

Appendix IV

DWQ Water Quality Monitoring Programs in the Watauga River Basin

DWQ Water Quality Monitoring Programs in the Watauga River Basin

Staff in the Environmental Sciences Section (ESS) and Regional Offices of DWQ collect a variety of biological, chemical and physical data. The following discussion contains a brief introduction to each program, followed by a summary of water quality data in the Watauga River basin for that program. For more detailed information on sampling and assessment of streams in this basin, refer to the *Basinwide Assessment Report* for the Watauga River basin, available on the ESS website <http://www.esb.enr.state.nc.us/bar.html> or by calling (919) 733-9960.

DWQ monitoring programs for the Watauga River Basin include:

- Benthic Macroinvertebrates
- Fish Community Assessments
- Aquatic Toxicity Monitoring
- Ambient Monitoring System

Benthic Macroinvertebrate Monitoring

Benthic macroinvertebrates, or benthos, are organisms that live in and on the bottom substrates of rivers and streams. These organisms are primarily aquatic insect larvae. The use of benthos data has proven to be a reliable monitoring tool, as benthic macroinvertebrates are sensitive to subtle changes in water quality. Since macroinvertebrates have life cycles of six months to over one year, the effects of short-term pollution (i.e., chemical spill) will generally not be overcome until the following generation appears. The benthic community also integrates the effects of a wide array of potential pollutant mixtures.

Criteria have been developed to assign a bioclassification to each benthic sample based on the number of different species present in the pollution intolerant groups of Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies), commonly referred to as EPT. A Biotic Index (BI) value gives an indication of overall community pollution tolerance. Different benthic macroinvertebrate criteria have been developed for different ecoregions (i.e., mountains, piedmont, coastal plain and swamp) within North Carolina and bioclassifications fall into five categories: Excellent, Good, Good-Fair, Fair and Poor.

Overview of Benthic Macroinvertebrate Data

There were 15 benthic sites sampled during this assessment period. The following table lists the total bioclassifications (by subbasin) for all benthos sites in the Watauga River basin. Benthos sampling may slightly overestimate the proportion of Fair and Poor sites, as DWQ special studies often have the greatest sampling intensity (number of sites/stream) in areas where it is believed that water quality problems exist.

Summary of Bioclassifications for All Freshwater Benthic Macroinvertebrate Sites (using the most recent rating for each site) Sampled in the Watauga River Basin

Subbasin	Excellent	Good	Good-Fair	Fair	Poor	Not Rated	Not Impaired	Total
04-02-01	7	5	2	0	0	0	1	15
Total (%)	47	33	13	0	0	0	7	100

For more detailed information and the history of sampling in the Watauga River basin, refer to the following table.

Benthic Macroinvertebrate Data Collected in the Watauga River Basin (1999-2004). Current basinwide sites are in bold font.

Waterbody	Location	County	Index No.	Date	Total Species	EPT	BI	EPT BI	Bioclassification
Watauga R	SR 1594	Watauga	8-(1)	8/16/04	----	43	----	2.53	Excellent
Watauga R	SR1580	Watauga	8-(1)	8/18/04	----	32	----	3.33	Good
				7/13/99	----	25	----	3.90	Good-Fair
Watauga R	NC 105	Watauga	8-(1)	8/18/04	106	55	4.01	3.27	Excellent
				7/14/99	88	42	3.91	3.38	Excellent
Boone Fk	SR 1561	Watauga	8-7	8/18/04	75	46	2.95	1.76	Excellent
				7/13/99	72	39	2.54	1.62	Excellent
Boone Fk	Off SR 1558	Watauga	8-7	8/18/04	----	39	----	3.30	Excellent
				7/12/99	----	32	----	2.84	Good
Laurel Fk	SR 1552	Watauga	8-10	8/18/04	58	34	2.88	2.37	Not Impaired
Laurel Fk	SR 1111	Watauga	8-10	8/18/04	----	26	----	2.91	Good-Fair
				7/13/99	----	27	----	3.28	Good-Fair
Cove Cr	SR 1149	Watauga	8-15	8/17/04	----	34	----	3.64	Good
				7/13/99	----	32	----	3.35	Good
Watauga R	SR 1121	Watauga	8-(16)	8/17/04	100	47	4.46	3.67	Excellent
				7/15/99	81	38	4.27	3.48	Good
Watauga R	SR 1200	Watauga	8-(16)	8/17/04	110	45	4.33	3.18	Excellent
				7/15/99	94	50	3.89	3.22	Excellent
Laurel Cr	SR 1123	Watauga	8-17	8/17/04	----	35	----	2.33	Good
				7/15/99	----	31	----	2.60	Good
Beaverdam Cr	SR 1202	Watauga	8-19	8/17/04	----	30	----	2.57	Good
				7/13/99	----	37	----	3.17	Good
Beech Cr	US 321	Watauga	8-20	8/17/04	----	41	----	2.01	Excellent
				7/15/99	----	38	----	2.51	Excellent
Elk R	Off NC 184	Avery	8-22-(3)	8/16/04	71	24	5.37	4.11	Good-Fair
				7/14/99	102	44	4.38	3.58	Good
Elk R	SR 1305	Avery	8-22-(14.5)	8/16/04	103	43	4.33	3.17	Good
				7/14/99	88	44	3.86	3.09	Excellent

Assessing Benthic Macroinvertebrate Communities in Small Streams

The benthic macroinvertebrate community of small streams is naturally less diverse than the streams used to develop the current criteria for flowing freshwater streams. The benthic macroinvertebrate database is being evaluated, and a study to systematically look at small reference streams in different ecoregions is being developed with the goal of finding a way to evaluate water quality conditions in such small streams.

Presently, a designation of Not Impaired may be used for flowing waters that are too small to be assigned a bioclassification (less than 4 meters in width) but meet the criteria for a Good-Fair or higher bioclassification using the standard qualitative and EPT criteria. This designation will translate into a use support rating of Supporting. However, DWQ will use the monitoring information from small streams to identify potential impacts to small streams even in cases when a use support rating cannot be assigned.

DWQ will use this monitoring information to identify potential impacts to these waters even though a use support rating is not assigned. DWQ will continue to develop criteria to assess water quality in small streams.

Fish Community Assessments

All of the fish community sites in this subbasin were sampled by DWQ for the first time in 2004. The 2004 basinwide assessment will therefore serve as a baseline for fish communities sampled during the 2009 basinwide assessment period. The North Carolina Index of Biotic Integrity (NCIBI) is used to assess biological integrity. The NCIBI uses a cumulative assessment of ten parameters or metrics. Each metric is designed to contribute unique information to the overall assessment. The scores for all metrics are then summed to obtain the overall NCIBI score.

Overview of Fish Community Data

There were 10 fish sites sampled in the Watauga River basin during this assessment period. The following table lists the most recent ratings (by subbasin) for all fish community sites.

Summary of NCIBI Categories for All Freshwater Fish Community Sites (using the most recent rating for each site) Sampled in the Watauga River Basin

Subbasin	Excellent	Good	Good-Fair	Fair	Poor	Not Rated	Total
04-02-01	0	1	3	0	1	5	10
Total (%)	0	10	30	0	10	50	100

For detailed information regarding the fish samples collected during this assessment period, refer to the following table.

Fish Community Data Collected in the Watauga River Basin (2004)

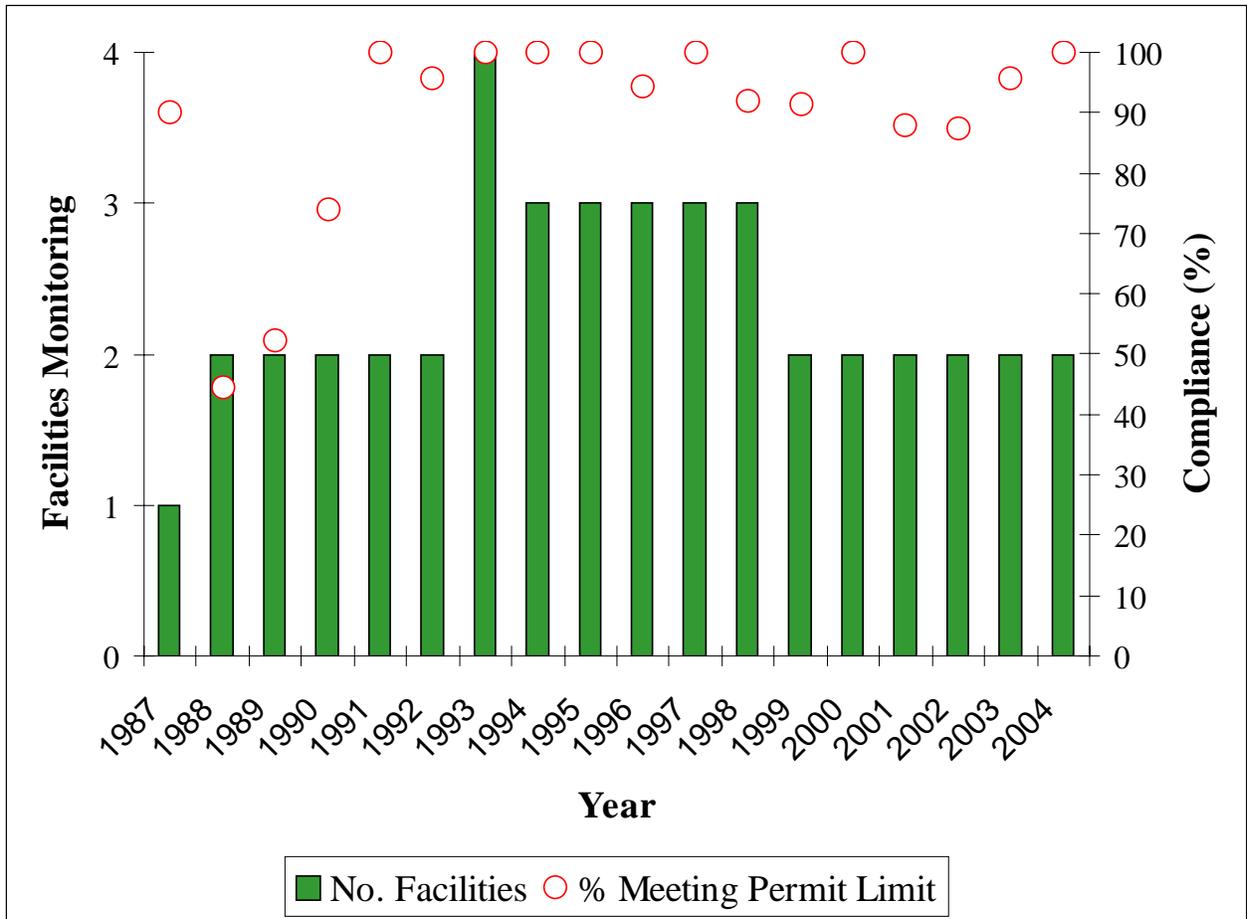
Waterbody	Location	County	Index No.	Date	NCIBI Score	NCIBI Bioclassification
Watauga R	off SR 1557	Watauga	8-(1)	05/06/04	44	Good-Fair
Boone Fk	off SR 1558	Watauga	8-7	05/06/04	50	Good
Laurel Fk	SR 1111	Watauga	8-10	05/05/04	---	Not Rated
Dutch Cr	SR 1112/NC 194	Watauga	8-12-(1.5)	05/05/04	46	Good-Fair
Cove Cr	SR 1149	Watauga	8-15	05/05/04	40	Good-Fair
				12/02/04	34	Fair
Laurel Cr	SR 1123	Watauga	8-17	05/04/04	---	Not Rated
Beaverdam Cr	SR 1202	Watauga	8-19	05/04/04	26	Poor
Beech Cr	off SR 1312	Avery	8-20	05/04/04	---	Not Rated
Elk R	SR 1326	Avery	8-22-(14.5)	05/03/04	---	Not Rated
Cranberry Cr	NC 194	Avery	8-22-16	05/03/04	---	Not Rated

Aquatic Toxicity Monitoring

Acute and/or chronic toxicity tests are used to determine toxicity of permitted discharges to sensitive aquatic species (i.e., fathead minnows and/or water fleas, *Ceriodaphnia dubia*). Results of these tests have been shown by several researchers to be predictive of point source discharge effects on receiving stream populations. Many facilities are required to monitor whole effluent toxicity (WET) by their NPDES permit or by administrative letter. The Aquatic Toxicology Unit (ATU) may also test other facilities. Per Section 106 of the Clean Water Act, the ATU is required to test at least 10 percent of the major discharging facilities over the course of the federal fiscal year (FFY). However, it is ATU's target to test 20 percent of the major dischargers in the FFY. This means that each major facility would be evaluated over the course of their five-year permit. There are no requirements or targets for minor dischargers.

In addition, the ATU maintains a compliance summary for all facilities required to perform tests and provides monthly updates of this information to regional offices and DWQ administration. Ambient toxicity tests can be used to evaluate stream water quality relative to other stream sites and/or a point source discharge.

Two NPDES permits in the Watauga River basin currently require WET testing. Both facility permits have a WET limit. The number of facilities required to monitor WET has increased steadily since 1987, the first year that WET limits were written into permits in North Carolina. The compliance rate has risen as well. Since 1996, the compliance rate has stabilized at approximately 90 percent. The following graph summaries WET monitoring compliance in the Watauga River basin from 1987 to 2004. Facilities with toxicity problems during the most recent two-year review period are discussed in the subbasin chapter (Chapter 1).



NPDES facility WET compliance in the Watauga River basin (1987-2004). The compliance values were calculated by determining whether facilities with WET limits were meeting their ultimate permit limits during the given time period, regardless of any Special Orders of Consent (SOC) in force.

Ambient Monitoring System

The Ambient Monitoring System (AMS) is a network of stream, lake and estuarine stations strategically located for the collection of physical and chemical water quality data. North Carolina has more than 378 water chemistry monitoring stations statewide, including 4 stations in the Watauga River basin. Between 23 and 32 parameters are collected monthly at each station. The locations of these stations are listed in the following table and shown on the subbasin map (Chapter 1). Notable ambient water quality parameters are discussed in the subbasin chapter (Chapter 1). Refer to the *2005 Watauga River Basinwide Assessment Report* (<http://www.esb.enr.state.nc.us/bar.html>) for a more detailed analysis of ambient water quality monitoring data.

Ambient Monitoring Stations in the Watauga River Basin

Station Number	STORET Number	Waterbody/ Location	County	Class
LA1	L1700000	Watauga River SR1557 nr Shulls Mill	Watauga	B Tr HQW
LA2	L2000000	Watauga River NC105 nr Shulls Mill	Watauga	B Tr HQW
LA3	L2350000	Watauga River SR1114 nr Valle Crucis	Watauga	B Tr HQW
LA4	L4700000	Watauga River SR1121 nr Sugar Grove	Watauga	B Tr HQW