Lake Wylie TMDL
1995
Catawba River Basinwide
Water Quality Management Plan

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.

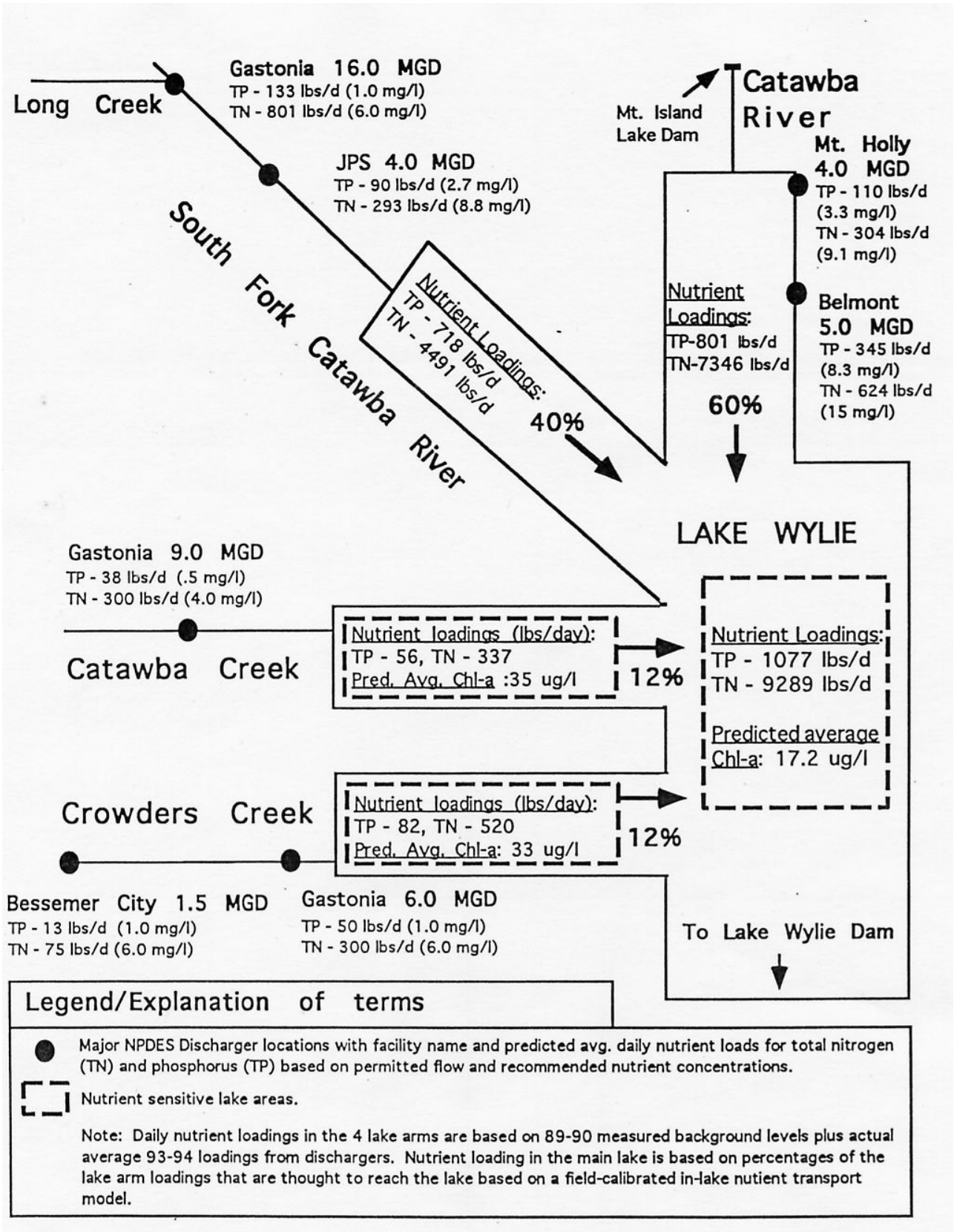

Figure 6.1 Schematic Diagram of Lake Wylie Showing Nutrient Loadings and Predicted Chlorophyll-a Concentrations in the 4 Major Arms and the Mainstem of the Lake Under the 1995 Lake Wylie Nutrient Management Strategy

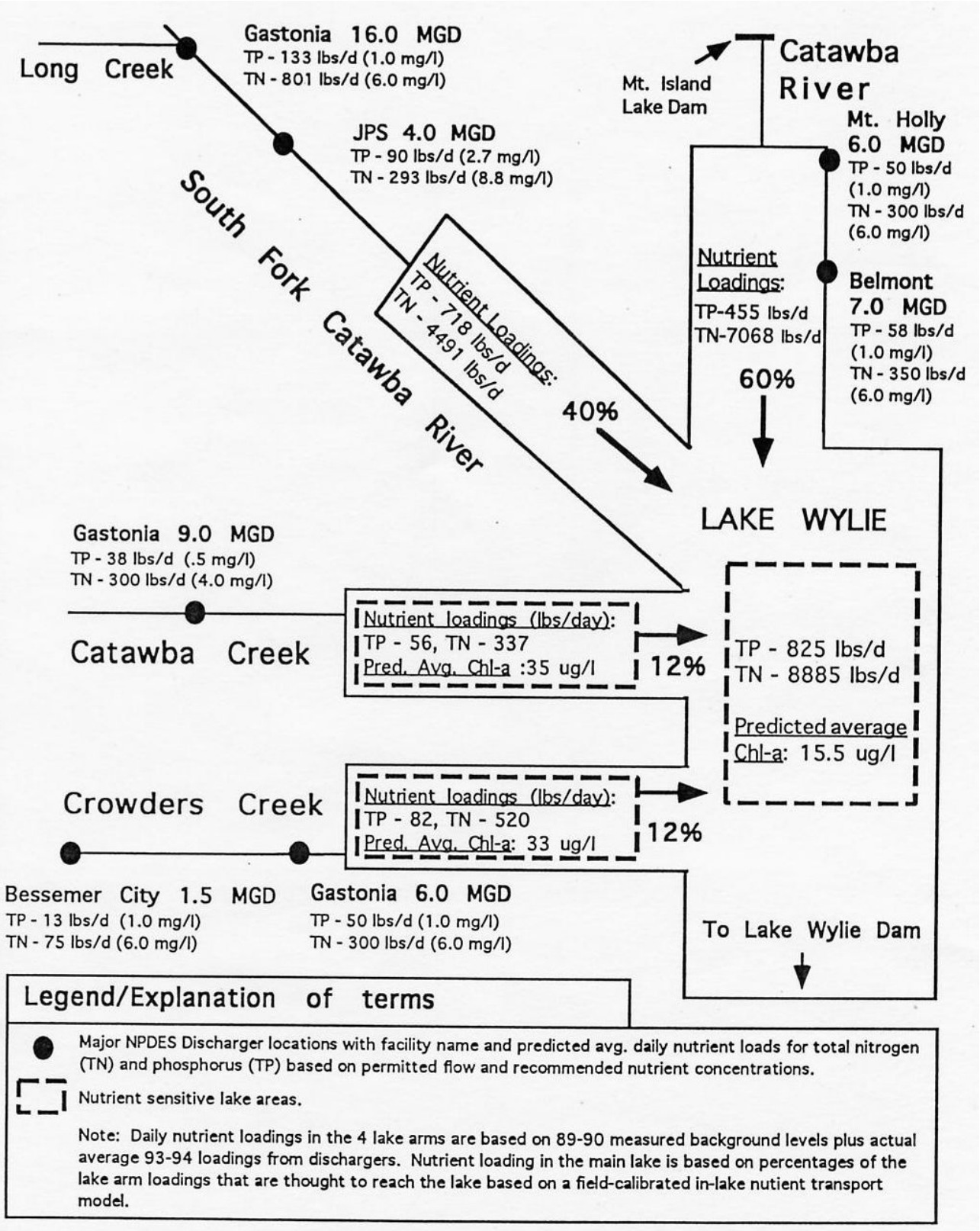

Figure 6.2 Schematic of Lake Wylie Showing Nutrient Loadings and Predicted Chlorophyll-a Concentrations in the 4 Major Arms and the Mainstem of the Lake Under the 1995 Lake Wylie Nutrient Management Strategy with Mt. Holly and Belmont Expanded by 2.0 MGD

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.