

CHAPTER 6

MAJOR BASINWIDE WATER QUALITY CONCERNS AND RECOMMENDED MANAGEMENT STRATEGIES

6.1 INTRODUCTION

Clean water is critical to the health, economic and ecologic well-being of this region of the state. Tourism, water supplies and a high quality of life are dependent on the water resources of this basin. Fortunately, many of the waters within the basin are still of high quality. The exceptions are Brasstown Creek and portions of the Valley River, which are currently rated Partially Supporting their intended uses. However, there are reasons to be concerned about the quality of other portions of the Valley River and Junaluska Creek, which are rated Support Threatened and are showing some signs of water quality degradation. The major concern for waters of the basin is erosion from such land use activities as residential developments, private road construction and agriculture. Other concerns include impacts associated with population growth and development of thoroughfares. Unfortunately, solving these problems and protecting water quality in the face of continued growth and development will be a major challenge.

Protecting water quality standards and intended uses requires controlling the causes and sources of water pollution. Sediment, toxics and fecal coliform bacteria are problem pollutants of concern in the Hiwassee River basin. Sedimentation, perhaps the problem most likely to worsen with future development of the mountain region, is discussed in section 6.4.

The long range mission of basinwide management is to provide a means of addressing the complex problem of planning for increased development and economic growth while protecting and/or restoring the quality and intended uses of the Hiwassee River basin's waters.

In striving towards this mission, DWQ's highest priority near-term goals are as follows:

- **To identify and restore impaired waters in the basin.** Section 6.3 discusses impaired waters (there is one impaired water in the basin). Section 6.4 discusses threatened waters and recommended strategies for restoring these waters.
- **To identify and protect high value resource waters and biological communities of special importance.** Section 6.5 discusses management strategies for protecting the HQW/ORW's in the basin.
- **To manage the causes and sources of pollution so as to ensure the protection of those waters currently supporting their uses while allowing for reasonable economic growth.** Major water quality issues addressed under this topic include management of growth and development (Section 6.6.1), sedimentation (Section 6.6.2), urban stormwater runoff (Section 6.6.3), fecal coliform bacteria (Section 6.6.4), toxic substances (Section 6.6.5), and oxygen-consuming wastes (Section 6.6.6).

6.2 MAJOR WATER QUALITY CONCERNS AND PRIORITY ISSUES

6.2.1 Growth and Development

Growth Trends and Water Quality

There has been limited growth in the Hiwassee River basin, with growth occurring primarily in Clay County and near Hayesville. This trend is expected to continue. Impacts to water quality from growth and development can include sedimentation, streambank erosion and degradation from a variety of fertilizers, chemicals, and road salts.

Traditionally, growth and development within the basin has occurred mostly along streams and rivers where lands are less steep. Growth along waterways can have a significant negative impact on water quality if construction activities are not undertaken with proper care. Recently, construction activities have also occurred on mountain ridges and slopes to obtain views of valleys and ridges. Building on slopes can be particularly harmful to water quality if appropriate erosion and sedimentation control measures are not used. Slopes tend to have soil types that are more shallow and unstable than those in valleys. Often, driveways to home sites on slopes are greater than 12% slope, the recommended slope for reducing erosion potential (Willett, pers. comm.).

In recent years, there has been a wave of development from Atlanta, Georgia to the North Carolina state line. Parcels of property have sold rapidly throughout areas of the Hiwassee River basin. Clay County has seen an approximate doubling of land parcels over the last ten years (Willett, pers. comm) as land is subdivided. Clay County is especially attractive to developers because of the beauty of the area, easy access due to new multi-lane highways, close proximity to Atlanta and recreation opportunities on Chatuge Lake. To date, most of the land has not been built upon. Approximately 61% of the land parcels in Clay County are held by out-of-state developers that intend to subdivide these large parcels when the market is most receptive (Mike Decker, pers. comm). When these developers perceive that the timing is right for building out these parcels, the rate of growth within this basin will accelerate quickly and may be too fast for local governments to keep pace with (Willett, pers. comm). The basin also receives a tremendous seasonal population fluctuation.

Proactive planning efforts at the local level are needed to assure that development is done in a manner that maintains the high water quality that is presently attracting people to the area. While increases in tourism and development can be seen as very positive for this portion of the state with some of the lowest average per capita incomes in the state, it is also very important for local governments and community leaders to look towards the future and balance economic growth with protection of the natural resources that draw people to the area.

Growth management requires planning for the needs of future population increases as well as maintaining a strong tourism base. These actions are critical to water quality management and the quality of life for the residents of the basin. Refer to section 6.6.1 for recommended management strategies relating to proper planning for growth and development.

Influence of the Cherokee Reservation Gambling Casino on Growth and Water Quality

The Cherokee Reservation gambling casino, the only legalized gambling casino in the Southeast, is geographically situated to become "...one of the primary gambling centers east of the Mississippi. It will be centrally located to many eastern cities and is within 500 miles of over half the U.S. population" (Willett and Eller, 1995). The development of the gambling casino on the Cherokee Indian Reservation is estimated to attract an additional 2 million visitors per year to the Reservation (Willett and Eller, 1995). It is expected that these visitors will tour surrounding areas.

A recent NC Division of Community Assistance study (Willett and Eller 1995) suggests that western North Carolina will be permanently impacted by the development of the Cherokee Indian Reservation gambling casino. In addition to other effects not related to water quality, the region is likely to experience:

- 1) The need for additional state support for road improvements. Road improvements will entail construction and the potential for increased erosion and sedimentation, as well as the potential for increased effects of acid runoff to streams if Anakeesta rock formations are exposed (See Multi-Lane Highways discussion below);
- 2) Increased traffic which may result in increased water quality impacts through stormwater runoff and exhaust emissions that contribute to acid rain (See discussion on acid deposition below);
- 3) The need for higher taxes to pay for the increased need for local government services (water and sewer improvements alone are estimated at \$5.6 million); and
- 4) The diversion of dollars from existing businesses to gambling enterprises and displacement of non-gambling tourists who travel to other areas to avoid increased traffic, lack of hotel accommodations, and avoidance of the gambling atmosphere (Willett and Eller, 1995).

The gambling casino may have effects on water quality as the outlying areas experience accelerated commercial activity due to displacement and spill-over. Commercial activity in these outlying areas will increase the demand for roads and services. In addition, strong economic activity may be viewed as an additional reason to build second homes or establish a new business by an outside entrepreneur. Construction of homes, commercial areas and roads increase stormwater runoff and sedimentation problems. This demand for goods, services and homes will need to be planned for and managed in order to reduce the potential for degradation of water resources. (See section 6.1 for recommended management strategies relating to proper planning for growth and development.)

Multi-Lane Highways

The NC Division of Community Assistance report estimates an additional 1,040,000 vehicles each year along six major traffic routes in western North Carolina. This dramatic increase in traffic will require significant changes to traffic flow patterns throughout western North Carolina. At present, there are six major corridors (See Chapter 2) planned by the NC Department of Transportation for improving traffic flow. These thoroughfares are expected to relieve the present congestion experienced by travelers in the vicinity of the Cherokee Reservation and provide opportunities for easy access to rather remote areas of the state. Corridor 1, through the Hiwassee River basin, is expected to carry an additional 72,800 vehicles on US 19/129.

The development of the four-lane thoroughfare from Andrews to Almond (via Robbinsville) will provide access to Robbinsville and Graham county for economic development in the area (DOT, 1996). This thoroughfare should also increase traffic flow across the mountains through the Hiwassee River basin, from Atlanta to the Great Smoky Mountains National Park and the Cherokee Indian Reservation gambling casino. Under the DOT Transportation Improvement Program, US Hwy. 64 will be widened to a five lane highway from NC 69 to the Hiwassee River. NC Highway 175 will be upgraded from the Georgia state line to the junction with US 64. That portion of US 64 from the Clay county line to Murphy is expected to be rerouted to a new location and developed to a two lane roadway, ultimately to become a four lane stretch of highway. NC 60 is planned to be developed to a four lane highway from the Georgia state line to US 64-74.

During road construction there are also increased risks for sediments to enter surface waters. Also, Anakeesta rock formations are sometimes found in this region of the state. These rock formations

can also significantly impact water quality if not handled properly. Chapter 4 provides more detail on water quality problems associated with Anakeesta rock formations and Chapter 5, Section 5.6.2 describes the N.C. Department of Transportation road construction policies in areas with Anakeesta rock formations. When roads are built along streams or rivers, there is also the increased potential for toxic and synthetic substances to enter these waters as runoff.

Acid Rain/Deposition

The developments of thoroughfares will make it easier for tourists and developers to access and use the area. As traffic flow increases, the emission of nitrous oxides from vehicles to the atmosphere will increase. Nitrous oxides react with volatile organic compounds to create ozone. At times, ozone levels in the Great Smoky Mountains National Park can reach levels nearly double the average ozone level in Raleigh (News and Observer, Sept. 1, 1996). The man-made pollutants that trouble the peaks of the Smokies is creating more widespread problems throughout the Southern Appalachians, as noted by the Southern Appalachian Man and the Biosphere (SAMAB). The region of the GSMNP presently receives some of the most acidic deposition in the country. This high amount of deposition combined with the low stream buffering capacity and the fact that the capacity of the soils to absorb excess nutrients has been reached in many areas, has produced many low pH streams at higher elevations and higher stream nitrogen levels than in any other national park (News and Observer, Sept. 1, 1996). Refer to Chapter 4 for a more thorough discussion of the effects of acid deposition of high elevation streams in western North Carolina.

6.2.2 Priority Issues as Identified by Workshop Participants

A public workshop was conducted in the Hiwassee River basin in Murphy in November 1995. Participants were asked to identify what they saw as the priority issues for the Hiwassee River basin. After issues were identified, participants were asked to recommend management actions to address the priority issues. Issues and actions were grouped into major categories by DWQ. A complete listing of workshop responses is presented in Appendix XI.

Table 6.1 provides the priority issues as identified by workshop participants. Issues are identified by category with a summary of the comments for each category. While each identified issue may not be directly responded to in the plan, an effort has been made to consider these issues within the framework of the basinwide approach. Where there has been some discussion about the category or specific comments within the plan, the table provides this reference.

Some suggested solutions to the identified priority issues were also presented by workshop participants and they have been incorporated into the summaries. Many of these solutions have likewise been recommended within this plan. Other recommendations by workshop participants will require further discussion with other agencies over the five year planning cycle of the basin.

6.2.3 Priority Issues and Recommended Actions Identified by Nonpoint Source (NPS) Team Members

DWQ has begun setting up nonpoint source teams in each of the state's 17 major river basins. These teams will have representatives from agriculture, urban stormwater, construction, mining, on-site wastewater disposal, forestry, solid waste, wetlands, groundwater, natural resource agencies, local governments, special interest groups and citizens. These teams will provide descriptions of current NPS management activities within a basin, conduct assessments of NPS controls in targeted watersheds, prioritize impaired waters for development and implementation (including funding) of restoration strategies and prioritize NPS issues for remedial action. The team will develop five year action plans to reflect these priorities.

Table 6.1 Priority Issues Identified by Workshop Participants (Sheet 1 of 2)

Comment Summary	DWQ Comments	Reference
<p>WASTEWATER TREATMENT PLANT DISCHARGES</p> <p>Concerns were expressed over whether the state could do more to clean up sewage treatment water and control toxic discharges from individual WWTP permits. Participants wanted to make sure the Valley River was protected. One participant observed that water quality in the river was much better than it was 20 years ago because of WWTP improvements.</p>	<p>NPDES permit limits are set to protect stream uses and limits are established for each individual discharger. As noted in the comment column, there have been major improvements, over the years, in the treatment levels at WWTPs. However, better treatment is expensive, and problems still persist for some facilities.</p>	<p>See Sections 3.3, 5.4, 6.5.2 and 7.3</p>
<p>BALANCING WATER USES AND FUTURE PLANNING</p> <p>Need to recognize and accommodate a wide range of stream uses. Tourism versus private property was mentioned at the workshop, as was the need to protect water resources for the future.</p>	<p>Protecting water uses is a basic premise of the federal Clean Water Act and the state's Water Quality Program. Finding ways of protecting competing uses is a major challenge and is one of the reasons for establishing the basinwide approach. Local land use planning will be important and recommendations are presented later in this Chapter. Information on water supply uses is presented in Chapter 2.</p>	<p>Sections 4.4, 4.5, 6.2, 6.6.1, Chapter 2 and Appendix II.</p>
<p>EMPHASIZE LOCAL VOLUNTARY EFFORTS</p> <p>Several comments were made indicating that we have enough regulation, that more emphasis should be placed on voluntary efforts and that the counties should be able to control their own affairs and not be told what to do by the state. It was also stated there should be more emphasis on proactive management versus reactive and that cooperative efforts should be encouraged. Participants suggested that the basinwide approach could be marketed better (delivery of message).</p>	<p>DWQ recognizes and strongly supports local efforts to protect water quality. This is one of the reasons the Division has begun establishing nonpoint source teams in each basin. This is a way of encouraging and involving governments, ag community reps and others in water quality management activities. NPS teams may play a growing role in targeting expenditure of state & federal funds for WQ protection.</p>	<p>Sections 5.6.3 and 7.2.2</p>
<p>PRIVATE PROPERTY RIGHTS</p> <p>Private property owner rights (the "takings" issue) needs to be addressed, particularly as it relates to wetlands regulation. If lands or land uses are to be restricted or taken away, then compensation should be provided. Development of a local conservation trust that could help property owners gain tax relief for setting aside buffers or other lands is a possibility.</p>	<p>DWQ has recently adopted new wetlands rules that help address this issue through providing more flexibility to property owners in the form of mitigation. In addition, The General Assembly passed a Wetlands Restoration Bill (HB 53) that is intended, in part, to simplify mitigation and streamline permit processing for permit applicants.</p>	

Table 6.1 Priority Issues Identified by Workshop Participants (Sheet 2 of 2)

Comment Summary	DWQ Comments	Reference
<p>WATER QUALITY MONITORING</p> <p>The question was asked, "why can't we monitor all streams?" More complete water quality monitoring would provide better understanding of water quality and sources of pollutants.</p>	<p>DWQ agrees with the need for accurate and comprehensive monitoring data for both assessing water quality and identifying pollution sources. Since resources are limited, efforts are underway to explore data sharing with others such as TVA.</p>	<p>Chapter 4 and Section 7.3</p>
<p>GOVERNMENT MISTRUST</p> <p>There was strong sentiment expressed by some participants that government misrepresented facts and that regulations were not enforced equally. It was recommended that government activities be better coordinated and that government set an example for the private sector.</p>	<p>DWQ acknowledges that major inconsistencies sometimes occur in the ways laws are enforced. This can result from a number of factors such as differences between regulations of different agencies at different levels of government (federal, state, local), or differences of opinion on how a specific law or regulation should be enforced. Having said that, it is strongly recommended that government (including DWQ) make every effort to address inconsistencies and that it be forthcoming with the facts. The basinwide planning approach is one way in which DWQ attempts regulatory programs to the public.</p>	
<p>"Comment Summary" is a summary of workshop comments summarized by DWQ. Complete comments are presented in the Appendix.</p>		
<p>"DWQ Comments" are comments/responses from the Division of Water Quality.</p>		
<p>"Reference" means the section of the basinwide plan where additional information may be found. The first number of each section refers to the chapter.</p>		

At the first meeting of the Hiwassee NPS Team in April 1996, the Team members identified development as the priority issue within the basin. The team also presented recommended actions to address development issues (Table 6.2). Issues and recommendations presented by the NPS team members will be incorporated into the five-year action plan being developed by the team. DWQ will continue to work with the NPS team to clarify the water quality issues of the Hiwassee River basin and formulate implementable strategies to deal with these issues.

Table 6.2 Priority Issues and Actions Recommended by the Nonpoint Source Team Members

Priority Issue	Recommended Actions
<ul style="list-style-type: none"> • Golf courses, strip malls, and second homes are being constructed all over the basins. • Private access roads and forest service roads are causing erosion problems. 	<ul style="list-style-type: none"> • Buffers need to be established and protected to shade waters. • Streambanks in developed areas should be properly stabilized.

Refer to Chapter 3 for discussion on how development can impact water quality. Refer to Section 6.6 for recommended strategies to protect waters from being degraded by the sedimentation often associated with development activities.

6.2.4 Priority Issues and Recommended Actions Identified by the Year of the Mountains Commission

The Year of the Mountains Commission was organized under an Executive Order of the Governor in 1995. The objectives of the Commission were to: 1) Educate, promote and celebrate the distinctive natural and cultural heritage of the WNC communities and region; and 2) Develop and market public policy goals which can address the issues of quality growth and development, natural resource protection, and preservation of the cultural identity of the WNC mountain region. The following recommendations relating to natural resource protection and specifically to water quality issues were made by the Commission .

- The establishment and/or expansion of sound planning capabilities throughout the 29 counties involved in The Year of the Mountains. The State should provide direct financial assistance to the counties of Haywood, Jackson, Swain, and Macon to assist in planning and preparing for development pressures as direct or indirect consequences from gaming on the Cherokee Indian Reservation.
- The State should encourage local governments to implement capital improvement planning in WNC. Encourage a system of long-term capital improvements planning through project grants or loans to local governments, perhaps through a baseline capital improvements financing fund; encourage congressional delegates to reconfigure and increase federal payments to local governments that have a lot of public lands.
- Protect and Enhance Water Quality. Establish a state and regional partnership to aggressively pursue a program to eliminate "straight-piping"; increase funding to the N.C. Agricultural Cost Share Program; increase funding and personnel for inspections of mines, dams and development sites; increase funding to the Governor's Task Force on Forest Sustainability to ensure inspection and mitigation of any negative forest impacts on water quality.
- Improve the air quality in WNC to reduce adverse effects on human health and the environment. Encourage support of Southern Appalachian Mountain Initiative (SAMI) and the Southern Appalachian Man and Biosphere (SAMAB) initiatives; seek and support federal and state regulations to limit air pollutants and to monitor the effects of air pollutants on ecosystems.
- Improve integration of environmental education into school curricula. Increase appropriations to the N.C. Environmental Education Plan and establish an Environmental Education Trust Fund for education grants to schools and communities.

6.3 IDENTIFICATION AND RESTORATION OF IMPAIRED AND "THREATENED" WATERS

6.3.1 What Are the Impaired Waters?

Impaired waters are those waters identified in Chapter 4 as partially supporting or not supporting their designated uses. The impaired streams in the basin are Brasstown Creek and portions of the Valley River (Table 6.3). These are the only waterbodies in the basin identified as impaired based upon biological or chemical monitoring data collected between 1990 and 1994. Some impaired waterbodies may not have been identified by DWQ due to the unavailability of chemical or biological monitoring data for those areas, so it cannot be assumed that there are no other impaired waters in the Hiwassee River basin. See Chapter 4 for explanation of use support ratings.

Table 6.3 Partially Supporting or Not Supporting Waters in the Hiwassee River Basin

Subbasin	Waterbody	Use Rating	No. of Miles	Source	Management Strategy	Chp. 6 Reference Section
04-05-01	Brasstown Creek	PS	8.5	NPS, P	Water quality problems are partially due to point source discharges in Georgia. Further monitoring at this site and coordination with Georgia's EPD is recommended. Impairment is likely primarily due to runoff from NC 66 and land use activities. The SENRLG (pg. 5-16) plans to survey the creek for potential restoration activities.	Section 6.4.1
04-05-02	Valley River (above Andrews)	PS	19.6	NPS	The source of impairment is unknown. Investigations of the river length could be a focus of the NPS team.	Section 6.4.2
NOTES:						
PS	Partially Supporting classified uses					
NS	Not Supporting classified uses					
NPS	Impairment due to Nonpoint Source pollution, though specific sources may not be known					
P	Impairment attributed to Point source pollution					

6.3.2 What are the "Threatened Waters"?

The following waters have notable water quality problems (Table 6.4) but the impact of the problem is not severe enough to cause the stream to be considered impaired under the state use support designation described in Chapter 4. These waters are rated support-threatened. These support-threatened waters may require additional monitoring to follow any changes in water quality over time. The identification of support-threatened waters can be useful to determine the sources and causes of degradation and determine if management strategies can be used to reduce or eliminate the causes of pollution.

Table 6.4 Support-Threatened Waterbodies in the Hiwassee River Basin

Subbasin	Waterbody	Use Rating	No. of Miles	Source	Management Strategy	Chp. 6 Reference Section
04-05-02	Valley River near Rhodo and Tomatla	ST	9.3	NPS	The pollution source is unknown and needs to be identified.	Section 6.4.2
04-05-02	Junaluska Creek	ST	7.4	NPS	Sources of degradation need to be identified.	Section 6.4.2
NOTES:						
PS	Partially Supporting classified uses					
NS	Not Supporting classified uses					
NPS	Impairment due to Nonpoint Source pollution, though specific sources may not be known					
P	Impairment attributed to Point source pollution					

6.3.3 How are Waters Prioritized for Restoration or Protection?

Priority Ratings for Nonpoint Source Control Federal Grant Spending

DWQ has developed criteria for assisting in the selection of NPS-impaired waters for prioritization by NPS agencies. It is expected that these priority waterbodies will be targeted by the various NPS agencies and groups in the allocation of the financial, technical, or educational assistance they deliver. These criteria are discussed in Appendix VII in the discussion of NPS Teams. In summary, the criteria for NPS-impaired waters are:

- highly valued resource waters in need of restoration or protection from NPS pollution, and
- waters with impaired water quality as a result of NPS pollution.

In all cases, waters prioritized for action should be those that have a high likelihood for restoration.

Section 303(d) of the Clean Water Act (CWA)

States are required to develop a list of waters not meeting water quality standards or which have impaired uses (Partially Supporting or Not Supporting) under Section 303(d) of the Clean Water Act. Waters may be excluded from the list if existing control strategies are expected to achieve the standards or uses. Control strategies may be both point or nonpoint programs. Waterbodies which are listed must be prioritized and a management strategy or Total Maximum Daily Load (TMDL) must be developed.

Use support ratings for the 303(d) list are based on monitoring data collected in the last five years. Further information on the 303(d) program and a complete list of waters in the Hiwassee River basin can be found in Appendix X. The list includes use support ratings, major causes and sources of impairment, descriptions of potential sources of pollution and the stream priority rating.

6.4 PRIORITY ISSUES AND RECOMMENDED MANAGEMENT STRATEGIES BY SUBBASIN

6.4.1 Chatuge Lake and Hiwassee River (Subbasin 04-05-01)

Overview

Overall water quality in the subbasin is considered Excellent based on benthic macroinvertebrate data collected since 1985. Very little physical/chemical water quality data has been collected in the subbasin to support or contradict the biological assessment. There are no ambient water quality monitoring stations in this subbasin, and only one (Hayesville) of the four NPDES permitted dischargers is required to conduct instream monitoring. The Town of Hayesville, with a maximum permitted waste flow of 0.073 MGD to Town Creek, is the only significant discharger of oxygen consuming waste. The TVA-Chatuge Hydro Electric plant is the largest discharger with a maximum permitted flow of 0.36 MGD. However, the TVA discharge is not known to contain oxygen consuming wastes or toxicants, and is not considered to have a significant impact on water quality.

Issues and Recommended Management Strategies

Brasstown Creek

Brasstown Creek is rated Partially Supporting its designated uses and is therefore considered impaired. The creek originates in north Georgia and flows along NC 66 for most of its length. The creek is affected by nonpoint source runoff from the highway and various land use activities. Brasstown Creek is also affected by elevated levels of fecal coliform bacteria relating to the effluent from the Young Harris Water Pollution Control Plant.

Senior U.S. District Judge Marvin Shoob recently noted that Georgia's Environmental Protection Division (EPD) had missed the 1979 Clean Water Act deadline for states to identify which waters are heavily polluted and to identify the assimilative capacity of these waters. This realization occurred due to a suit brought against EPA by the Sierra Club in 1994. By 1994, Georgia had set pollution limits for only two of the 340 polluted waterways it had identified. The Judge ordered the EPA and the Sierra Club to submit plans to remedy the problem and ordered a trial to consider whether the EPA should have approved Georgia's list of 340 polluted waters. The outcome of this case is still pending.

The Southeastern Natural Resources Leaders Group (SENRLG) has chosen Brasstown Creek as a potential waterbody for conducting a survey of land use activities and identifying potential restoration projects. The efforts of SENRLG could have very positive benefits for Brasstown Creek.

The State of North Carolina and DWQ should work more closely with Georgia's EPD to assure that proper NPDES limits are established and maintained for those dischargers in the upper Hiwassee River watershed as these streams enter North Carolina.

Town of Hayesville

The Hayesville WWTP has experienced chronic compliance problems over the years with its BOD5, fecal coliform, and flow permit limits. Operational problems and high waste flows appear to be the primary cause. In January 1996, Clay County took over operation of the plant from the town. Since the Hayesville plant is at capacity, the county is planning to construct a new 0.3 MGD WWTP with an outfall to the Hiwassee River. The additional capacity will help get failing septic systems connected as well as to help prepare the county for the predicted future growth. Construction of a new WWTP should be considered environmentally preferable over the current

situation given that the new plant should produce a better quality effluent and the Hiwassee River has a greater assimilative capacity than Town Creek.

The impact the Hayesville WWTP has had on Town Creek is difficult to assess because the town has not been conducting its instream monitoring in accordance with its permit. The town has been collecting downstream data too close to the outfall. As a result, the downstream dissolved oxygen (DO) measurements are likely not capturing the DO sag. The Asheville regional office has contacted the town about this error and more representative data should be forthcoming in the future. Improved water quality in Town Creek is expected once the Hayesville discharge is removed.

Chatuge Dam Operation

The Tennessee Valley Authority (TVA) operates Chatuge Dam on the Hiwassee River approximately 4.5 miles upstream of the proposed new Hayesville WWTP. The dam is used for flood control, recreation, and power generation from its single turbine. TVA has no minimum release requirement from the dam. A discontinued USGS gauging station located approximately 1.5 miles downstream of the dam repeatedly recorded monthly minimum stream flows of < 2.0 cfs over the last ten years of its operation (1965-1975). When water is being released from the dam maximum stream flows can be over 1000 cfs.

Since water used to generate electricity is drawn from near the bottom of Chatuge Lake, instream dissolved oxygen (DO) concentrations below the dam can be <1.0 mg/L. In order to minimize the wide fluctuations in streamflow as well as to increase the instream DO concentration, TVA constructed a reaeration weir approximately 0.8 mile downstream of the dam. The reaeration weir was put into service in November 1992. The weir is designed to maintain a minimum instream DO concentration of 5.0 mg/L and a minimum flow of 60 cfs from the weir pool.

Given the potential for DO concentrations to be near the state standard of 5.0 mg/L immediately below the reaeration weir, it is recommended that Hayesville conduct instream DO monitoring once Clay County relocates the outfall to the Hiwassee River.

6.4.2 Hiwassee River, Hiwassee Lake and Apalachia Lake (Subbasin 04-05-02)

Overview

Overall water quality in this subbasin is considered very good. The majority of the 17 benthos sites surveyed resulted in excellent bioclassifications for the streams sampled. The two ambient monitoring stations in the subbasin did not detect any dissolved oxygen or toxicant violations during the period January 1990 to December 1994. However, Valley River near the Town of Andrews was identified in 1994 by DWQ biologists in a special study as having lower than expected water quality.

Issues and Recommended Management Strategies

The Town of Andrews

The Town of Andrews operates a 1.5 MGD WWTP which discharges to Valley River. The 1994 special study could not attribute the observed water quality problems in Valley River (rated as Partially Supporting) solely to the Andrews discharge since samples taken upstream of the discharge indicated water quality problems as well. The Andrews WWTP had compliance problems when it failed three toxicity test in 1995. Since those three failures the town has passed its toxicity test the last four consecutive times. It is recommended that the Andrews municipal area be targeted for a non-point source survey to determine if non-point sources of pollution are contributing to the water quality problems in the area.

The Town of Murphy

The Town of Murphy operates the second largest WWTP in the subbasin with a maximum permitted discharge of 0.925 MGD to the Hiwassee River. The town has had no significant compliance problems nor has it failed any toxicity tests since 1992. However, the Asheville Regional Office has reported that the town has substantial inflow and infiltration (I&I) problems. The I&I problems have resulted in occasional raw wastewater discharges to the Hiwassee River. Currently the town is under a flow moratorium for additional sewer hookups. The Town of Murphy is working with an engineering consulting firm to alleviate the I&I problems as well as to investigate the possibility of an expansion. Long term instream dissolved oxygen problems are not anticipated as a result of this discharge. It is recommended that the facility continue to monitor its effluent for total phosphorus and total nitrogen in order to provide nutrient data for the future management of Hiwassee Lake.

Clifton Precision South Division

Clifton Precision South Division operates a 0.3 MGD groundwater remediation facility which discharges to Slow Creek. The instream waste concentration is 46%. The facility failed its toxicity test six consecutive times during a period stretching from August 1995 to March 1996. The Asheville Regional Office investigated the problem and it was determined that the treatment units were undersized. Clifton Precision has responded by adding an additional carbon adsorption unit as well as recirculation equipment. Since the treatment upgrade the facility has passed the subsequent two toxicity tests. Extra attention should be given to this facility to ensure that long periods of toxicity test failures do not reoccur.

Valley River

The Valley River is rated either Support Threatened or Partially Supporting its designated uses at the three DWQ sampling sites above Andrews, near Rhodo and near Tomatla. The Partially Supporting portion of the river is addressed above under discussion for the Town of Andrews. The entire length of the Valley River should be a focus of the Hiwassee NPS team to determine the sources of degradation to the river.

Junaluska Creek

Junaluska Creek is bordered by SR 1505 from its headwaters to the Town of Andrews. It is likely that this road is contributing to its Support Threatened status. As a tributary of the Valley River, Junaluska Creek should also be investigated for potential sources of degradation by the Hiwassee NPS team.

6.5 IDENTIFICATION AND PROTECTION OF HIGHLY VALUED RESOURCE WATERS

6.5.1 Overview of High Quality and Outstanding Resource Waters as well as Special Classifications and Habitats

Waters considered to be biologically sensitive or of high resource value may be given protection through reclassification to HQW (high quality waters), ORW (outstanding resource waters), Tr (trout) or WS (water supply), or they may be protected through more stringent NPDES permit conditions. Waters eligible for reclassification to HQW or ORW may include native trout waters, designated critical habitat for threatened or endangered species (as designated by the NC Wildlife Resources Commission), waters having Excellent water quality or those classified for domestic water supply purposes (WS I and II). The HQW, ORW and WS classifications generally require more stringent point and nonpoint source pollution controls than do basic water quality classifications such as C or SC (see Appendix II).

The Hiwassee River basin contains a large number of streams that have either ORW or HQW classifications, as well as trout (Tr) and water supply (WS) status. Britton Creek was reclassified to HQW in August 1992. Based on data collected from summer 1994 surveys, the following streams may qualify for ORW/HQW reclassification:

- Peachtree Creek
- Hanging Dog Creek
- Persimmon Creek
- Beaverdam Creek

There are eleven species listed by the NC Natural Heritage Program as Endangered, Special Concern or Significantly Rare in the Hiwassee River basin. Those listed as Endangered and Special Concern are given special protection status by the North Carolina Wildlife Resources Commission and/or the North Carolina State Endangered Species Act (G.S. 113-331 to 113-337). The species and the status of each can be found in Section 2.5.

Where waters are known to support state or federally listed endangered or threatened species or species of concern, consideration will be given during the NPDES permitting process to minimize impacts to habitat areas consistent with the requirements of the federal Endangered Species Act and North Carolina's endangered species statutes. Possible protection measures may include but are not limited to dechlorination or alternative disinfection, tertiary or advanced tertiary treatment, outfall relocation, and backup power provisions to minimize accidental plant spills. The need for special provisions will be determined on a case-by-case basis during review of individual permit applications and take into account the degree of impact and the costs of protection.

6.5.2 Strategies for Controlling Discharges to High Quality Waters (HQWs) and Outstanding Resource Waters (ORWs)

The presence of many HQW and ORW streams in the basin (Refer to Figure 2.9) will prevent the addition of any new discharges or expansion of existing discharges in many parts of the basin.

High Quality Waters (HQWs)

Many streams in the Hiwassee River basin are classified as high quality waters. For HQWs, a distinct set of management strategies applies to wastes discharged from a facility. New discharges and expanding discharges that have an increase in pollutant load to HQW streams are subject to the following management strategies adopted by DWQ pursuant to 15A NCAC 2B.0224 (1) and 15A NCAC 2B .0224 (1)(b)(vii):

- Discharges from new single family residences will be prohibited. Those that must discharge must install a septic tank, dual or recirculating sand filters, disinfection and step aeration. (15A NCAC 2B.0224 (1)(a)).
- All new or expanded wastewater discharges (except single family residences) will be required to meet effluent limitations for oxygen consuming wastes as follows: BOD₅ = 5 mg/l, NH₃-N = 2 mg/l, and DO = 6 mg/l. More stringent limitations will be set, if necessary, to ensure that the cumulative pollutant discharge of oxygen consuming wastes will not cause the DO of the receiving water to drop more than 0.5 mg/l below background levels, and in no case below the standard. Where background information is not readily available, evaluations will assume a percent saturation determined by staff to be generally applicable to that hydroenvironment. (15A NCAC 2B .0224 (1)(b)(i)).
- Emergency Requirements: Failsafe treatment designs will be employed (except single family residences), including stand-by power capability for entire treatment works, dual train design

- for all treatment components, or equivalent failsafe treatment designs. (15A NCAC 2B .0224 (1)(b)(iv)).
- **Volume:** The total volume of treated wastewater for all discharges combined will not exceed 50 percent of the total instream flow under 7Q10 conditions. (15A NCAC 2B 0.224 (1)(b)(v)).
 - **Toxics:** In cases where complex wastes (those containing or potentially containing toxicants) may be present in a discharge, a safety factor will be applied to any chemical or whole effluent toxicity allocation. The limit for a specific chemical constituent will be allocated at one half of the normal standard at design conditions. Whole effluent toxicity will be allocated to protect for chronic toxicity at an effluent concentration equal to twice that which is acceptable under design conditions. In all instances there may be no acute toxicity in an effluent concentration or 90 percent. Ammonia toxicity shall be evaluated according to EPA guidelines promulgated in "Ambient Water Quality Criteria for Ammonia - 1984"; EPA document number 440/5-85-001; NTIS number PB85-227114; July 29, 1985 (50 FR 30784).
 - North Carolina does not have a numeric water quality standard for suspended solids. All dischargers must meet federal effluent guideline values at a minimum (e.g. 30 mg/l for domestic discharges). New discharges to high quality waters (HQW) must meet a total suspended solids (TSS) limit of 10 mg/l for trout waters and primary nursery areas and 20 mg/l for all other HQWs.

Outstanding Resource Waters (ORWs)

No new discharges nor expansions of existing discharges directly to waters classified as ORW are permitted in accordance with 15 NCAC 2B .0225 (c)(1) (see Appendix II). Those existing discharges will be handled on a case-by-case basis following standard operating procedures.

6.6 GENERAL MANAGEMENT STRATEGIES FOR PROTECTING WATER QUALITY IN THE BASIN

6.6.1 Management Strategies for Growth and Development in Western North Carolina

The institution of programs and initiatives to balancing economic growth with water quality protection is the responsibility of local governments. The following strategies are examples of a few of the initiatives local governments in the region could pursue.

- Develop a Regional Organization. It is suggested that a regional organization be developed for the western eight counties of North Carolina (covering the Hiwassee, Little Tennessee, Savannah and French Broad River basins). While the focus of this group could primarily be aimed at sustainable economic growth development, a separate task force could be developed to conduct an analysis of the impacts of the Cherokee gambling casino on natural resources. Several economic development organizations are already in existence in the region.
- Develop a variety of land use management tools. Land use management issues will need to be addressed either by the local governments or by the natural resource task force of the regional organization. The lack of land use planning can have long-term negative impacts on water quality. Chapter 5, Section 5.6.3 presents information on local governments that have some land use planning in effect.

Both of the counties within the Hiwassee River basin should have a Sedimentation and Erosion Control Ordinance, Pre-Development Ordinance (or subdivision ordinance) and a Land Use Plan in effect. The development of a Land Use Guidance System (LUGS) may be a feasible system to enact within these counties. LUGS is a systematic land use planning and management tool that allows for land use decisions to be made on a site specific basis. The concept behind LUGS is that projects are heard case-by-case, often based on a pre-existing growth guidance assessment. A committee reviews the project for its compatibility with the growth guidance assessment. Anyone from the surrounding area that may be affected by the project is invited to attend review meetings. The Board of Commissioners typically makes a final decision on the project. This process is less generic in its approach than zoning and yet allows for protection of the integrity of the community.

- Pursue Funding for Local Water Quality Protection Projects. The Clean Water Management Trust Fund (see Chapter 5, Section 5.8) may be a source of funding to assist local governments in obtaining a balance between economic growth and protecting surface waters of the state. Local governments will need to take responsibility for planning for the additional tourists and growth and development. This region of the state typically has a lower tax base than other areas of the state. Problems with aging infrastructure are also typical, especially for the small towns in the region. The Clean Water Management Trust Fund can be used for many purposes including: acquiring land for conservation easements and riparian buffers, restoring degraded lands to protect water quality, repairing failing waste treatment systems and septic tank systems and improving stormwater management. Local governments and regional organizations should consider pursuing funding through the Clean Water Management Trust Fund as a means to upgrade infrastructure and manage land to protect water quality. Contact the Executive Director, Dave McNaught at (919) 974-5497 for more information.
- Support Local Initiatives for Water Quality Protection. Local governments and regional organizations can also support local efforts to protect areas by developing greenways, bikeways and monitoring efforts conducted by citizen volunteers and protection of lands near surface waters and wetlands.
- State support to encourage the development and implementation of land use plans. This incentive policy has been applied in other states. The premise of an incentive program is to provide partial funding to staff the program if a local government develops a land use plan and then enforces its plan. If the land use plan is not developed or enforced, no funding would be available. Such a program has not yet been developed in North Carolina.
- DWO assistance to local governments for wastewater planning. Over the past several years DWQ has been involved in a number of projects to encourage and assist local governments in carrying out wastewater planning and growth management activities. DWQ will continue to work with local governments to encourage them to take steps to manage the effects of growth.

6.6.2 Management Strategies For Controlling Sedimentation

Sedimentation has not been identified as a major source of water quality degradation and stream impairment in the Hiwassee River basin (See Table 6.3).

Sedimentation is a widespread nonpoint source-related water quality problem that results from land-disturbing activities. The most significant of these activities include agriculture and land development (e.g., highways, shopping centers, and residential subdivisions). For each of these major types of land-disturbing activities, there are programs being implemented by various government agencies at the state, federal and/or local level to minimize soil loss and protect water quality. Some of these programs are listed in Table 6.5 and are briefly described in Appendix VI.

Table 6.5 State and Federal Sediment Control-Related Programs

Agricultural Nonpoint Source (NPS) Control Programs	North Carolina Agriculture Cost Share Program NC Cooperative Extension Service and Agricultural Research Service Watershed Protection and Flood Prevention Program (PL 83-566) Food Security Act of 1985 (FSA) and the Food, Agriculture, Conservation and Trade Act of 1990 (FACTA). (Includes Conservation Reserve Program, Conservation Compliance, Sodbuster, Swampbuster, Conservation Easement, Wetland Reserve and Water Quality Incentive Program)
Construction, Urban and Developed Lands	Sediment Pollution Control Act Federal Urban Stormwater Discharge Program Water Supply Protection Program ORW and HQW Stream Classification
Forestry NPS Programs	Forest Practice Guidelines National Forest Management Act Forest Stewardship Program Best Management Practices Forest Management Program Services
Mining	The Mining Act of 1971
Wetlands Regulatory NPS Programs	Section 10 of the Rivers and Harbors Act of 1899 Section 404 of the Clean Water Act Section 401 of the Water Quality Certification (from CWA) North Carolina Dredge and Fill Act (1969)

Construction activities, private access roads, state road construction and agriculture are sources of sediment and are discussed below. Golf courses and urban stormwater are other potential sources of sediment that are discussed in separate sections.

Before action is taken to restore a stream channel and riparian area, it is essential to understand the cause and nature of the problem. For example, if a landowner notices that excess gravel is accumulating in the stream on their property, they should first investigate the causes on their property and, if necessary, throughout the watershed. Stabilizing a streambank can result in an expense of time and money which will have to be repeated until the underlying cause is addressed. It is important to understand that a streambank may erode for many different reasons and the cause is not always obvious. Underlying causes might be as simple as a lack of bank vegetation to hold the soil in place or as complex as changes in runoff caused by urban runoff, poor logging or farming practices or other activities in the watershed.

Also, watershed inventories should not focus solely upon problem areas. Without advance planning and protection, sensitive resources, highly productive resource or critical components of natural systems are easily degraded or lost through development or overuse. Riparian buffers, wetlands, floodplains, animal movement corridors and rare species should be identified and their protection incorporated into watershed planning and management efforts.

Proven Techniques for Controlling Sediment and Protecting Streams

The following techniques are proven to be effective at controlling sedimentation to streams, thereby protecting the water quality of streams.

- Protect existing riparian forest buffers.
- Avoid disturbance of streams and the riparian zone. Restore vegetation that has been cleared from the riparian zone.
- Use BMPs for sediment control. A wide variety of agricultural BMPs have proven effective for sediment control. These include conservation tillage/residue management, filter strips and field borders, and cover crops.
- Don't straighten channels. Maintain natural channels or, if modification is unavoidable, design channels based on the stability and behavior of natural stream channels. Channel designs based on natural stability principles will be less susceptible to erosion, dissipate energy more effectively, remain more stable, and provide more habitat than traditional engineered channel designs.
- Maintain pre-development peak flows, flow velocities, and flow timing to the extent possible through the use of stormwater management techniques and appropriate BMPs.

The Use of Riparian Buffers to Protect Stream Quality and Integrity

A stream and its riparian area function as one. The condition of the riparian area and its vegetation play a central role in determining the integrity of stream channels and water quality. Although streamside vegetation of any kind is desirable, forests provide the greatest amount of benefit and highest potential for meeting both water quality and habitat restoration objectives. A sound scientific foundation exists to support the sediment reduction, nutrient reduction, and ecological values and functions of riparian forest buffers. The use of riparian buffers as a management tool should be promoted.

Riparian Forest Buffers are streamside ecosystems, managed for the protection of water quality through control of nonpoint source pollution and maintenance of the stream environment. Riparian Forest Buffer Systems are typically managed as three integrated streamside zones which are designed to intercept surface runoff and subsurface flow. They comprise an area of trees, usually accompanied by shrubs and other vegetation, that is adjacent to a body of water. The Riparian Forest Buffer is managed to:

- maintain the integrity of stream channels and shorelines,
- reduce the impact of upland sources of pollution by trapping, filtering, and converting sediments, nutrients, and other chemicals, and
- supply food, cover, and thermal protection to fish and other wildlife.

Construction Activities

Construction activities can dramatically increase the sediment delivered to streams. Construction activities can be especially harmful in the mountains where slopes are steep and rainfall is frequent. Construction activities are controlled under the Sedimentation and Erosion Control Act administered by the NC Division of Land Resources (DLR). This act requires anyone disturbing more than one acre of land to submit a Sedimentation and Erosion Control Plan to DLR. One of the major requirements is that there are adequate erosion control measures to retain all sediment on a development site during the 25-year storm. Generally, a land owner must install acceptable Best Management Practices (BMPs) when the land is disturbed by construction or development activities. Management practices may include barriers, filters, or sediment traps to reduce the amount of sediment that leaves a site. Under this act, local governments may take responsibility

for reviewing and enforcing the Sedimentation and Erosion Control Program within their jurisdiction; however, their program must be at least as stringent as DLR's.

In the Hiwassee River basin, development pressure is likely to increase. In order to match the pace of land disturbing activity, more staff hours will be needed within the DLR in order to effectively administer and fully enforce the provisions of the Act. At present, planning and inspection staff are stretched thinly across large geographic areas and a wide variety of projects. Careful planning prior to construction, perhaps the most important part of erosion control, may often be neglected due to lack of available staff time.

The responsibility for controlling sediment from construction activities falls on many shoulders. The parties with the greatest responsibility include: homeowners, developers/contractors, local governments, and the NC Division of Land Resources. Table 6. 6 presents actions that will help to address sediment problems associated with construction activities.

References/Resources:

- The following can be ordered from the NC Division of Land Resources at P.O. Box 27687, Raleigh, NC 27611, (919)733-3833:
 - 1) *NC Erosion and Sediment Control "Planning and Design Manual"* (\$55 for in-state, \$75 for out-of-state)
 - 2) *NC Erosion and Sediment Control "Inspector's Guide"* (\$20 for in-state or out-of-state)
 - 3) *NC Erosion and Sediment Control "Field Manual"* (\$20 for in-state or out-of-state)
 - 4) *NC Erosion and Sediment Control "Video Modules"* (\$15 for in-state, \$50 for out-of-state)
- Asheville Regional Office of the Division of Land Resources at (919)251-6208.

No sediment control measures are 100% effective so some level of sedimentation will occur with land-disturbing activities. Education and promotion of stewardship are keys to reducing sedimentation, along with judicious strengthening of regulations and enforcement.

Private Access Roads

Improperly designed, constructed, and maintained private access roads are a significant source of sediment in the mountains. Often, landowners do not realize the importance of building driveways for lasting service. Some landowners depend entirely on their contractor to design the road. Others try to design it themselves without consulting a reputable source. The consequences of not paying attention to an access road as it is designed and constructed can be serious. In addition to losing the road and potentially losing land and property, the washed-out road can damage water quality.

Most of the responsibility for an access road rests on the landowner. However, local governments, citizens, and state/federal agencies can also make their contribution to solving this problem. Recommendations for controlling sediment loss from private access roads are presented below in Table 6.7.

References/Resources:

- *Guidelines for Drainage Studies*, NCDOT Hydraulic Design Unit (1995). To obtain, call NCDOT at (919)250-4128.
- *Final Report: Timbered Branch Demonstration/BMP Effectiveness Monitoring Project* by Richard Burns, USDA Forest Service (1994). To obtain, call USDA at (704)257-4214.
- Asheville Regional Office of the Division of Land Resources, (919)251-6208.

Table 6.6 Recommended Actions to Address Construction-Related Sediment Problems

Homeowners	<p><u>Know and follow state and local erosion and sedimentation ordinances.</u></p> <p><u>Fit the development to existing site conditions.</u> Development that follows natural contours and avoids flood plains and highly erodible soils, is much easier to control erosion and sedimentation.</p> <p><u>Establish, maintain, and protect vegetation beside streams on your property.</u> Buffers provide a filter for sediment and other pollutants.</p> <p><u>Carefully monitor the construction process.</u></p> <p><u>Ensure permanent vegetation is established and maintained on construction site ASAP.</u></p> <p><u>Continue to control sediment after construction is complete.</u></p>
Developers Contractors	<p><u>Fit the development to existing site conditions.</u> Development that follows natural contours and avoids flood plains and highly erodible soils is much easier to control erosion and sedimentation.</p> <p><u>Minimize the extent and duration of exposure.</u> Schedule construction according to weather and season. Try to pick dry times.</p> <p><u>Protect areas to be disturbed from stormwater runoff.</u> Use dikes, diversions, and waterways to intercept runoff and divert it away from cut-and-fill slopes or other disturbed areas. To reduce erosion, install these measures before clearing and grading.</p> <p><u>Keep runoff velocities low.</u> Convey stormwater away from steep slopes to stabilized outlets, preserving natural vegetation when possible.</p> <p><u>Inspect and maintain control structures during the construction process.</u> If not properly maintained, some erosion control measures can cause more damage than they correct.</p> <p><u>Retain sediment onsite.</u> Protect low points below disturbed areas. Build barriers to reduce sediment loss. When possible, construct sediment traps before other land disturbing activities.</p> <p><u>Stabilize disturbed areas as soon as possible after construction.</u> Apply mulch and vegetation to land and line channels for protection. Consider future repairs and maintenance of these measures:</p> <p><u>Train equipment operators to execute erosion and sediment control practices.</u></p>
Citizens	<p><u>Report any serious sediment problems on construction sites.</u> This would include bare soil that has not been stabilized within 30 days, brown or red runoff during a storm, or obviously malfunctioning erosion/sediment controls.</p>
Local Govts. Without Delegated Sediment/ Erosion Control Programs	<p><u>Educate citizens as to the importance of erosion and sediment control before they begin construction activities to ensure they understand their responsibilities under the State Sedimentation Pollution Control Act.</u></p> <p><u>Report any serious problems on construction sites.</u> This would include bare soil that has not been stabilized within 30 days, brown or red runoff during a storm, or obviously malfunctioning erosion/sediment controls.</p> <p><u>If your resources allow, consider taking responsibility for sediment and erosion control in your jurisdiction.</u> This will allow greater control over implementation and enforcement of the program. It will also offer the opportunity to require sediment control on developments disturbing under one acre.</p> <p><u>Maintain publicly-owned open space.</u> Will prevent sediment loss from certain tracts of land.</p>
Local Govts. With Delegated Sediment/ Erosion Control Programs	<p><u>Educate citizens as to the importance of erosion and sediment control.</u></p> <p><u>Maintain publicly-owned open space.</u> Will prevent sediment loss from certain tracts of land.</p> <p><u>Evaluate the effectiveness of current sediment control enforcement.</u></p> <p><u>Identify staff resource needs.</u></p> <p><u>When possible, coordinate efforts with other agencies such as the Dept. of Transportation, Div. of Forest Resources, and Soil and Water Conservation Districts.</u></p>

Table 6.6 Recommended Actions to Address Construction-Related Sediment Problems (Cont'd)

NC Div. of Land Quality	<p><u>Continue to promote effective implementation and maintenance of erosion and sediment control measures on construction sites.</u> <u>Research innovative new ways to control sediment on construction sites.</u> <u>Evaluate the effectiveness of current sediment control enforcement & Identify staff resource needs.</u> <u>When possible, coordinate efforts with other agencies such as the Dept. of Transportation, Div. of Forest Resources, and Soil and Water Conservation Districts.</u> <u>Encourage more delegated programs by local governments where resources allow, especially in rapidly developing areas.</u></p>
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Table 6.7 Recommended Actions to Address Sediment from Private Access Roads

Homeowners	<p><u>Know the state and local laws, ordinances and regulations about access road construction.</u> <u>Construct a good road that will last.</u> The cost of constructing a road will vary greatly from site to site. The cost may increase due to steep or rocky land, low stability soils, or drainage needs. In the long run, it does not pay to skimp. <u>Avoid steep grades.</u> Sustained grades should not exceed 10% for gravel or crushed stone roads. <u>Make sure the road has adequate drainage.</u> Adequate drainage is necessary to control erosion. The following water sources must be considered: rainfall on the roadbed and cut/fill slopes, overland storm flows from the watershed above the road, and springs or streams intercepted by the road. <u>Use drainage methods that protect water quality.</u> These methods include capture areas to treat runoff and routing runoff parallel to streams. <u>Inspect the road periodically.</u> Check for ruts and dips in the road, the condition of the drainage outlets, and the general condition of the cut and fill slopes. <u>Repair any problems immediately.</u> Any problems with ruts, drainage outlets, bare areas, etc. should be repaired before a small problem turns into a large problem.</p>
Contractors	<p><u>Watch for signs of subsurface drainage problems before, during, and after construction.</u> Some things to look for include: soils that are gray in color, areas with springs or seeps, low areas, and areas dominated by water-tolerant plants such as alders, black walnut, poplar, cattails, reeds, etc. <u>Road and ground cover should be applied as soon as possible after construction.</u></p>
Citizens	<p><u>Report any serious problems with access roads.</u> Some problems to look for include big ruts in the roadway, wash-outs, and clogged drainage outlets. You can report problems to your local government officials. If they are not able to help, contact the regional office of the NC Division of Land Resources.</p>
Local Governments	<p><u>Require properly designed and constructed roads as part of the building permit process.</u> <u>Institute ordinances requiring proper maintenance of private access roads.</u></p>
State and Local Agencies	<p><u>Provide citizens with information about how to properly construct private access roads.</u> <u>Investigate innovative new ways of constructing private access roads while protecting water quality.</u></p>

State Road Construction

Like any impervious surface, roadway systems have the potential to generate stormwater runoff problems. Various types of pollutants from the road surface can be carried to surface waters by rainfall. In addition, roadway construction, roadside vegetation management and roadway operation and maintenance activities can contribute to stormwater pollution problems.

The Division of Water Quality is currently working with the NC Department of Transportation (DOT) to finalize a stormwater management permit for DOT activities. This permit will address pollution from stormwater runoff related to roadways, road construction, vegetation management, operation and maintenance and other related DOT activities throughout the state. The major permit requirements are the implementation of a comprehensive stormwater management program, monitoring programs to direct the stormwater program and annual reports to outline the effectiveness and direction of the program.

The initial emphasis of the stormwater programs will be on high volume roadway segments in sensitive water areas such as coastal areas and water supply watersheds. The stormwater management programs will try to locate and characterize pollutant problems and to develop and implement appropriate best management practices to protect surface waters.

DOT is responsible for its own sedimentation and erosion control program. DOT has a number of projects with effective sedimentation and erosion control in mountain areas. Table 6.8 presents recommended road construction measures.

Table 6.8 Recommended State Road Construction Measures

<p>NC Dept. of Transportation</p>	<p><u>Know the state and local laws, ordinances and regulations about construction.</u> <u>Implement high quality sediment and erosion control.</u> This is extremely important in areas with steep slopes. <u>Increase training for DOT staff to ensure that sedimentation and erosion control devices are properly sized and installed.</u> It is also important to include specific instructions for sediment and erosion control and phasing on the plans so that contractors can understand their responsibility. <u>Inspect sedimentation and erosion control devices frequently.</u> This is particularly important when contractors are responsible for the work. <u>Implement pre-, during, and post-construction water quality monitoring at selected sites.</u> This is the only way to tell for sure if sediment and erosion controls are working effectively. <u>Reduce the threshold of exposed area when roads are constructed on steep slopes.</u></p>
<p>Citizens and Local Governments</p>	<p><u>Contact the district DOT office if you observe sediment problems at a road construction site.</u> Some things to watch out for include: bare soil that is not mulched and/or planted within 30 days, washed-out sediment basins and filter cloths, and soil disposal sites that are placed in or directly adjacent to creeks.</p>

References/Resources:

- Dan Martin, District Office of DOT, (704)586-2141.

Agriculture

Streambank Fencing and Alternative Livestock Water Supply

Streambanks trampled by livestock can be a significant source of sediment. Streambank fencing and livestock watering facilities outside the riparian zone can help maintain the vegetation necessary for stabilizing streambanks and preventing erosion. The water quality benefits of streambank fencing have been well documented. Fencing and exclusion can create vegetative buffer strips along streams that trap sediment and reduce pesticide and nutrient runoff before they enter the stream. Streambank fencing also provides food, cover, and nesting sites for upland and aquatic

wildlife. Allowing natural vegetation to re-establish can not only provide better habitat within the stream but also create a corridor for wildlife movement and a connection with other habitat.

Livestock exclusion may also improve water quality by preventing manure deposition in the stream. For example, according to Penn State University, one cow produces approximately 5.4 billion fecal coliform bacteria per day. At this rate, unrestricted access of fifty cows to a stream for a 24 hour period could contaminate the equivalent of one day's untreated water supply for a city the size of Baltimore.

Exclusion from the riparian area may also improve the health of livestock. Bacteria and other disease-causing organisms entering the stream can transmit diseases between and within livestock herds. Streambank fencing reduces contact with disease-causing organisms that thrive in these environments. For example, environmental mastitis is most commonly caused by coliform bacteria which enter teats as cows wade in streams. The first recommendation in any mastitis prevention program is to provide a clean, dry environment for the cows. Streambank fencing also reduces the risk of foot and leg injuries and can be part of an effective lameness prevention program.

6.6.3 Management Strategies For Urban And Industrial Stormwater Control

Recommendations for Urban Stormwater Control

Urban stormwater runoff can be a significant contributor to water quality problems. In the Hiwassee River basin, urban development is relatively limited at present. As land is converted to impervious surfaces with construction of housing developments and commercial areas, careful attention to stormwater control will be more important. Stormwater problems are likely to be centered around the Towns of Andrews, Murphy and Hayesville, and any high density developments that may arise. There are no municipalities in the Hiwassee River Basin required to obtain permits to manage stormwater runoff within their jurisdiction.

The best time to address urban stormwater impacts are when it is most effective and least costly to do so -- before development occurs. Numerous studies have demonstrated a serious decline in the health of receiving waters when 10 to 15 percent of a watershed is turned into impervious surfaces (Schuler 1995). The entire community plays a role in controlling the quality and quantity of urban stormwater. Table 6.9 is a list of recommendations for local governments, citizens, businesses, developers, and state agencies. Table 6.10 offers tips for minimizing water quality impacts from lawn and car care. Table 6.11 presents non-toxic alternatives to commonly used, but potentially toxic, home care products (e.g., cleaning agents and paints).

References/Resources for Urban Stormwater:

- Stormwater Management Guidance Manual*, 1993, Cooperative Extension Service
Stormwater Management in North Carolina: A Guide for Local Officials, 1994, Land-of-Sky Regional Council, Asheville, NC (Eaker 1994)
Stormwater Fact Sheets by Land-of-Sky Regional Council, 1994
1. *Stormwater Problems and Impacts: Why all the Fuss?*
 2. *Stormwater Control Principles and Practices*
 3. *Stormwater Management Roles and Regulations*
 4. *Local Stormwater Program Elements and Funding Alternatives*
 5. *Municipal Pollution Prevention*
 6. *Managing Stormwater in Small Communities: How to Get Started*
 7. *Maintaining Wet Detention Ponds*
 8. *Plan Early for Stormwater in Your New Development*
 9. *How Citizens Can Help Control Stormwater Pollution*
- Stormwater Best Management Practices*, 1995, DWQ Stormwater Group: (704)251-6208.

Table 6.9 Recommendations for Urban Stormwater Control

<p>Local governments</p>	<p><u>Create public education programs.</u> These programs advise citizens about how to care for their homes, businesses, and neighborhoods while minimizing stormwater pollution. Topics that can be covered include environmentally sensitive methods of caring for lawns and vehicles (see Table 6.8).</p> <p><u>Support stream clean-up programs.</u> Clean-up programs such as Big Sweep remove harmful debris from streams and instill a sense of pride that will protect the waterbody in the long-term.</p> <p><u>Create and enforce strict penalties for improper waste disposal.</u> Local governments should provide fencing around dumpsters and clean them regularly.</p> <p><u>Institute land use planning to protect water quality.</u> Through planning, local governments can reduce flooding by limiting the total area of impervious surfaces and directing runoff into vegetated areas or stormwater control devices. In addition, planning can be used to protect surface waters by directing growth away from sensitive areas/waters such as floodplains, steep slopes, wetlands, high quality waters, and water supplies.</p> <p><u>Review local ordinances pertaining to parking and curb and gutter.</u> Local ordinances often require larger parking lots than are needed. Parking lots should be designed to handle the average parking needs with overflow areas in grass. When possible, it is best to eliminate curbs and gutters to allow runoff to flow off the street or parking lot in sheet flow.</p> <p><u>Protect open spaces and streamside buffers in and around urban areas.</u> This will preserve recreational areas and significant natural resources near the town or city.</p> <p><u>Attend stormwater workshops for local government officials.</u> Various agencies like DWQ offer workshops on stormwater management or reference materials. For more information, contact the DWQ stormwater group at (919)733-5083.</p> <p><u>Map the storm sewer system.</u> If local governments map the inlets, pipes, and outlets that make up their storm drain system, they will be well equipped to identify the source of any observed stormwater problems.</p> <p><u>Offer hazardous waste collection days.</u></p>
<p>Citizens</p>	<p><u>Participate in stream clean-up programs.</u> Clean-up programs remove harmful debris from streams and instill a sense of pride that will protect the waterbody in the long-term. A Big Sweep event is held each year in September. Stream clean-up is a great service activity for groups such as Scouts, 4-H, Rotary Clubs, etc.</p> <p><u>Practice environmentally-friendly lawn care.</u> Table 6.9 has a list of suggestions for keeping a green lawn while minimizing harm to the environment.</p> <p><u>When possible, use less-harmful substances in the home for cleaning or painting.</u> Any time hazardous substances are used, there is a risk that they can enter the water by interfering with the proper functioning of septic tanks, leaking out of sanitary sewers, etc. When possible, use less hazardous substances such as latex instead of oil paint (see Table 6.10).</p> <p><u>Educate adults and children about how to protect water quality.</u> Educational materials can be obtained from the NC Office of Environmental Education, (919)733-0711.</p> <p><u>Utilize hazardous waste collection centers for paints and most chemicals.</u></p> <p><u>Never dispose of oil, yard wastes, or other materials in storm drain inlets or dump these materials on lands.</u> Storm drains connect directly to nearby streams without any treatment of the water.</p> <p><u>Maintain and protect riparian buffers on private property.</u> Buffers provide a critical right of way for streams during storms. When buffers contain the 100-year floodplain, they are an extremely cost-effective form of flood insurance. Buffers remove a wide array of pollutants, including sediment, nutrients, and toxic substances. They can also increase property value.</p> <p><u>Support your local government's land use planning initiatives.</u></p>

Developers	<u>Incorporate stormwater management in the planning of projects.</u> Plan developments to reduce impervious areas (roads, driveways, and roofs). Do not build in environmentally sensitive areas such as floodplains and wetlands. (This is also a flood insurance policy.) <u>Maintain natural drainageways and buffers along streams.</u>
Businesses	<u>Maintain and protect riparian buffers on commercial property.</u> Buffers provide a critical right of way for streams during storms. When buffers contain the 100-year floodplain, they are an extremely cost-effective form of flood insurance. Buffers remove sediment, nutrients, and toxic substances. <u>Cover and contain waste materials.</u> This will prevent runoff from the disposal area from becoming contaminated and polluting the receiving water. <u>Practice good housekeeping.</u> A clean and litter-free facility will promote good water quality. <u>Institute hazardous waste collection sites.</u> Automobile service centers, hardware stores, and other pertinent businesses can institute hazardous waste collection sites for used oil, antifreeze, paint, and solvents.
State and Federal Agencies	<u>Provide technical information about urban stormwater.</u> State and federal agencies should strive to increase their communication with local governments, businesses, and citizens. <u>Create and maintain stormwater wetlands along streams.</u> Like buffers, stormwater wetlands treat stormwater and reduce flows. Stormwater wetlands must be designed and maintained properly to be effective.

Table 6.10 How to Take Care of Your Lawn and Car and Protect Water Quality

If you are caring for...	This is the environmentally-friendly practice.
your lawn	<ul style="list-style-type: none"> • Use only fertilizers that are needed, based on soil tests and plant needs. • Keep fertilizers off driveways and sidewalks. • Avoid using fertilizers within 75 feet of any waterbody. • If you use a lawn service, request natural rather than chemical management. • Plant hardy, native species that do not require chemical inputs. • Contact your Cooperative Extension Agent for more information.
your vehicle	<ul style="list-style-type: none"> • Maintain motor vehicles and repair leaks promptly. • Dispose of used motor oil and antifreeze in recycling centers. • Avoid gas tank overflows during refueling.

from S.C. Dept. of Health and Environmental Control, "Turning the Tide" (1995)

Table 6.11 Substitutions for Household Hazardous Substances

Instead of...	Try...
<ul style="list-style-type: none"> • Ammonia-based Cleaners • Abrasive Cleaners • Furniture Polish • Toilet Cleaner • Oven Cleaner • Drain Cleaners • Upholstery Cleaners • Mothballs • Window Cleaner • Oil-Based Paints and Stains 	<ul style="list-style-type: none"> • Vinegar + Salt + Water • Lemon Dipped in Borax or Salt + Baking Soda • Lemon Juice + Olive Oil • Baking Soda + Toilet Brush • Liquid Soap + Borax + Warm Water • Boiling Water + Baking Soda + Vinegar • Dry Cornstarch • Cedar Chips or Lavender Flowers • White Vinegar + Water • Water-based Paints and Stains

from S.C. Dept. of Health and Environmental Control, "Turning the Tide" (1995)

Recommendations for Controlling Industrial Stormwater

Throughout the Hiwassee River basin various types of industrial activities with point source discharges of stormwater are required to be permitted under the NPDES stormwater program. These include facilities engaged in industrial activities such as ready mixed concrete, asphalt, metal products and equipment, textiles, timber products, furniture and cabinet making, mining, and stone, clay, and glass manufacturing.

Surface waters can be significantly impacted by stormwater runoff from industrial facilities, particularly those that store or transfer materials out of doors. The types of chemicals, industrial operations and various ancillary sources influence the pollution potential of each individual facility. As such, industrial facilities can reduce stormwater impacts by developing a comprehensive site-specific Stormwater Pollution Prevention Plan (SPPP or Plan) which is based on an accurate understanding of the pollution potential of the site. The Plan provides a flexible basis for developing site-specific measures to minimize and control the amounts of pollutants in stormwater runoff by implementing best management practices (BMPs). With respect to stormwater, the ultimate BMP is the elimination of exposure of any significant materials to rainfall or runoff.

Facilities subject to NPDES stormwater permitting are required to develop and implement a SPPP. The SPPP approach focuses on two major objectives: 1) to identify sources of pollution potentially affecting the quality of stormwater discharges from the facility; and 2) to describe and ensure that practices are implemented to minimize and control pollutants in stormwater discharges from the facility. The basic components of a SPPP include a site plan detailing the facility layout and locations of potential pollutant sources, a stormwater management plan describing materials management practices and feasibility of employing best management practices, a spill prevention and response plan, a preventive maintenance and housekeeping plan, annual employee training and semi-annual facility inspections. The facility SPPP must be periodically reviewed and updated to reflect changes at the facility.

In addition to the SPPP, all permitted facilities are required to perform qualitative monitoring. This monitoring requires the periodic visual inspection of each stormwater outfall. Inspections are performed for parameters including color, odor, clarity, floating and suspended solids, foam, oil sheen, and other obvious indicators of stormwater pollution. Facilities with significant stormwater pollution potential are also required to perform quantitative analytical monitoring.

6.6.4 Management Strategies for Controlling Fecal Coliform Bacteria

Fecal coliform bacteria are typically associated with the intestinal tract of warm-blooded animals and are widely used as an indicator of the potential presence of disease-causing bacteria and viruses. They enter surface waters from a number of sources including failing onsite wastewater systems, broken sewer lines, improperly treated discharges of domestic wastewater, pump station overflows, straight piping and runoff carrying livestock and wildlife wastes.

There are no monitored waterbodies in the Hiwassee River basin where fecal coliform bacteria standards have been exceeded in at least 25% of the samples taken by DWQ. However, Brasstown Creek has had some problems with elevated fecal coliform bacteria due to effluent from the Young Harris Water Pollution Control Plant. The Hiwassee River and the Valley River have had occasional elevated levels of fecal coliform bacteria.

Several general management strategies for addressing fecal coliform contamination include:

- Proper maintenance and periodic inspections of onsite waste disposal systems such as septic tanks.
- Maintenance and repair of sanitary sewer lines by WWTP authorities.
- Elimination of direct unpermitted discharges of domestic waste (also known as "straight piping").
- Proper management of livestock to keep wastes from reaching surface waters.
- Encouragement of local health departments to routinely monitor waters known to be used for body contact recreation (e.g., swimming and tubing).

The 1996 General Assembly established a program designed to eliminate domestic sewage or wastewater discharges from both direct (straight pipe) and from overland flow of failing septic systems. The focus of the program contains three components:

- 1) the identification and elimination of domestic sewage discharges into streams proposed or currently used for public water supplies,
- 2) an amnesty period to end December 31, 1997 during which time violations for identification of domestic dischargers will not be incurred, and
- 3) a public education program about the amnesty period will be implemented. The majority of the funds allocated to this program are recurring funds.

Septic tanks are used widely throughout this basin, particularly since many citizens live outside of the service area of a regional wastewater treatment plant. Unfortunately, many citizens are not aware of how to care for their septic tanks. Some of the actions that homeowners, local governments, and state and federal agencies can take to reduce pollution from septic tanks are listed in Table 6.12.

Table 6.12 Recommended Actions for Proper Maintenance of Septic Tanks

Homeowners	<p><u>Do not put harmful substances in your septic tank.</u> These substances include: cooking grease, oils, fats, pesticides, paints, solvents, disinfectants, and other household chemicals. These substances can kill the microorganisms that help purify the groundwater and can themselves pollute groundwater.</p> <p><u>Know the location of your system and keep heavy vehicles and plant roots away from drain field pipes.</u> These things can compact soils and inhibit the proper functioning of the system.</p> <p><u>Conserve water and stagger intensive uses.</u> Some intensive water uses include showers, laundry, dishwasher, etc. <u>Look for ways to reduce (e.g., full loads) and to not use all at once.</u></p> <p><u>Have your septic tank pumped out every three to five years.</u> This will ensure that your household has a functioning wastewater treatment system.</p> <p><u>Look for "greener grass over the septic tank."</u> This could be a sign that the septic tank is failing.</p> <p><u>Divert overland runoff from your property away from the drainfield area.</u> This will reduce the likelihood of saturating the soil and causing malfunctions.</p>
County Health Departments	<p><u>Require regular inspections of septic systems.</u></p> <p><u>Enforce severe penalties for uncorrected septic system malfunctions.</u></p> <p><u>Ensure that citizens understand how to maintain their septic tank when they first obtain property in the county.</u></p>
NC Div. of Environmental Health	<p><u>Provide leadership to county health offices. Encourage county health offices to require regular inspections.</u></p> <p><u>Provide public education materials.</u></p>

References/Resources:

Please contact the local county health department for more specific advice.

6.6.5 Management Strategies For Controlling Toxic Substances

Toxic substances, or toxicants, routinely regulated by DWQ include metals, organics, chlorine, and ammonia, as described in Chapter 3.

The waters of the Hiwassee River basin need to be protected from immediate acute effects and the residual chronic effects of toxic substances. Toxic limitations for point source discharges are based on the volume of the effluent released and the 7Q10 flow condition of the receiving stream. In the Hiwassee River basin, four point source discharges are required to conduct whole effluent toxicity testing (The Towns of Hayesville, Andrews, and Murphy and Clifton Precision South Division). Violations have occurred for the Towns of Hayesville and Andrews, as well as Clifton Precision. Refer to Section 6.3 for recommended control strategies for these NPDES permit holders.

Toxics from nonpoint sources of pollution typically enter streams during storm events through runoff from roads, parking lots, agricultural lands or golf courses. In the Little Tennessee River basin, low pH levels have been observed in many high elevation streams. These low pH levels have been attributed to chronic acid deposition and the low buffering capacity of high elevation streams in the basin. With continued chronic input of acid deposition over the mountain region, there is also the potential for acid deposition to degrade surface water in the Hiwassee River basin. This issue is discussed further in Chapter 4. Continued research and monitoring will be important to fully understand the relationship between acid deposition and water quality and for furthering the development of policies to reduce impacts to surface waters from the chronic introduction of atmospheric pollution.

Residents can also do their part in managing toxic substances at home. Recommendations are included in Table 6.10 for environmentally friendly methods of caring for your lawn and car. Table 6.11 presents substitutions for household hazardous substances.

6.6.6 Management Strategies For Oxygen-Consuming Wastes

Maintenance of dissolved oxygen (DO) is critical to the survival of aquatic life and to the general health of surface waters. The daily average dissolved oxygen standard for most waters in the state, except for waters classified as trout and swamp waters is 5.0 mg/l. The trout waters so prevalent in the Hiwassee River basin have a daily average standard for dissolved oxygen of 6.0 mg/l. The major threat to oxygen levels is from point sources. Discharge permits must include limits that protect standards.

While the impact of point source discharges on dissolved oxygen is relatively low in this basin because of the naturally high reaeration rates of mountain streams, special precautions have been taken to protect HQW, ORW and trout waters from the potential impacts of point source discharges. Refer to Section 6.5 for strategies used to protect Highly Valued Resource Waters, such as HQWs and ORWs, in the basin.

REFERENCES - CHAPTER 6

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