The Sheepscot River at the North Whitefield provides the most complete record of biological monitoring data of any site sampled by the Biological Monitoring Program. Because the North Whitefield site is located in close proximity to a USGS flow gaging station it provides a wealth of information about natural variability in the benthic macroinvertebrate

Introduction

Geography

The Sheepscot River basin covers 1,056 square miles. The Sheepscot River originates out of the hills of Montville, approximately 26 miles northeast of Augusta. The river runs southwest through the small towns of Palermo, Somerville, and Whitefield where it joins the West Branch. The West Branch begins in Palermo, above Branch Pond, and also flows southwest for approximately 17 miles through China and Windsor before joining the mainstem above North Whitefield. The mainstem reaches tidewater in Alna. The total length of the mainstem to tidewater is about 34 miles. The Sheepscot tidal waters continue for another 20 miles before emptying into Sheepscot Bay just east of the mouth of the Kennebec River. There are two other sampled tributaries within this basin listed in Basin Table 7, p. 152.

Basin Summary Statistics	
Biomonitoring Activities in the Basin	Period of Record: 1984-1998 *(1998 data not yet available)* Waterbodies Sampled: 4 Established Stations: 7 Number of Sampling Events: 23
Wastewater Discharges	None. **Note:** There are seven municipal treatment plants and one electronics industry in this basin discharging into tidal waters. These impacts are not measured by the Biological Monitoring Program.
Other Sources	Agricultural activity; stormwater run-off
Flow Regulation *(Total Capacity)	Water level controlled by approx. 54 dams. No FERC licensed hydro-projects.
Quality	Excellent except for some enrichment from non-point sources

Drainage area	Average Annual Discharge	Wastewater Flow Volume (Major Industrials and All Municipal Discharges Only)	Mainstem Average Dilution
Sheepscot--145mi2 (at N. Whitefield)	Sheepscot.---248cfs (at N. Whitefield)	N/A	N/A

Overview of Biological Monitoring Activities

Of the eight stations established in the Sheepscot River basin, four are considered low risk and have not been sampled since 1984 (Stas. 59; 60; 86 and 87). The remaining four stations are on the mainstem and the West Branch of the Sheepscot and are monitored for the effects of non-point sources and as permanent ambient monitoring stations (Basin Table 7, p. 152, Basin Map 7, p. 168). The two mainstem stations in North Whitefield and Whitefield (Stas. 74 and 75) periodically do not attain assigned Class AA standards due to enrichment effects from non-point sources, as well as probable lake outlet effects (Basin Map 7). Dissolved oxygen and bacteria problems have been recorded in the mainstem and some tributaries, also attributable to non-point sources. The West Branch station (Sta. 268) is relatively new, established in 1995 to serve as a second, annual ambient monitoring site, to provide information on the natural variability of small, headwater reaches (See Case Study 10, below). That station has consistently attained Class A biological standards.

The Sheepscot River is one of the seven designated Atlantic salmon rivers addressed under the state Atlantic Salmon Conservation Plan (See Basin Chapter 6, p. 95) and as such has received considerable interest from local watershed groups and Atlantic salmon interest groups. Several monitoring and best management practices (BMP) demonstration projects are underway in the basin. A watershed restoration project to address non-point source related water quality problems in the basin was funded by US EPA in 1999.

Case Study 9

Natural Variability at a Long-term Ambient Monitoring Station, Sheepscot River at North Whitefield

Station 74, the Sheepscot River at the North Whitefield USGS gaging station, provides the most complete record of biological monitoring data of any site sampled by the Biological Monitoring Program. Because the North Whitefield site is located in close proximity to a USGS flow gauging station it provides a wealth of information about natural variability in the benthic macroinvertebrate community. The North Whitefield site hosts a borderline biological community between Class A and Class B, indicative of the enriching effects of non-point sources from agriculture and road crossings. Of the fourteen sampling years between 1984 and 1997, 6 attained Class A aquatic life standards and 8 attained Class B standards (Basin Map 7, p. 168). Table 12 provides summary statistics for several biological community variables for all Station 74 sampling events, in comparison to the same statistical summary for the entire biomonitoring dataset. Figure 18 shows annual variation in selected community structure variables for the Sheepscot River in comparison to variation in mean August flows for the same years. Figures 19a and 19b provide a graphical representation of the distribution of variable values for all Station 74 monitoring years (n=14) as compared to the distribution of variable values for the set of all sampling events within each water quality class in the complete dataset. Refer to Appendices 1 and 2 for a description of the variables and an explanation of box plot data.

The Biological Monitoring Program intends to continue annual sampling of Stations 74 (North Whitefield) and 268 (on the West Branch in Weeks Mills) to provide a long-term record of annual variability and long-term response to enrichment.

Table 13 Summary Statistics for selected variable for the Sheepscot River at North Whitefield, 1984-1997 and complete biomonitoring dataset.

Variable Name	Summary Statistics	Complete Dataset	Sheepscot Dataset
		N=538	N=17
Total Abundance	Max	9080	1780
	Min	3	299
	Mean	697	816
	Std. Dev.	981	339
	C.V.	1.409	0.416
Generic Richness	Max	88	52
	Min	4	25

Variable Name	Summary Statistics	Complete Dataset	Sheepscot Dataset
Generic Richness	Mean	33	38
	Std. Dev.	13	8
	C.V.	0.381	0.21
S-W Diversity	Max	4.89	4.13
	Min	0.42	2.63
	Mean	3.1	3.34
	Std. Dev.	0.828	0.449
	C.V.	0.268	0.134
Hilsenhoff Biotic Index	Max	8.5	4.8
	Min	1.8	2.9
	Mean	4.6	3.9
	Std. Dev.	1.12	0.52
	C.V.	0.24	0.13
EPT Generic Richness	Max	29	22
	Min	0	14
	Mean	14	19
	Std. Dev.	5.9	2.15
	C.V.	0.43	0.11

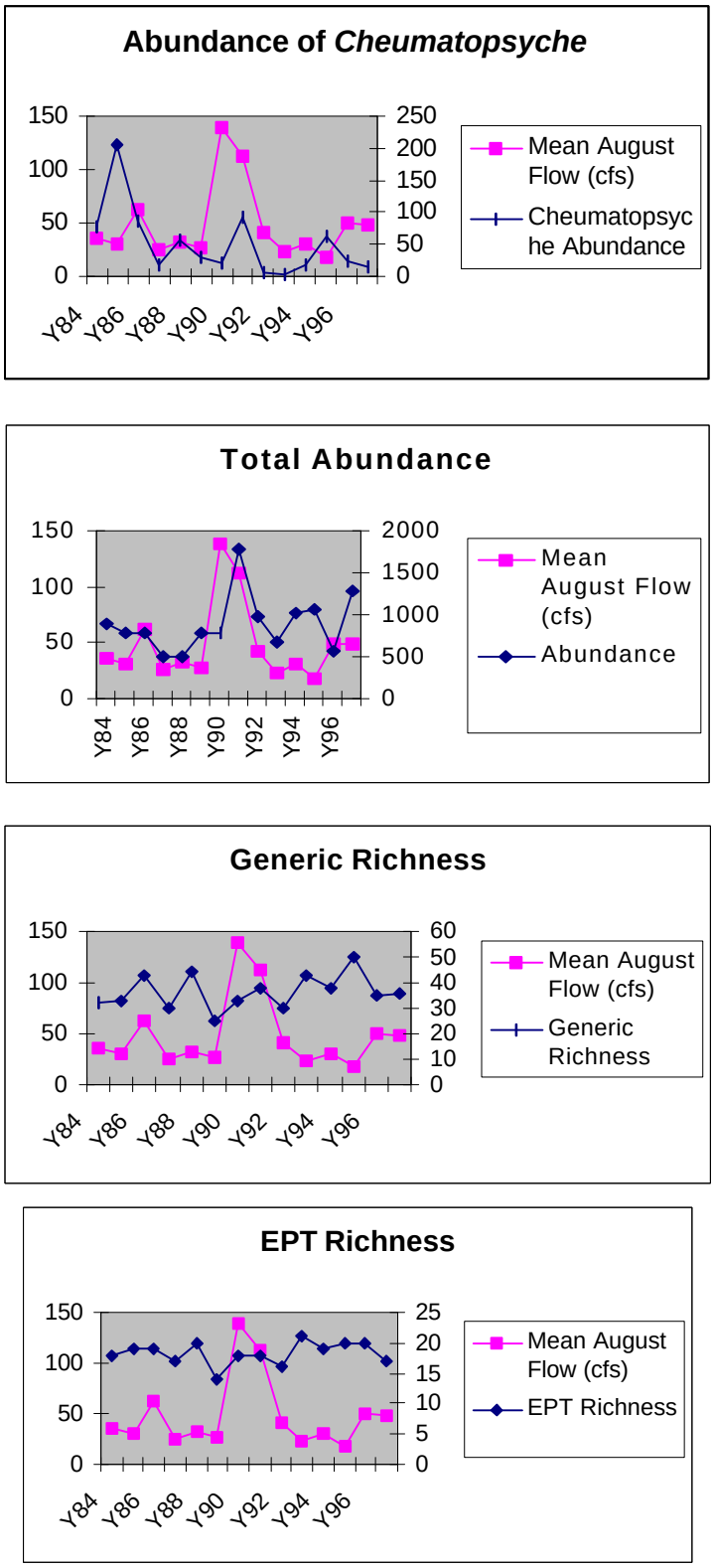

Figure 17 Sheepscot River at North Whitefield: Annual variability in selected biological community attributes and mean August flows between 1984 and 1997

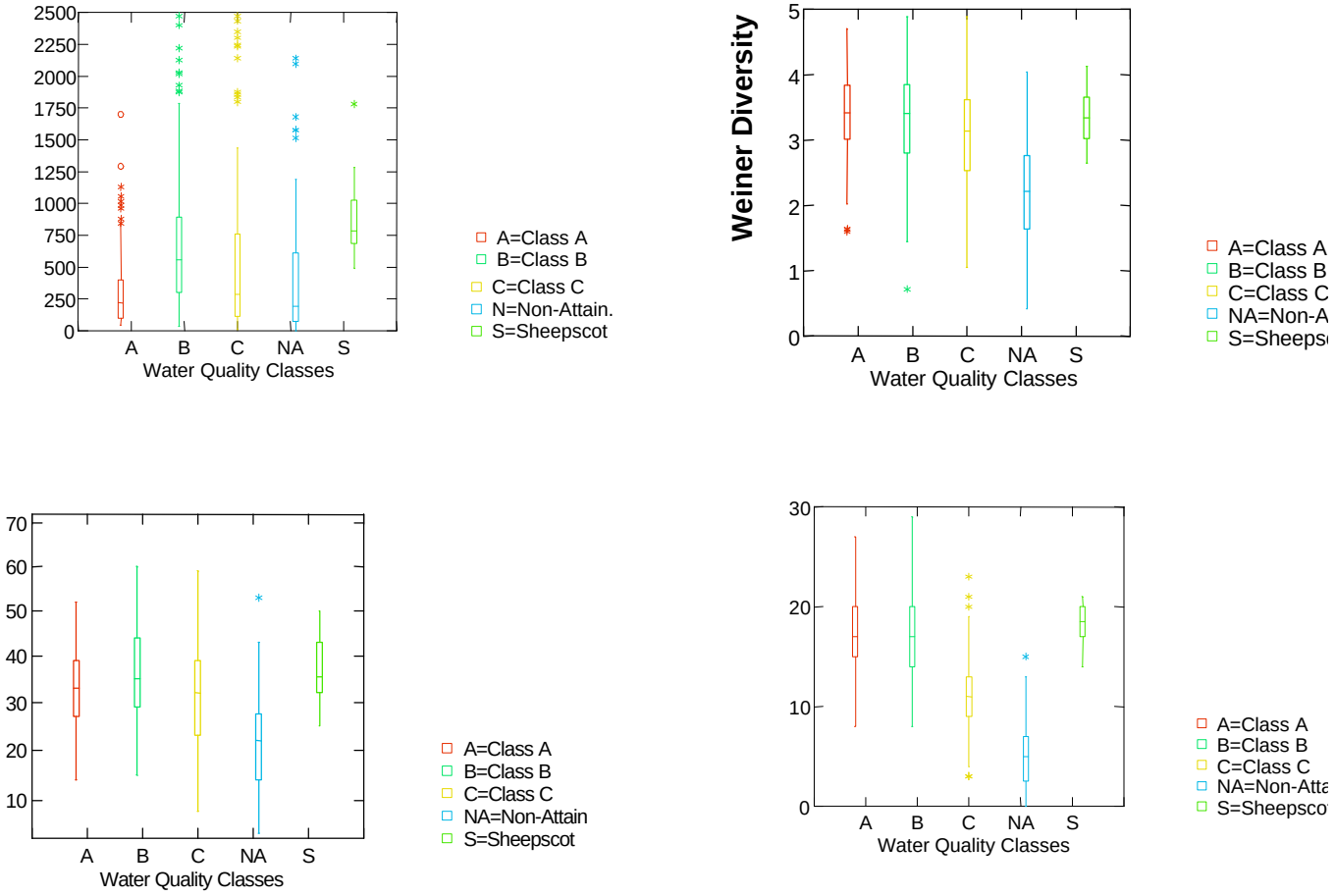

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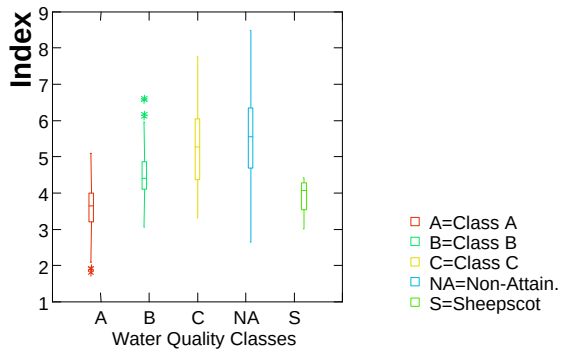
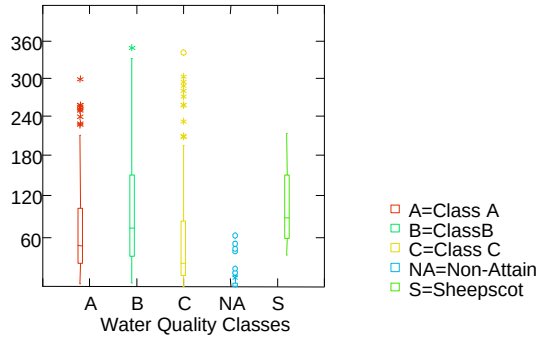
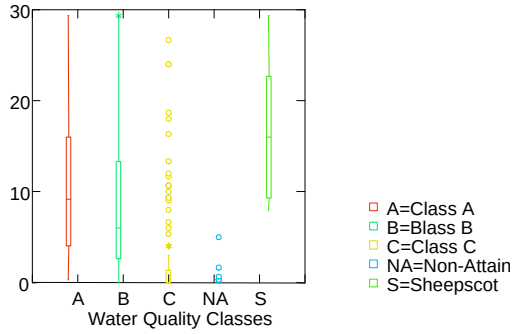
Figure 18a Variability of selected community structure attributes for the Sheepscot River at North Whitefield, 1984-1997 as compared to variable distributions for four water quality classification clusters (see Appendices 1 and 2).

N=538 n_A=119 n_B=182 n_C=145 n_{NA}=78 n_S=14







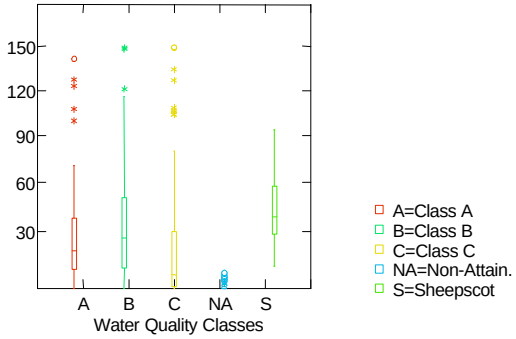


Figure 18b Variability of selected community structure attributes for the Sheepscot River at North Whitefield, 1984-1997, as compared to variable distributions for four water quality classification clusters (see Appendices 1 and 2).

N=538 n_A=119 n_B=182 n_C=145 n_{NA}=78 n_S=14