

## **Section B**

# **Water Quality Data and Information by Subbasin**

# Chapter 1 -

## Roanoke River Subbasin 03-02-01

Includes a portion of the Dan River, Town Fork and Snow Creeks

### 1.1 Water Quality Overview

#### ***Subbasin 03-02-01 at a Glance***

##### **Land and Water Area**

Total area:	453 mi <sup>2</sup>
Land area:	445 mi <sup>2</sup>
Water area:	8 mi <sup>2</sup>

##### **Population**

1990 Est. Pop.:	45,777 people
Pop. Density:	103 persons/mi <sup>2</sup>

##### **Land Cover (%)**

Forest/Wetland:	72.8
Water:	1.9
Urban:	0.6
Cultivated Crop:	2.9
Pasture/ Managed Herbaceous:	21.8

Although the headwaters of the Dan River are in Virginia, this North Carolina subbasin contains a large portion of the upper reaches that flow through moderately steep terrain including the towns of Danbury and Walnut Cove. Waters include Snow Creek, North and South Double Creeks, Town Fork Creek and Belews Lake. A map of this subbasin including water quality sampling locations is presented in Figure B-1.

Bioclassifications for these sample locations are presented in Table B-1. Use support ratings for each applicable category in this subbasin are summarized in Tables B-2 and B-3. Refer to Appendix III for a complete listing of monitored waters and more information about use support ratings.

As a result of moderately steep slopes throughout the area, streams in this subbasin, as well as major sections of the Dan River, are deeply entrenched, suggesting the effects of long-term erosion. Soil erosion rates as high as 21 tons/acre/yr have been documented for cultivated cropland in the upper Dan River watershed, compared to 7.3 tons/acre/yr in the nearby upper Tar River basin (USDA, 1992).

Most of the land in this portion of the basin is forested (73 percent), but a significant portion is also in use as cultivated cropland and pasture (25 percent). The estimated subbasin population, based on the 1990 census, is 45,777. Stokes County is projected to receive the largest population increase of the sixteen counties in the Roanoke River basin (NC portion). From 1998 to 2018, estimated population growth for Stokes County is 28 percent and Forsyth County is 16 percent.

There are 23 NPDES permitted dischargers in the subbasin, most of which are small wastewater treatment plants serving schools or subdivisions. Four of these small wastewater treatment plants had problems with elevated BOD and ammonia in their discharges. The largest discharge is from the Town of Walnut Cove's WWTP to Town Fork Creek. Duke Power Company's Belews Creek Steam Station discharges cooling water to Belews Lake and ash pond basin effluent to the Dan River. Five dischargers, including the steam station, are required to monitor their effluent's toxicity: Kobe Copper Products, two Stokes County high schools, and Rayco Utilities. There were no indications of toxicity problems in 1999, and substantial improvements in effluent toxicity were observed relative to earlier data.

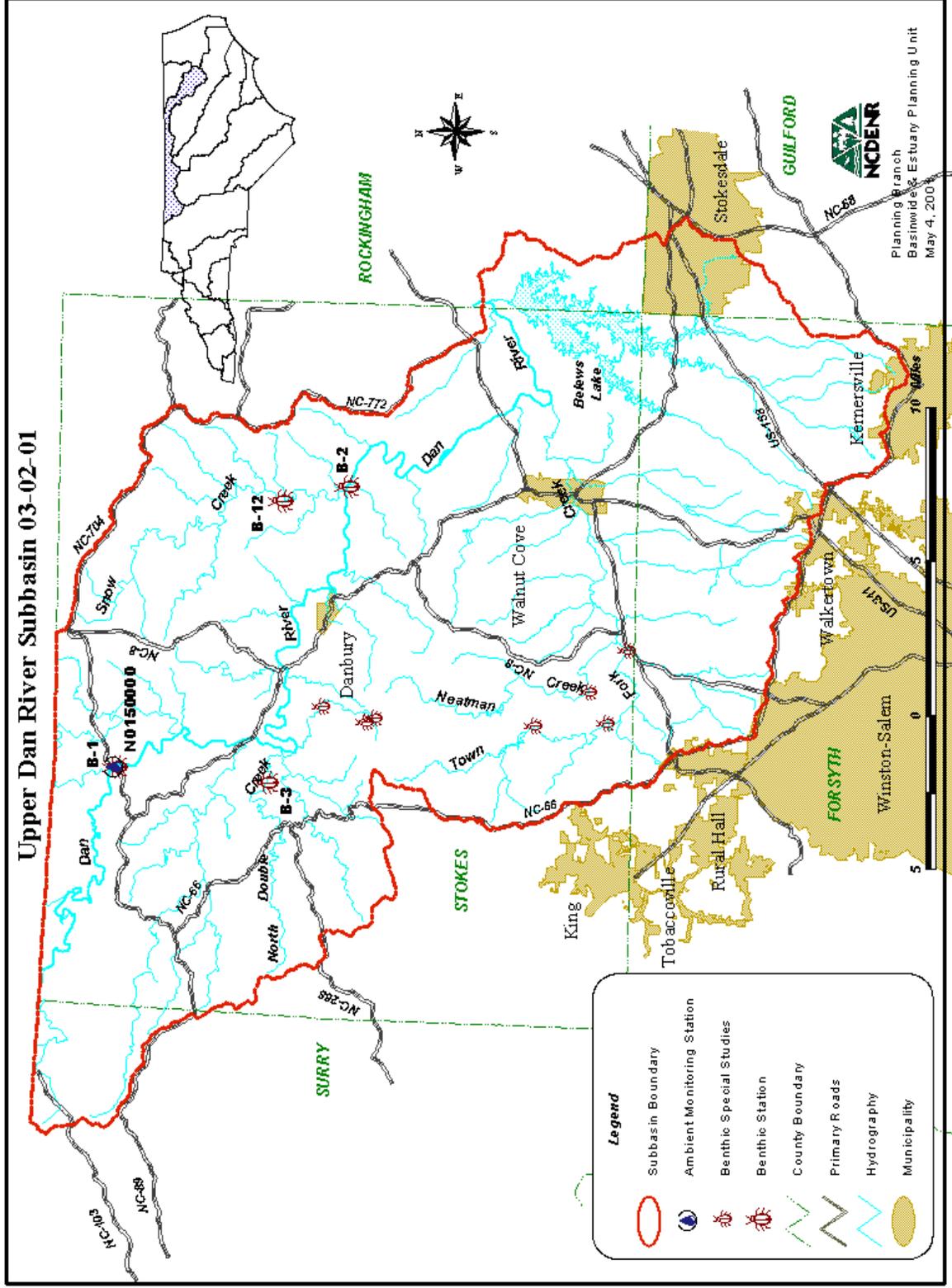


Figure B-1 Sampling Locations within Subbasin 03-02-01

Table B-1 DWQ Monitoring Locations and Benthic Macroinvertebrate Bioclassifications (1999-2000) for Roanoke River Subbasin 03-02-01

Site	Stream	County	Road	Bioclassification
<b><i>Benthic Macroinvertebrates</i></b>				
B-1*	Dan River	Stokes	NC 704	Good
B-2	Dan River	Stokes	SR 1695	Good
B-3	North Double Creek	Stokes	SR 1504	Good-Fair
B-12	Snow Creek (1999)	Stokes	SR 1673	Fair
B-12	Snow Creek (2000)	Stokes	SR 1673	Good
<b><i>Ambient Monitoring</i></b>				
N0150000	Dan River	Stokes	NC 704	N/A

\* Historical data are available; refer to Appendix II.

Benthic macroinvertebrates in this subbasin were sampled under extreme low flow conditions in 1999. For larger streams affected by nonpoint source pollution, a sharp decline in flow may result in a higher bioclassification; smaller streams, however, might be adversely affected by extremely low flow.

No sample was collected at Town Fork Creek in 1999 due to inaccessibility, but a special study was conducted in the watershed in 1995. Two sites in the middle portion of Town Fork Creek (see Figure B-1) received Good-Fair bioclassifications, but the upstream portion received a Poor bioclassification. The aquatic life/secondary recreation uses in the upper part of Town Fork Creek are impaired. This portion is discussed further in Part 1.3.1 of this chapter. Neatman Creek was also sampled as part of the study and the benthic community received a Good bioclassification.

Good benthic macroinvertebrate bioclassifications have been recorded since 1983 from the two Dan River sampling locations, but more variable results have been observed at tributary sites. Historically, the only Excellent bioclassifications were from small headwater tributaries in Hanging Rock State Park which are classified High Quality Waters.

Snow Creek received the lowest bioclassification (Fair) of the four sites sampled in 1999. Snow and North Double Creeks both drain agricultural areas, and their bioclassifications have fluctuated between Fair and Good-Fair. Because of this fluctuation, Snow Creek was sampled again by DWQ in August 2000. The benthic community received a Good bioclassification at the time of this collection. Part 1.5.1 contains more details about impacts observed at Snow Creek.

Water chemistry samples are collected monthly from the Dan River a few miles above Danbury. This site is located well into North Carolina, but above any major tributaries in order to monitor the condition of the river as it flows in from Virginia. These data have indicated good water quality, with the exception of turbidity and total suspended solids. The Dan River at this location is protected for trout propagation and survival of stocked trout (Tr) making the water quality

standard for turbidity, among other parameters, more restrictive. This turbidity standard was exceeded in 35 percent of samples collected from 1995 to 1999, at times reaching levels seven and eight times the standard. For more information regarding general water quality issues in the Dan River watershed, including sedimentation, refer to Section A, Chapter 4.

Three lakes in this subbasin were monitored in 1999: Hanging Rock Lake, Kernersville Reservoir and Belews Lake. Hanging Rock and Belews Lakes are oligotrophic lakes with no indications of water quality problems. Kernersville Lake's status changed from mesotrophic in 1994 to eutrophic in 1999, reflecting high nitrogen and phosphorus concentrations. In 1999, chlorophyll *a* concentrations were greater than the state standard; however, no algal blooms have been reported.

For more detailed information on sampling and assessment of streams and lakes in this subbasin, refer to the *Basinwide Assessment Report - Roanoke River Basin* (DENR-DWQ, May 2000), available from DWQ Environmental Sciences Branch at <http://www.esb.enr.state.nc.us/bar.html> or by calling (919) 733-9960.

Table B-2 Use Support Ratings Summary (1999) for Monitored Lakes (acres) in Roanoke River Subbasin 03-02-01

Use Support Category	FS	PS	NS	Total <sup>1</sup>
<b>Aquatic Life/ Secondary Recreation</b>	4,087	0	0	4,087
<b>Fish Consumption<sup>3</sup></b>	0	4,030	0	4,030
<b>Primary Recreation</b>	4,042	0	0	4,042
<b>Water Supply</b>	4,075	0	0	4,075

Table B-3 Use Support Ratings Summary (1999) for Monitored and Evaluated<sup>2</sup> Freshwater Streams (miles) in Roanoke River Subbasin 03-02-01

Use Support Category	FS	PS	NS	NR	Total <sup>1</sup>
<b>Aquatic Life/ Secondary Recreation</b>	288.1	0	8.0	137.3	433.4
<b>Fish Consumption<sup>3</sup></b>	0	55.8	0	0	55.8
<b>Primary Recreation</b>	0	0	0	11.3	11.3
<b>Water Supply</b>	45.2	0	0	0	45.2

<sup>1</sup> 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.

<sup>2</sup> For the fish consumption use support category, only monitored stream miles are presented.

<sup>3</sup> These waters are impaired because of a statewide fish consumption advisory for bowfin. Refer to Section A, Part 4.8.4 for further information. Fish tissue monitoring in the Dan River is discussed in Chapter 3 of this section.

## **1.2 Status and Recommendations for Previously Impaired Waters**

This section reviews use support and recommendations detailed in the 1996 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 1996 Roanoke River Basinwide Plan identified one impaired water in this subbasin: Belews Lake. This lake is no longer impaired and is discussed in further detail below.

### **1.2.1 Belews Lake (4,030 acres)**

#### 1996 Recommendation(s)

Belews Lake was constructed by Duke Power Company in 1973 to provide a source of cooling water for the Belews Creek Steam Station. Water was used to wash out ash residue, routed to a settling pond, and then discharged into the lake. In 1978, it was determined that this practice resulted in the accumulation of high concentrations of selenium in fish tissue. The 1996 plan reported a fish consumption advisory for selenium contamination in common carp, redear sunfish and crappie, which resulted in a rating of partially supporting for the lake. In 1984, the Belews Creek Steam Station upgraded their ash disposal system and rerouted the discharge into the Dan River. The current NPDES permit contains a protective selenium limitation. Therefore, the only recommendation given in the 1996 plan was to monitor selenium concentrations in water quality and fish tissue in the lake and the Dan River.

#### Status of Progress

Belews Lake was most recently sampled by DWQ during the summer of 1999. Surface water selenium concentrations were less than the laboratory detection limit. Concentrations in benthic macroinvertebrates have declined, but are still at levels higher than those observed in benthic macroinvertebrates found in uncontaminated waters. Selenium concentrations in fish tissue have declined to levels considered safe for human consumption by the Department of Health and Human Services. The consumption advisory was lifted in August 2000. Chapter 3 of this section discusses recent fish tissue monitoring in the Dan River below Belews Lake (near Eden).

## **1.3 Status and Recommendations for Newly Impaired Waters**

Town Fork Creek, from its source to Timmons Creek, is an additional stream segment rated impaired (not supporting) based on recent DWQ monitoring (1995-1999). This section outlines the potential causes and sources of impairment and provides recommendations for improving water quality.

### **1.3.1 Town Fork Creek (8.0 miles from source to Timmons Creek)**

#### Current Status

During a special study conducted by DWQ in 1995, the upper section of Town Fork Creek received a Poor benthic macroinvertebrate bioclassification. As a result, the referenced portion of the stream is rated not supporting aquatic life due to severe habitat degradation and possible organic enrichment. The stream is impounded above the sample location, and the drainage area supports a mixture of agricultural and residential land uses. There is one small permitted

discharge on an unnamed tributary higher up in the watershed, but records do not indicate any problems at the facility.

#### 2001 Recommendation(s)

More field investigation is needed in order to determine the actual sources of pollution in this watershed. DWQ will further investigate the one permitted facility to ensure compliance. However, identification and reduction of nonpoint sources of pollution that contribute to habitat degradation will likely result in significant improvement for the aquatic community at this location. Refer to Section A, Chapter 4 for more information about habitat degradation.

### **1.4 Section 303(d) Listed Waters**

Belews Lake (discussed above) is the only water listed on the state's year 2000 §303(d) list. A portion of Town Fork Creek, discussed above, will likely be added to the list in 2002. Refer to Appendix IV for more information on the state's §303(d) list and listing requirements.

### **1.5 Other Issues and Recommendations**

The surface waters discussed in this section are fully supporting designated uses (or not rated) based on recent DWQ monitoring; however, data revealed some impacts to water quality. Although no action is required for these streams, voluntary implementation of BMPs is encouraged and continued monitoring is recommended. 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. Additionally, education on local water quality issues is always a useful tool to prevent water quality problems and to promote restoration efforts. Nonpoint source program agency contacts are listed in Appendix VI.

#### **1.5.1 Snow Creek**

Snow Creek has been sampled by DWQ on three occasions, each time producing a different bioclassification. These changes appear to be related to both varying flow conditions and land use activities in the watershed. In August 1994, the benthic community received a Good-Fair bioclassification. The site was sampled under normal flow conditions, although flow records from nearby Hyco Creek suggest that at least two high flow events had occurred prior to DWQ's sample date. It is likely that some scouring of the streambed occurred during those high flow events impacting the benthic macroinvertebrate community.

In August 1999, flow was extremely low and the benthic community received a Fair bioclassification. Floating algal mats were observed along the edges of the stream suggesting nutrient enrichment. Samples were collected just after construction of a new bridge which may have created a localized impact on part of the stream. DWQ sampled Snow Creek again in August 2000 and the benthic community received a Good bioclassification. This year represented optimal flow conditions that were reflected in the species diversity and abundance.

Although aquatic life in this stream is not considered impaired, there are nonpoint source pollution impacts present in the watershed. Sedimentation, infrequent riffle areas and a

significant lack of riparian vegetation have been observed. Identification and reduction of nonpoint sources of pollution that contribute to habitat degradation are needed in order to insure a healthy aquatic community in the future. For general recommendations on habitat degradation and best management practices, please refer to Section A, Chapter 4.

### **1.5.2 Dan River**

As was mentioned previously, the Dan River from the Virginia state line to the confluence with Big Creek is protected for trout propagation and survival of stocked trout. Trout (as well as other aquatic life) are sensitive to turbidity in streams and rivers. The turbidity standard at a DWQ ambient monitoring station above Danbury was exceeded in 35 percent of samples collected from 1995 to 1999, at times reaching levels seven and eight times the standard. Aquatic life in the Dan River is currently not considered to be impaired because the benthic community was assigned a Good bioclassification in 1999. However, high levels of turbidity over a sustained period of time have the potential to negatively impact aquatic communities.

It has come to the attention of DWQ that all-terrain vehicle use occurs in portions of the Dan River. Disturbing channel substrate with any type of heavy equipment or vehicles destroys instream habitat. In flowing water, this type of disturbance also creates turbidity and adds to suspended sediment concentrations. Public education about impacts of all-terrain vehicles on the river and riparian areas is needed in this subbasin.

### **1.5.3 Projected Population Growth**

Stokes County is projected to receive the largest population increase of the sixteen counties in the Roanoke River basin (NC portion). From 1998 to 2018, estimated population growth for Stokes County is 28 percent and Forsyth County is 16 percent. Growth management within the next five years will be imperative in order to maintain good 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.

### **1.5.4 NPDES Discharges**

As was mentioned in this chapter's overview, four facilities experienced problems complying with NPDES permit limits over the most recent two-year review period. The Town of Walkertown and the Winston-Salem/Forsyth County Utility Commission are planning to construct sewer lines in order to connect both Walkertown Middle and Elementary Schools into the Winston-Salem WWTP. It is estimated that this connection will be completed in 2003, eliminating these two discharges.

Two small "package plant" wastewater treatment facilities also had occasional, fairly short-term violations of ammonia limits: Greystone Subdivision and Cain's Way Mobile Home Park. The Greystone Subdivision WWTP is in need of major improvements to allow it to meet the restrictive ammonia limits consistently. Flow-splitting between the two clarifiers at the plant often causes excessive flows to be routed through only one unit.