http://ils.unc.edu/parkproject/trails/grant.html>

Recreational Trails Program (RTP)

A \$1.1 million dollar grant program with the intent to meet the trail and trail-related recreational needs identified by the Statewide Comprehensive Outdoor Recreation Plan (SCORP). The grant applicants must be able contribute 20% of the project cost with cash or in-kind contributions.

Septic Systems – Repairing or Replacing – Grants and/or Loans

Grants and/or loans may be available to individuals and agencies for assistance in repairing or replacing inadequate wastewater treatment systems (both septic and ‘straight-pipe systems). Funding Sources for individuals located in counties with an active WaDE program, the individual may apply to the county itself for financial assistance. Funding Sources for

Individuals in counties without an active WaDE program:

<http://www.deh.enr.state.nc.us/oww/Wade/funds.PDF>

Funding Sources for Agencies:

http://www.deh.enr.state.nc.us/oww/Wade/USDA_offices.PDF

Urban and Community Forestry Grant Program

Division of Forest Resources. Grants are available to local or state government, educational institutions, non-profit 501(c)(3) organizations and other tax-exempt organizations. The program goal is to encourage citizen involvement in creating and supporting long-term and sustained urban and community forestry programs at the local level.

http://www.dfr.state.nc.us/managing/urban_grant.htm

Waste Reduction Grants

Division of Pollution Prevention - Grants are to reduce the flow of waste (i.e., organics, construction and demolition debris, electronics, paper, etc.) to North Carolina disposal facilities. Some grants are available only to government and nonprofit organizations, while others are available to the private sector as well.

<http://www.p2pays.org/financial/index.htm>

Water Quality Planning and Protection - Division of Water Quality – Water Quality Section – 205j Grant Program

The Clean Water Act - Section 205(j) allows EPA to provide funds to states (such as NC) that distribute the money to eligible candidates (regional planning organizations) in a competitive process for water quality management planning. The Division prefers potential projects that deal with long-term growth management, impaired waters restoration, and public education. For more information please contact Dianne Reid 919-807-6300, dianne.reid@ncdenr.gov

Water System Improvements – Division of Environmental Health – Public Water Supply Section

To provide guidance, technical and financial assistance to units of local government and certain non-profit water corporations, in order to provide safe drinking water in North Carolina.

http://www.deh.enr.state.nc.us/pws/srf/srf_branch.htm

Wetland Protection Development Grant

USEPA - Develop comprehensive monitoring and assessment programs; Improve compensatory mitigation effectiveness; Refurbish wetland, aquatic resources, protection. 25%. States, tribes, local gov'ts interstate association, non governmental organizations, (NGOs), intertribal consortia, nonprofit's
<http://www.epa.gov/owow/wetlands/grantguidelines/>

Water Resources Grants – Division of Water Resources

This program is designed to provide cost-share grants and technical assistance to local governments throughout the State. Applications for grants are accepted for seven purposes: General Navigation, Recreational Navigation, Water Management, Stream Restoration, Beach Protection, Land Acquisition and Facility Development for Water-Based Recreation, and Aquatic Weed Control.
<http://www.dwr.ehnr.state.nc.us/wrps/grant.htm>

Voluntary Environmental Improvement Bonds

The Environmental Finance Advisory Board recently released a report on summarizing an alternative funding strategy for local governments to promote household environmental projects. In a few other states where localities have been given (or already had) the authority to implement such a program, counties and municipalities have started to lend money to households that volunteer to install environmental improvements (i.e. photovoltaic panels, energy efficiency). The local government is then paid back through a special assessment on property through property taxes. These types of assessments could potentially be used for a number of environmental improvements to a property (i.e. green roofs, stream buffers, replacement of old wood stoves, etc.).
<http://www.epa.gov/efinpage/publications/VoluntaryEnviroImprovementBondsReports.pdf>

FOUNDATION FUNDING

The Foundation Center

This website provides information on individual grants as well as grants for non-profits.
<http://foundationcenter.org/>

Z. Smith Reynolds Foundation

This is a strong resource for county and town government striving to create “active” reform
ZSR Foundation Focus Areas: community and economic development; democracy and civic engagement; environment; pre-collegiate education; social justice and equity
<http://www.zsr.org/>

GRANT RESOURCE SITES

Environmental Finance Center at UNC Chapel Hill

In addition to its Environmental Funding Database for the Southeast, the EFC provides a compendium of NC water and sewer water funding resources. Federal funding sources for environmental protection, solid waste management, watershed protection, brownfields remediation, capacity building, and energy efficiency and conservation are also posted online at <http://www.efc.unc.edu/funding.html>

Grants.gov

Allows organizations to electronically find and apply for more than \$400 billion in Federal grants. Grants.gov is THE single access point for over 1,000 grant programs offered by all federal grant making agencies.

<http://www.grants.gov/>

EPA Grants

The EPA has created a guide to assist local governments in the federal grant process. A list of all EPA grants, including regional grants, can be found at <http://www.epa.gov/epahome/grants.htm>

ENVIRONMENTAL EDUCATION

[American Honda Foundation Grants](#)

The American Honda Foundation makes grants to K–12 schools, colleges, universities, trade schools, and others for programs that benefit youth and scientific education. The average grant range is \$40,000 to \$80,000. Grants are awarded on a quarterly schedule.

[Annenberg Foundation](#)

The Annenberg Foundation focuses its grantmaking on the following program areas: education and youth development; arts, culture, and humanities; civic and community; animal services and the environment; and health and human services. Letters of inquiry that address the Foundation's interests are accepted throughout the year. The Foundation only considers organizations that are tax exempt.

[Ben & Jerry's Foundation](#)

The Ben & Jerry's Foundation offers competitive grants to not-for-profit, grassroots organizations throughout the United States which facilitate progressive social change by addressing the underlying conditions of societal and environmental problems. The Foundation will only consider proposals from grassroots, constituent-led organizations. Full grants range from \$1,001 - \$15,000 and throughout the year, the Ben & Jerry's Foundation may fund a small number of material grants for \$1,000 or less. The application process to the Ben & Jerry's Foundation begins with an initial Letter of Interest, and if invited, is followed by a full proposal. Letters of Interest may be submitted at any time and are reviewed on an ongoing basis.

[Campus Ecology Fellowships](#)

For more than a decade, NWF's Campus Ecology program has been helping transform the nation's college campuses into living models of an ecologically sustainable society, and training a new generation of environmental leaders. Campus Ecology Fellowships are awarded to college undergraduate and graduate students who desire to help reverse global warming on campus and beyond. The maximum grant request is \$3,000

[Captain Planet Foundation \\$250 - \\$2,500 Grants](#)

The Captain Planet Foundation provides grants of up to \$2,500 to school and community groups to support hands-on environmental projects. You can submit a proposal at any time during the year. However, proposals will only be reviewed the last day of March, June, September, and December.

[DonorsChoose.org and Progress Energy Support Classroom Energy Projects](#)

Progress Energy will fund \$50,000 in creative energy education projects in the North Carolina communities it serves this school year.

[Garden Club of America Scholarships and Fellowships](#)

GCA offers several research fellowships and scholarships for undergrads, grads and people already in the field. Topics include: ecological restoration, urban forestry, environmental studies, wetland studies, botany, desert studies and more.

[Georgia Pacific Foundation](#)

The Georgia-Pacific Foundation supports a wide range of organizations that improve the quality of life in communities where Georgia-Pacific operates. The Foundation has identified the following key investment areas: educational efforts; community enrichment; environmental programs; and entrepreneurship initiatives. Applications may be submitted online from January 1 through October 31, annually.

[Jenny Jones Announces Continuation of Community Grant Program](#)

Jenny's Heroes community grant program will donate \$1 million during 2009. The program provides grants of up to \$25,000 each to fund projects that promise long-term community benefits. The program's focus is primarily on smaller communities where fundraising can be difficult.

[Keepers in the Classroom](#)

Programs for children offered at your location. These K-8 programs are designed to transport N.C. Zoo's education resources into the classroom. Educators will use hands-on learning techniques to unravel the mystery and marvel of the Earth's wildlife.

[Lowe's Charitable & Educational Foundation Grants](#)

Grants range from \$5,000 to \$50,000. Community improvement projects and K-12 Public School Initiatives are primary philanthropic focus areas.

[Plum \\$500 Youth Grants](#)

Plum TV and Do Something want to see you and your project reach the next level. Youth, age 25 or under (at time of application) are eligible to apply. \$500 Plum grants are awarded weekly.

[National Geographic Society Young Explorer Grants](#)

The National Geographic Society's Young Explorers Grants offer opportunities to individuals between the ages of 18 and 25 to pursue research, exploration, and conservation-related projects consistent with National Geographic's existing grant programs, including the Committee for Research and Exploration, the Expeditions Council, and the Conservation Trust. The grant program accepts applications throughout the year.

[Pay it Forward Foundation Minigrants](#)

Pay it Forward Foundation offers minigrants (from \$50 to \$500) to fund service-oriented projects designed by youth to support their school, neighborhood, or greater community. Application deadlines are January 15, April 15 and October 15 of each year.

[Toshiba America Grants for Enhancing Math and Science Ed.](#)

Toshiba America grants up to \$5,000 for 7th-12th grade teachers and up to \$1,000 for K-6th grade teachers for enhancement in science and math education. K-6th grade program grants are due October 1. 7th - 12th grade program grants are due February 1 and August 1.

[Urban and Community Forestry Challenge Cost-Share Grant Program](#)

The National Urban and Community Forestry Advisory Council's 2009 Challenge Cost-Share Grant Program seeks to establish sustainable urban and community forests by encouraging communities to manage and protect their natural resources. Innovation Grants and Best Practices Grants of up to \$50,000

support nonprofit organizations urban and community forestry efforts. All grants must be matched at least one-to-one with non-federal funds. Applications are due in February

Some local governments also subscribe to fee based grant information sites.

Information in this Appendices has been gleaned from multiple resources most notably:
Jessica Stevermer, Master of Public Affairs Student, Western Carolina University
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