How its tributaries contribute to the health and vitality of the Hoosic River

The south branch of the Hoosic River flows north from the outlet of Cheshire Lake. The segment of the river from Cheshire Lake to just south of the Town of Adams is designated as Class B waters, suitable for primary contact recreation, and as a cold water fishery, suitable for trout and other stenothermal species. The last published assessment of the segment questions whether it meets the classifications (Kennedy, L.E. and Weinstein, M.J., 2000). The presence of the lake, straightening of portions of the river and limited assess to its floodplain as the result of residential uses, roads, and the railroad grade have the potential to adversely affect the health of the river. The tributaries downstream of the lake appear to be less effected by residential and infrastructure development.

During the summer of 2004, the Hoosic River Watershed Association (HooRWA) focused its monitoring program on gaining an understanding of the interactions between several of the tributaries and the conditions in the Hoosic. The studied segment flows from just south of Cheshire Lake to just upstream of the Dry Branch in Adams, and includes Kitchen Brook, South Brook, and Bassett Brook. Water quality samples were collected, water temperatures measured, the benthic macroinvertebrate communities characterized, and land uses analyzed. This report presents what we learned and what we think it means.

Procedures

In order to evaluate how and in what ways the tributaries might affect the conditions in the Hoosic River, we collected data that could be compared with available water quality standards. When available, we used the standards established by the Massachusetts Department of Environmental Protection for flowing waters (Massachusetts Surface Water Quality Standards, 1995), and supplemented these as necessary with thresholds suggested by River Watch Network (Behar, 1997) or the U.S. Environmental Protection Agency (EPA, 1997)). We collected water samples at 9 locations once per month from May through September. Berkshire Enviro Labs. conducted the analyses for *E. coli* bacteria and for total suspended solids (TSS) while we did the analyses for nitrate nitrogen, conductivity, and turbidity. The standards we compared these 5 water quality indicators to are:

E. coli – DEP standard not yet set but the standard for public beaches is 235 colonies/100 mL of water.
Nitrate nitrogen – natural levels generally less than 1 mg/L.
TSS – less than 20 mg/L generally considered clear.
Turbidity – changes above 5 to 10 nephelometric turbidity units (NTU) considered significant.
Conductivity – levels between 150 and 500 microsiemens/cm generally support good fisheries.
Stream temperature – a mean month temperature less than 68 degrees Fahrenheit (F).

The 9 locations included the outflow from Cheshire Lake (LAK), the Hoosic River about 50 yards downstream of the Cheshire Lake dam, Kitchen Brook, the Hoosic River both upstream and downstream of South Brook, the Hoosic River at Cheshire Harbor both upstream and downstream of Bassett Brook, Bassett Brook, and the Hoosic River just upstream of Route 8 opposite the Old Stone Mill in Adams. (See Fig. 1)

We collected stream temperature data using instream temperature loggers that recorded the temperature hourly from early June through mid September in three of the tributaries and five locations in the Hoosic River. We calculated 30-day running averages to represent the mean monthly temperature standard. The temperature sensors were placed in the Hoosic River just upstream of Kitchen Brook, in Kitchen Brook, in the Hoosic River just upstream of South Brook, in South Brook, in the Hoosic both upstream and downstream of Bassett Brook, in Bassett Brook, and just upstream of Dry Branch in Adams.

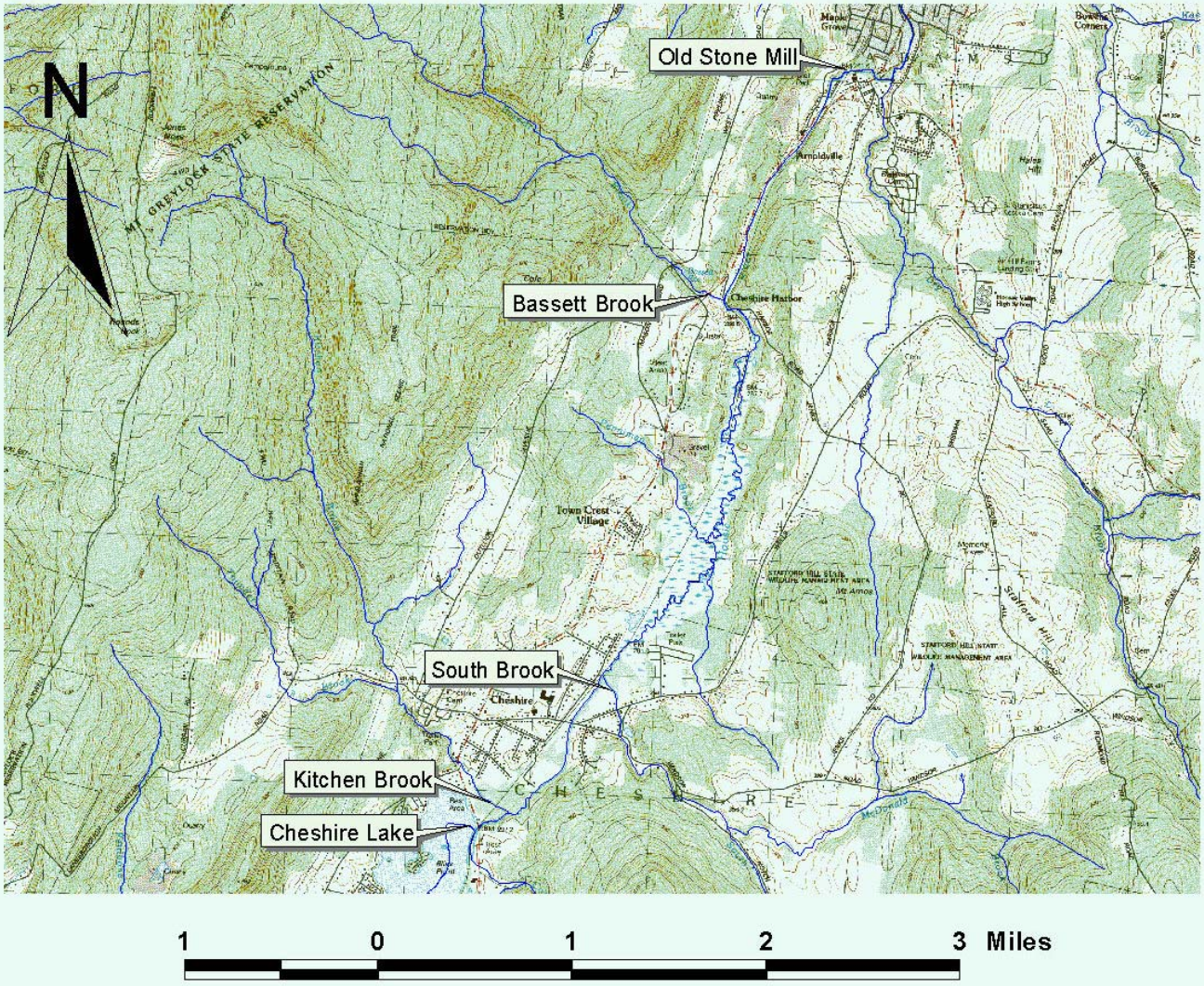

Fig. 1. The Hoosic River and the tributaries studied.

The third monitoring element of the program was to collect benthic macroinvertebrate samples using the River Watch Network procedures for riffle areas. Samples were collected at five locations, South Brook and the Hoosic River just downstream of South Brook, Bassett Brook and the Hoosic River just downstream of Bassett Brook, and the Hoosic River about 100 yards upstream of Route 8 opposite the Old Stone Mill in Adams. The macroinvertebrate samples were returned to the laboratory and 100 individuals from each sample identified to the family level. The data was then summarized using the Massachusetts Water Watch Partnership spreadsheet.

Finally, land use data was obtained from the MassGIS website and analyzed using ArcView GIS software. Four categories of land uses (forests, agriculture, water, and residential/urban) were determined for the entire watershed upstream of Adams and for the individual tributaries studied.

Results and Discussion

In the past, the levels of *E. coli* in this section of the Hoosic River have been higher than desirable for primary contact recreation (Hoosic River Watershed Assoc. 2003). In 2004, the levels were acceptable at

7 of the 9 locations, but were above our alert threshold for the two sites bracketing South Brook(Fig. 2). The site upstream of the brook (HUS) exceeded the threshold in May, June, and July, while the site downstream (HDS) did so in May, July, August, and September. The downstream site had lower levels than the upstream one in May, June, and July, indicating that the levels in South Brook were lower than those in the Hoosic River. However, the reverse was true in August and September, indicating higher levels in the tributary.

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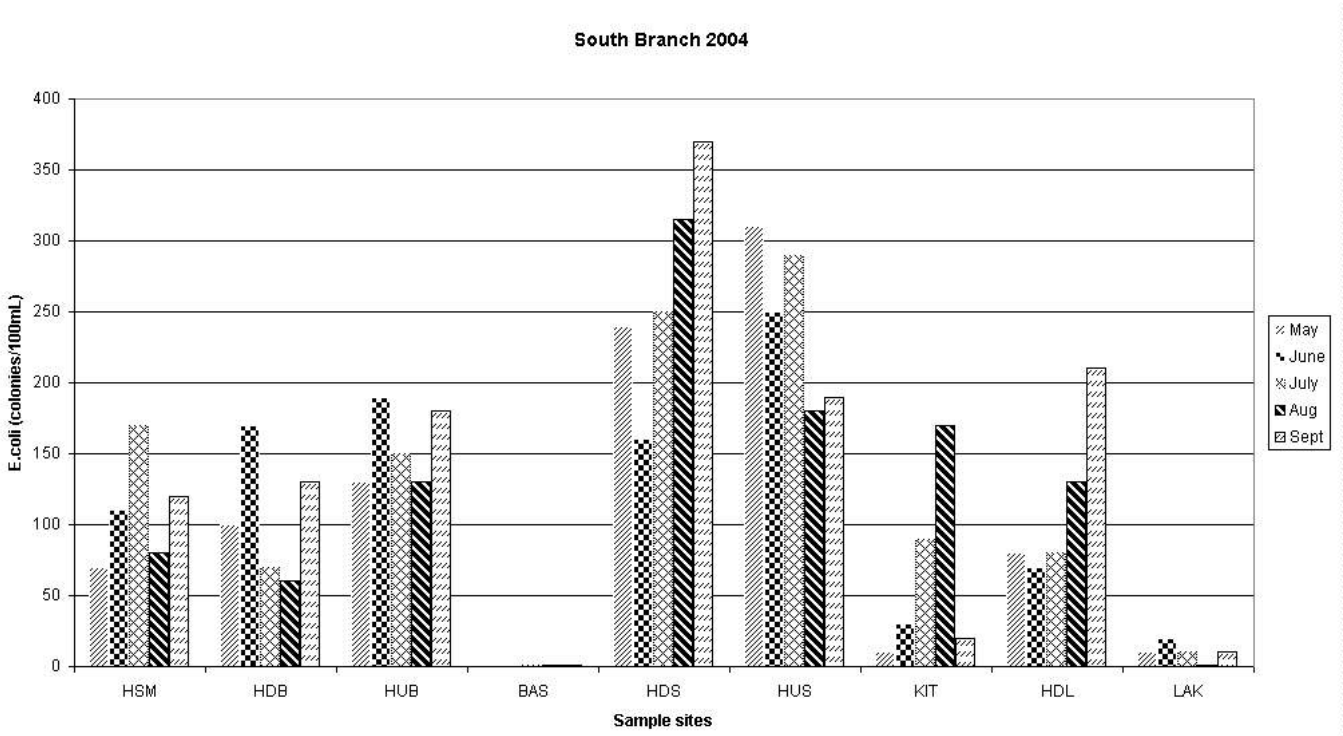

Figure 2. Bacteria levels.

Farther downstream at Cheshire Harbor, Bassett Brook (BAS) had no detectable *E .coli*, and the site upstream of the brook (HUB) had higher levels than the downstream site (HDB) for all 5 sample days. These results would indicate that this tributary consistently reduced the concentration of bacteria in the river.

The nitrate nitrogen levels were all well below our level of concern. The outflow from the lake (LAK), averaging only 0.009 mg/L, and the Hoosic just downstream (HDL), averaging 0.014 mg/L, showed the lowest levels of nitrates. The highest average levels were in Kitchen Brook (KIT) (0.186 mg/L) and the Hoosic near the Old Stone Mill (HSM) (0.174 mg/L), while the highest single sample of 0.25 mg/L was from the Hoosic near the Old Stone Mill.

The total suspended solids and turbidity values were likewise well below our levels of concern, the maximum TSS value being 9 mg/L in the Hoosic upstream of Bassett Brook and the highest turbidity reading being 3.9 NTU from the Hoosic downstream of Bassett Brook. Since all of our samples were dry weather samples, those results are to be expected.

The conductivity readings were all well below the threshold of concern for recreation (Fig. 3). The two tributaries sampled directly showed levels consistently much lower than the river. The site just

downstream of South Brook was always lower than the site just upstream, indicating that the conductivity of South Brook was also lower than the river.

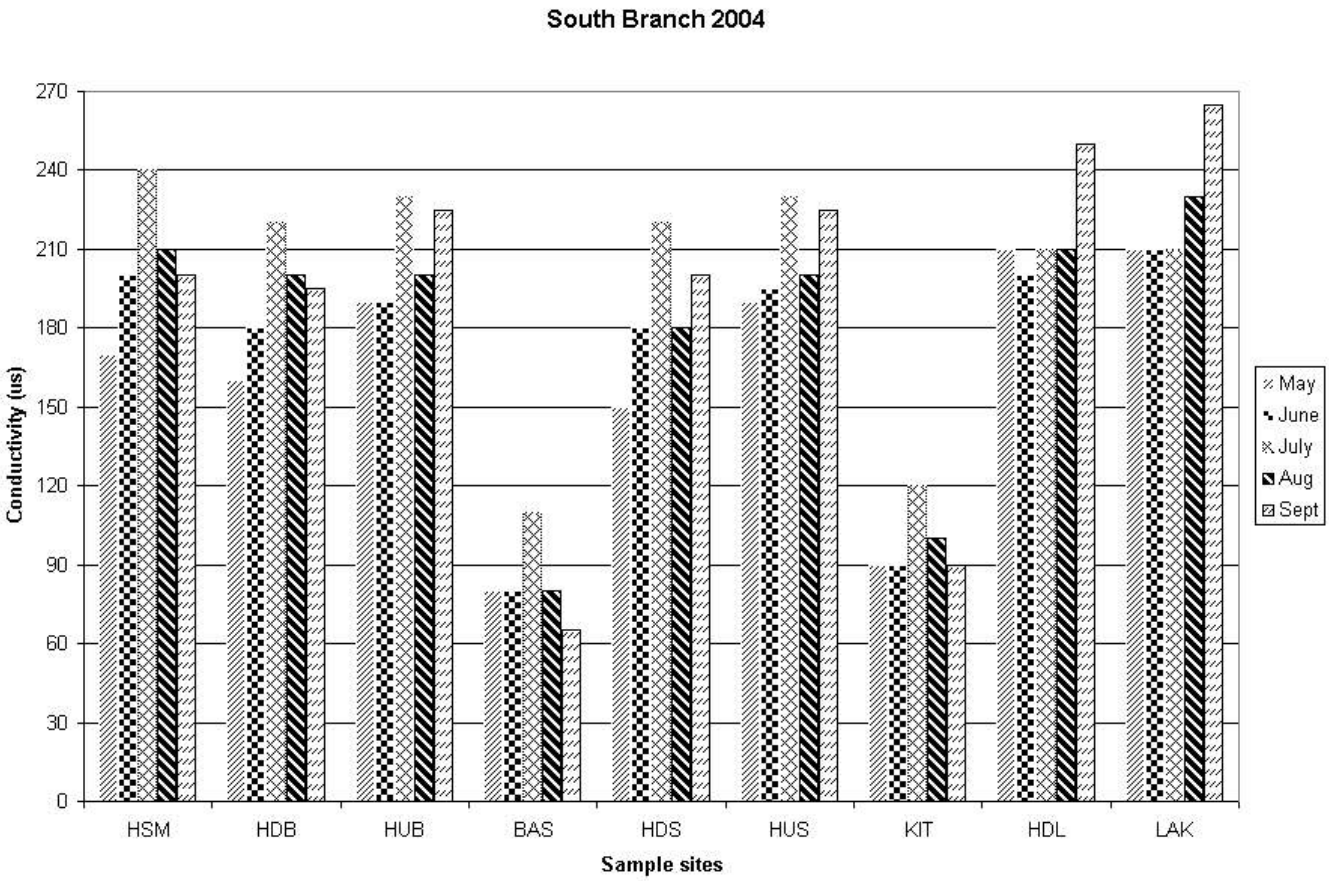

Figure 3. Conductivity levels.

Since conductivity for a good fishery is stated to be between 150 and 500 microsiemens, it is possible that the tributaries may have less nutrients that might be optimal. However, one of the primary variables for assessing the fisheries is water temperature. For this segment of the Hoosic, the presence of Cheshire Lake in the headwaters is of concern due to the fact that impoundments often result in heating of the waters. Indeed, our stream temperature monitoring found the highest temperatures just downstream of the lake and upstream of Kitchen Brook (Fig. 4). At this location, just a few hundred meters downstream of the lake, the 30-day mean temperature was above the 68 degree threshold for a cold water fishery for the entire measurement period, a total of 80 days.

Each of the tributaries provided colder water to the river. Kitchen Brook was 12 to 15 degrees F. cooler than the river. Just upstream of South Brook, about a mile downstream of the lake, the river still exceeded the threshold value for a portion of the measurement period, but for just 51 days. The waters from South Brook were 6 to 8 degrees cooler than the river. Just upstream of Bassett Brook, about 4 miles downstream of the lake, the threshold was exceeded for only 11 days (Fig. 5). The temperature difference between Bassett brook and the upstream location was similar to South Brook, 6 to 8 degrees, the river did not exceed the standard downstream of the brook at any time.

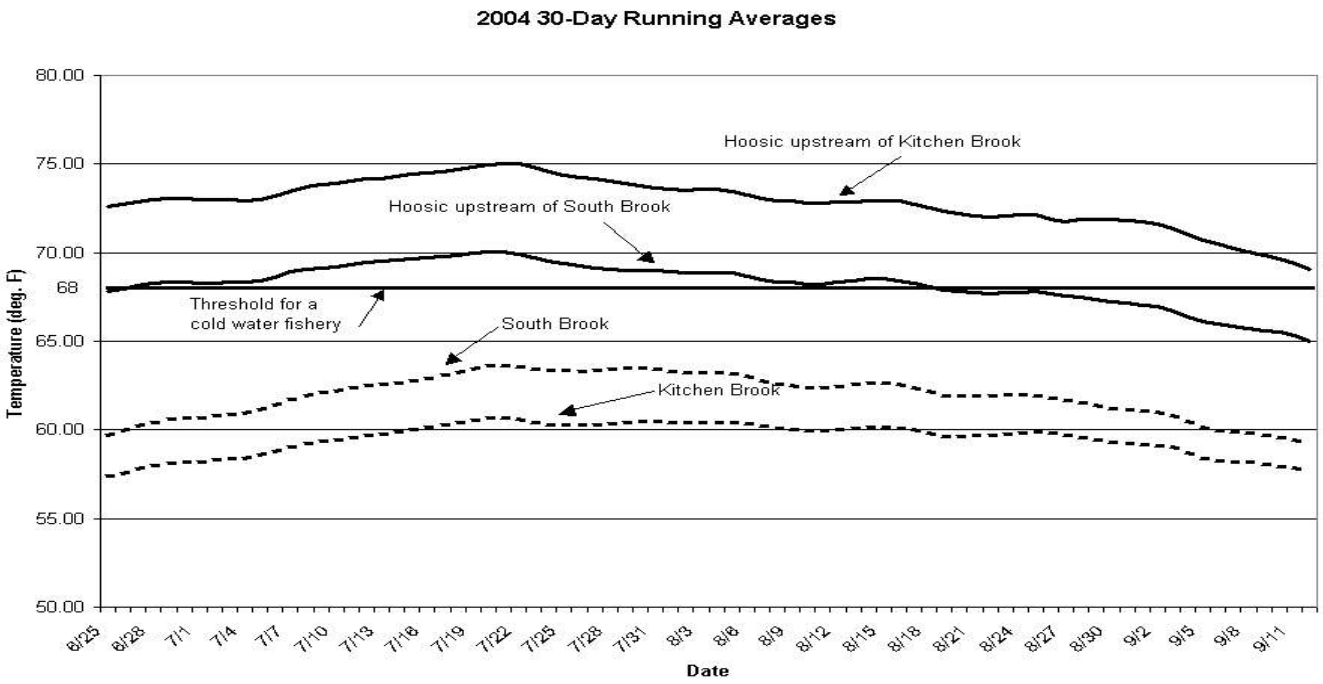

Figure 4. Stream temperature just downstream of Cheshire Lake.

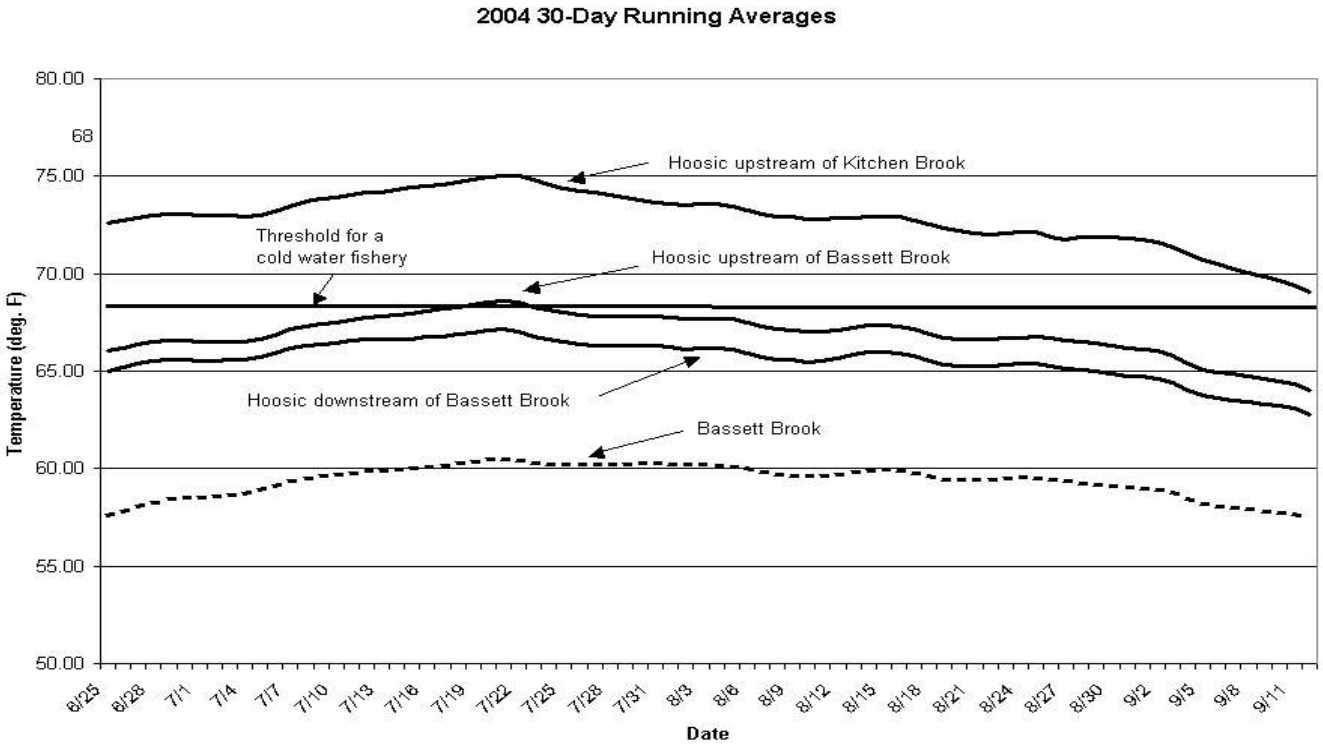

Figure 5. Stream temperature at Cheshire Harbor.

The two tributaries sampled for benthic macroinvertebrates had more mayfly, stonefly, and caddisfly families (the EPT index) than any of the three Hoosic River samples. South Brook had 12 families while the river just downstream had 9. Bassett Brook had 11 families while the river just downstream had 6. Just south of Adams, the river had 9 EPT families. In general, members of these families are relatively

intolerant of pollution, and thus higher numbers indicate cleaner waters, cooler waters, and higher amounts of dissolved oxygen.

The family biotic index (FBI), which combines the numbers of individuals within a families with the family's pollution tolerance value, showed a similar pattern. South Brook and Bassett Brook (FBI = 3.48 and 2.55 respectively) are within the range of values representative of excellent conditions. The river just downstream of South Brook (3.79) is in the very good range, the river just downstream of Bassett Brook (4.75) is in the good range, and the river south of Adams (3.69) is just into the excellent range for this metric.

Conclusions

In 2004, much of this segment of the Hoosic did meet its target for primary contact recreation, but the first 4 miles downstream of the lake was warmer than the threshold for a cold water fishery for some of the period. The tributaries proved to be several degrees cooler than the main river, had lower bacteria and conductivity levels, and relatively intolerant benthic macroinvertebrate communities. As the waters of the tributaries mixed with the river, we found improved conditions, both cooler and cleaner.

A likely explanation for the cleaner, cooler waters in the tributaries can be found in the mixes of land uses within the subwatersheds. The subwatersheds of the three tributaries are 90% forested, ranging from 87% to 99%, with an additional 8% in agriculture and slightly less than 2% in residential use. In comparison, the remainder of the watershed for this segment of the river, from just north of Pittsfield to the southern edge of Adams, is 66% forested, 18% agriculture, 5% open water, and 11% residential and other urban uses.

The three tributaries studied in 2004 carried cleaner waters to the river, helping to maintain conditions for Class B primary contact recreation uses. They also added cooler waters, that were eventually able to offset the warmed lake waters so as to meet the standards for a cold water fishery some 4 miles downstream of the lake. Especially in this headwaters section of the Hoosic, in which the three tributary subwatersheds comprise 32% of the total drainage area, the importance of the tributaries for the health of the river is quite apparent. Perhaps less apparent, but likely equally important, are the contributions of the many tributaries to the health of the Hoosic throughout its journey to the Hudson.

Acknowledgements

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