Appendix IV

DWQ Water Quality Monitoring Programs in the Savannah River Basin

DWQ Water Quality Monitoring Programs in the Savannah 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 Savannah 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 Savannah River basin, available from the Environmental Sciences Branch website at

DWQ monitoring programs for the Savannah River Basin include:

- Benthic Macroinvertebrates
- Aquatic Toxicity Monitoring
- Lake Assessment
- Ambient Monitoring System

http://www.esb.enr.state.nc.us/bar.html or by calling (919) 733-9960.

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 (such as a 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 EPTs. A Biotic Index (BI) value gives an indication of overall community pollution tolerance. Different benthic macroinvertebrate criteria have been developed for different ecoregions (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

Based on benthic macroinvertebrate data, water quality in the Savannah River basin is Excellent to Good. Since 1999, 14 benthic macroinvertebrate basinwide samples have been collected with three (21%) receiving Good bioclassifications and 11 (79%) resulting in Excellent bioclassifications. Comparisons of benthos data from 1999 to 2004 between repeat sites show that one site (Indian Creek at US 64) improved from Good to Excellent while two sites (Horsepasture River at NC 281 and Norton Mill Creek at SR 1107) declined in bioclassification from Excellent to Good. Overall, water quality in this basin is unchanged since 1999. The decline in the Horsepasture River may be the result of natural variation. This site has received four different bioclassifications from eight samples since 1985. This site also supports an ambient chemistry site and analysis of that data show no significant adverse trends in water quality. The decline at Norton Mill Creek is possibly related to upstream development associated with the town of Cashiers. Additional monitoring at both sites will help discern whether the changes in bioclassification from 1999 to 2004 were anthropogenic or natural.

Several rare invertebrate taxa were collected in the Savannah River basin in 2004 including the mayflies Drunella longicornis (Thompson and Whitewater Rivers), Danella lita (Thompson River), Litobrancha recurvata (Thompson River), Serratella spiculosa (Thompson and Chattooga Rivers), Rhithrogena fuscifrons (Big Creek and Whitewater River), the caddisflies Mayatrichia ayama (Horsepasture and Chattooga River), Oecetis avara (Chattooga River), and the stonefly Beloneuria (Thompson River, Big Creek, Norton Mill Creek). In addition, the Chattooga River at SR 1100 had among the highest total taxa (124) and EPT taxa (64) ever collected in North Carolina and were the highest ever recorded in the Savannah River basin. For detailed information regarding the samples collected during this assessment period, refer to the tables at the end of this appendix.

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.

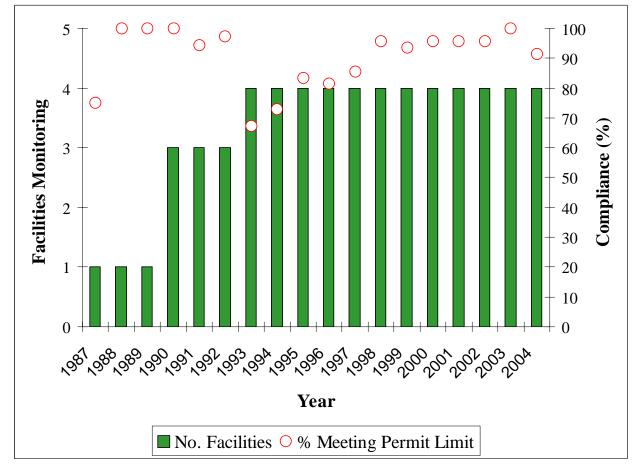
DWQ will use this monitoring information to identify potential impacts to these waters even though a use support rating is not assigned. DWQ will continue to develop criteria to assess water quality in small streams.

Aquatic Toxicity Monitoring

Acute and/or chronic toxicity tests are used to determine toxicity of discharges to sensitive aquatic species (usually fathead minnows or the water flea, *Ceriodaphnia dubia*). Results of these tests have been shown by several researchers to be predictive of discharge effects on receiving stream populations. Many facilities are required to monitor whole effluent toxicity (WET) by their NPDES permit or by administrative letter. Other facilities may also be tested by DWQ's Aquatic Toxicology Unit (ATU). 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 get evaluated over the course of their five-year permit. There are no requirements or targets for minor dischargers.

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.

Four facility permits in the Savannah River basin currently require whole effluent toxicity (WET) monitoring. Both facility permits have a WET limit. Across the state, the number of facilities required to perform WET has increased steadily since 1987, the first year that WET limits were written into permits in North Carolina. Consequently, compliance rates have also risen. Since 1996, the compliance rate has stabilized at approximately 90 percent. The following graph summaries WET monitoring compliance in the Savannah River basin from 1987 to 2002. Facilities with toxicity problems during the most recent two-year review period are discussed in subbasin chapters.



Lakes Assessment Program

Two lakes were sampled in the Savannah River Basin during the 2004 Ambient Lakes Monitoring: Cashiers Lake and Lake Toxaway. Each of these lakes were sampled three times during the summer (June, July and August). Lakes with noted water quality impacts are discussed in the appropriate subbasin chapter.

Ambient Monitoring System

The Ambient Monitoring System (AMS) is a network of stream, lake and estuarine stations strategically located for the collections of physical and chemical water quality data. North Carolina has more than 378 water chemistry monitoring stations statewide, including 1 station in

the Savannah 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 individual subbasin maps. Notable ambient water quality parameters are discussed in the subbasin chapters. Refer to 2005 Savannah Basinwide Assessment Report at http://www.esb.enr.state.nc.us/bar.html for more detailed analysis of ambient water quality monitoring data.

Subbasin/ Station ID	Location	Class	Lat.	Long.	County	Map ID				
01	Chattooga River									
	No Stations									
02	Toxaway, Horepasture, Thompson, and Whitewater Rivers									
H6000000	Horsepasture River at NC 281 near Union	B Tr	35.0922	-82.9764	Transylvania	A1				

Locations of Ambient Monitoring Stations in the Roanoke River Basin by Subbasin

Waterbody	Location	County	Index No.	Date	ST	EPT	BI	EPT BI	Rating
)1									
Chattooga R	SR 1107	Jackson	3	8/04		48		2.2	Excellent
Chattooga R	SR 1100	Jackson	3	8/04	124	64	3.5	2.8	Excellent
				7/99		48		1.5	Excellent
Norton Mill Cr	SR 1107	Jackson	3-3	8/04	108	40	4.2	2.7	Good
				6/99	119	51	4.0	2.7	Excellent
Big Cr	SR 1608	Macon	3-10-3	8/04		45		2.4	Excellent
				7/99	118	53	3.7	2.6	Excellent
02									
Toxaway R	At Auger Hole Trail (Gorges State Park)	Transylvania	4-(4)	8/04		36		2.7	Excellent
Indian Cr	US 64	Transylvania	4-5-(3)	8/04		40		2.4	Excellent
				7/99					
Bearwallow Cr	At Auger Hole Trail (Gorges State Park)	Transylvania	4-7-(2)	8/04		41		2.4	Excellent
Horsepasture R	NC 281	Transylvania	4-13-(12.5)	8/04	98	41	4.1	2.9	Good
				7/99	73	36	4.4	3.5	Good
Whitewater R	NC 281	Transylvania	4-14-(1.5)	8/04		46		2.3	Excellent
				7/99		38		2.9	Excellent
Thompson R	NC 281	Transylvania	4-14-6	8/04		46		1.9	Excellent

Benthic Macroinvertebrate Data Collected in the Savannah River Basin, 1999 – 2004