Appendix II

Water Quality Data Collected by DWQ

- **Benthic Macroinvertebrate Collections**

Benthic Macroinvertebrate Sampling Methodology and Bioclassification Criteria

Benthic macroinvertebrates can be collected using two sampling procedures. DWQ's standard qualitative sampling procedure includes 10 composite samples: two kick-net samples, three bank sweeps, two rock or log washes, one sand sample, one leafpack sample, and visual collections from large rocks and logs. The purpose of these collections is to inventory the aquatic fauna and produce an indication of relative abundance for each taxon. Organisms are classified as Rare (1-2 specimens), Common (3-9 specimens) or Abundant (≥10 specimens).

Several data analysis summaries (metrics) can be produced from standard qualitative samples to detect water quality problems. These metrics are based on the idea that unimpaired streams and rivers have many invertebrate taxa and are dominated by intolerant species. Conversely, polluted streams have fewer numbers of invertebrate taxa and are dominated by tolerant species. The diversity of the invertebrate fauna is evaluated using taxa richness counts; the tolerance of the stream community is evaluated using a biotic index.

EPT taxa richness (EPT S) is used with DWQ criteria to assign water quality ratings (bioclassifications). "EPT" is an abbreviation for Ephemeroptera + Plecoptera + Trichoptera, insect groups that are generally intolerant of many kinds of pollution. Higher EPT taxa richness values usually indicate better water quality. Water quality ratings are also based on the relative tolerance of the macroinvertebrate community as summarized by the North Carolina Biotic Index (NCBI). Both tolerance values for individual species and the final biotic index values have a range of 0-10, with higher numbers indicating more tolerant species or more polluted conditions.

Water quality ratings assigned with the biotic index numbers are combined with EPT taxa richness ratings to produce a final bioclassification, using criteria for mountain/piedmont/coastal plain streams. EPT abundance (EPT N) and total taxa richness calculations also are used to help examine between-site differences in water quality. If the EPT taxa richness rating and the biotic index differ by one bioclassification, the EPT abundance value is used to determine the final site rating.

Benthic macroinvertebrates can also be collected using the DWQ's EPT sampling procedure. Four composite samples are taken at each site instead of the 10 taken for the qualitative sample: 1 kick, 1 sweep, 1 leafpack and visual collections. Only intolerant EPT groups are collected and identified, and only EPT criteria are used to assign a bioclassification.

The expected EPT taxa richness values are lower in small high quality mountain streams, <4 meters in width or with a drainage area <3.5 square miles. For these small mountain streams, an adjustment to the EPT taxa richness values is made prior to applying taxa richness criteria. Both EPT taxa richness and biotic index values also can be affected by seasonal changes. DWQ criteria for assigning bioclassification are based on summer sampling (June-September). For samples collected in other seasons, EPT taxa richness can be adjusted. The biotic index values can also be seasonally adjusted for samples collected outside the summer season.

Criteria have been developed to assign bioclassifications ranging from Poor to Excellent to each benthic sample. These bioclassifications primarily reflect the influence of chemical pollutants. The major physical pollutant, sediment, is not assessed as well by a taxa richness analysis.

Habitat Evaluation

DWQ has developed a habitat assessment form to better evaluate the physical habitat of a stream. The habitat score has a potential range of 1-100, based on evaluation of channel modification, amount of instream habitat, type of bottom substrate, pool variety, bank stability, light penetration and riparian zone width. Higher numbers suggest better habitat quality, but no criteria have been developed for assigning ratings indicating Excellent, Good, Fair or Poor habitat.

Table A-II-1 Benthic Macroinvertebrate Data Collected in the Watauga River Basin, 1983 - 1999 (Current basinwide monitoring sites have the map number bolded.)

Subbasin/ Stream	Location	County	Map No.[1]	Index No.	Date	S/ EPT S	NCBI EPT BI	Bio Class[1]
04-02-01								
Watauga R	SR 1339	Avery	B-1	8-(1)	07/88	-/38	-/1.70	E
					08/85	61/33	3.25/1.94	E
Watauga R	SR 1594	Watauga	B-2	8-(1)	03/90	-/40	-/1.89	G
					07/88	83/44	3.35/2.58	E
					08/85	67/34	3.40/2.64	E
Watauga R	SR 1580	Watauga	**B-3**	8-(1)	07/99	-/25	-/3.90	G-F
					08/94	-/38	-/3.28	E
					07/88	-/38	-/3.16	E
					08/85	76/32	4.64/3.51	G
Watauga R	NC 105	Watauga	**B-4**	8-(1)	07/99	88/42	3.91/3.38	E
					08/94	74/41	3.91/3.31	E
					03/90	99/57	3.32/2.60	E
					08/89	104/46	3.97/3.18	E
					07/88	-/45	-/2.71	E
					08/87	93/45	4.11/2.91	E
					08/85	84/45	4.27/3.06	E
Valley Cr	NC 105	Watauga	B-5	8-4	07/99	-/23	-/1.89	NR
					03/90	-/29	-/1.90	NR
Spice Bottom Cr	SR 1560	Watauga	B-6	8-5-1	03/90	-/38	-/2.76	G
Boone Fk	SR 1561	Watauga	**B-7**	8-7	07/99	72/39	2.59/1.61	E
					08/94	59/37	2.44/1.78	E
					11/89	-/42	-/1.59	E
Boone Fk (below lake)	off SR 1558	Watauga	**B-8**	8-7	07/99	-/32	-/2.84	G
					08/94	-/31	-/2.68	G
					03/90	-/45	-/2.27	E
Lance Cr (above golf course)		Watauga	B-9	8-8-(1)	03/90	-/33	-/1.88	E
Lance Cr (in golf course)		Watauga	B-10	8-8-(2)	03/90	-/27	-/2.39	G-F
Laurel Fk	SR 1111	Watauga	**B-11**	8-10	07/99	-/27	-/3.27	G-F
					09/94	-/24	-/3.36	G-F
					03/90	-/31	-/2.71	G
Dutch Cr	off NC 105	Watauga	B-12	8-12-(3.5)	07/88	87/38	4.62/3.41	G
Cove Cr	SR 1305	Watauga	B-13	8-15	07/88	-/33	-/3.46	G
Cove Cr	US 321	Watauga	**B-14**	8-15	07/99	-/32	-/3.35	G
					08/94	-/30	-/3.62	G
Watauga R	NC 194	Watauga	B-15	8-(16)	03/90	93/51	3.80/2.83	E
Watauga R	SR 1121	Watauga	**B-16**	8-(16)	07/99	81/38	4.27/3.47	G
					08/94	87/42	4.28/3.52	G
					07/90	101/48	4.73/3.70	E
					07/88	105/46	4.93/3.40	G
					07/86	101/45	5.00/3.57	G
					08/85	88/40	4.82/3.64	G
					08/84	99/41	4.88/3.32	G
					08/83	94/40	4.81/3.63	G
Watauga R	SR 1200	Watauga	**B-17**	8-(16)	07/99	94/50	3.89/3.22	E
					08/94	97/46	3.71/2.89	E
					07/88	86/38	4.66/3.07	G
Laurel Cr	off SR 1123	Watauga	**B-18**	8-17	07/99	-/31	-/2.59	G

Subbasin/ Stream	Location	County	Map No.[1]	Index No.	Date	S/ EPT S	NCBI EPT BI	Bio Class[1]
04-02-01 (con't)								
Beaverdam Cr	SR 1201	Watauga	**B-19**	8-19	07/99	-/37	-/3.17	G
					08/94	-/32	-/2.61	G
Beech Cr (above Pond Cr)		Watauga	B-20	8-20	09/87	53/29	2.59/1.41	G
Beech Cr (below Pond Cr)	SR 1126	Watauga	B-21	8-20	09/87	54/30	2.95/1.57	G
Beech Cr (above Poga Cr)	US 321	Watauga	**B-22**	8-20	07/99	-/38	-/2.50	E
					08/94	94/46	3.26/2.52	E
Pond Cr (above WWTP)		Watauga	B-23	8-20-2	09/87	54/29	3.05/1.44	E
Pond Cr (near mouth)		Watauga	B-24	8-20-2	09/87	41/24	2.77/1.50	G
Buckeye Cr (headwaters)		Watauga	B-25	8-20-3-(0.5)	04/84	48/26	3.08/1.74	G
Buckeye Cr (above Grassy Gap Cr)		Watauga	B-26	8-20-3-(1.5)	04/84	50/29	2.45/1.79	G
Buckeye Cr	SR 1312	Avery	B-27	8-20-3-(2.5)	04/84	59/31	2.93/1.73	G
Elk R (below SR 1337)	off NC 184	Avery	**B-28**	8-22-(3)	07/99	102/44	4.37/3.58	G
					08/94	77/33	4.80/4.49	G
Elk R (below Banner Elk)	SR 1326	Avery	B-29	8-22-(3)	08/94	76/33	4.12/3.33	G
Elk R	SR 1305	Avery	**B-30**	8-22-(14.5)	07/99	88/44	3.93/3.16	E
					08/94	-/36	-/3.08	E

[1] E = Excellent, G = Good, G-F = Good-Fair, F = Fair, and NR = not rated.