Section B: Chapter 4

Yadkin-Pee Dee River Subbasin 03-07-04

Includes Muddy Creek, Grants Creek and High Rock Lake

4.1 Water Quality Overview

Subbasin 03-07-04 at a Glance

Land and Water

Total area:	730 mi^2
Stream miles:	438.0
Lake acres:	11,137.3

Population Statistics

1990 Est. Pop.:	325,945 people
Pop. Density:	461 persons / mi^2

Land Cover (%)

Forest / Wetland:	55.9
Surface Water:	3.6
Urban:	6.0
Cultivated Crop:	2.8
Pasture / Managed Herbaceous:	31.7

This subbasin is located entirely within the piedmont portion of the state. Muddy Creek is the largest tributary of the Yadkin River within this subbasin and its watershed drains the Winston-Salem area. Grants Creek, in the southwestern part of the subbasin, flows through Salisbury, Spencer and East Spencer. Dutchman Creek (subbasin 03-07-05) and the South Yadkin River (subbasin 03-07-06) enter the Yadkin River above High Rock Lake in this subbasin. Abbotts Creek (discussed in subbasin 03-07-07) is a tributary to High Rock Lake. The subbasin contains all or part of more than 15 different municipalities and five counties. The Yadkin River and High Rock Lake serve as the county boundary between Davie and Davidson and Rowan and Davidson counties.

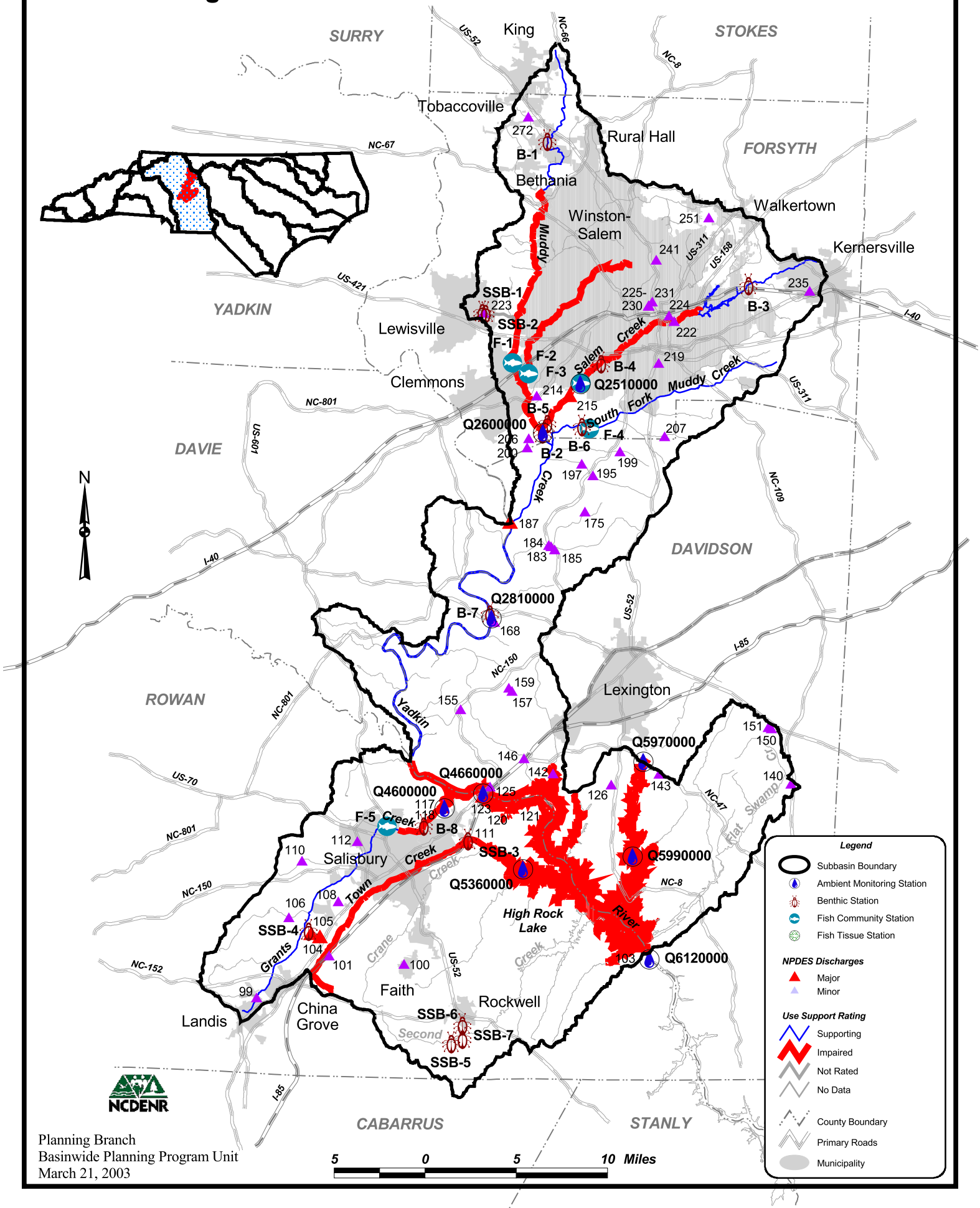
A map including the locations of NPDES discharges and water quality monitoring stations is presented in Figure B-4. Table B-7 contains a summary of monitoring data types, locations and results. Use support ratings for waters in this subbasin are summarized in Table B-8. Appendix I provides a key to discharge identification numbers. Refer to Appendix III for a complete listing of monitored waters and more information about use support ratings.

This subbasin is one of only a few in which more than 5 percent of land is described as urban. The northern portion of the subbasin includes Winston-Salem, Rural Hall, Tobaccoville and parts of King, Lewisville, Clemmons and Kernersville and is almost completely developed. Approximately 56 percent of the land is forested and nearly 35 percent is in agriculture. More than 3 percent is surface water reflecting a large portion of the 15,750-acre High Rock Lake.

This subbasin contains more than one quarter (27 percent) of the total basin population, and the population density in 1990 was the highest of any other subbasin. Population is expected to increase 32 percent in Rowan, 26 percent in Forsyth and 25 percent in Davidson counties between 2000 and 2020. The subbasin contains 40 NPDES permitted discharges and eight registered animal operations. Facilities with compliance or toxicity problems are discussed in following sections.

The majority of waters within this subbasin exhibit some level of impacts to water quality. Many streams are Impaired by a combination of nonpoint and point source pollution. There are no High Quality Waters or Outstanding Resource Waters within the subbasin.

Figure B-4 Yadkin-Pee Dee River Subbasin 03-07-04



Planning Branch
Basinwide Planning Program Unit
March 21, 2003

Table B-7 DWQ Monitoring Locations, Bioclassifications and Notable Chemical Parameters (1998-2002) for Yadkin-Pee Dee River Subbasin 03-07-04

Site	Stream	County	Road	Bioclassification or Noted Parameter[2]
Benthic Macroinvertebrate Community Monitoring				
B-1	Muddy Creek[1]	Forsyth	SR 1898	Good-Fair
B-2	Muddy Creek	Forsyth	SR 2995	Good-Fair
SSB-1	Reynolds Creek[1]	Forsyth	Above Sequioa WWTP	Not Rated
SSB-2	Reynolds Creek	Forsyth	Below Sequioa WWTP	Not Rated
B-3	Salem Creek[1]	Forsyth	SR 2657	Not Rated
B-4	Salem Creek	Forsyth	SR 2902	Fair
B-5	Salem Creek	Forsyth	SR 2991	Fair
B-6	South Fork Muddy Cr[1]	Forsyth	SR 2902	Good-Fair
B-7	Yadkin River[1]	Davidson	SR 1447	Good
B-8	Grants Creek[1]	Rowan	SR 1914	Fair
SSB-4	UT Grants Creek[1]	Rowan	SR 1500	Not Impaired
SSB-3	Town Creek[1]	Rowan	I-85	Fair
Fish Community Monitoring				
F-1	Muddy Creek	Forsyth	SR 1891	Fair
F-2	Silas Creek	Forsyth	SR 1137	Fair
F-2	Silas Creek (2002)	Forsyth	SR 1137	Good-Fair
F-3	Salem Creek	Forsyth	SR 1120	Poor
F-4	South Fork Muddy Cr	Forsyth	SR 2902	Good-Fair
F-5	Grants Creek	Rowan	SR 2202	Good-Fair
Ambient Monitoring				
Q2510000	Salem Creek	Forsyth	At Elledge WWTP	Fecal coliform
Q2600000	Muddy Creek	Forsyth	SR 2995	Nutrients, Fecal coliform
Q2810000	Yadkin River	Davie/ Davidson	US 64	Turbidity
Q4600000	Grants Creek	Rowan	Near mouth	Turbidity, Nutrients, Fecal coliform
Q4660000	Yadkin River	Rowan/ Davidson	NC 150	Turbidity Fecal coliform
Q5970000	Abbotts Creek Arm of High Rock Lake	Davidson	NC 47	Turbidity, Iron, Dissolved oxygen
Q5990000	Abbotts Creek Arm of High Rock Lake	Davidson	SR 2295	Turbidity, Dissolved oxygen

Q5360000	Town Creek Arm of High Rock Lake	Rowan	SR 2168	Turbidity, Iron, Dissolved oxygen
Yadkin-Pee Dee River Basin Association Monitoring				
Q2291000	Muddy Creek	Forsyth	I-40	Fecal coliform
Q2479455	Salem Creek	Forsyth	SR 2740	None
Q2540000	Salem Creek	Forsyth	SR 1120	None
Q2570000	Salem Creek	Forsyth	SR 2991	Fecal coliform
Q2720000	Muddy Creek	Forsyth	SR 1485	Turbidity
Q2810000	Yadkin River[3]	Davie/ Davidson	US 64	Turbidity
Q4540000	Grants Creek	Rowan	3RD St. Extension	Fecal coliform, Turbidity
Q4600000	Grants Creek[3]	Rowan	Near mouth	None
Q4660000	Yadkin River[3]	Rowan/ Davidson	NC 150	Turbidity
Q5240000	Town Creek	Rowan	I-85	None
Q5980000	Abbotts Creek Arm of High Rock Lake[3]	Davidson	NC 47	None
Lakes Assessment				
--	Winston Lake	Forsyth	1 station	None
--	Salem Lake	Forsyth	3 stations	None
--	High Rock Lake	Rowan/ Davidson	8 stations	% DO saturation, Turbidity, Nutrients, Chlorophyll *a*, pH
--	Lake Wright	Rowan	1 station	None
--	Lake Corriher	Rowan	1 station	None

[1] Historical data of this type are available for this waterbody; refer to Appendix II. Sites may vary.

[2] Parameters are noted if in excess of state standards in more than 10 percent of samples collected within the assessment period (9/1996-8/2001).

[3] This site duplicates a DWQ ambient monitoring station.

For more detailed information on sampling and assessment of streams in this subbasin, refer to the *Basinwide Assessment Report - Yadkin-Pee Dee River Basin* (NCDENR-DWQ, June 2002), available from DWQ Environmental Sciences Branch at http://www.esb.enr.state.nc.us/bar.html or by calling (919) 733-9960.

Table B-8 Use Support Ratings Summary (2002) for Monitored and Evaluated[2] Freshwater Streams (miles) and Lakes (acres) in Yadkin-Pee Dee River Subbasin 03-07-04

Use Support Category	Units	Supporting	Impaired	Not Rated	No Data	Total[1]
Aquatic Life/Secondary Recreation	miles	69.3	**48.2**	3.3	317.2	438.0
	acres	275.3	**10,449.7**	71.0	341.3	11,137.3
Fish Consumption[2]	miles	352.7	**85.3**	0.0	0.0	438.0
	acres	301.8	**10,835.5**	0.0	0.0	11,137.3
Primary Recreation	miles	0.0	0.0	0.0	3.0	3.0
	acres	4,880.9	0.0	0.0	359.5	5,240.4
Water Supply	miles	76.9	0.0	0.0	0.0	76.9
	acres	11,084.5	0.0	0.0	0.0	11,084.5

[1] Total stream miles/acres assigned to each use support category in this subbasin. Column is not additive because some stream miles are assigned to more than one category.

[2] These waters are impaired based on fish consumption advice issued for three species of freshwater fish due to mercury contamination. Refer to page 104 of Section A for details.

4.2 Status and Recommendations for Previously Impaired Waters

This section reviews use support and recommendations detailed in the 1998 basinwide plan, reports status of progress, gives recommendations for the next five-year cycle, and outlines current projects aimed at improving water quality for each water. The 1998 Yadkin-Pee Dee River basin plan identified portions of Reynolds Creek, Salem Creek and Grants Creek as Impaired. These waters are discussed in further detail below.

4.2.1 **Reynolds Creek** (3.3 miles from source to Muddy Creek)

1998 Recommendations

Biological surveys conducted in 1994 revealed that Reynolds Creek was Impaired downstream of the Sequoia WWTP. This facility was a package WWTP serving a residential community. DWQ recommended that an engineering alternatives analysis be conducted to determine the feasibility of eliminating this discharge and connecting to the Winston-Salem/Forsyth County collection system. Recommendations were also made for reducing nonpoint source pollution.

Current Status

Benthic macroinvertebrate communities in Reynolds Creek were sampled again at two locations in 2000. Due to reduced flow, the stream was too small for bioclassifications to be assigned. Upstream of the discharge, DWQ biologists found that there had been a slight decline over the six-year period, which is likely due to increased development in Lewisville. Downstream, significant problems still existed that were attributed primarily to the WWTP. Areas of sludge deposition were observed that were contributing to water quality problems. The Sequoia WWTP discharge was removed in July 2001.

2002 Recommendations

Although Reynolds Creek is currently Not Rated due to its small size, significant water quality problems still exist. DWQ will continue to monitor this stream to evaluate any improvement

following the removal of the Sequioa WWTP discharge. However, local actions are needed to reduce the effects of nonpoint source pollution, particularly from stormwater runoff, and to restore habitat in the lower portion of the watershed. It is likely that Forsyth County and Lewisville will be required by DWQ to obtain an NPDES permit for municipal stormwater systems under the federal Phase II stormwater rules.

4.2.2 **Salem Creek** (12.0 miles from dam at Salem Lake to Muddy Creek)

1998 Recommendations

Recommendations for the Salem Creek watershed include support for the City of Winston-Salem's stormwater program and call for further action by the city and Forsyth County to help maintain and improve water quality in the face of continuing development. DWQ planned to reevaluate the computer model used to determine the wasteload allocation for the Archie Elledge WWTP and adjust the NPDES permit accordingly, based on the outcome.

Current Status

The Salem Creek watershed continues to develop, particularly in the headwaters near Kernersville, but also on the lower end. Some habitat degradation was observed above Salem Lake, but the majority of water quality problems exist below the confluence with Brushy Fork. Biological surveys were conducted by DWQ at three sites below Salem Lake, and water chemistry samples were also collected at three sites. Although a small percentage of samples downstream of the Archie Elledge WWTP contained dissolved oxygen concentrations less than 5.0 mg/l, the WWTP does not seem to be adversely impacting the stream. Benthic macroinvertebrate communities were very similar above and below the WWTP. Significant habitat degradation was observed throughout the lower watershed, including severe bank erosion, a lack of riparian vegetation, and sedimentation leading to a very uniform sand/silt substate (i.e., lack of pool and riffle habitat). Additionally, the fish community site, which received a Poor bioclassification, is located upstream of the WWTP discharge. Salem Creek, from the dam at Salem Lake to the confluence with Muddy Creek, remains Impaired.

The geometric means of fecal coliform samples collected from three stations between 1998 and 2001 and one station between 1996 and 2001 from Salem Creek (307, 327, 368 and 773 colonies/100ml) indicate that the stream may not be suitable for primary recreation. In addition, fecal coliform concentrations were greater than 400 colonies/100ml in more than 20 percent of samples from each site. Salem Creek is not currently classified for primary recreation (Class B). However, the stream was historically placed on the 303(d) list for fecal coliform and a TMDL is being developed by DWQ.

2002 Recommendations

Further investigation into the causes and sources of biological impacts to Salem Creek is needed before specific recommendations to improve water quality can be made. Local actions are needed to reduce sedimentation, turbidity and fecal coliform contamination and to promote the production of instream habitat by restoring riparian vegetation throughout the watershed. DWQ will develop a TMDL for fecal coliform and work with local agencies to implement it over the next five-year basinwide planning cycle. Many of the BMPs employed to reduce fecal coliform contamination will likely help reduce habitat degradation in the watershed also. In addition, Forsyth County and Kernersville are required to obtain NPDES permits for municipal

stormwater systems under the Phase II stormwater rules. Refer to page 37 of Section A, Chapter 2 for details.

Water Quality Improvement Projects
The Salem Creek watershed, including Peters Creek and Brushy Fork (03040101 170060), is one of 55 watersheds in the Yadkin-Pee Dee River basin that has been identified by the NC Wetlands Restoration Program (NCWRP) as an area with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than a nontargeted watershed for the implementation of NCWRP restoration projects. Refer to page 278 in Section C for details.

4.2.3 **Grants Creek** (1.2 miles from SR 1910 to Yadkin River)

1998 Recommendations
The 1998 basin plan discussed water quality impacts from the Salisbury Grants Creek WWTP and Spencer Sowers Ferry Road WWTP discharges and Salisbury's plans to relocate the Grants Creek WWTP discharge to the Yadkin River. Recommendations were for DWQ to monitor the stream following the removal of this discharge and for local action to reduce nonpoint source pollution.

Current Status
Biological data were collected from two sites, and water chemistry data were collected from three sites along Grants Creek over the previous basinwide planning cycle. Although the uppermost site (above the WWTP discharges) received a Good-Fair bioclassification, biological surveys indicated severe habitat degradation as well as nutrient enrichment. Further downstream, Grants Creek is impaired by a combination of historical point source problems and current nonpoint source problems.

At two water chemistry sites (above and below the WWTPs), turbidity concentrations were in excess of state standards in more than 10 percent of samples. The geometric means of fecal coliform samples collected from two stations between 1998 and 2001 and one station between 1996 and 2001 from Grants Creek (282, 231 and 291 colonies/100ml) indicate that the stream may not be suitable for primary recreation. In addition, fecal coliform concentrations were greater than 400 colonies/100ml in more than 20 percent of samples from each site. Grants Creek is not currently classified for primary recreation (Class B). However, the stream was historically placed on the 303(d) list for fecal coliform and a TMDL has already been developed by DWQ.

The City of Salisbury relocated the Grants Creek WWTP discharge to the Yadkin River in 1998. The City of Spencer's Sowers Ferry Road WWTP continued to have significant and chronic problems with BOD as well as chronic problems with dissolved oxygen and total suspended solids over the most recent assessment period (1998-2001). However, in November 2000, the City of Salisbury purchased the Sowers Ferry Road WWTP. Salisbury worked throughout 2001 and 2002 to divert all flows into the Grants Creek WWTP and the Sowers Ferry Road WWTP discharge was eliminated by the end of 2002.

2002 Recommendations

Although Grants Creek above the City of Salisbury is not Impaired, impacts are evident. Further investigation into the causes and sources of biological impacts in the lower portion of Grants Creek is needed before specific recommendations to improve water quality can be made. DWQ expects to see some improvement below the old Sowers Ferry Road WWTP during the next basinwide planning cycle due to Salisbury's elimination of this discharge. However, local actions will continue to be needed throughout the watershed to reduce sedimentation and turbidity and to promote the production of instream habitat by restoring riparian vegetation.

DWQ's fecal coliform TMDL for Grants Creek was approved by the EPA in 2002. The study revealed that the sources of fecal coliform in the Grants Creek watershed are urban sources in the Landis, China Grove and Salisbury areas, livestock grazing and manure application on agricultural lands and pasturelands, and wildlife in the forested areas of the watershed. The Coliform Routing and Allocation Program was utilized to simulate instream fecal concentrations and to allocate the fecal coliform loads to the various sources. In order for water quality standards for fecal coliform to be met in Grants Creek, a nonpoint source load reduction of 33-60 percent under dry weather conditions and 85-97 under wet weather conditions must be met. The model estimates that WWTP discharges contribute an insignificant percentage of the fecal coliform loading in the watershed. In addition, both major discharges have now been removed from Grants Creek. Therefore, the reduction allocation focuses on the fecal coliform loading from urban sources in the Landis, China Grove and Salisbury areas and livestock grazing and manure application on agricultural lands.

These calculations are the first step in reducing fecal coliform concentrations in the watershed. Many of the BMPs employed to implement the TMDL will likely help reduce habitat degradation in the watershed as well. In addition, Landis, China Grove and Salisbury are required to obtain an NPDES permit for municipal stormwater systems under the federal Phase II stormwater rules. Refer to Section A, page 37 for details.

Water Quality Improvement Projects

The Grants Creek watershed (03040103 010010) is one of 55 watersheds in the Yadkin-Pee Dee River basin that has been identified by the NC Wetlands Restoration Program (NCWRP) as an area with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than a nontargeted watershed for the implementation of NCWRP restoration projects. Refer to page 278 in Section C for details.

4.3 Status and Recommendations for Newly Impaired Waters

Town Creek, a portion of Muddy Creek and High Rock Lake are rated Impaired based on recent DWQ monitoring (1996-2001). This section outlines the potential causes and sources of impairment and provides recommendations for improving water quality.

4.3.1 **Muddy Creek** (15.2 miles from Mill Creek #3 to SR 2995)

Current Status

The headwaters of Muddy Creek flow from Stokes County, and the stream is currently the western boundary of the City of Winston-Salem. The watershed continues to develop, particularly in the headwaters near King, Tobaccoville and Rural Hall, but also on the lower end where Clemmons and Winston-Salem meet. Some habitat degradation was observed above the confluence with Mill Creek, but the majority of water quality problems exist below this point. On the low end, the stream exhibits some recovery below the confluence with South Fork Muddy Creek; however, impacts are evident in this portion of stream as well. The middle portion of Muddy Creek is Impaired based primarily on fish community data collected in 1996 and 2001. Benthic macroinvertebrate communities in this middle reach of stream have also received bioclassifications that indicate impairment, although these communities were not sampled at this location over the most recent assessment period.

Water chemistry is collected at three locations along Muddy Creek. Elevated nutrients, turbidity and fecal coliform were observed over the five-year period (1996-2001). The geometric means of fecal coliform samples collected from two stations between 1998 and 2001 and one station between 1996 and 2001 from Muddy Creek (265, 255 and 488 colonies/100ml) indicate that the stream may not be suitable for primary recreation. Fecal coliform concentrations were greater than 400 colonies/100ml in more than 20 percent of samples from each site as well. Current methodology requires additional bacteriological sampling for streams with a geometric mean greater than 200 colonies/100ml or when concentrations exceed 400 col/100ml in more than 20 percent of samples. However, these additional assessments are prioritized such that, as monitoring resources become available, the highest priority is given to those streams where the likelihood of full-body contact recreation is greatest. Muddy Creek is not currently classified for primary recreation (Class B).

The impairment of Muddy Creek is primarily attributed to nonpoint source pollution from stormwater runoff from construction sites and developed areas. The input of heavily developed and/or Impaired tributaries also contributes: Mill, Silas, Reynolds and Salem Creeks.

2002 Recommendations

Further investigation into the actual causes and sources of biological impacts to Muddy Creek is needed before specific recommendations to improve water quality can be made; however, the potential for water quality improvement for this stream is still strong. Local actions are needed to reduce sedimentation, turbidity and fecal coliform contamination and to promote the production of instream habitat by restoring riparian vegetation throughout the watershed. In addition, Forsyth County as well as King, Tobbacoville, Rural Hall, Lewisville and Clemmons are required by DWQ to obtain an NPDES permit for municipal stormwater systems under the Phase II stormwater rules. Refer to Section A, page 37 for details. Section A, Chapter 4 contains more recommendations for reducing habitat degradation from stormwater runoff.

Water Quality Improvement Projects

Although Muddy Creek is not one of 55 watersheds in the Yadkin-Pee Dee River basin that has been identified by the NC Wetlands Restoration Program (NCWRP) as an area with the greatest need and opportunity for stream and wetland restoration efforts, several of its tributary

watersheds have been selected. The Mill Creek, Silas Creek and South Fork Muddy Creek watersheds have been targeted. These watersheds will be given higher priority than nontargeted watersheds for the implementation of NCWRP restoration projects. Refer to page 278 in Section C for details.

4.3.2 **Town Creek** (15.4 miles from source to Crane Creek)

Current Status

Town Creek begins just east of Kannapolis and flows through Salisbury and East Spencer before reaching High Rock Lake. The City of Salisbury historically had a discharge from a WWTP on Town Creek. Significant improvement has been observed since the discharge was removed in 1990. However, both fish and benthic communities are Impaired in Town Creek. Habitat degradation was noted along with a few occurrences of low dissolved oxygen and elevated turbidity. The lower half of the watershed is heavily developed, and stormwater runoff is likely a major contributor to the impairment. There is one minor discharge in the headwaters which continues to be compliant with its NPDES permit.

2002 Recommendations

DWQ plans to conduct further investigation into the causes and sources of the biological impairment of Town Creek during this basinwide planning cycle. DWQ will notify local agencies of water quality concerns regarding these waters and work with them to conduct further monitoring and to locate sources of water quality protection funding. In addition, Rowan County and Salisbury are required to obtain an NPDES permit for municipal stormwater systems under the Phase II stormwater rules. Refer to Section A, page 37 for details.

Water Quality Improvement Projects

The Town Creek watershed (03040103 010020) is one of 55 watersheds in the Yadkin-Pee Dee River basin that has been identified by the NC Wetlands Restoration Program (NCWRP) as an area with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than a nontargeted watershed for the implementation of NCWRP restoration projects. Refer to page 278 in Section C for details.

4.3.3 **High Rock Lake** (15,750 acres)

1998 Recommendations

High Rock Lake was not rated Impaired during the assessment period leading up to the 1998 Yadkin-Pee Dee River basin plan. However, the lake was rated support threatened and is extensively discussed in the plan, indicating impacts to water quality that could lead to impairment. The plan focuses on problems with excessive algal growths related to high nutrient levels in the arms of the lake. Although nutrients were also high in the main body of the lake, designated uses seemed to be supported. Recommendations are for DWQ to investigate the feasibility of developing a nutrient strategy for the watershed and consider reclassifying the lake as Nutrient Sensitive Waters. DWQ also planned to require phosphorus limits for major discharges into the arms and urged all major dischargers in the watershed to identify ways to optimize phosphorus removal using existing capabilities.

Current Status

Eight stations on High Rock Lake were monitored by DWQ in 1999, 2000 and 2001. This increased monitoring of High Rock Lake over the most recent assessment period has allowed DWQ to determine that the lake is Impaired. The decision is based on high levels of nutrients, combined with chlorophyll *a*, turbidity and percent dissolved oxygen saturation in excess of state standards. Low dissolved oxygen and high turbidity in the Abbotts Creek and Town Creek Arms are also contributing to aquatic life impairment. An extensive discussion of water quality data collected from High Rock Lake is found in Section A, Chapter 4 beginning on page 107.

2002 Recommendations

The High Rock Lake watershed (map on page 279) comprises slightly more than half of the Yadkin-Pee Dee River basin. Recommendations for improving water quality in the lake are detailed in *Section A, Chapter 4: Recommendations for Water Quality Issues Related to Multiple Subbasins in the Yadkin-Pee Dee River Basin*. The High Rock Lake part of the discussion begins on page 107.

4.4 Section 303(d) Listed Waters

Currently, portions of six waters in this subbasin are listed on the state's draft 2002 303(d) list for biological impairment: Reynolds Creek, Salem Creek, Grants Creek, Town Creek and two small unnamed tributaries. Grants Creek and a portion of Salem Creek are also listed for fecal coliform and turbidity. A fecal coliform TMDL for Grants Creek has been developed by DWQ, and one for Salem Creek will likely be developed during this basinwide planning cycle. Refer to Appendix IV for more information on the state's 303(d) list and listing requirements.

4.5 Status and Recommendations for Waters with Notable Impacts

Based on DWQ's most recent use support assessment, the surface waters discussed below are not Impaired. However, notable water quality impacts were documented. While these waters are not considered Impaired, attention and resources should be focused on them over the next basinwide planning cycle to prevent additional degradation or facilitate water quality improvement. A discussion of how impairment is determined can be found in Appendix III.

Although no action is required for these streams, voluntary implementation of BMPs is encouraged and continued monitoring is recommended. DWQ will notify local agencies and others of water quality concerns discussed below and work with them to conduct further monitoring and to locate sources of water quality protection funding. Additionally, education on local water quality issues is always a useful tool to prevent water quality problems and to promote restoration efforts. Nonpoint source agency contacts are listed in Appendix VI.

4.5.1 Mill Creek
Silas Creek

Mill and Silas Creeks parallel Salem Creek in the Muddy Creek watershed. These streams are likely being impacted by stormwater runoff from the City of Winston-Salem. Mill Creek has not been sampled by DWQ, but the lower two-thirds of the watershed contain moderate road

coverage indicating large amounts of developed area, similar to the watershed of Silas Creek. The fish community of Silas Creek was sampled by DWQ for the first time in 2001. Severe habitat degradation was observed and the data indicated impairment. However, the stream was resampled in 2002 and received a Good-Fair bioclassification. This score is likely due to the reduction in nonpoint source pollution that accompanies an extended drought. Refer to Section A, Chapter 4 for recommendations and management strategies for reducing impacts of runoff from developed areas.

The Mill Creek and Silas Creek watersheds (03040101 170020 and 170040) are two of 55 watersheds in the Yadkin-Pee Dee River basin that have been identified by the Wetlands Restoration Program as areas with the greatest need and opportunity for stream and wetland restoration efforts. These watersheds will be given higher priority than nontargeted watersheds for the implementation of NCWRP restoration projects. Refer to page 278 in Section C for details.

4.5.2 Salem Lake
Kerners Mill Creek

Although the most severe water quality problems in the Salem Creek watershed occur downstream of Salem Lake, habitat degradation has been observed in Kerners Mill Creek above the lake. In addition, this water supply lake exhibits signs of nutrient enrichment and a diverse assemblage of algae. The Lowery Creek arm exhibits slightly lower dissolved oxygen compared with the other two stations on Salem Lake. Local actions are needed to reduce the effects of nonpoint source pollution in the Salem Lake watershed, particularly from stormwater runoff from construction sites and developed areas. Kernersville is required to obtain an NPDES permit for municipal stormwater systems under the Phase II stormwater rules. Refer to page 37 of Section A, Chapter 2 for details.

The Salem Creek watershed (03040101 170060) is one of 55 watersheds in the Yadkin-Pee Dee River basin that has been identified by the NC Wetlands Restoration Program (NCWRP) as an area with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than a nontargeted watershed for the implementation of NCWRP restoration projects. Refer to page 278 in Section C for details.

4.5.3 South Fork Muddy Creek

South Fork Muddy Creek borders the City of Winston-Salem on the southeastern side. The watershed contains a mix of residential and agricultural land uses. Most of the new development is occurring in the Fiddlers Creek watershed. Substantial habitat degradation was observed during biological surveys of South Fork Muddy Creek below the confluence of Fiddlers Creek. The Good-Fair bioclassification could be due to the reduction in nonpoint source pollution that accompanies an extended drought. Local actions are needed to reduce the effects of nonpoint source pollution, particularly from stormwater runoff from construction sites and developed areas in Fiddlers Creek, but also from agricultural activities in other parts of the watershed.

The South Fork Muddy Creek watershed (03040101 170070) is one of 55 watersheds in the Yadkin-Pee Dee River basin that has been identified by the NC Wetlands Restoration Program

(NCWRP) as an area with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than a nontargeted watershed for the implementation of NCWRP restoration projects. Refer to page 278 in Section C for details.

4.5.4 North Potts Creek
South Potts Creek

North and South Potts Creeks flow south in Davidson County near Lexington into the upper reaches of High Rock Lake. The South Potts Creek watershed (larger of the two) is mostly in agriculture, with the exception of the I-85 corridor and a large rail yard on the lower end. Some historic channelization is evident, and residential development is increasing along US 29/70 between Lexington and Spencer. One NPDES permitted discharge (Davidson County Churchland Elementary) is in significant noncompliance for ammonia in the headwaters.

There is already more developed area in the North Potts Creek watershed and major channelization has occurred. Two NPDES permitted discharges (Davidson County Tyro Junior High and West Davidson High) are in significant noncompliance for BOD, ammonia and chlorine. DWQ sampled North Potts Creek in 1988, but there is no recent data for either stream.

DWQ will attempt to conduct a special study of these streams during the next basinwide planning cycle to determine: 1) the level of impacts associated with these land uses and discharges; and 2) the contribution of this watershed to the impairment of High Rock Lake. In addition, local actions are needed to reduce the effects of nonpoint source pollution, particularly from stormwater runoff.

4.6 Additional Water Quality Issues with Subbasin 03-07-04

The previous parts discussed water quality concerns for specific stream segments. This section discusses water quality issues related to multiple watersheds within the subbasin. Information found in this section may be related to concerns about things that threaten water quality or about plans and actions to improve water quality.

4.6.1 NPDES Discharges

Twenty-two of the 40 NPDES discharges had a few permit violations over the two-year review period (September 1999 - August 2001). Nine facilities are in significant noncompliance; six are Davidson County schools. Almost every school in Davidson County is in significant noncompliance for at least one parameter. Because the facilities are scattered throughout several subbasins, these problems and the plans to correct them are discussed on page 113 of Section A, Chapter 4. Color/Tex Finishing had significant problems meeting COD, pH and total suspended solids limits in 2000. The Sowers Ferry Road WWTP (originally owned by Spencer, then bought by Salisbury) was in significant noncompliance over the entire period of review for problems meeting BOD, dissolved oxygen and total suspended solids limits. This discharge was eliminated in 2002. The Hilltop Living Center had problems meeting BOD limits over the two-year review period.

Fifteen facilities are required to monitor effluent toxicity; three have had significant compliance problems over the previous basinwide planning cycle. The Lucent Technologies groundwater remediation facility failed four consecutive chronic toxicity tests during the period from March to June of 1999. Facility staff replaced the system's carbon filter media and optimized application of treatment chemicals to address the problem. No failures have occurred since June 1999. Noncompliances in 1999 and 2000 at the City of Salisbury's Sowers Road WWTP seemed to be associated with operational problems at the WWTP. There were no WET test failures between September 2000 and 2002 when the discharge was eliminated. The Scarlett Acres Mobile Home Park WWTP has produced sporadic failures since it began operation in 1990. Its most recent noncompliances in 2001 have been attributed to poor operation and numerous power outages.

4.6.2 Projected Population Growth

The population of Rowan County is projected to increase 32 percent, Davidson County – 25 percent, and Forsyth County – 26 percent between 2000 and 2020. Much of this development is likely to occur along highway corridors (I-40, I-85, US 64 and US 29/70) and in smaller suburban municipalities like King, Kernersville, Lewisville and Clemmons. Figure B-5 presents population increases between 1990 and 2000 for selected municipalities this subbasin.

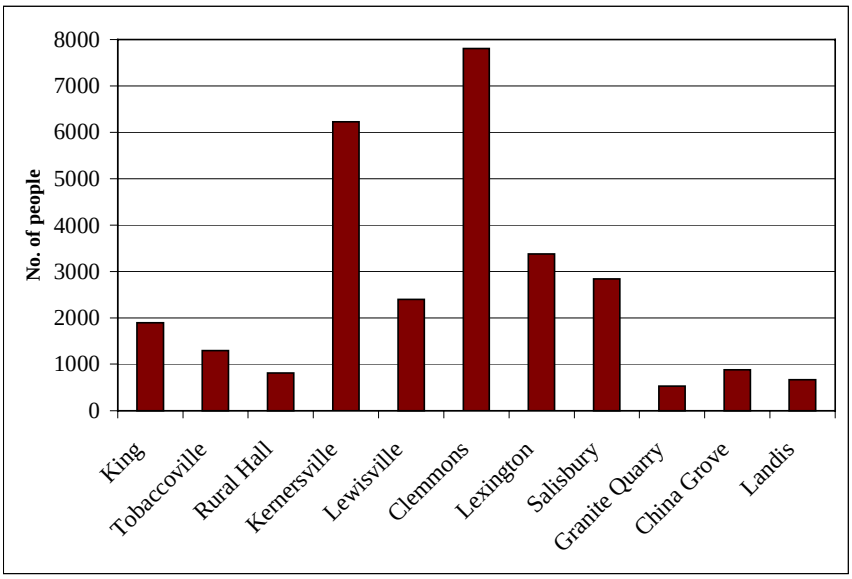


Figure B-5 Population Increases for Selected Subbasin 03-07-04 Municipalities (1990-2000)

Growth management within the next five years will be imperative in order to improve or maintain water quality in this subbasin. Growth management can be defined as the application of strategies and practices that help achieve sustainable development in harmony with the conservation of environmental qualities and features of an area. On a local level, growth management often involves planning and development review requirements that are designed to maintain or improve water quality. Refer to Section A, Chapter 4 for more information about minimizing impacts to water quality from development.

4.6.3 The South Yadkin/Yadkin River Corridor Conservation Plan

The LandTrust for Central NC (LTCNC) received $7,500 from the Conservation Trust for North Carolina and the Clean Water Management Trust Fund to develop a report evaluating the conservation needs and opportunities along 24 miles of the lower South Yadkin River and a 26-mile section of the Yadkin River above High Rock Lake. This corridor incidentally included a portion of lower Grants Creek as well.

The South Yadkin/Yadkin River Corridor Conservation Plan was completed in December 2001. The highest priorities for conservation identified by the plan are land between Fourth Creek and the South Yadkin River, above and including the confluence of the two streams; and land between the South Yadkin River and the Yadkin River, above and including the confluence of the two rivers. There are large tracts of land (owned by Duke Power-Progress Energy) along the Yadkin River which are in close proximity to lands that are already by LTCNC. There are also large amounts of riparian land (owned by ALCOA) along both the South Yadkin and Yadkin Rivers. These Duke Power and ALCOA lands also received high priority for protection (Merrill, December 2001).

The conservation plan has been integrated into the daily efforts of LTCNC while pursuing conservation opportunities in the Yadkin-Pee Dee River basin. Page 294 of Section C contains more information about The LandTrust for Central NC. You may also visit the website for details about the many lands which LTCNC helped place in conservation ownership at http://www.landtrustcnc.org/aboutlandtrust.html.