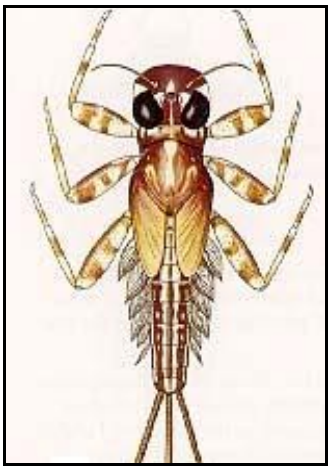
A BIOLOGICAL ASSESSMENT OF SELECTED STREAMS IN HAMILTON COUNTY, NY

Final Report of the 1999 Monitoring Program



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INTRODUCTION

Hamilton County

Hamilton County is situated in the center of the Adirondack Park. It is the third largest county in the state with an area of 1,118,080 acres. It is also the least populated county in the state (5,279 people – 1990 census). Approximately three-quarters of the county is state owned land. This area is mandated by the State Constitution to be left unaltered by man. Approximately 89% of the county is forested and over 5% of the land area is water, which includes 77 lakes. The remaining 6% includes open areas, hamlets, rivers and streams.

The soils of the county are predominantly shallow, poorly drained, and highly acidic. Peat and muck soils are also prevalent. The topography of the county ranges from a low elevation of approximately 780 feet in the southern end of the county to its highest point, Snowy Mountain, with an elevation of 3,899 feet.

The main enterprises are tourism and forestry. Tourism is generally confined to areas adjacent to highways, hamlets, and those lakes accessible by road. The forests on private lands are periodically harvested for both timber and pulp. The state owned timber land is not available for harvest (Krawiecki 1982).

History of Benthic Macroinvertebrate Studies in New York State

Benthic macroinvertebrates are defined as bottom-dwelling invertebrates, animals lacking backbones, which are large enough to be visible without a microscope and retained by a U.S. no. 30 sieve. The New York State Conservation Department conducted it's first round of biomonitoring surveys in the 1926-1939 period. This first round of surveys proved very useful in documenting many cases of pollution in the state's rivers and streams. In 1972, the New York State Department of Environmental Conservation (NYS DEC) Stream Biomonitoring Unit began using benthic macroinvertebrates in streams to assess the water quality and to track changes over time (Bode 1993). There are also a number of high schools, colleges, and universities throughout the state that perform macroinvertebrate studies as part of their educational and research programs.

Rapid Stream Assessment

Rapid stream assessment involves collecting macroinvertebrates from the bottom of streams along with other physical and chemical parameters to assess water quality.

Some of the advantages of using benthic macroinvertebrates as indicators of stream water quality include:

- macroinvertebrates are good indicators of site specific conditions because of their inability to migrate from an area,
- these communities are sensitive to conditions existent at the moment so changes in the community will be immediate,
- this method is relatively easy to do, it is inexpensive, it produces an abundance of useful information, and is easily reproduced.

The stream assessment methods used in this study are based on methods described in "Quality Assurance Work Plan for Biological Stream Monitoring in New York State" by R.W. Bode, M.A. Novak, and L.E. Abele published in 1996 by the NYS DEC. This stream assessment approach is an easily reproduced method for assessing stream water quality. This approach requires various types of data collection including physical, chemical, and biological information from the stream. The Hamilton County Soil & Water Conservation District will use the results of this study as a means of prioritizing future site specific studies. Additionally results can be used as base line data to be compared to future studies by the District and other agencies.

PURPOSE

The major goal of this project was to quickly and economically collect base line water quality data throughout the county. Since 1993, the Hamilton County Soil & Water Conservation District has been monitoring 21 lakes in the county. Priority was given to streams that lead into these lakes and streams that are easily accessible.

The purpose of this report is to present the data that was collected throughout the study period. This information will be presented in detail so that future water monitoring technicians can go back to the same sites, collect in the same manor, and compare results.

METHODOLOGY

Equipment

The method of biological assessment designed for this study involves the following equipment: a standard 24cm x 46cm opening standard kick net, tennis ball, stop watch, Yellow Springs Instrument (YSI) 610-DM multi-probe, 500ml sample jars, 99% isopropyl alcohol, examining pan, forceps, data and lab sheets, measuring tape, hip waders, camera, identification keys, and microscope.

Field Procedure

Before entering the field, potential site locations were chosen. Stream depth and stream flow were measured in the field to determine if the site meet the study criteria. The sites chosen for sampling were limited to streams that were less than one meter in depth with a flow of at least 0.4 meters per second. A five meter transect of stream was marked off. A tennis ball was

floated down the marked off section. A stopwatch was used to record the time it took the tennis ball to float through the marked section. This procedure was done twice and the average was calculated. The stream depth was measured at three points in a cross section of the stream.

When sites meeting the study criteria were found a YSI multi-probe was used to measure water temperature, conductivity, dissolved oxygen, and pH. A visual assessment was made to determine the percent substrate particle size for the sample site. Substrate categories were selected from Environmental Protection Agency (EPA) size categories listed below.

TYPE	**SIZE OR CHARACTERISTIC**
Boulders	> 256mm (10 in.)
Rubble	64 – 256 mm
Gravel	2 – 64 mm
Sand	0.06 – 2.0 mm
Silt	0.004 – 0.06 mm
Clay	< 0.004 mm

The percent of vegetation covering the banks along the sample area was also determined by a visual assessment. Detailed maps of the sample sites and site locations were drawn. An upstream and downstream photo was taken at each site.

Next the kick sample was collected. Starting at the upstream end of the measured section the kick net was placed into the stream. An individual standing upstream of the net disturbed the bottom by foot so that the dislodged organisms were carried into the net. Care was taken to overturn moveable rocks and thoroughly rub bottoms to dislodge any attached organisms. The stream bottom was disturbed for a distance of five meters for five minutes. The contents of the net were then transferred into an examining pan and put into labeled sample jars containing 99% ethyl alcohol. Samples were then returned to the laboratory for identification.

Lab Procedure

First, one hundred organism sub-samples were randomly chosen from each sample. All organisms were then identified. The organisms were returned to preservation jars and stored at the Hamilton County Soil & Water Conservation District office for future reference. The results were then plugged into three equations to indicate stream water quality; Percent Model Affinity (PMA), Ephemeroptera Plecoptera Trichopter Value (EPT Value), and Hilsenhoff Biotic Index (HBI).

First the PMA was calculated. Samples containing less than 100 organisms were extrapolated to fit into this model. For example: if a sample contains 36 organisms then 100 is divided by 36 which equals 2.8 therefore each organism is then multiplied by 2.8 before being figured into the model.

To complete this model first the extrapolated number of individuals in each group was filled in. Then the absolute difference between the model community and the sample was calculated. The absolute differences were summed. The sum was then multiplied by 0.5. This number was then subtracted from 100. The final number is the PMA value.

PERCENT MODEL AFFINITY			
GROUPS	NUMBER OF INDIVIDUALS IN SAMPLE	NUMBER OF INDIVIDUALS IN MODEL COMMUNITY	ABSOLUTE DIFFERENCE
Mayflies		40	
Stoneflies		5	
Caddisflies		10	
Midges		20	
Beetles		10	
Worms		5	
All Others		10	
TOTALS	100	100	

PMA = 100 – TOTAL / 0.5 = _____

EPT value is equal to the total number of species of mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera). Generally these species are considered indicators of good water quality.

EPT GROUPS	NUMBER OF SPECIES (KINDS) IN SAMPLE
Mayflies	
Stoneflies	
Caddisflies	
TOTAL NUMBER OF EPT	

Biotic index value is calculated by multiplying the number of individuals in each group by an assigned tolerance value. The sum of these values divided by 10 equals the biotic index value.

BIOTIC INDEX			
ORGANISM	COUNT (A)	BIOTIC VALUE(B)	GROUP BIOTIC VALUE(A x B)
Mayfly		10	
Stonefly		10	
Caddisfly		10	
Dobsonfly		10	
Riffle Beetle		10	
Water penny beetle larva		10	
Beetle larva (other)		8	
Crane fly larva		8	
Scud		6	
Clam		6	
Crayfish		6	
Dragonfly		6	
Damselfly		6	
Black fly		6	
Midge		5	
Snail		4	
Sowbug		2	
Leech		2	
Aquatic worm		0	
TOTAL	100	XXXXX	TOTAL
			INDEX(Total/10)=_____=Biotic Value

RESULTS

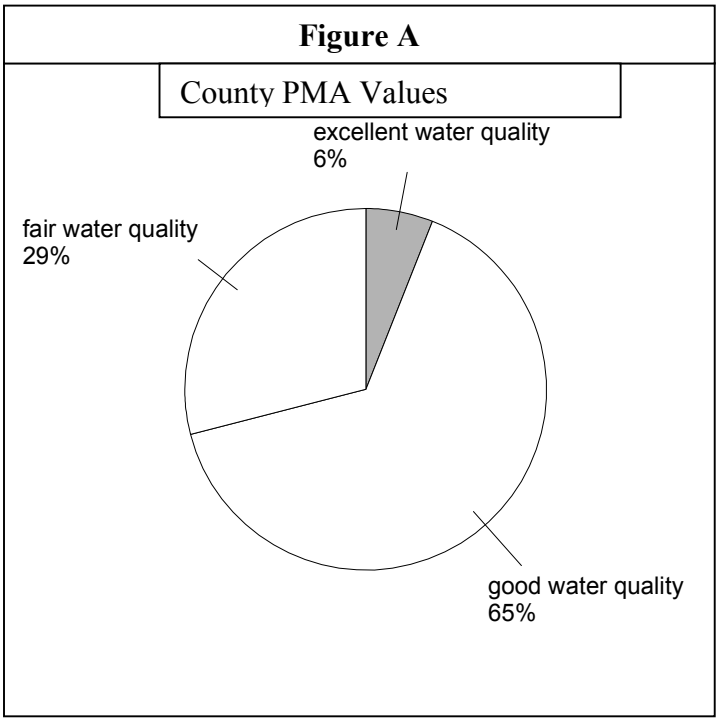
Refer to figure 1 in the appendix for a county map with site locations. Figure 2 lists all sites with detailed locations and sample dates. Figures 3, 4, and 5 show the physical and chemical parameters collected at each site. Figure 6 shows the results of the laboratory tally. Figure 7 shows the tally of the number of kinds of mayflies, stoneflies, and caddisflies in each sample. These numbers are used to calculate the EPT Value. Figure 8 shows the PMA value, EPT value, and Biotic Index for each macroinvertebrate sample.

The PMA model compares an actual stream community with an ideal stream community in New York State. Hamilton County's PMA values indicate (Figure A):

- 6% of streams have excellent water quality
- 65% of streams have good water quality
- 29% of streams have fair water quality

The county average PMA value is 55 showing good water quality.

Figure A

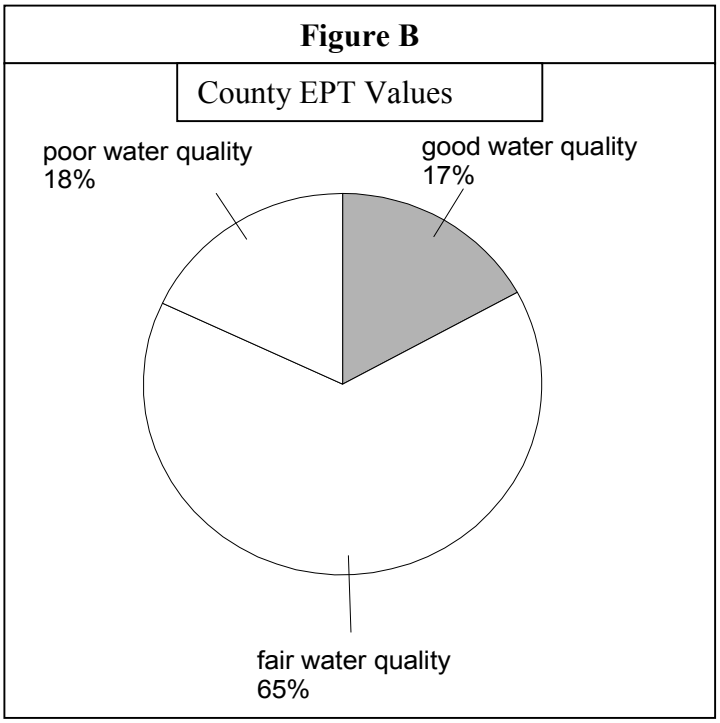


The EPT value indicates the number of families of mayflies, stoneflies, and caddisflies in each sample. Hamilton County's EPT values indicate (Figure B):

- 17% of streams have good water quality
- 65% of streams have fair water quality
- 18% of streams have poor water quality

The county average EPT value of 4 indicates fair water quality

Figure B

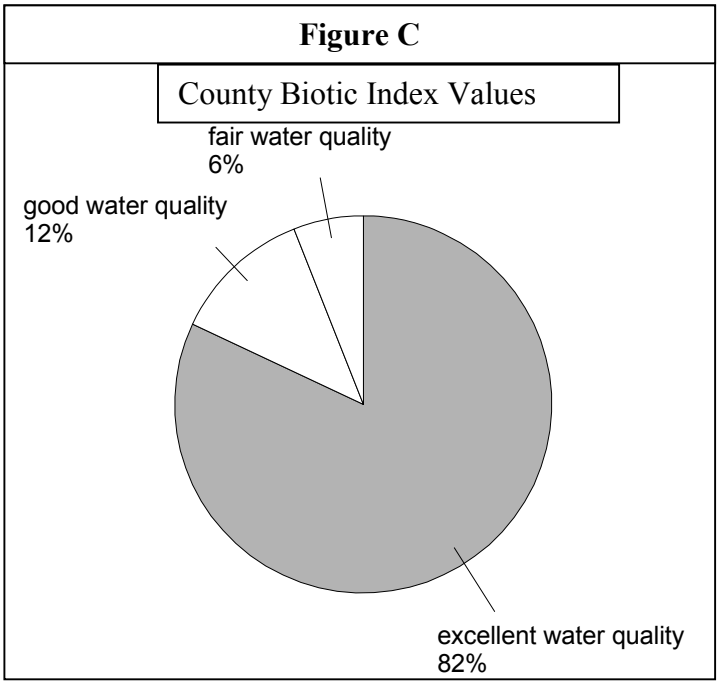


The Biotic Index value is calculated according to the tolerance each macroinvertebrate in the sample. Hamilton County's Biotic Index values indicate (Figure C):

- 82% of streams have excellent water quality
- 12% of streams have good water quality
- 6% of streams have fair water quality

The county average Biotic Index value of 89 indicates excellent water quality.

Figure C



DISCUSSION

Results

The 1999 sampling season was conducted as a small preliminary study consisting of only a small percentage of the county's streams. Sampling was conducted to collect baseline data to be compared with future years. The results of this study are not meant to represent the county as a whole, sites were not chosen to be representative of the county.

Model Values

Referring to Figure 8 some of the values are lower than may be expected for Adirondack streams. This may be a result of a dry year in the region. These values indicate a need for future study. The 2000 sampling season results may indicate that low values in the 1999 season were due to low water levels.

Future Study

These individual site values along with the county average will be compared with the 2000 stream assessment results giving a clearer picture of stream water quality throughout the county. Also in the 2000 sampling season other streams may be added if stream flow allows. Others that may be interested in returning to these sites for future studies should contact the District to receive copies of photos taken at each site and to receive detailed location maps.

REFERENCES

Bode, R.W., M.A. Novak, and L.E. Abele. 1991. Methods for Rapid Biological Assessment of streams. NYS DEC Stream Biomonitoring Unit. Albany, NY.

Bode, R.W., M.A. Novak, and L.E. Abele. 1993. 20 Year Trends in Water Quality of Rivers and Streams in New York State based on Macroinvertebrate Data 1972-1992. NYS DEC Stream Biomonitoring Unit. Albany, NY.

Bode, R.W., M.A. Novak and L.E. Abele. 1996. Quality Assurance Work Plan for Biological Stream Monitoring in New York State. NYS DEC Stream Biomonitoring Unit. Albany, NY.

Bode, R.W., M.A. Novak, and L.E. Abele. 1997. Biological Stream Testing: Methods for use in schools. NYS DEC Stream Biomonitoring Unit. Albany, NY.

Fiske, Steve and Byrne, J. 1988. Key to the freshwater macroinvertebrate fauna of New England. River Watch Network. Montpelier, Vermont.

Krawiecki, Val J. 1982. Soils report for selected areas in Hamilton County, New York. Pages 136. Soil Conservation Service. New York.

Lehmkuhl, Dennis M. 1979. How to know the aquatic insects. 168 pages. Wm. C. Brown Company Publishers. Dubuque, Iowa.

McCafferty, W. Patrick. 1998. Aquatic Entomology, the fishermen's and ecologists' illustrated guide to insects and their relatives. Pages 448. Jones and Bartlett Publishers. Sudbury, Massachusetts.

Novak, M. A., and R. W. Bode. 1992. Percent model affinity: a new measure of macroinvertebrate community composition. J. N. Am. Benthol. Soc., 11(1): 80-85.

Seargent, M., M. DeAngelo, and M. R. Martin. 1999. Franklin County Water Quality Assessment, March 1999. The Adirondack Aquatic Institute at Paul Smith's College. Paul Smiths, NY.

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