Benthic Macroinvertebrate in the Little Hoosic

Benthic macroinvertebrates are animals without backbones that live at least part of their life cycle in or on the bottom of a body of water. They include aquatic insects such as mayflies, stoneflies, caddisflies, midges, and beetles as well as crayfish, worms, clams and snails. The families of macroinvertebrates have various levels of tolerance to pollution, so we can assess the general health of a stream segment by looking at the mix of critters. Lots of critters with little tolerance to pollution would indicate a healthy stream, more of the tolerant critters would indicate a less healthy stream. Thus the make up of the BMI community serves as the water quality indicator.

Procedures

We collected samples of the critters from four segments of the Little Hoosic in New York (see map in Appendix A), following the procedures given in River Watch Network's "Living Waters", 1997. Sampling in 2005 was done on September 7 and 13 by members of the Homewaters Chapter of Trout Unlimited (Bob Davis, Pete Ficalora, Bob Hill, Bill Shorter, and Vic Widman) and the Hoosic River Watershed Association (Dick Schlesinger). A subsample of about 100 critters was randomly pick out from each sample, and identified to the taxonomic level of "family". (Identified by Dick Schlesinger with voucher specimens verified by Mike Cole, Senior Aquatic Scientist & Taxonomist, ABR, Inc.--Environmental Research & Services, an aquatic entomologist).

The four sample sites are all along the Route 22 corridor, starting upstream of Petersburg and ending near the confluence of the Little Hoosic with the Hoosic in North Petersburg. The watershed as a whole is 92.0% forested, 5.8% agricultural, 1.5% residential/commercial, and 0.7% streams and wetlands. Although quite limited in extent, the residential and agricultural lands are concentrated in the stream valleys, especially the Route 22 corridor itself.

We compared the macroinvertebrate communities using several "metrics". The simplest is the number of families of mayfly, stoneflies, and caddisflies, the EPT richness. A second is the Family Biotic Index, and a third is the % Model Affinity. We also considered the overall abundance of the critters sampled, the numbers of critters within each family, and the habitat assessment score for each segment.

The modified Family Biotic Index is as follows.

0-3.73	=	excellent
3.76-4.25	=	very good
4.26-5.00	=	good
5.01-5.75	=	fair
5.76-6.50	=	fairly poor
6.51-7.25	=	poor
>7.26	=	very poor

The % Model Affinity uses a model community developed for New York, as follows.

>64%	=	non-impacted
50-64%	=	slightly impacted
35-49%	=	moderately impacted
<35%	=	severely impacted

We placed water temperature sensors (Optic Stowaway) at the southernmost (upstream) site and the northernmost (downstream) site on June 15. They were set to record temperature hourly. The upstream sensor was removed on September 7, at which time the downstream sensor was found to be missing. Data

from that location was downloaded on July 11, so we have slightly less than one month's worth of data to compare the two locations.

Results and discussion

Using just one year's sampling at a few locations can not provide a complete picture of stream health, but some tentative conclusions can be made. In general, the BMI surveys show the Little Hoosic supporting very good to excellent macroinvertebrate communities. But also some impacts to stream quality. The site-specific details follow.

Upstream from Petersburg near the fishing access parking area. Site coded as LH14.10. This site has an EPT richness of 5 (see Table 1 below), a family biotic index (FBI) of 3.95, in the very good range, and a % model affinity (PMA) of 57%, indicating a slight impact from pollution. The total abundance (estimated total number of critters in the sample) was 372 (see Table 2 for a summary of the 100 critters identified by family). The habitat assessment score was 114 (out of 150 possible, Table 3).

Petersburg park. Site coded as LH09.68. This site had an EPT richness of 8, an increase compared with the previous site. The FBI is in the very good range (3.96) and essentially identical to the previous site, and the PMA was also essentially the same (56%). Total abundance was 525 and the habitat assessment score was 95.

Prosser Hollow. Site coded as LH05.91. This site has an EPT richness of 8, unchanged compared with Petersburg, but a higher FBI (4.10) and a lower PMA (47%), both indicating some reduction in water quality compared with Petersburg. The FBI is still well within the very good range. Total abundance was 384 and the habitat assessment score was 111.

Downstream of Rt.346 bridge. Site coded as LH00.26. This site had an EPT richness of 9, the highest of the four sites. Also, the FBI was the lowest (3.52), best of the four and in the excellent water quality range. However, the PMA was only 46% and thus in the moderately impacted range. Also, total abundance was only 185, the lowest number for the Little Hoosic sites and the habitat assessment score was 72, also the lowest.

A moderately enriched environment from organic pollution (onsite sewage, animal manure) is often dominated by caddisflies and true flies. Both the Petersburg Park and Prosser Hollow communities are dominated by caddisflies and may reflect this situation (Table 2). Physical habitat degradation (flow alteration, silt and sand sedimentation, removal of shading may result in overall decline in abundance. This situation might be the case near the confluence with the Hoosic (site LH00.26). This site was surprising in the diversity of the macroinvertebrate community, but did have the lowest number of critters in total.

A further factor possibly reducing the abundance at this site could be warmer water compared to LH14.10. LH00.26 averaged 3.2 degrees Fahrenheit warmer than LH14.10 during the 27 day period for which we have the records from both sensors. Indeed, the downstream site was as much as 5 or more degrees warmer during portions of the period (Fig. 1 below). The warmer temperatures would reduce the dissolved oxygen levels and thus potentially impact the macroinvertebrate community.

The results from benthic macroinvertebrate monitoring in 2005 show the Little Hoosic to be healthy and supporting a diverse mix of critters. There are some indications of limited non-point source pollution, but in general, the river appears to be in good health. Repeated monitoring in the future would be useful to

confirm the 2005 data and to evaluate changes in land use within the watershed that may improve or adversely affect the water quality of the Little Hoosic.

Table 1. Metrics calculated for the BMI communities.

		HooRWA 2005 BMI Summary			
METRICS Summary	*Expected response to impact*	LH14.10 C	LH09.68 C	LH05.91 C	LH00.26 C
Org. Density / sample		372	525	384	185
Taxa Richness	Decline	9	14	14	13
EPT Richness	Decline	5	8	8	9
Family Biotic Index	Rise	3.95	3.96	4.10	3.52
% Contrib. Dom. Taxa	Rise	33.00	43.00	57.00	25.00
% Hydropsych. of Trich.	Rise	66.67	82.69	90.48	51.22
% Trichoptera	Decline	21.00	52.00	63.00	41.00
% model affinity	Decline	0.57	0.56	0.47	0.46
EPT/Chironomid	Decline	1.72	4.25	6.33	9.83

Table 2. Number of individuals by family for the Little Hoosic samples.

Family	LH14.10	LH09.68	LH05.91	LH00.26
Mayflies				
Baetidae	2	6	2	
Caenidae				5
Heptageniidae	2	3	5	4
Leptophlebiidae				3
Isonychiidae			2	
Stoneflies				
Chloroperlidae	6	3		3
Perlidae		4	3	2
Perlodidae			1	1
Caddisflies				
Brachycentridae	7	4		19
Glossosomatidae			1	
Hydropsychidae	14	43	57	20
Hydroptilidae		2		
Polycentropodidae			5	1
Rhyacophilidae		3		
True flies				
Athericidae		1		
Chironomidae	18	16	12	6
Simuliidae		1		
Tipulidae	17	7	6	3
Dobson/fishflies				
Corydalidae			2	
Beetles				
Elmidae	33	6	2	25
Psephenidae		1	1	7

	Dragonflies & damselflies				
Gomphidae		1		1	
Aeshnidae					1

Table 3. Habitat assessment

	Habitat Assessment Scores	LH14.10	LH09.68	LH05.91	LH00.26
Max	% Cobble	17	13	10	10
equals	Velocity	13	11	10	9
20	Embeddedness	14	14	19	6
	Velocity/Depth Regimes	9	6	9	1
	Bank/Channel Alteration	5	6	5	3
Max	Sediment Deposition	9	9	9	6
equals	Riffle Characteristics	8	8	9	3
10	% Bottom Exposed	8	6	7	8
	Condition of Bank (% eroding)	9	9	9	9
	Bank Vegetation	9	3	9	7
	Riparian Vegetation Zone	5	3	9	4
	Overhead Canopy	8	7	6	6
	Total (maximum =150)	114	95	111	72

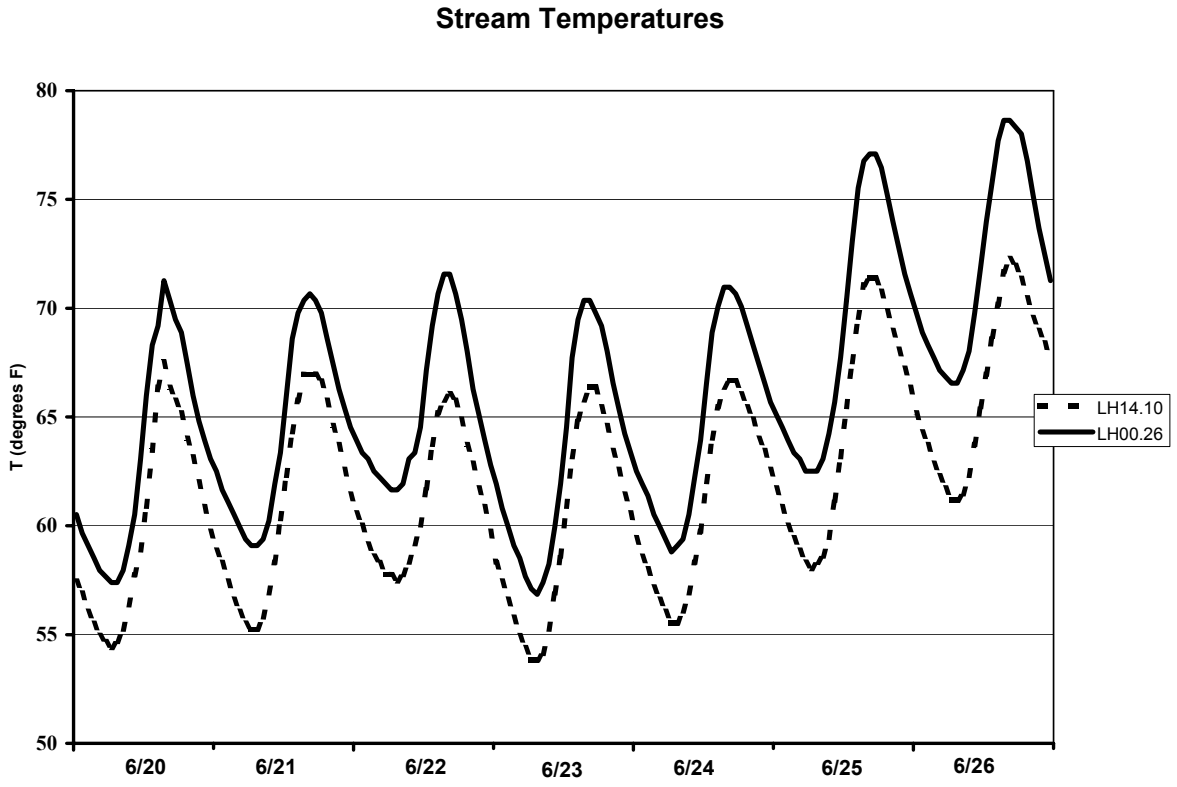

Figure 1. Comparison of the upstream and downstream stream temperatures during one week.

Reference

Dates, Geoff and Jack Byrns. 1997. Living Waters, Using Benthic Macroinvertebrates and Habitat to Assess Your River's Health. River Watch Network.

Report prepared by Dick Schlesinger April 2, 2006

Appendix A