CHAPTER 6

BASINWIDE GOALS, MAJOR WATER QUALITY CONCERNS AND RECOMMENDED MANAGEMENT STRATEGIES FOR THE CATAWBA BASIN

6.1 BASINWIDE MANAGEMENT GOALS

The long-range goal 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 Catawba Basin's surface waters. In striving towards the long-range goal stated above, DEM's highest priority near-term goals will be as follows:

- identify and restore the most serious water quality problems in the basin (**Section 6.2.1**)
- protect those waters known to be of the highest quality or supporting biological communities of special importance (**Section 6.2.2**)
- manage problem pollutants, particularly biochemical oxygen demand and nutrients, in order to correct existing water quality problems and to ensure protection of those waters currently supporting their uses (**Sections 6.2.3, 6.3, 6.4, 6.5, 6.6, 6.7** and **6.8**).

To achieve these goals, water quality planning must consider the 3000 miles of free-flowing streams in the Catawba Basin as the well as the many lakes and reservoirs created through impoundment of streams. Lakes and reservoirs are common features of the Catawba Basin. They play an important role in the physical, hydrologic and chemical composition of the Catawba waters. The Catawba River in North Carolina is dominated by a series of seven major reservoirs from Lake James through Lake Wylie. Smaller impoundments are also found along the South Fork Catawba River and other tributaries in the basin. These reservoirs provide for a multitude of recreational opportunities and contribute to the diverse biological communities of Catawba Basin. However, these reservoirs also present water quality planning issues that differ in some ways from those of free-flowing streams.

Lakes along the Catawba River interrupt the regular stream flow of water through the mainstem. The relatively slow velocities, increased depths and widths of lakes create an environment that can differ significantly from free-flowing streams in their response to pollution loading. For example, lakes can provide an environment where algae can grow given sufficient nutrient enrichment (e.g. fertilizers). This means that lakes can be more sensitive to nutrient loading than free-flowing streams. Also, because of limited mixing in lake waters, lakes can demonstrate localized problems from pollution loading. On the other hand, the slow velocities and increased retention time of lakes means that lakes can trap nutrients and suspended solids in sediments. Nutrient concentrations and turbidity are typically lower in water flowing out of Catawba river basin lakes than above them.

The controlled nature of flow down the Catawba affects DEM's abilities to develop specific long-term pollution control strategies, or total maximum daily loads (TMDLs), for the major streams within the basin. As the Catawba River changes from river to lake and back to river, the impact on water quality of pollutant constituents changes. The recommended management strategies presented in this chapter have been designed to reflect not only the integration of pollution sources throughout the basin but also the anticipated local responses to pollutant loading.

6.2 MAJOR WATER QUALITY CONCERNS AND PRIORITY ISSUES

6.2.1 Identifying and Restoring Impaired Waters

Impaired waters are those rated in Chapter 4 as partially supporting or not supporting their designated uses based on either evaluated or monitored water quality data described in Section 4.7. A list of those impaired freshwater streams has been compiled in Table 6.1. The table includes the planned water quality management strategies for these waters. Impairment of waters of the Catawba River basin is due to both point and non-point source pollution. This table includes those streams on the state's 303(d) list of impaired waters required by the US Environmental Protection Agency under Section 303(d) of the Clean Water Act.

The list of impaired streams in Table 6.1 cannot be considered a comprehensive list of all water bodies where water quality improvements or protective management strategies are necessary. Some impaired streams may not yet have been identified by DEM. Surface waters where water quality issues exist but specific data have not been obtained to evaluate water quality have been identified by recent public comment, State and Federal agency comment, and other sources. Following are water bodies where DEM recognizes water quality issues in waters not defined as impaired but where protective management strategies are needed: Lake Wylie, Mountain Island Lake, Rhodhiss Lake, Lake Hickory, South Fork Catawba River, Linville River, Sixmile Creek, and Lyle Creek.

Planned Management Strategies fall into two major categories. The first is continuation of ongoing programs that have not yet reached full effectiveness. For example, nonpoint source programs constitute an extremely important set of management strategies and many are in relatively early stages of implementation. These programs, described briefly in Chapter 5 are wide-ranging and are grouped under general nonpoint source categories such as urban development, construction, agriculture, forestry, mining, onsite wastewater treatment and wetlands protection. Agricultural programs such as the NC Agricultural Cost Share Program, which provides farmers with financial assistance to install best management practices (BMPs), and the Farm Bill (Food, Agriculture, Conservation and Trade Act of 1990), which among its provisions reduces government funding subsidies for farming on highly erodible land, are examples of potentially effective ongoing programs which should reduce water quality impacts of certain agricultural activities over the long run.

Another example of an ongoing program is the planned upgrade of wastewater treatment plants (WWTPs) to reduce pollution loading to waters of the Catawba Basin. Many cities, towns, and industries in the Catawba Basin are currently in the process of planning for, designing, or building upgraded treatment facilities with the objective of reducing total pollution loading.

The second category of planned management strategies includes several other initiatives. Where water quality problems have been identified but the source(s) is not evident, investigation of the source(s) will be necessary before any specific actions can be outlined. Water quality monitoring will be an important component of this strategy. An example of ongoing investigations to identify and address water quality issues in the Catawba Basin is the McDowell Creek study. Mecklenburg County and DEM are in the midst of a two year study to monitor and document nutrient loading throughout the McDowell Creek watershed. The study also monitors the impact of nutrients downstream on Mountain Island Lake. Preliminary results of this study have been incorporated

Table 6.1 Management Strategies for Impaired Freshwater Streams in the Catawba Basin

Subbasin	Stream Name	Use Rating	Source	Planned Management Strategy	NPS (319) Priority
30	Corpening Creek	PS/NS	NP	BMP implementation	High
31	Lower Creek	PS	NP, P	BMP targeting for sediment control	High
32	Big Branch	PS to NS	P	Troutman WWTP received toxicity limit.	
	Powder Spring Br.	PS	P	Point source discharge removed	
33	McDowell Creek	PS		McDowell Creek Study	
	UT Fites Creek	NS	P	Point source discharge removed	
34	McCullough Br	PS	P	Charlotte Stormater Prog.	
	Dixon Branch	NS	P	Point source discharge removed	
	Mcintyre Creek	PS	P	Point source discharge removed	
	Walker Branch	PS	P	Point source discharge removed	
	Sugar Creek	PS	NP, P	Upgrade WWTPs, Charlotte Stormater Prog.	High
	Little Sugar Creek	NS	NP	Upgrade WWTPs, Charlotte Stormater Prog.	High
	Irwin Creek	PS	NP, P	Upgrade WWTPs, Charlotte Stormater Prog.	High
	Stewart Creek	PS	NP	Upgrade WWTPs, Charlotte Stormater Prog.	Medium
	Brier Creek	NS	NP	Charlotte Stormater Prog.	High
	McAlpine Creek	PS/NS	NP	Upgrade WWTPs, Charlotte Stormater Prog.	High
	Irvins Creek	NS	NP, P	Upgrade WWTPs, Charlotte Stormater Prog.	High
	Fourmile Creek	PS	NP	Charlotte Stormater Prog.	Medium
	McMullen Creek	NS	NP	Charlotte Stormater Prog.	High
	Steele Creek	NS	NP	Charlotte Stormater Prog.	High
35	Clark Creek	PS to NS	NP	Color Study, Toxicity TMDL	High
	Bills Branch	PS	P	Point source discharge removed	
36	Long Creek	PS	NP, P	Long Creek Watershed Study, WWTP upgrade	High
	Dallas Branch	PS	NP	Long Creek Watershed Study	High
37	Catawba Creek	PS/NS	NP, P	Nutrient removal (Section 6.4)	High
	Crowders Creek	PS/NS	NP, P	Nutrient removal (Section 6.4), QUAL2E	High
	UT Crowders Cr	PS		Nutrient removal (Section 6.4), QUAL2E	
	McGill Creek	NS	P	Investigate sources	
	Abernethy Creek	PS/NS	NP, P	Nutrient removal (Section 6.4), QUAL2E	High
	UT Abernethy Cr	NS	P	Nutrient removal (Section 6.4), QUAL2E	High
	Mill Creek	NS	P	Point source discharge removed	High
	Sixmile Creek	PS	P	Encourage regional WWTP	

DEFINITIONS	
PS	Partially Supporting classified uses
NS	Not Supporting classified uses
NP	Impairment due to Nonpoint Source pollution, though specific sources may not be known.
P	Impairment attributed to Point source pollution
UT	Unnamed tributary
Use Rating	Use support rating - See Section 4.5 and Appendix IV for explanation
Color Study	See Section 6.7 for discussion
QUAL2E	Type of water quality model used to determine oxygen-consuming waste limits for dischargers

into this basin plan and finalized results will be used to update future basinwide planning efforts. A similar multi-agency study is underway on the Long Creek watershed of subbasin 03-08-36. Studies of five reservoirs in the Catawba Basin are also in various stages of completion. Data from these and other future studies will be used to guide the continuous process of updating this basinwide plan on a five year schedule.

The *NPS (319) Priority* column in Table 6.1 indicates DEM's recommended priority rating for nonpoint source management of impaired streams under Section 319 of the federal Clean Water Act. Monitored streams have been prioritized in Table 6.1 for nonpoint source controls which may be implemented through programs such as Section 319, the Agriculture Cost Share Program and the Forest Practice Guidelines Related to Water Quality. A schedule of priority from high to medium has been established to help direct the resources of the programs so that nonpoint sources problems can be addressed and water can be protected from degradation. Funding opportunities under Section 319 do not apply to urban stormwater NPDES program activities.

High priority streams:

- monitored streams that have an overall use support rating of "nonsupporting,"
- monitored streams that have a "partial support" rating but have a predicted loading of one or more pollutants that is high,
- streams that are unusually sensitive as documented by special studies (not included in table)
  - High Quality Waters
  - Outstanding Resource Waters
  - Water Supply I; Water Supply II; Critical Areas of WS-II, WS-III, WS-IV
  - Shellfish Waters (Class SA) closed due to pollutants that have a Significant Shellfish Resource (SSR) as identified by the Division of Environmental Health. (Saltwaters only)

Medium priority streams:

Monitored streams that have an overall use support rating of "partially supporting." Also, in salt waters, shellfish waters (Class SA) that are closed due to pollutants and that do not have a SSR are also considered medium priority streams.

The United States Fish and Wildlife Service has also identified Unique Aquatic Communities (UAC) that the Division could consider as sensitive resource waters for the purpose of prioritizing for 319 grant funding. These areas usually encompass waters which provide habitat for threatened and endangered species.

6.2.2 Identification and Protection of High Resource Value or Biologically Sensitive Waters

Waters considered to be biologically sensitive or of high resource value may be afforded protection through reclassification to HQW (high quality waters), ORW (outstanding resource waters) or WS (water supply), or they may be protected through more stringent permit conditions. Waters eligible for reclassification to HQW or ORW include those approved for designation as native trout waters, critical habitat for threatened or endangered species (as designated by the NC Wildlife Resources Commission), waters having excellent water quality or those used for domestic water supply purposes having a WS I and II primary classification. 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. Lists of streams classified as HQW, ORW or WS are presented in Chapter 2. Protection requirements are presented in Appendix I.

Where waters are known to support state or federally listed endangered or threatened species or species of concern, but where water quality is not Excellent and where no critical habitat has been

designated, consideration will be given during NPDES permitting to minimize impacts to these habitat areas consistent with the requirements of the federal Endangered Species Act and North Carolina's endangered species statutes. The federally endangered Carolina Heelsplitter, a freshwater mollusk, is known to exist in the waters of subbasin 03-08-38. Possible point-source related protection measures may include, but are not limited to: effluent dechlorination or alternative disinfection, tertiary or advanced tertiary treatment, outfall relocation, backup power provisions to minimize accidental plant spills, evaluation of nondischarge alternatives and others. 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.

In addition, that portion of the Linville River that flows through the Linville Gorge Wilderness Area in Pisgah National Forest above Lake James has been designated as a state Scenic River.

6.2.3 Managing Problem Pollutants to Maintain Water Quality Standards and Existing Uses

In addition to restoring impaired waters, protection of other waters which currently meet their standards and are considered supporting of their uses is a basic responsibility of the state's water quality program and a primary goal of basinwide management. Protecting standards and uses rests on DEM's ability to control the causes and sources of water pollution from point and nonpoint sources. Existing point and nonpoint source programs are outlined in Chapter 5. Oxygen-demanding wastes, or biochemical oxygen demand (BOD), nutrients (in lakes and impoundments), and sediment are the most widespread problem pollutants in the Catawba Basin. Metals, fecal coliform bacteria, and color are other important pollutants requiring management. Point-source oriented control strategies for oxygen-demanding wastes are further addressed in section 6.3. Nutrients are addressed in section 6.4 and toxic substances (including metals, ammonia and chlorine) are addressed in section 6.5. Sediment control is discussed in section 6.6. Color is discussed in section 6.7.

The management strategies outlined below are the results of comprehensive evaluations of all previously summarized data. It is the intention of DEM that the following recommendations serve the public of North Carolina for long-term planning purposes. General nonpoint source management strategies are discussed thoroughly in Chapter 5. Point source controls are implemented through limiting wastewater parameters in NPDES permits.

6.3 RECOMMENDED MANAGEMENT STRATEGIES FOR OXYGEN DEMANDING WASTES

Oxygen demanding wastes are described in Chapter 3. BOD and ammonia nitrogen (NH_3) are generally the types of oxygen-consuming wastes of greatest concern. Therefore, NPDES permits generally limit BOD_5 (or $CBOD_5$) and NH_3 in point source discharge effluents to control the effects of oxygen depletion in receiving waters.

In most surface water systems throughout the State of NC, the lowest concentrations of dissolved oxygen usually occur during summertime conditions when temperature is high and streamflow is low. During these periods point source discharges have their greatest impact, while nonpoint input is generally low. Nonpoint loads are typically delivered at high flow during and after storm events, but may have residual effects on water quality through runoff and sediment oxygen demand. Modeling of oxygen-consuming wastes is typically performed under low flow scenarios, accounts for the residual effects of nonpoint sources and is used to establish appropriate NPDES permit limits. Where the residual BOD is significant, management of nonpoint sources to reduce loading is recommended by implementation of best management practices.

General Recommended Strategies for Expanding and Proposed Dischargers in the Catawba Basin

The transitional environment between free flowing streams and lakes is a potentially sensitive area to loading of oxygen demanding wastes. As stream waters slow and deepen as they enter a lake, the rate at which oxygen enters the water is reduced. This means that a concentration of oxygen demanding waste that was acceptable in a free flowing stream may result in dissolved oxygen levels below the State standard.

The seven major reservoirs that make up the chain of lakes along the Catawba River create many transition zones between streams and lakes. The hundreds of tributaries to the seven major reservoirs create local environments where waters may be relatively sensitive to oxygen demanding wastes. Due to the transitional nature of such waters, the exact allowable amount of oxygen demanding wastes that can be discharged without impairing water quality is difficult to determine. Water quality studies can be conducted on a case-by-case basis to support wasteload allocations. However, due to the widespread occurrence of transitional waters in the Catawba Basin and the high demand on water for the assimilation of oxygen-consuming wastes, a basinwide strategy is recommended. Over the past five years, DEM has implemented a minimum treatment strategy for discharges of oxygen demanding waste in the Lake Norman watershed. It is recommended that this strategy, described below, be extended to all seven major lakes in the Catawba Basin.

All new and expanding dischargers of oxygen-consuming wastes that discharge to the Catawba River Chain of Lakes or are predicted to increase oxygen-demanding waste loading to the lakes, (Lake James, Rhodhiss Lake, Lake Hickory, Lookout Shoals Lake, Lake Norman, Mountain Island Lake, and Lake Wylie) will be required to meet a minimum of advanced treatment limits. Typical NPDES permit conditions for advanced treatment facilities are 15 mg/l BOD_5 and 4 mg/l NH_3-N. These limits will help to protect water quality standards in the Catawba River chain of lakes and will allow for continued growth in the region.

6.3.1 Catawba River Mainstem Watersheds (Subbasins 03-08-30 to 03-08-33)

Subbasin 03-08-30 (Catawba River Headwaters, Lake James)

Corpening Creek

Corpening Creek has been listed as an impaired stream due to non-point source pollution from agricultural and urban runoff from the City of Marion. In addition, Corpening Creek receives treated wastewater from the 3.0 MGD Marion WWTP via Youngs Fork Creek. Benthic macroinvertebrate studies conducted above and below the Marion WWTP indicate only Fair water quality above the discharge and Fair (1985) or Poor (1990) water quality below the discharge. This suggests that the Marion WWTP was affecting the invertebrate community but that upstream non-point pollution sources play a significant role in the stream impairment.

Over the past three years, the Marion WWTP has averaged less than 5 mg/l BOD5 and less that 1 mg/l NH3-N. These concentrations of oxygen-consuming wastes are well below the facilities secondary treatment based limits. Therefore it is recommended that efforts to address water quality issues in the Corpening Creek watershed be concentrated upon non-point source pollution reduction. Section 6.8 contains several recommendations that the City of Marion should consider in order to begin addressing urban stormwater pollution. Additional information and guidance can be provided by DEM's Water Quality Section.

Lake James

At present Lake James is fully supporting its designated uses and there is no indication that the lake is adversely impacted by the discharge of oxygen-consuming wastes. However, there is

significant development activity in the Lake James watershed. Future development has the potential to increase pollutant loading to Lake James, particularly oxygen demanding wastes, nutrients, and suspended solids. DEM is currently working with the Western Piedmont Council of Governments (WPCOG) and the U.S. Geological Survey (USGS) to develop and implement a water quality study of Lake James to assess water quality conditions in the reservoir for present and possible future conditions. A water quality model and a geographical information system (GIS) are planned to be used to anticipate and plan for water quality impacts of future activities in the Lake James watershed. This study should be completed by the second issuance of the Catawba Basinwide plan in April 2000.

Subbasin 03-08-31 (Johns River, Rhodhiss Lake)

Rhodhiss Lake

The WPCOG and the USGS in conjunction with DEM are presently performing a three-year water quality study of Rhodhiss Lake. The objectives of this study include an effort to estimate the assimilative capacity of Rhodhiss Lake for oxygen demanding wastes. Rhodhiss Lake receives a considerable load of oxygen-consuming wastes from both point and non-point sources. The largest point source contribution are from Valdese and Morganton WWTPs. Each of these facilities is permitted to release over 7 MGD of wastewater receiving only secondary limits. However, significant dilution of these and other sources exists due to the 126 cfs 7Q10 flow of the Catawba River. Existing water quality models of Rhodhiss Lake suggest that oxygen-consuming wastes are less likely to affect dissolved oxygen than increased nutrient loading. Studies underway to evaluate the effects of nutrients on Rhodhiss Lake are discussed in Section 6.4.3.

Subbasin 03-08-32 (Lake Hickory, Lake Norman)

Powder Spring Branch

Powder Spring Branch was listed as impaired due to impacts from the South Iredell High School WWTP to a zero flow stream reach. This facility has since ceased to discharge, and the NPDES permit was rescinded January 17, 1992. Additional monitoring should be done to determine if the stream has improved.

Lake Hickory

The WPCOG and the USGS in conjunction with DEM are presently in the mist of a three year water quality study of Lake Hickory. The objectives of this study include an effort to estimate the assimilative capacity of Lake Hickory for oxygen demanding wastes. Existing water quality models of Lake Hickory suggest that oxygen-consuming wastes are less likely to affect dissolved oxygen than increased nutrient loading. Studies underway to examine the impact of nutrients on Lake Hickory are discussed in Section 6.4.3.

Lyle Creek Watershed Management Strategy

This watershed includes Lyle Creek, Huffman Branch, McLin Creek, Mull Creek, Hagan Fork and all other Lyle Creek Tributaries. In July of 1988, a watershed-wide modeling analysis of the Lyle Creek watershed was conducted by the Technical Support Branch of DEM. This model was developed to address a request for an expansion of the Conover Northeast WWTP from 0.5 MGD to 1.5 MGD. Results of this model indicated that BOD_5 and NH_3 had been over allocated under previous WLA procedures. The watershed model was used to establish NPDES permit limits for the Conover plant that would protect the DO standard and was used to guide general recommendations for future expansion and new facilities in the Lyle Creek watershed. To control oxygen-consuming wastes in Lyle Creek, the strategy below has been used in the WLA procedure since 1988. It is recommended that this strategy be continued as part of the Catawba Basinwide Plan.

Expanding facilities in the Lyle Creek watershed will receive BOD and NH_3 limits that will hold their load of oxygen-consuming wastes constant. This condition will not be used to bring permit limits below summer limits of 8 mg/l BOD_5 and 2 mg/l NH_3 unless other analyses demonstrate the need for lower limits.

All new facilities discharging to the Lyle Creek watershed will receive limits for oxygen-consuming wastes of ultimate summer BOD not greater than 21 mg/l (equivalent to 8 mg/l BOD_5 and 2 mg/l NH_3 for domestic discharges).

Subbasin 33 (Dutchman's Creek, Mountain Island Lake)

Unnamed Tributary to Fites Creek

This stream segment was listed as impaired due to impacts from the Parkdale Mill discharge to a zero flow segment of the stream. This facility has since ceased to discharge, and the NPDES permit was rescinded January 24, 1991. Additional monitoring should be done to determine if the stream has improved.

6.3.2 Sugar Creek Watershed (Subbasin 34)

Sugar Creek Watershed

A water quality study of 32.3 stream miles in the Sugar Creek, Little Sugar Creek, and McAlpine Creek watersheds in Mecklenburg County, North Carolina, and York County South Carolina was performed to calibrate a QUAL2E water quality model. This model was used to predict dissolved oxygen, ammonia, and biochemical oxygen demand at low flow conditions.

The goal of the field study and water quality modeling was to provide a tool to assist with management of wastewater discharge issues in the Sugar Creek watershed. The Sugar Creek watershed receives a significant amount of wastewater from three major municipal discharges operated by the Charlotte-Mecklenburg Utilities Department; Irwin Creek WWTP, Sugar Creek WWTP, and McAlpine Creek WWTP. In addition, the Sugar Creek watershed receives pollutant loading from eight minor discharges and a highly urbanized landscape.

Current permit limits do not protect water quality in the study area. However, each major facility has new permit limits that will apply to any future modification. In May of 1994, McAlpine Creek WWTP began operation of advanced tertiary treatment to meet permit limits of 4 mg/l BOD and 1 mg/l ammonia. Sugar Creek WWTP and Irwin Creek WWTP are scheduled to meet advanced tertiary limits in 1995. These new limits will significantly lower BOD loading to the system and are predicted to prevent DO from dropping below the instream standard during 7Q10 conditions.

Results of the study suggest that the current management plan and new permit limits for the Irwin Creek, Sugar Creek, and McAlpine Creek WWTPs are consistent with the goal of improving water quality in the Sugar Creek watershed. Once the new permit limits are met at the three major WWTPs, the model predicts that the discharge of oxygen-consuming wastes will not result in water quality problems in the Sugar Creek watershed.

Sugar Creek is also impacted by urban stormwater from the Charlotte area. Efforts to control the effect of stormwater discharge from Charlotte are discussed in Section 6.8.2.

6.3.3 South Fork Catawba River Watersheds (Subbasins 03-08-35 and 03-08-36)

Subbasin 35 (South Fork Catawba Headwaters, Clark Creek)

Bills Branch

Bills Branch was listed as impaired due to BOD and TSS loading from the North Carolina Department of Correction Catawba Correctional Center WWTP. This facility has since ceased to discharge, and the NPDES permit was rescinded April 10, 1990. Additional monitoring should be done to determine if the stream has improved.

Subbasin 36 (Long Creek, Lower South Fork Catawba River)

Long Creek

In 1990, the Gaston County Quality of Natural Resources Commission and the North Carolina Cooperative Extension Service , in conjunction with 13 other agencies and companies including DEM, initiated a water quality study of the Long Creek watershed. The objectives of the study were to identify and monitor point and non-point pollution sources and to collect water quality data that would allow for the development of policies and plans to protect natural resources within the watershed. North Carolina Agricultural Cost-Share Program funds will be targeted for BMP implementation for animal waste management systems to address non-point sources of oxygen-consuming wastes.

In addition, DEM has been working with the City of Gastonia to reduce the discharge of oxygen demanding wastes from the Long Creek WWTP, the single largest point source discharge in the watershed. The Long Creek WWTP will be upgraded to an advanced tertiary plant upon expansion. This treatment upgrade means that even as permitted wasteflow is doubled, the facility will be able to reduce the total loading of oxygen-consuming wastes in the watershed.

South Fork Catawba River

A water quality study of 10 miles of the South Fork Catawba River was performed in order to calibrate a QUAL2E water quality model. This model was used to predict dissolved oxygen (DO), ammonia (NH3), and biochemical oxygen demand (BOD) at low flow conditions.

Results of the study suggest that the assimilative capacity for oxygen demanding wastes in the lower South Fork Catawba River is extremely limited. It is recommended that major discharges (Permitted wasteflow greater than 1.0 MGD) to the South Fork below Long Creek should receive advanced tertiary limits upon major modification or expansion. All new discharges to the South Fork Catawba River below Long Creek should also receive advanced tertiary limits.

6.3.4 Catawba Creek and Crowders Creek Watersheds (Subbasin 37)

Crowders, McGill and Abernethy Creeks

A water quality study of 25 stream miles of McGill, Crowders, and Abernethy creeks in Gaston County was performed in order to calibrate a QUAL2E water quality model. This model was used to predict dissolved oxygen (DO), ammonia (NH3), and biochemical oxygen demand (BOD) at low flow conditions. The study was initiated due to high instream waste concentration in Crowders Creek and observations of poor water quality downstream of Crowders Creek in Lake Wylie. Crowders Creek watershed receives a significant amount of wastewater from 19 NPDES discharges, including 2 major municipal discharges (Bessemer City and Gastonia Crowders Creek) and 5 significant industrial discharges.

Results of the study suggest that the recent collection of wastewater by the Gastonia Crowders Creek WWTP from smaller facilities has significantly reduced loading of oxygen demanding wastes to Crowders Creek. This is due to the advanced treatment capabilities of the Gastonia

Crowders Creek WWTP. DO violations are no longer predicted. However, it is recommended that the smaller facilities continue to tie on the Gastonia's WWTP as collection services become available.

6.3.5 Union County Watersheds (Subbasin 38)

The entire Sixmile Creek Watershed in North Carolina has zero 7Q10 flow. However, much of Sixmile Creek does have a positive 30Q2 flow. Existing water quality models cannot accurately predict the effects of discharges to a zero 7Q10 flow stream, yet because of the positive 30Q2 flow, current DEM procedures have allowed for new and expanding facilities to be permitted at advanced tertiary limits. The limit to this procedure is that without a model in place there is no way to estimate at what point such a stream will be impaired by additional wastewater flow. This is a concern in watersheds such as Sixmile Creek where a significant amount of wastewater is discharged to zero 7Q10 streams. It is also a potential concern for nearby Waxhaw Creek which is less developed but which provides habitat for the state and federally endangered Carolina Heelsplitter mussel.

At present there are eight existing and proposed discharges in the Sixmile Creek watershed totaling nearly 3 MGD of wastewater. Dissolved oxygen values of less than the state standard of 5 mg/l have been reported downstream in South Carolina's portion of the Creek. Instream monitoring data from several of the existing WWTPs have also indicated DO values below the state standard.

The most environmentally sound method to address the problem of high wastewater flow in this zero 7Q10 flow watershed is to remove the discharges. A planned expansion of the Charlotte Mecklenburg County Utility Department (CMUD) McAlpine Creek WWTP collection system offers an opportunity to do this. CMUD has proposed a collection system that will tie on at least five of the discharges in Sixmile Creek watershed. Therefore, the following strategy is recommended for the Sixmile Creek watershed.

Sixmile Creek Watershed Management Strategy

All new and expanding facilities will receive summer limits of 5 mg/l BOD_5, 2 mg/l NH_3, and 6 mg/l DO per the existing DEM procedure and regulations for zero 7Q10 flow streams. Winter limits for new and expanding facilities will be 10 mg/l BOD_5, 4 mg/l NH_3, and 6 mg/l DO. All facilities will be required to tie on to sewer lines serving a regional facility within 180 days of availability.

6.4 MANAGEMENT STRATEGIES FOR NUTRIENTS

Control of nutrients is necessary to limit algal growth potential, to assure protection of the instream chlorophyll *a* standard, and to avoid the development of nuisance conditions in the state's waterways. Point source controls are typically NPDES permit limitations on total phosphorus (TP) and total nitrogen (TN). Nonpoint controls of nutrients generally include best management practices (BMPs) to control nutrient loading from areas such as agricultural land and urban areas.

Assimilative capacity for nutrients vary greatly in the Catawba Basin as the waters flow from stream to lake to stream. A 1992 report by DEM and South Carolina Department of Health and Environmental Control (92-04) described the assimilative capacity of Lake Wylie as exhausted. Rhodhiss Lake and Lake Hickory are eutrophic lakes, but their short retention time mitigates the effect by somewhat controlling algal growth. Ongoing and planned studies will further detail the assimilative capacity for nutrients of Lake James, Rhodhiss Lake, Lake Hickory, Lookout Shoals Lake, and Mountain Island Lake.

6.4.1 Lake Wylie Management Strategy

The 1992 Lake Wylie Report (92-04) documented eutrophic conditions in Lake Wylie and several of its major tributaries. To address eutrophication in Lake Wylie, the state developed a point and non-point nutrient control strategy for the Lake Wylie watershed. For point sources, it required state-of-the-art nutrient removal for all new or expanding wastewater discharges in the vicinity of the lake. In addition, the nutrient management strategy required existing facilities on tributaries to the three most highly eutrophic arms of the lake (South Fork Catawba River, Catawba Creek and Crowders Creek) to meet stringent nutrient removal requirements. For nonpoint sources, this strategy included targeting of funds from the state's Agricultural Cost Share Program for the Reduction of Nonpoint Source Pollution for implementation of best management practices on agricultural lands to highly impacted watersheds of Lake Wylie.

In conjunction with the Catawba River basinwide planning effort, the existing Lake Wylie management strategy was reexamined using current water quality data to assess the strategy's consistency with the State's stated goal of managing problem pollutants while accommodating reasonable economic growth. The Lake Wylie nutrient management strategy presented below is designed to reduce and eventually prevent the occurrence of eutrophication-related water quality standard violations in Lake Wylie and is consistent with the general results and conclusions of the 1992 Lake Wylie report.

The Lake Wylie Nutrient Management Area

In order to control nutrient loading in Lake Wylie and its major tributaries, both point and non-point source controls need to be implemented. For the purposes of this document, the Lake Wylie Nutrient Management Area is considered to be Lake Wylie and its tributaries including the Catawba River and its tributaries below Mountain Island Dam and the South Fork Catawba River below its confluence with Long Creek. The upper watersheds of the Catawba River, above Mountain Island Lake Dam, and the South Fork Catawba River, above Long Creek, are not included in the management area due to both the distance of these waters from Lake Wylie and the presence of impoundments which trap some nutrients. Because distance from the lake and the presence of impoundments may somewhat mitigate the effects of nutrients released into the upper Lake Wylie watersheds, nutrient management will be focused within the study area as defined above.

Future study will be conducted to reevaluate the extent of the defined management area. Point and non-point sources on the South Fork Catawba River upstream of Long Creek will be further assessed to determine what effect additional control of nutrients in the upper South Fork Catawba River basin may have upon eutrophication in Lake Wylie. Results of this study will be considered during the development of the next Catawba River Basin Plan.

Recommended Point Source Nutrient Reduction Strategies

To reduce nutrient enrichment of Lake Wylie, the following recommendations are made for point source discharges within the Lake Wylie Nutrient Management Area. These recommendations are summarized and compared with those from the 1992 Lake Wylie Report in Table 6.2, below.

Reference is also made to Figures 6.1 and 6.2, below, and Figure 3.4 in Chapter 3. Figures 6.1 and 6.2 depict the average daily nutrient loading and predicted chlorophyll *a* concentrations in the four major tributary arms and the mainstem of Lake Wylie based on the nutrient management strategy described below. The key differences between Figures 6.1 and 6.2 pertain to nutrient loadings in the Catawba River arm and the lake mainstem resulting from possible future expansions and upgrading of the Mt. Holly and Belmont municipal wastewater treatment plants (WWTPs). In Figure 6.1, the nutrient loadings to the lake mainstem area, which are shown enclosed by a dashed box in the figure, would be 1077 lbs/day for total phosphorus (TP) and 9289 lbs/day for total nitrogen (TN). The predicted average chlorophyll *a* concentration would be 17.2

ug/l (compared to the state standard of 40 ug/l). Figure 6.2 shows conditions in which the Mt. Holly and Belmont WWTPs are enlarged. Even though their respective flows would increase by 2.0 MGD, their actual nutrient loadings are reduced because nutrient limits would apply to the plants upon expansion. As a result, the TP and TN loads and the predicted chlorophyll *a* concentrations in the mainstem of the lake are lower in Figure 6.2 than in 6.1.

Finally, a comparison can be made between present and permitted nutrient loadings and chlorophyll *a* concentrations by comparing Figures 6.1 and 6.2 with Figure 3.4 in Chapter 3. Major nutrient loading reductions and predicted chlorophyll *a* concentrations can be seen in the Catawba Creek and Crowders Creeks arms when comparing existing conditions (Figure 3.4) and the recommended permitting strategies contained herein. The reductions in nutrient loadings and chlorophyll *a* in the two other lake arms and the lake mainstem are less dramatic but significant.

New Discharges

It is recommended that no new discharges should be allowed to the lake mainstem or its tributaries, unless an evaluation of engineering alternatives shows that it is the most environmentally sound alternative. For any new discharges that meet this requirement it is recommended that advanced treatment technology be required. It is further recommended that any new facility with a permitted design flow of greater than or equal to 1 MGD should be required to meet monthly average limits of 1.0 mg/l total phosphorus (TP) and 6.0 mg/l total nitrogen (TN), (nitrogen limits to apply for the months April through October only). For new facilities with a permitted design flow of less than 1 MGD but greater than 0.05 MGD (50,000 gallons per day) it is recommended that they meet a total phosphorus limit of 2.0 mg/l.

All industrial discharges will be handled on a case-by-case basis because attainable advanced removal technology cannot be clearly defined for them as a group. The Division will require the industries in the management area to control TP and TN to best available technology levels applicable to their industrial type.

Existing Discharges

Existing discharges to the lake mainstem and tributaries should be encouraged to be removed when alternatives become available. Programs such as the Charlotte-Mecklenburg Utility Department (CMUD) sewer line extension project should continue to be supported.

Upon expansion or major modification, it is recommended that all existing discharges should be required to apply advanced nutrient removal technology. For all expanding facilities with a permitted design flow greater than or equal to 1 MGD, recommended monthly average limits are as follows: 1.0 mg/l TP and 6.0 mg/l TN, (nitrogen limits to apply for the months of April through October only). For expanding facilities with a permitted design flow less than 1 MGD but greater than or equal to 0.05 MGD, the recommended TP limit is 2.0 mg/l. No expansion should be allowed that increases the total nutrient load from the facility unless an evaluation of engineering alternatives shows that it is the most environmentally sound alternative.

All existing industrial discharges will be handled on a case-by-case basis because attainable advanced removal technology can not be clearly defined for them as a group. DEM will require the industries in the management area to reduce TP and TN to best available technology levels.

To reduce nutrient enrichment in the two most eutrophic arms of Lake Wylie, additional recommendations are made for point source discharges to the Catawba Creek and Crowders Creek watersheds. In both watersheds, incentives should be established to encourage the privately owned facilities to tie on to larger municipal WWTPs which have a greater resource base to draw on in order to consistently operate the state-of-art treatment facilities required to protect water quality in the above listed sensitive areas. In addition, specific nutrient management recommendations are presented below.

Table 6.2 Comparison of 1992 and 1995 Point Source Phosphorus Reduction Strategies for Lake Wylie

1992 STRATEGY	1995 STRATEGY
NEW/EXPANDING DISCHARGES TO LAKE WYLIE*	NEW/EXPANDING DISCHARGES TO LAKE WYLIE*
Upon expansion, all facilities must meet BAT limits (defined as 0.5 mg/l TP, 4 mg/l summertime TN and 8 mg/l wintertime TN)	≥ 1 MGD, all new and expanding facilities must meet limits of 1 mg/l (TP) and 6 mg/l (TN - summer only). <1 MGD, but >0.05 MGD, all new and expanding facilities must meet a 2 mg/l TP limit.
INDUSTRIAL DISCHARGES	INDUSTRIAL DISCHARGES
All industrial discharges will be handled on a case-by-case basis because best available technology (BAT) is not clearly defined for them. The Division will require the industries in the management area to reduce TP and TN to BAT levels.	No change
DISCHARGES TO CATAWBA CREEK (>0.05 MGD)	DISCHARGES TO CATAWBA CREEK (>0.05 MGD)
By 1998, all facilities must meet BAT limits (defined as 0.5 mg/l TP, 4 mg/l summertime TN and 8 mg/l wintertime TN)	By 2001, all facilities must meet a 1 mg/l TP limit and 6 mg/l summertime TN limit. By 2006, all facilities must meet a 0.5 mg/l TP limit and TN limits of 4 mg/l in the summertime and 8 mg/l in the wintertime.
DISCHARGES TO CROWDERS CREEK (>1 MGD)	DISCHARGES TO CROWDERS CREEK (>1 MGD)
By 1998, all facilities must meet BAT limits (defined as 0.5 mg/l TP, 4 mg/l summertime TN and 8 mg/l wintertime TN)	By 2001, all facilities must meet limits of 1 mg/l (TP) and 6 mg/l (TN - summer only).
DISCHARGES TO SOUTH FORK CATAWBA RIVER DOWNSTREAM OF LONG CREEK	DISCHARGES TO SOUTH FORK CATAWBA RIVER DOWNSTREAM OF LONG CREEK
By 1998, all facilities must meet BAT limits (defined as 0.5 mg/l TP, 4 mg/l summertime TN and 8 mg/l wintertime TN)	≥ 1 MGD, all new and expanding facilities must meet limits of 1 mg/l (TP) and 6 mg/l (TN - summer only). <1 MGD, but >0.05 MGD, all new and expanding facilities must meet a 2 mg/l TP limit.

*Defined as the Catawba River and its tributaries (unless otherwise noted) from the Mountain Island Lake dam to the Lake Wylie dam.

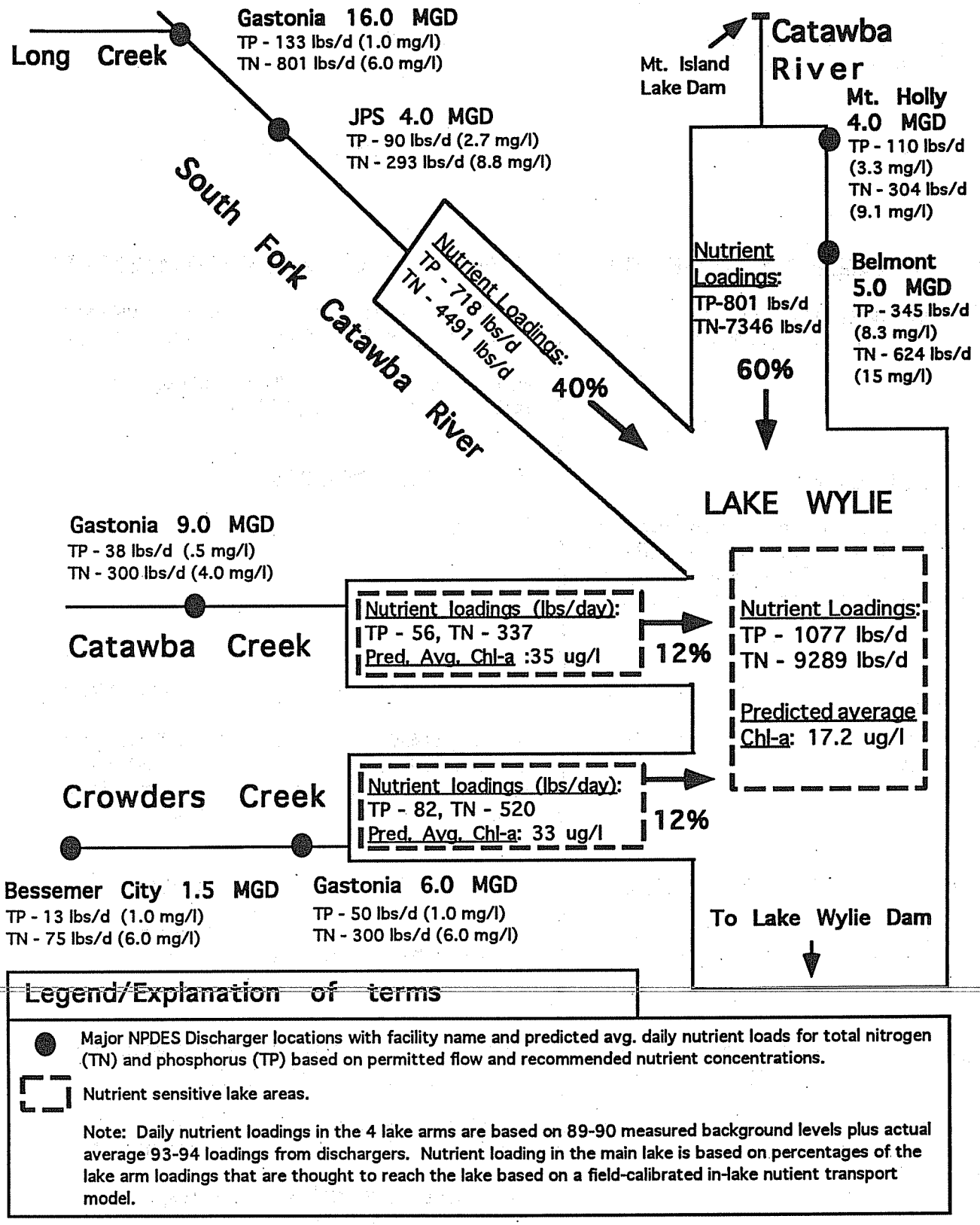

Figure 6.1 Schematic Diagram of Lake Wylie Showing Nutrient Loadings and Predicted Chlorophyll-a Concentrations in the 4 Major Arms and the Mainstem of the Lake Under the 1995 Lake Wylie Nutrient Management Strategy

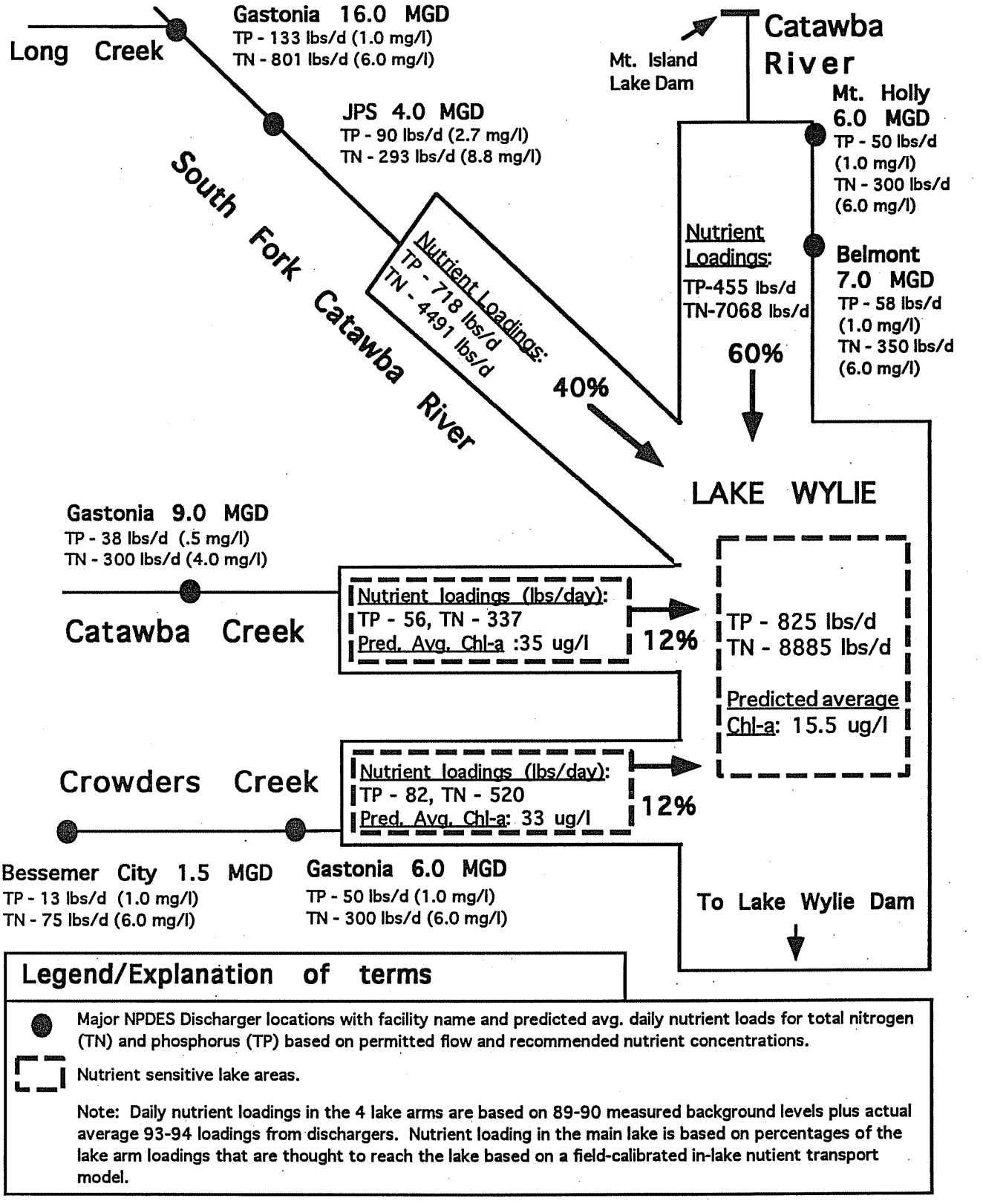

Figure 6.2 Schematic of Lake Wylie Showing Nutrient Loadings and Predicted Chlorophyll-a Concentrations in the 4 Major Arms and the Mainstem of the Lake Under the 1995 Lake Wylie Nutrient Management Strategy with Mt. Holly and Belmont Expanded by 2.0 MGD

Catawba Creek
All existing surface water discharges in these watersheds with a permitted design flow of greater than or equal to 0.05 MGD should be required to apply state-of-art nutrient removal technology. Existing facilities have been notified of this strategy and will be required to meet permit limits of 0.5 mg/l TP and TN limits of 4 mg/l in the summer and 8 mg/l in the winter by 2006. Interim limits of 1.0 mg/l TP and 6.0 mg/l TN (summer) will become effective January 1, 2001. Based on a comparison between Figure 3.4, in Chapter 3, and Figure 6.1, it can be seen that these recommendations would result in reducing the predicted chlorophyll *a* concentration in Catawba creek from 74 ug/l (Figure 3.4) to 35 ug/l (Figure 6.1).

Crowders Creek
By January 1, 2000, it is recommended that all facilities with a permitted design flow of greater than or equal to 1 MGD will be required to meet limits of 1.0 mg/l TP and 6.0 mg/l TN. The nitrogen limits would apply for the months of April through October only. Based on a comparison between Figure 3.4, in Chapter 3, and Figure 6.1, it can be seen that these recommendations would result in reducing the predicted chlorophyll *a* concentration in the creek from 43 ug/l to 33 ug/l.

Non point sources
All tributaries to Lake Wylie should be targeted by the NC Division of Soil and Water Conservation for cost share funds for use in implementation of best management practices (BMPs). When possible, resources should be targeted toward implementation of BMPs in the Catawba Creek, Crowders Creek, and the South Fork Catawba River watersheds since a significant amount of the nutrients reaching these streams is from non-point sources. Since the South Fork Catawba River provides by far the largest nutrient load of any tributary to Lake Wylie, the South Fork should be considered the highest priority for implementation of BMPs.

6.4.2 Mountain Island Lake

DEM and Mecklenburg County are completing a two-year cooperative study of nutrient loading in the McDowell Creek watershed and the eutrophic response in Mountain Island Lake. Preliminary data suggest that the CMUD McDowell Creek WWTP discharge is the largest source of nutrients to the McDowell Creek arm of Mountain Island Lake. This facility will be required to implement nutrient removal upon major modification or expansion.

6.4.3 Rhodhiss Lake and Lake Hickory

The WPCOG and the USGS in conjunction with DEM are presently performing a three-year water quality study of Rhodhiss Lake and Lake Hickory. The objectives of this study include an effort to quantify nutrient loading to the lakes and to evaluate eutrophic response to nutrient enrichment. Both lakes receive significant nutrient loading from point and non-point sources.

When compared to other major lakes in the Catawba river basin, Rhodhiss Lake and Lake Hickory have relatively fast velocities and short retention times (see Table 2.1 in Chapter 2). This suggests that these lakes may be less sensitive to nutrient enrichment than other lakes in the Catawba river basin, as mixing and limited retention time in the reservoirs may limit algal growth. Specific management plans for point and/or non-point source pollution sources to Rhodhiss Lake and Lake Hickory will be developed after completion of the WPCOG, USGS, DEM study and incorporated into the second edition of the Catawba basinwide plan.

6.5 TOXIC SUBSTANCES

6.5.1 Assimilative Capacity

Toxic substances, or toxicants, routinely regulated by DEM include metals, organics, chlorine and ammonia. These are described in Chapter 3.

The assimilative capacity, that is, the amount of wastewater the stream can assimilate under designated flow conditions (7Q10 for aquatic life based standards, average flow for carcinogens), available for toxicants in the Catawba Basin varies from stream to stream. In larger streams where there is more dilution flow, there is more assimilative capacity for toxic dischargers. In areas with little dilution, facilities will receive chemical specific limits which are close to the standard. Toxicants from nonpoint sources typically enter a waterbody during storm events. The waters need to be protected from immediate acute effects and residual chronic effects. A review of the ambient station data in the Catawba Basin indicates that there are no significant problems occurring for measured toxicants within any one subbasin. Most ambient stations where metals data is collected, show levels of copper, zinc and iron above detection and in some cases above the designated action level instream. Action levels are not limited in the effluent unless the facility has a federal guideline limit for the parameter or if the facility is failing toxicity and the cause is known to be the substance regulated by the action level.

6.5.2 Control Strategies

Basinwide Strategies

Point source dischargers will be allocated chemical specific toxic substance limits and monitoring requirements based on a mass balance technique discussed in the Instream Assessment Unit's Standard Operating Procedures manual and in Appendix III of this report. Whole effluent toxicity limits are also assigned to all major dischargers and any discharger of complex wastewater. Where clusters of discharges and other pollution sources exits, concerns about the interaction of toxicants from different facilities are addressed by calculating a total maximum daily load (TMDL) for these streams. This method involves determining the total dilution available downstream of a number of pollution sources that are believed to contribute to a threat to water quality, and allocating pollutant loads from those sources so as to prevent instream violations of water quality standards. Examples of this TMDL strategy for Clark Creek and the South Fork Catawba River are discussed below.

Subbasin 35 - Clark Creek

One four mile segment of Clark Creek receives potentially toxic effluent from three major WWTPs; Newton WWTP, Maiden WWTP and Delta Mills. Benthic macroinvertebrate data collected below the Newton WWTP indicated a decline in bioclassification from 1984 to 1991. The largest of these facilities, Newton WWTP at 5.0 MGD, will be required to meet new limits for cadmium, chromium, nickel, lead, cyanide and toluene during the next permit cycle. In addition, due to the potential interaction of toxic wastes from these three facilities, future wasteload allocations for each facility will include a TMDL analysis for total loading below all three facilities. Copper has not been included in the list of metals recommended for limitations in the upcoming permits primarily because there is no specific standard for it, only an action level, and there is no demonstrated linkage between the elevated copper concentration in the stream and affects on aquatic life in Clark Creek. However, because copper levels above the action level have been observed, DEM will assess the need for recommending copper limits in the discharger permits prior to permit renewal.

Subbasin 36 - South Fork Catawba River

The South Fork Catawba has been identified by EPA as one of fourteen areas nationwide where potential toxicity problems exist. The South Fork is used both as a drinking water supply and for the assimilation of wastewater. To address concerns about potential toxicity, point source

wasteload allocations for each facility discharging to the South Fork from Lincolnton to Lowell will include a TMDL analysis for total loading at the Lowell Gage (120 cfs).

Nonpoint source strategies to be implemented through the industrial NPDES stormwater program should also be helpful in reducing toxic substance loading to surface waters. Industries are being required to control runoff from their sites and to cover stockpiles of toxic materials that could pose a threat to water quality.

6.6 MANAGEMENT STRATEGIES FOR CONTROLLING SEDIMENTATION

Sedimentation refers to the deposition of sediment in surface waters. The causes, sources and water quality impacts of sedimentation are described in section 3.2.4 of Chapter 3. It is essentially a widespread nonpoint source-related water quality problem which results from land-disturbing activities. The most significant of these activities include agriculture, construction (e.g., highways, shopping centers and residential subdivisions) urban stormwater, forestry and mining. For each of these 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. These programs are listed in Table 6.3 and are briefly described in Chapter 5.

Table 6.3 State and Federal Sediment Control-related Programs (with Chapter 5 Section References in Parentheses)

- Agricultural Nonpoint Source (NPS) Control Programs (Section 5.3.1)
  - 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 (Sections 5.3.2 and 5.3.3)
  - Sediment Pollution Control Act (Section 5.3.3)
  - Federal Urban Stormwater Discharge Program
  - Water Supply Protection Program
  - NC Coastal Stormwater Management Regulations
  - Coastal Nonpoint Pollution Control Programs
  - ORW and HQW Stream Classifications

- Forestry NPS Programs (Section 5.3.6)
  - Forest Practice Guidelines Related to Water Quality
  - National Forest Management Act (NFMA)
  - Forest Stewardship Program

- Mining Act (Section 5.3.7)

- Wetlands Regulatory NPS Programs (Section 5.3.8)
  The sediment trapping and soil stabilization properties of wetlands are particularly important to nonpoint source pollution control. Several important state and federal wetland protection programs are listed below.

  - Section 10 of the Rivers and Harbors Act of 1899
  - Section 404 of the Clean Water Act
  - Section 401 Water Quality Certification (from CWA)

DEM's role in sediment control is to work cooperatively with those agencies that administer the sediment control programs in order to maximize the effectiveness of the programs and protect water quality. Where programs are not effective, as evidenced by violation of instream water quality standards (section 3.2.4), and where DEM can identify a source, then appropriate enforcement action can be taken. Generally, this would entail requiring the land owner or responsible party to install acceptable best management practices (BMPs). BMPs vary with the type of activity, but they are generally aimed at minimizing the area of land-disturbing activity and the amount of time the land remains unstabilized; setting up barriers, filters or sediment traps (such as temporary ponds or silt fences) to reduce the amount of sediment reaching surface waters; and recommending land management approaches that minimize soil loss, especially for agriculture.

Some control measures, principally for construction or land development activities of 1 acre or more, are required by law under the state's Sedimentation and Erosion Control Act administered by the NC Division of Land Resources. For activities not subject to the act such as agriculture, sediment controls are carried out on a voluntary basis through programs administered by several different agencies. The NC Agricultural Cost Share Program administered by the NC Division of Soil and Water Conservation provides incentives to farmers to install BMPs by offering to pay up to 75% of the average cost of approved BMPs. A federal Farm Bill program administered by the Soil Conservation Service provides an incentive not to farm on highly erodible land (HEL) by taking away federal subsidies to a farmer that fails to comply with the provision.

The NC Cost Share Program totals are cumulative for an approximate 10-year period. The cost share figures include a wide array of BMPs including conservation tillage, terraces, diversions, critical area plan, sod-based rotation, crop conservation grass, crop conservation trees, filter strip, field border, grass waterway, water control structure and livestock exclusion.

Despite the combined efforts of all of the above programs for construction, forestry, mining and agriculture, there were still 376 miles of streams in the Catawba Basin found to be impaired by sediment, thus pointing to the need for continued overall improvements in sediment control. The following streams have been identified as being impaired or threatened by sediments and so should receive high priority as sediment control programs are implemented. The Linville River, as noted earlier, is one of four state-designated scenic rivers, and Waxhaw Creek provides habitat for a federally-endangered mussell, the Carolina Heelsplitter.

Stream	Subbasin	Stream	Subbasin
Linville River	03-08-30	South Fork Catawba	03-08-35
Lower Creek	03-08-31	Long Creek	03-08-36
Lower Little River	03-08-32	Twelve Mile Creek	03-08-38
Clark Creek	03-08-35	Waxhaw Creek	03-08-38

6.7 MANAGEMENT STRATEGIES FOR CONTROLLING COLOR

The discharge of color is to be regulated such that only such amounts as will not render the waters injurious to public health, secondary recreation, or to aquatic life and the wildlife or adversely affect the palatability of fish, aesthetic quality or impair the waters for any designated uses. However, the practical application of this regulation must take into account the various ways in which color is perceived in the environment. Color in natural waters is rarely the result of one specific chemical, rather a mixture of many dissolved and/or suspended constituents contribute to color. Also, the stream bed and sediments may also contribute to color. Because color is perceived differently by different people and in different lighting conditions, no general definition of color impairment can be specified by a simple set of criteria.

Because textile industries are a significant source of color to waters of the Catawba and other river basins, DEM is working with the industrial and municipal dischargers to develop appropriate methodologies for evaluating color impairment.

The two subbasins that make up the South Fork Catawba River watershed (03-08-35 and 03-08-36) will be targeted in a pilot study to address color. These subbasins were selected for a pilot study because of the relative high concentration of textile discharges in the watershed and public concerns and complaints regarding color. The study will involve color monitoring and development of color control measures for the following facilities in the South Fork Catawba watershed:

FACILITY	STREAM	FACILITY	STREAM
Hickory Henry Fk WWTP	Henry Fork	Gastonia Long Cr WWTP	Long Creek
Newton WWTP	Clark Creek	Cromton & Knowles	S. Fork Catawba
Delta Mills	Clark Creek	Stowe Pharr Mills	S. Fork Catawba
Lincolnton South Fork	S. Fork Catawba	JPS Automotive	S. Fork Catawba
Cherryville WWTP	Indian Creek		

Color monitoring will consist of ADMI monitoring (as cited below). All samples taken should have complete descriptive recordings of the color in the sample container including hue (distinctive characteristics and tint), clarity (clearness of the color sample) and luminance (brightness or glowing quality) of the sample as it looks in the collection container. Descriptions of stream color should also be recorded when color samples are collected. Below is language typically contained in NPDES discharge permits for color monitoring:

> Color samples should be analyzed as follows:
>
> a) at natural pH
> b) free from turbidity (True Color); and
> c) Samples shall be analyzed in accordance with the provisions of Method 2120 E.4. as described in the 18th Edition of Standard Methods for the Examination of Water and Wastewater. Using a narrow-band scanning spectrophotometer to produce a complete spectral curve of the visible spectrum (350-75-nm), calculate and report results in ADMI values for true color values at the sample's ambient pH value. All color data including visual observations should be submitted with the monthly DMRs.
>
> Color Monitoring shall take place instream above the effluent outfall, downstream below the effluent outfall and in the effluent.
> Frequency shall be 3 consecutive days (preferably Tuesday, Wednesday and Thursday) once per month.

In addition to the monitoring, the Division will work with the Office of Waste Reduction to identify possible source reduction methods for the control of color at the facilities listed above. The results of the monitoring program will be used to guide color management decisions throughout the Catawba River basin and to develop a color management strategy for the South Fork Catawba watershed as part of the Catawba basinwide plan update in 1999.

6.8 MANAGEMENT STRATEGIES FOR STORMWATER CONTROL

A number of studies, including the Nationwide Urban Runoff Program (NURP) sponsored by the US Environmental Protection Agency, have shown that urban stormwater runoff, and the pollutants it carries, can be a significant contributor to water quality impairment. The North Carolina Division of Environmental Management (DEM) has identified 111 miles of streams in the

Catawba River Basin as being impaired by urban stormwater. DEM administers a number of programs aimed at controlling urban stormwater runoff. These include: 1) programs for the control of development activities near High Quality Waters (HQW) and Outstanding Resource Waters (ORW) and activities within designated Water Supply (WS) watersheds and 2) NPDES stormwater permit requirements for industrial activities and municipalities greater than 100,000 in population (see Section 5.3.2).

6.8.1 HQW, ORW and Water Supply Watersheds

The Catawba River Basin includes a significant number of streams and lakes that are assigned these sensitive water classifications. As described in other parts of this plan, these waters carry with them specific management strategies to protect their uses, including measures to control stormwater runoff from urban development (Section 2.5.3 and Appendix I). The HQW and ORW requirements are implemented by DEM through it's Mooresville and Asheville Regional Offices. Any development activities subject to the HQW or ORW requirements must submit plans and receive stormwater approvals from these regional offices. The water supply protection requirements are implemented by all local governments that have jurisdiction in a water supply watershed. There are 38 local governments in the Catawba basin that have developed water supply watershed protective ordinances for twenty watersheds in the basin. Development activities covered by water supply protection requirements must be reviewed and approved by the appropriate local government. As part of the Catawba Plan, these programs will continue to focus on protection measures for these sensitive water areas.

6.8.2 NPDES Stormwater Management

Throughout the Catawba Basin various types of industrial activities with point source discharges of stormwater are required to be permitted under the NPDES stormwater program. These include discharges related to manufacturing, processing, materials storage areas and construction activities with greater than five acres of disturbance. All of those areas requiring coverage must develop Stormwater Pollution Prevention Plans (SWPPP) to minimize and control pollutants discharged from their stormwater systems. These SWPPPs are subject to review and modification by the permitted facilities and DEM to assure that management measures are appropriate.

In the Catawba Basin one municipality, the City of Charlotte, is currently covered by the NPDES stormwater requirements. The City of Charlotte's permit became effective on November 1, 1993 and expires on June 30, 1998. This permit covers discharges of stormwater from the city's storm sewer system as it exists today and any additional storm sewer outfalls that may be added. The Stormwater Quality Management Program (SWQMP) developed by the City involves stormwater management to address a wide range of activities within the jurisdictional area of the City of Charlotte. These programs are designed to control the discharge of pollutants from the city's storm sewer system associated with stormwater runoff from commercial, residential, industrial and construction activities. Like the other municipal areas across the state that are covered by this program, the City of Charlotte is responsible for implementing programs to reduce the discharge of pollutants from their municipal storm sewer system to the maximum extent practical. Stormwater management through source reduction and pollution prevention are the major areas of emphasis of all of these programs. Appendix VI of this document contains fact sheet information related to the city's permit. Additional information on the City of Charlotte's Stormwater Permit can be obtained from the Division or from the Charlotte/Mecklenburg Stormwater Services.

The programs associated with the SWQMP are comprehensive programs that will take a number of years to implement fully. For this reason Charlotte, like other municipalities, will implement management activities on a priority basis. The Division recognizes municipal stormwater permits as living documents that will most likely change over the life of the permit to afford the most effective management of stormwater runoff. Annual reports on the progress and effectiveness of

the cities stormwater management programs are part of the NPDES municipal permits and will serve as an assessment tool for DEM and for the cities to make needed adjustments to various parts of their program. In the case of the City of Charlotte, Table 6.4 below outlines some of the highlights of their programs. This is a very generalized summary of Charlotte's program which is a very progressive and comprehensive stormwater management program.

Table 6.4 Highlights of Charlotte's NPDES Municipal Stormwater Management Programs

Commercial and Residential: Charlotte will monitor and evaluate the effectiveness of management practices including maintenance activities, recycling controls, litter controls and other housekeeping programs that impact stormwater management in these areas. **Construction:** Charlotte will utilize ongoing training programs to educate people involved in sedimentation and erosion control activities on state-of-the-art control practices and measures. **Industrial:** Charlotte is implementing inspection and monitoring programs to identify water quality problems associated with industrial areas including illicit connections programs. **Recycling:** Charlotte is enhancing programs, along with the county, for collection of household wastes - used oil, household chemicals, etc. These programs will be implemented in conjunction with educational programs. **Monitoring:** Charlotte will utilize various forms of chemical and biological monitoring to locate problem areas for controls and to assess the effectiveness of stormwater management programs.

6.8.3 Recommendations for Controlling Stormwater Impacts by Local Governments Not Subject to NPDES Stormwater Requirements

Other local governments throughout the Catawba basin are encouraged to evaluate the potential impacts of stormwater runoff and develop stormwater management programs for control of these sources of pollutants. In this process a few program areas consistent with existing municipal NPDES programs are recommended as starting points for stormwater management. These include:

- Mapping of the local government's storm sewer system and outfall points, and development of procedures to update this information.
- Evaluating existing land uses in the local government's jurisdictional area to determine where sources of stormwater pollution may exist. In addition, local government activities and programs should be evaluated to determine where existing activities address stormwater management in some way, or could be modified to do so.
- Developing educational programs to alert people to the activities that may contribute pollutants to stormwater runoff and how they can change their practices to minimize or eliminate these problems.
- Developing programs to locate and remove illicit connections (illegal discharge of non-stormwater materials) to the storm sewer system. These often occur in the form of floor drains and similar connections. In practice, stormwater management programs represent an area where local governments can develop their own ideas and activities for controlling sources of pollution.