

Section 6

Strategies to Address Causes of Existing Degradation

This section discusses recommended management activities to address the major problems that are widespread in the Peachtree-Martins Creek area:

- Channel modification and lack of riparian vegetation (Section 6.1);
- Pollution from sediment, nutrients and fecal coliform bacteria (Section 6.2);

Strategies to address more localized impacts are also recommended, including:

- Stormwater issues in the Peachtree area (Section 6.3);
- Mission Quarry (Section 6.4); and
- Groundwater contamination (Section 6.5)

6.1 Channel Modification and Lack of Riparian Vegetation

Stream channels and riparian vegetation in the Peachtree-Martins Creek area have been widely modified, resulting in major degradation of ecosystem function. These problems are addressed through riparian area enhancement and stream channel restoration projects. The nature of these projects is discussed below. Potential NCEEP project sites are identified.

6.1.1 General Considerations

Riparian area enhancement (RAE) involves the re-establishment of natural woody vegetation on stream banks. RAE projects are generally undertaken where channels lack proper streamside vegetation, but basic channel morphology (form) is sound and channels are relatively stable (not subject to excessive bed or bank erosion). In some cases some bank stabilization or fencing of livestock may be a necessary part of RAE. Woody riparian zones of 30 to 100 feet on each bank are often recommended to promote aspects of watershed function (Wenger, 1999; Jones et al, 2006). NCEEP requires a minimum width of 30 feet on each bank. Projects implemented using other funding sources may utilize other riparian area widths.

Stream channel restoration (SCR) involves the re-establishment of natural stream morphology and channel hydrology by reconstructing channels with proper dimension (width and depth), pattern (sinuosity) and profile (slope). SCR projects are generally undertaken where: morphology has been highly altered by straightening or other modification; channels are incised and no longer have an appropriate connection to their floodplains; or channels are otherwise unstable. Revegetation of riparian areas is generally undertaken in conjunction with channel restoration. In some cases fencing of livestock may also be necessary.

The need for both RAE and SCR is extensive. Over 90 miles of stream have riparian areas with inadequate vegetation on both sides, while about 26 miles of stream have been channelized. NCEEP can address some of these needs, but the agency is limited both by project criteria (which determine which sites it can select) and overall mitigation needs (which determine the number of linear feet of steam improvement the agency can fund). Given these constraints it is likely the NCEEP will be able to undertake only a small portion of the work needed. If additional

progress is to be made, the HRWC or other local organizations and agencies will need to play an active role in promoting landowner participation and securing funding.

6.1.2 Recommended Strategies

Recommendation: Where channel morphology and stability have been compromised, stream channels should be restored to a natural pattern, dimension and profile. Streams identified by the IPSI as channelized (Appendix A Figure A5) provide a good first approximation of the reaches where SCR projects are needed. NCEEP should undertake these projects to the extent feasible. The HRWC should take the lead to initiate projects for stream reaches where NCEEP cannot operate.

Recommendation: Where channel morphology does not need restoration, but riparian vegetation is inadequate, woody vegetation should be replanted. Streams identified by the IPSI as having inadequate riparian revegetation provide a fairly accurate indication of reaches where RAE projects are needed (Appendix A Figure A4). NCEEP should undertake these projects to the extent feasible. The HRWC should take the lead to initiate projects for stream reaches where NCEEP cannot operate.

Recommendation: Where severely eroding stream banks exist outside of areas to be included in RAE and SCR projects, they should be stabilized and revegetated. The HRWC, Cooperative Extension Service or Cherokee County SWCD could take the lead in this work.

6.1.3 Potential NCEEP Project Sites

Sixteen potential NCEEP stream channel and riparian projects were identified and prioritized as discussed below.

Site selection

The process of identifying stream project sites for NCEEP involved three steps.

1. Initial reach identification. This involved a GIS screening using the IPSI data base to identify reaches that met the following criteria, developed to meet NCEEP project needs:

- Stream is classified as intermittent or perennial by the IPSI;
- Riparian vegetation on both banks is classified as inadequate, based on the IPSI screening (adequate is defined as a zone of woody vegetation at least 30 feet wide);
- Stream reach is $\geq 1,900$ linear feet; and
- Stream reach drainage area < 10 square miles.

2. Field reconnaissance. This involved a field evaluation to assess the reliability of the GIS data and to identify important site features that could not be determined from available GIS data. This was a limited evaluation, based on what could be observed from public rights of way. Several sites were eliminated due to feasibility concerns.

3. Scoring and prioritization. Reaches were scored based on several factors pertaining to potential mitigation value and restoration feasibility. The factors used included the following (range of possible scores shown in parenthesis):

- Number of landowners per reach (0 to 3);
- Total length of the identified project reach (0 to 2);
- Livestock access to the reach (0 to 2);

- Percent of reach identified as eroding (0 to 1); and
- Whether the reach is located adjacent to areas identified as potential wetland restoration sites (0 to 1).

Individual criteria scores for each site were summed to obtain a total site score, with possible values ranging from 0 to 9. The scoring of individual attributes is described further in the *Project Atlas*. Sites were then prioritized based on this scoring as follows: ≥ 6 = high priority; 4-5 = medium priority; ≤ 3 = low priority.

While an initial effort was made to differentiate between potential riparian enhancement and channel restoration projects, most sites appear to contain elements of both and are combined here. The site identification process is described in detail in the *Project Atlas* that is a companion document to this management plan.

Recommended sites

Sixteen feasible sites were identified (Table 6.1 and Figure 6.1), representing a total of more than 72,000 feet of potential stream projects. Riparian revegetation is warranted for virtually the entire length of all of these sites. All sites also have significant opportunities for channel restoration, although more detailed on-site evaluations would be required to accurately estimate reach lengths.

Four potential sites, totaling about 20,000 linear feet are located in the Middle Martins Creek focus area (see Section 5). Two of these had site scores placing them in the high priority category. The lower Slow Creek focus area also had four potential sites, totaling 17,000 linear feet. Two of these had site scores placing them in the high priority category. See the *Project Atlas* for additional details on the scoring and prioritization process, features of each site and detailed site maps.

Table 6.1 Summary Information for Potential NCEEP Stream Projects

Reach ID ¹	Stream Name	Sub-WS ²	No. of Landowners	Reach Length (ft)	Total Score ³	Site Priority ⁴	Focus Area
5	Hampton Ck	HCK	1	7,450	6	High	
3	Martins Ck	MMC	9	9,434	6	High	Primary
1	Martins Ck	MMC LMC	4	4,558	6	High	Primary
15	Ut Slow Ck	SHW	2	3,465	6	High	Secondary
13	Slow Ck	LSL MBR SMD	4	4,170	6	High	Primary
8	Slow Ck	LSL MPT PBT	5	7,287	6	High	Primary
4	Martins Ck	MMC	5	3,286	5	Med	Primary
2	George Ck	MMC	3	3,133	5	Med	Primary
14	Slow Ck	SMD	5	3,966	5	Med	Secondary
9	Fate Puett Cove Ck	MOB	5	3,134	5	Med	
7	Peachtree Ck	PBT	2	2,865	4	Med	
12	Graham Br	LSL	4	2,930	4	Med	Primary
19	Mission Br	CMB	2	5,901	4	Med	
10	Snead Br	LSL	3	2,623	3	Low	Primary
22	Calhoun Br	CMB	6	5,617	2	Low	
18	Ut Hiwassee	SUT	5	2,309	1	Low	

Notes:

1. See Figure 6.1.
2. If site falls into more than one sub-watershed, the primary sub-watershed is shown in bold type.
3. Scores range from 0 to 9. See *Project Atlas* for details.
4. High priority=6, medium priority=4-5, low priority=1-3.

6.2 Measures to Address Sources of Sediment, Nutrients and Fecal Coliform Bacteria

6.2.1 General Considerations

The most likely sources of bacterial contamination in the project area are livestock and inadequate human waste disposal. Sources of sediment, nitrogen and phosphorus are quite varied, with developed areas and agricultural activities both important contributors. Management activities will have to address a variety of issues in order to reduce nutrient and sediment loads. There is considerable overlap between strategies recommended to address these pollutants.

Pollution from land surfaces reaches streams via a variety of pathways, with numerous factors involved. Practices implemented to reduce *transport* can be effective in reducing loading to streams. However, the actual effectiveness of transport interception is highly variable, depending on the particular management activity and its location. Eliminating or *reducing specific pollution sources* is a more reliable and effective approach. Many strategies (e.g. BMPs to reduce sediment inputs from crop land), use elements of both approaches, depending upon the specific practice implemented.

6.2.2 Strategies for Agricultural Sources

Recommendation: Sediment and nutrients from crop land should be addressed using standard BMPs for controlling erosion, sediment and nutrients on cultivated land. These include conservation tillage, filter strips, field borders, the development of nutrient management plans and other practices. These practices are eligible for cost share from both the Natural Resources Conservation Service (NRCS) and the NC Agricultural Cost Share Program (NCACSP). These practices should be targeted at areas currently using low residue practices (Appendix A Figure A9) and other areas identified by agricultural agency staff as having a high potential for impacts. NRCS and the Cherokee Soil and Water Conservation District (SWCD) should prioritize these areas for appropriate practices.

Recommendation: Sediment, nutrients and bacterial contamination from livestock operations should be addressed using standard BMPs for controlling these pollutants on pasture land. These include limiting livestock access to streams, the establishment of buffer areas between pastures and stream channels, heavy use area protection, rotational grazing and other practices. These practices are eligible for cost share from both the NRCS and the NCACSP. These practices should be targeted at areas with documented livestock stream access (Appendix A Figure A8), pasture land that is in the poorest condition (Appendix A Figure A9) and other areas identified by agricultural agency staff as having a high potential for impacts. NRCS and the Cherokee SWCD should prioritize these areas for appropriate practices.

Discussion. Agricultural activities, including row crops and pasture, are estimated to account for about 21% of the TSS load, 33% of the TP load and 26% of the TN load in the planning area. Crop land contributes more pollution on a per acre basis than does pasture, but the amount of pasture is more extensive. The potential for pollutant inputs from crop land and pasture varies with current land condition and management. According to the IPSI a large proportion of the crop land loading (40% for sediment) comes from fields with low residue. Pasture classified by the IPSI as overgrazed accounts for 55% to 57% of the load from all pasture land, depending on

the pollutant. While ground-truthing by NRCS indicates that much of the land in this category may not be technically overgrazed, these locations do generally represent the pasture land in the planning area that is in the poorest condition.

6.2.3 Strategies for Existing Developed Areas

Recommendation. Education efforts should target property owners to inform them of the importance of a variety of activities aimed at reducing pollution sources. These include: maintaining vegetative cover; using proper erosion and sediment control methods when land disturbance is necessary; conservative use of fertilizer and other lawn and garden products; septic system maintenance; and road design and maintenance. The HRWC, Cooperative Extension Service or a county-developed watershed education program could all be appropriate entities to carry out this work.

Recommendation. Sources of fecal coliform bacteria contamination should be identified and eliminated, including contamination from both domestic waste and livestock. NCDWQ, the Wastewater Discharge Elimination (WaDE) program of the NC Division of Environmental Health and local resource agencies should work together towards this goal. This work should focus on waters where violations of water quality standards were documented by NCDWQ during the summer of 2007, although additional priority areas may be identified by further investigation. The WaDE program should conduct a field survey to determine the extent of straight piping and malfunctioning septic systems in the planning area and identify sites in need of remediation.

Recommendation. An effort should be made to identify specific developed areas which are significant and ongoing sources of sediment. Features in these areas which are major sediment contributors should be stabilized and vegetated. The HRWC, Cooperative Extension Service or Cherokee County SWCD could take the lead in securing funding for these tasks.

Discussion. Developed areas have been identified by the IPSI as a major source of sediment and nutrients, although little information is available on the specific activities within residential areas that are most responsible for generating this load. In general, sediment from established residential areas can originate from a variety of sources, including cut slopes that were never properly stabilized, eroding driveways and associated ditches, landscaping and building additions, and other sources. Nutrient inputs during storms could come from turf fertilization, eroding areas, septic system inputs, or other sources. Additionally, inputs during nonstorm periods, such as nutrients from straight pipes or septic systems may also occur but have not been quantified. Without information on which source activities are most important, it is not clear which specific source control practices should be emphasized.

The WaDE program has some resources available to assist homeowners in addressing domestic waste problems identified during field surveys. Beyond the WaDE survey, additional field assessment would be required to identify which specific areas most merit attention. In practice, effective control is difficult because important sources are dispersed, sometimes difficult to identify, and are located on private property. Unlike agriculture, there are no ongoing programs to provide financial incentives or cost-share assistance to property owners.

6.2.4 Strategies for New Construction and Disturbed Areas

Recommendation: Cherokee County should consider establishing a local Erosion and Sediment Control Program to improve enforcement of regulations and promote the use of more

effective practices. Efforts to reduce construction-related sediment will be most effective if they include not only regulatory requirements, but also non-regulatory efforts to educate contractors and property owners regarding the importance of limiting disturbance and utilizing appropriate control practices. This recommendation is discussed further in Section 8.

Discussion. Areas under construction are a significant source of sediment in the planning area. Many local residents and officials believe that existing state erosion and sediment control requirements are poorly enforced by the state, and that construction site practices are in need of dramatic improvement. Mission Quarry is also a significant source of sediment. Recommendations to address this source are discussed in Section 6.4.

6.2.5 Strategies for Roads

Recommendation: High priority areas of roadway and bank/ditch erosion should be identified and stabilized to the extent practicable. The HRWC, Cooperative Extension Service or Cherokee County SWCD could take the lead in securing funding for these tasks.

Discussion. Sediment from eroding unpaved road surfaces and eroding road banks and ditches is believed to account for about 10% of the sediment load in 2005. The vast majority of the unpaved roads and eroding banks recorded in the IPSI (Appendix A Figure 7) are on private land and maintenance is not the responsibility of the NCDOT. These roads vary greatly in the likelihood of erosion based upon the road surface (gravel, dirt or grass), the gradient, and the existence of drainage problems. Additional field assessment would be required to identify those unpaved roads that most merit attention. Additionally, rates of road surface erosion can be affected by a variety of drainage issues, such as improper ditching. Without information on specific activities associated with these sources, those source control practices that would be most useful cannot be reliably specified.

While road-related sediment sources can be dealt with in theory, control is difficult in practice. There are no ongoing programs to provide financial incentives or cost-share assistance to property owners for road repair and maintenance. Some roads will likely be found to be on slopes too steep to allow for effective erosion and runoff control. Other roads may have severe space constraints that limit remediation options. Additionally, unpaved roads require ongoing maintenance to insure proper erosion control and hydrologic condition. Even if active erosion areas are remediated, problems may return in the future if property owners do not engage in proper maintenance practices.

A variety of resources are available on road maintenance and design. NRCS has developed a guide the southern mountains (Tew et al, 1985), and the Choctawhatchee, Pea and Yellow Rivers Watershed Management Authority (Alabama) has compiled useful documentation (CPYWMA, 2000). The Penn State University Center for Dirt and Gravel Road Studies (<http://www.dirtandgravelroads.org/>) has developed a series of information bulletins on various aspects of road maintenance.

6.2.6 Other Recommendations

Recommendation: BMPs to protect water quality should be used during harvesting and other silvicultural operations, as outlined in the North Carolina Forestry Best Management Practices Manual to Protect Water Quality (NCDNR, 2006). Particular attention should be paid to recommended practices regarding streamside management zones, stream crossings and roads.

Recommendation: Landowners should be educated regarding the importance of proper maintenance and revegetation practices to limit erosion from recreational and other activities on forest land.

Discussion. Forested areas are generally not significant sources of sediment, but can become source areas in the absence of proper management. Proper silvicultural practices are important, particularly during road construction and timber harvest. Other activities, such as the intensive use of off road vehicles, can also result in erosion if these activities are not properly managed and damage is not repaired. A recent survey by the NC Division of Forest Resources (NCDFR) found that, across all sites surveyed in the NC mountains, only 69% of the appropriate BMPs were implemented, the worst record of any region of the state (NCDFR, 2005).

The repair of eroding stream banks and replanting of riparian areas, carried out to address channel modification and the lack of streamside vegetation (Section 6.1) will also serve to reduce pollutant inputs to streams.

6.3 Stormwater Issues in the Peachtree Area

Recommendation: Potential stormwater retrofit sites should be identified in the Tri-County Community College / Murphy Medical Center area, and an effort undertaken to secure funding to implement these projects. Retrofit projects would be useful even if they do not treat large areas and serve primarily educational purposes.

Recommendation: NCDWQ should continue its investigation into the nature of water quality degradation in McComb Branch and its tributaries, and the role of stormwater impacts in that degradation. NCDWQ should make recommendations to improve water quality in these streams. Recommended actions should include the identification and elimination of any illicit discharges in the Tri-County Community College / Murphy Medical Center area.

Discussion: Existing stormwater impacts in the Peachtree area can be remediated through the practice of stormwater retrofitting - installing stormwater control structures such as detention ponds, stormwater wetlands and bioretention areas in existing developed areas. An exhaustive effort was not made to identify stormwater retrofit opportunities. However, a preliminary search was made of the Tri-County Community College (TCCC) and Murphy Medical Center properties and surrounding parcels. The goal was to identify potential sites suitable for retrofits. A number of areas exist that may be suitable, though these are generally on land owned by other parties that may be subject to development in the future. Two areas on the TCCC property may be suitable for a small facility such as a bioretention area (Figure 6.2). Both sites receive runoff from College buildings and parking lots, though the area draining to each site is difficult to determine since the contributing areas to individual storm outflows are not clear.

- Site No.1 is turf area of approximately one acre between the tennis courts and the NC Division of Forest Resources office;
- Site No. 2 is a somewhat larger field (2.7 acres) located behind the Cochran Funeral Home.

Without better design and stormwater control practices, further stormwater impacts in the vicinity of US64/ NC141 are likely as additional commercial developments occurs. Implementation of these practices is critical to prevent further deterioration in the McComb

Branch sub-watershed, which has already seen substantial impacts. Recommendations regarding stormwater management are discussed further in Section 8.

Tributaries to McComb Branch flow under both the TCCC campus and facilities adjacent to the Murphy Medical Center. The nature of connections to these underground segments (from both stormwater and other sources) is unknown. The potential for illicit discharges is a particular concern in the TCCC area due to high baseflow metals concentrations and unusual stream discharge conditions observed by NCDWQ.

6.4 Impacts from Mission Quarry

Recommendation: In order to reduce sediment impacts to the stream below the quarry and to the Hiwassee River, the NCDWQ and NCDLR should continue their effort to bring the Mission Quarry operation into compliance with all operating permits. Steps should be taken to ensure that ongoing enforcement is sufficient to induce continued compliance and that additional impacts do not occur.

Recommendation: NCDWQ should continue its efforts to identify the source of high conductivity in the stream below the quarry, as well as high nutrient levels. The agency should make recommendations for water quality improvement upon completion of the investigation.

6.5 Groundwater Contamination

Recommendation: The NC Division of Waste Management (NCDWM) should conduct follow up sampling of private drinking wells in the Peachtree area to determine if a health risk exists from groundwater contamination at the Tri-County Community College or Moog sites. Sampling should be conducted in consultation with the Cherokee County Health Department.

Recommendation: NCDWM should continue to monitor compliance with remediation activities at the two sites to insure that reductions in contaminant concentrations continue and that required monitoring occurs.

No threat to drinking water or to aquatic life has been documented from the contaminated groundwater. However, additional investigation of drinking water wells is warranted.