

2003 Water Quality Report The Housatonic River - West and Southwest Branches



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And for the hard labor of many, caring volunteers! (Please see page 11)

HOUSATONIC VALLEY ASSOCIATION

Berkshire Office
1383 Route 102, P.O. Box 251
South Lee, MA 01260
Phone: 413-394-9796
Fax: 413-394-9818
E-mail: csibner@hvatoday.org

Connecticut Office
150 Kent Road, P.O. Box 28
Cornwall Bridge, CT 06754
Phone: 860-672-6678
Fax: 860-672-0162
E-mail: ct@hvatoday.org

Website: www.hvatoday.org

I. OVERVIEW

The shoreline survey information collected by the West Branch Stream Team volunteers in 1998 provided preliminary information about this section of river and its watershed. These surveys described the general characteristics of the river and surrounding land use, identified potential areas of negative impacts, and provided a basic overview of the health of the watershed.

We used this information to develop our water quality monitoring program, which we have continued each year since 2002. The data results from month to month and year to year have varied, but they have pointed out areas where there may be some human-caused sources of pollution. Even two years' worth of sampling does not provide concrete data to fully pinpoint causes of water quality impairments, but it is helping us to narrow down the sources.

II. INTRODUCTION

HVA started monitoring six sites in Pittsfield on the West and Southwest Branches of the Housatonic River in June of 2002. In August, 2002, one more site was added (Atwood Ave.). All seven of those sites were monitored again in 2003, from April through October.

This report summarizes the data we collected on the sites that we monitored in 2003.

Samples were collected monthly for Fecal Coliform bacteria, E-Coli bacteria, Total Phosphorus, Nitrate-Nitrogen, and Total Suspended Solids. These samples were taken to Berkshire Enviro-Labs (BEL) for analysis. Dissolved oxygen was also measured monthly, but those samples were analyzed at HVA's lab. Water and air temperatures were measured at all of the sites, by the volunteers. pH and alkalinity are sampled only in the spring and the fall since previous years' data showed the levels generally stay well within state standards.

This data is providing valuable information about the condition of the Housatonic River and the impacts we are having upon it. Since we sample on only one day per month, it is important that we sample over an extended period of time to be able to see if any trends are forming. One day's bad results, or one day's good results, do not provide enough information to draw any accurate conclusions about the health of the river at that location. Water quality can vary from hour to hour and day to day.

III. PROJECT DESCRIPTION

In September of 1998, volunteers carried out shoreline surveys of the West Branch of the Housatonic River, starting above Pontoosuc Lake, on Town Brook. Some of the questions and concerns that arose from the surveys revolved around the possible impacts on the river from land use activities in the watershed, especially in such a densely developed area like the city of Pittsfield (population > 40,000). Also in question is whether the water in the lakes and reservoirs has any impact on the river, due to decreased oxygen or elevated temperatures and/or nutrients in the impounded water.

In 2002, HVA volunteers and staff started sampling the water quality of the West and Southwest Branches in Pittsfield.

What We Tested:

In 2003 we tested the river for nine basic parameters that measure the health of a river: dissolved oxygen, temperature, pH, alkalinity, nutrients (total phosphorus and nitrate-nitrogen), total suspended sediments, E-coli and fecal coliform bacteria. The parameter information summarized below is primarily from the EPA's Volunteer Monitoring Manual.

1) Dissolved Oxygen: Waters that are consistently high in dissolved oxygen are considered to be healthier since they can support many different kinds of aquatic organisms, even those, like trout, that require high amounts of oxygen. Massachusetts' state standards require at least 6 mg/l of oxygen for cold water fisheries, and 5 mg/l for warm water fisheries. All sites in the West and Southwest Branches are classified as Class B Cold Water fisheries.

2) Water Temperature: Temperature affects the rates of many biological and chemical processes. Every organism has an optimum temperature at which its growth and reproduction occurs most efficiently. Colder water can also hold more oxygen. Massachusetts' state standards require the cold water fisheries in the East, West and Southwest Branches remain below 20 degrees Celsius (warm water fisheries must not exceed 28.3° C).

3) pH: Measures the concentration of hydrogen ions in a water sample. pH levels can be affected by the surrounding bedrock, by rain and snow deposition from burning fossil fuels, and/or by wastewater discharges. Massachusetts' state standards require the pH remain between 6.5 and 8.3.

4) Alkalinity, or Acid Neutralizing Capacity (ANC): The alkalinity of a river is a measurement of the water's ability to neutralize acids. This shows us how vulnerable the river is to acid rain. Alkalinity is strongly affected by the surrounding bedrock. There are no state standards for alkalinity, but if the levels are below 20 mg/l then that water is considered to be susceptible to acid rain.

5) Total Phosphorus and Nitrate-Nitrogen: These two plant nutrients are both found naturally in the environment, but high levels can also indicate inputs resulting from human activities. High levels of these nutrients can lead to excessive plant growth, which causes an imbalance in the ecosystem, and can impair human recreation in those waters. High levels of phosphorus and nitrogen can be caused by fertilizers. High levels of nitrogen can also indicate insufficient treatment of animal wastes from septic systems or wastewater treatment plants. There are no state standards for either of these two nutrients, but high levels of nutrients during times of low stream flow are especially indicative of potential pollution sources.

6) Fecal Coliform bacteria and E-Coli bacteria: Fecal coliform and E-Coli bacteria are two kinds of bacteria found in the waste from warm-blooded animals. Potential sources of bacteria are failing septic systems, wastewater treatment plants, runoff, or animal manure. Massachusetts' state standards require that for safe swimming, known as "primary contact", the fecal coliform bacteria levels must remain below 200 colonies per 100ml of sample water. For safe "secondary contact" (i.e. fishing or boating) the levels need to remain below 1000 colonies of fecal coliform per 100 ml sample. There are no state standards yet for E-coli levels.

7) Total Suspended Sediments (TSS):

“Total Suspended Solids” refers to the silt and clay particles, plankton, algae, fine organic debris and other particles suspended in the water that are larger than 2-microns in size. High amounts of sediments in the water affect water clarity, decreasing the amount of light that can pass through the water, thereby slowing photosynthesis by aquatic plants. Photosynthesis produces oxygen, so more suspended solids in the water results in less oxygen available for aquatic plants and animals. Suspended solids can also carry certain toxins that cling to those particles. Water will heat up more rapidly, and hold more heat, when it has higher amounts of solids. This can cause problems for those species, like trout, that require lower temperatures and higher amounts of oxygen. Sources of solids include sewage, road runoff and soil erosion. State standards do not require specific numerical levels.

Quality Assurance Procedures:

HVA wrote a Quality Assurance Project Plan (QAPP) to describe how we collect, transport, and analyze our samples. This is an important component of a monitoring program since it ensures that the results were obtained using standard, approved procedures. This river monitoring QAPP has been approved by the DEP and EPA.

In order to be sure that our results were reliable, at least 10% of the samples we take are quality control samples. Duplicate samples, and/or blank samples and/or split samples are taken every month to be sure our results were falling within an acceptable range of accuracy.

We also participate in the quality control program from the lab at the University of Massachusetts Amherst. Each month they send us samples that have fixed levels of dissolved oxygen. We then analyze those samples in our lab at HVA to see whether our results fall within an acceptable range, which, happily, they always have (if a piece of equipment does not produce acceptable results, it will not be used for analyzing samples that day). Results are in Appendix D.

IV. OUR 2003 SAMPLING SITES AND THEIR WATER QUALITY RESULTS

From April through October of 2003, the sites described below were monitored on the fourth Tuesday of each month. The findings of our studies are summarized for each site, and Appendix B has the complete data tables. CDs are available for those who want to see all the tables *and* graphs of the data from both 2002 and 2003. Please see Appendix A for a map showing the locations of these monitoring sites. See pages 4 and 13 for descriptions of the state standards.

Pontoosuc Lake Dam: Monitored in 2002 by HVA staff and in 2003 by Hilary Bashara, Laurie Galok, Josh Goddard and Carolyn Sibner.

Description: This site is the site farthest upstream on the West Branch of the Housatonic River. The West Branch officially starts in Pittsfield as it leaves Pontoosuc Lake, and this site is ~100 yards downstream of the dam. Water leaves the lake via one of two ways. Either the water level is high enough that the water flows over the dam, into the main channel of the river, or it is diverted into a bypass channel, or “sluiceway”, on the west end of the dam. This bypass channel

runs parallel to the main riverbed for approximately 100 yards before joining up with it. This 100 yard stretch of the main riverbed is often dry or very nearly dry since much more water leaves the lake via the bypass channel instead of flowing over the dam. This site was established in 2002 to help us assess the impact on the river from the water quality in the lake. Access to this site is from the parking lot on Hancock Road. The samples are taken just below the confluence of the bypass channel and the main stem.

Results:

Dissolved Oxygen, pH, Alkalinity, and Bacteria either met their state standards or did not otherwise indicate any distinct water quality concerns.

Total Phosphorus levels range from 0.018 mg/l (in dry August) to 0.036mg/l (in wet May).

Nitrate levels were much higher in April (0.328 mg/l, in dry weather) than any other month (<0.01mg/l in dry August), but most of the other sites also had unusually high nitrates this month.

Water Temperatures were at, or above, their cold water standard of 20°C in June, July and August.

Total Suspended Solids (TSS) were usually only 1-2 mg/l but got up to 6mg/l in August.

Conclusions: Water quality in general appears fairly good as it leaves Pontoosuc Lake. No high bacteria levels were seen in 2003, and the dissolved oxygen levels were good throughout the year. Some indicators, like nitrates, phosphorus and TSS, had months when the levels seemed higher than usual, but there are no state standards against which to compare our results, so it is hard to know how high is too high. Water temperatures did exceed the state standard for a cold water fishery (20°C) on three out of the seven days we tested. Low flows and high temperatures seem to be the most persistent problems that the lake's water presents to the river's inhabitants.

Onota Lake Dam: Monitored in 2002 & 2003 by Jane Winn.

Description: This site is located on Peck's Brook, just below the dam on Onota Lake, upstream from Valentine Road in Pittsfield. This site is accessed from Peck's Road, near a small drainage ditch that runs from the road to the brook. This site was established in 2002 to help us assess the impact on the river from the water quality in the lake.

Results:

Dissolved Oxygen reached a low of 6.84 mg/l in July (it can't dip below 6.0 mg/l and still meet its state standard as a cold water fishery).

pH, Alkalinity, and Bacteria either met their state standards or did not otherwise indicate any distinct water quality concerns.

Total Phosphorus levels range from <0.01 mg/l (in wet September) to 0.038mg/l (in wet May).

Nitrate-Nitrogen levels were higher in April (0.081 mg/l, in dry weather) and September (0.09mg/l in wet weather) than their usual 0.02mg/l, but most of the other sites in Pittsfield had nitrate levels that were often quite a bit higher than at this site.

Water Temperatures were too high for their cold water standard (20°C) in June, July, August and September.

Total Suspended Solids (TSS) were usually around 1-2 mg/l, but jumped up to 9mg/l in July and 8mg/l in September, both wet weather sampling days.

Conclusions: Water quality leaving Onota Lake is probably typical for water leaving an impoundment: often too warm, and a bit low in oxygen, in the summer months, but not presenting any other significant threats to the river's water quality. Bacteria levels never exceeded 200 colonies/100ml.

Peck's Confluence: Monitored in 2002 by Henry Rose & HVA staff, and in 2003 by Henry Rose and Raisa Kachevsky.

Description: This site is on Peck's Brook, upstream of the West Branch confluence. Access is via the cemetery on Wahconah St. This data will be compared to the results from upstream where the brook leaves Onota Lake, to see the changes in the brook's water quality between the dam and the confluence. It will also give us an idea of the impact the brook's water quality is having on the water quality in the main stem of the West Branch.

Results:

Dissolved Oxygen levels were well within the state standards on our sampling days in 2003.

pH and Alkalinity either met their state standards or did not otherwise indicate any distinct water quality concerns.

Bacteria levels, for both fecal coliform and E-coli, exceeded 1,000 colonies in wet July, at this site and three other sites. The rest of the year the levels remained below 200 colonies, except in September (wet weather) when fecal reached its standard of 200 colonies, but E-coli was 160 colonies. Bacteria levels at this site do not tend to be much higher than upstream at the Onota dam site.

Total Phosphorus levels range from 0.018 mg/l (in dry August) to a very high 0.142mg/l (in wet July). Levels at both sites on Peck's Brook, in dry weather, usually range around 0.02mg/l, but in wet weather the levels at Peck's Confluence are often double or more what they are upstream at the Onota dam site. For example, July's high at Peck's Confluence (0.142mg/l) showed a big increase from Onota's level of 0.032mg/l on the same morning.

Nitrate levels are always much higher at Peck's Confluence than they are at the Onota dam (Onota levels averaged at 0.037 mg/l whereas at Peck's the average was 0.153 mg/l). Nitrate levels here ranged from 0.08mg/l in wet October to 0.30mg/l in wet September. Most of the sites in Pittsfield had higher nitrate levels in April than any other month.

Water Temperatures were too high for their cold water standard (20°C) in June, July, and August.

Total Suspended Solids (TSS) levels here were usually around 2 mg/l, but jumped up to a very high 47mg/l in July (wet weather). By comparison, in July Barker Road had 63mg/l (it was the only site with higher TSS levels), Jimmy's was at 34mg/l, and at Onota it was "only" 9mg/l.

Conclusions: Bacteria levels at Peck's Confluence do not usually indicate a problem with water quality in this brook. However, nutrient and sediment levels, especially in comparison to the levels upstream at the Onota dam site, do fluctuate enough to indicate that a potential source of

pollutants may be located somewhere along this short brook. If funding allows, this brook should be investigated further in 2004.

Jimmy's & Rt. 20: Monitored in 2002 & 2003 by Michael Makes.

Description: This site is on Route 20 in Pittsfield, just upstream of the bridge next to "Jimmy's Restaurant". Access is via the northwestern bank. DEP has taken water samples here in the past, and HVA started sampling here in 2002. This site is located in the center of Pittsfield and provides a measure of the impact from the city on the river's water quality.

Results:

Dissolved Oxygen and pH levels met their state standards. Alkalinity was never below 20 mg/l.

Bacteria levels at this site exceeded 200 colonies of fecal coliform/ml on 6 of the 7 days we sampled in 2003. E-coli bacteria exceeded 235 colonies/ml on 5 of those 7 days.

Total Phosphorus levels here in 2003 were frequently one of the highest of all the sites in the West and Southwest Branches. The high here of 0.123mg/l, in July, was by far the highest of all seven of the sampling days in 2003 (the other six days averaged only 0.036mg/l).

Nitrate levels here were consistently among the higher ones in Pittsfield. April's high of 0.297 mg/l was significantly higher than the rest of the year, but all the sites had significantly higher results in April than any other sampling day in 2003.

Water Temperatures reached, but never exceeded, their cold water standard of 20°C, in June, July and August.

Total Suspended Solids (TSS) levels here were frequently one of the highest of all the sites, with a high of 34mg/l on July 22nd (wet weather).

Conclusion: The elevated bacteria, TP, nitrate, and TSS levels here indicate at least one source of pollution exists upstream from this site. HVA will continue to monitor this site in 2004, and add additional sites upstream from here in an effort to locate this source(s).

Atwood Ave: Monitored in 2002 & 2003 by Carolyn Sibner.

Description: This monitoring site is just downstream of Jimmy's and Rte. 20, at a location where a stream team volunteer discovered a white liquid in the river coming from a large storm drain. We chose to monitor this spot in case we could catch a sample if that effluent ever appeared again. When we started monitoring this site in 2002, we found extremely high bacteria levels (14,300 to 20,000 colonies) in the summer months. The Pittsfield Department of Public Works responded promptly and quickly located a cracked sewer line that was leaking into a cracked storm drain that leads to this site.

Results:

Dissolved Oxygen and pH levels met their state standards. Alkalinity was never below 20 mg/l.

Bacteria levels at this site exceeded 200 colonies of fecal coliform/100ml on 6 of the 7 days we sampled in 2003. Levels ranged from a low of 50 colonies on dry April 29th, to a high

of 3,960 colonies on wet September 23rd. E-coli bacteria exceeded 235 colonies/100ml on 5 of those 7 days.

Total Phosphorus levels were highest in July at all the sites we monitored. At this site, the high in July was 0.12 mg/l, which is significantly higher than the usual average of 0.026 mg/l. Phosphorous values here were frequently one of the highest in the West Branch.

Nitrate levels here were among the higher levels in Pittsfield. The results here echoed the results seen just upstream at Jimmy's.

Water Temperatures reached, but never exceeded, their cold water standard of 20°C, in June, July and August.

Total Suspended Solids (TSS) levels here, like at Jimmy's, were frequently one of the highest of all the sites, with a high of 30mg/l on July 22nd.

Conclusion: The levels of bacteria, TP, nitrates and TSS are often elevated at this site in the middle of Pittsfield, indicating at least one source of pollution exists upstream from here. The results at Atwood Ave. are very similar to those at Jimmy's, which is just a short distance upstream from here. Although the bacteria levels were frequently too high at this site (they were almost always above 200 colonies, and twice they were above 1,000 colonies), they were never nearly as high as they were the previous summer (which had high spikes from 14,300 colonies to > 20,000 colonies) when the storm drain was carrying raw sewage into the river here.

Richmond Pond Dam: Monitored in 2002 & 2003 by Ted Potter and Mark Watkins.

Description: This site was established in 2002 to help us assess the impact from the water quality in Richmond Pond on the water quality in the Southwest Branch of the Housatonic River. The Southwest Branch originates from Richmond Pond and our sampling site is located just downstream from the dam. Access is via the private property of the Lakeside Camp on Cloverdale Street in Pittsfield (HVA's monitoring volunteer, Mark Watkins, is the director of the camp).

Results:

Dissolved Oxygen reached a low of 6.84 mg/l in August (it needs to remain above 6.0 mg/l to meet its state standard for a cold water fishery).

pH levels met their state standards.

Alkalinity was higher coming out of Richmond Pond than at any of the sites on the West Branch (115 mg/l in April, and 116 in October). Barker Road, also on the Southwest Branch, was the only other site to have a higher level (137 in April!). This may be due to the bedrock in the area.

Bacteria levels were always very low at this site.

Total Phosphorus levels range from <0.01 mg/l (in wet July) to 0.028mg/l (in wet May).

Nitrate levels were usually very low, but it was higher in April (0.189 mg/l, in dry weather), as it was at most of the other sites in Pittsfield.

Water Temperatures were too high for their cold water standard of 20°C in June, July, and August.

Total Suspended Solids (TSS) were usually very low.

Conclusions: Water quality leaving Richmond Pond is generally quite good, other than being too warm in the summer months. Though we do not officially measure the flow levels here, it has been observed to be very low at times. These low flows and high temperatures seem to be the most persistent problems that the pond's water presents to the river's inhabitants.

Barker Road: Monitored in 2002 & 2003 by Holly Stover and David Pelletier.

Description: This site is also on the Southwest Branch of the Housatonic River. Testing has been done here in the past, by DEP, and the results we see here show us the changes in the river's water quality after it leaves Richmond Pond. It also gives us an idea of the impact the water quality in the Southwest Branch is having on the water quality in the West Branch.

Results:

Dissolved Oxygen and pH levels always met their state standards.

Alkalinity appears to be higher throughout the Southwest Branch than in the West Branch. This may be due to the bedrock in the area, especially considering how high the levels are even at the point where the water first leaves Richmond Pond to form the Southwest Branch.

Bacteria levels at this site exceeded 200 colonies of fecal coliform/100ml on 6 of the 7 days we sampled in 2003. E-coli bacteria exceeded 235 colonies/100ml on 5 of those 7 days.

Total Phosphorus levels here in 2003 were frequently one of the highest of all the sites in the West and Southwest Branches. The high here of 0.147mg/l, in July, was the highest of all the sites, out of all seven sampling days.

Nitrate levels were often higher here than at most of the other sites in Pittsfield, and the increase from the site just below Richmond dam to this site is significant.

Water Temperatures never exceeded their cold water standard of 20°C, even in the summer months.

Total Suspended Solids (TSS) levels were also frequently one of the highest of all the sites, with a peak of 63mg/l on July 22nd (wet weather). At our Richmond Pond site that day the TSS was less than 1mg/l.

Conclusions: The high bacteria levels, high TP and nitrate levels, and higher TSS levels all indicate a likely pollution source(s) exists upstream from Barker Road. HVA will continue to monitor this site in 2004, and add another site upstream from it in an effort to locate this source(s). There is a farm with horses and donkeys below Richmond Pond that may be contributing manure to the river. There was also an animal shelter located shortly upstream from the Barker Road site, but it moved to a new location in early July, 2003, so we will see if the water quality results are any different in 2004.

V. CONCLUSIONS AND RECOMMENDATIONS

Even two years of testing does not tell you everything about a river's water quality and the impact human activities are having on it. There are some patterns that are showing up, however, that warrant further investigation. HVA will continue to monitor the sites that appear to have problems, such as Jimmy's, and Barker Road, in order to confirm the trends, and narrow down the possible sources. Additional sites and sampling will be added as needed.

Due to funding and time constraints, in 2004 we will decrease the monitoring of pH, alkalinity, and phosphorus since these parameters usually did not appear to indicate any significant problems for the health of the river, nor its ability to meet its state classification as a Class B Cold Water Fishery. Starting in 2004, we will monitor pH and alkalinity in April and October only, but we believe this will still allow us to watch for trends in these indicators. Phosphorus levels in 2002 or 2003 were not as elevated as the nitrate-nitrogen levels, for example, and did not seem to indicate any significant problems that were not already flagged by other indicators. Because of this, we will eliminate phosphorus sampling until we either receive additional funding to cover it, or we believe it can tell us something the other parameters are not.

VI. ACKNOWLEDGEMENTS

We would like to thank all our major funders from these first two years of monitoring for their support, especially the Massachusetts Executive Office of Environmental Affairs (DEP), the Massachusetts Environmental Trust, the Berkshire Environmental Fund, the Wharton Trust, the Berkshire Environmental Endowment Fund and the Berkshire Taconic Community Foundation.

We also want to thank the people and organizations who have given us their help, support and wisdom over the years. These people include: Peter Kerr, Jerry Schoen and Marie-Francoise Walk at the UMassAmherst, as well as Arthur Screpetis and Peter Mitchell at DEP, John Lambert at Berkshire Community College, Holly Adams at Crane & Co., and Bill Enser at Berkshire Enviro-Labs. Thank you all for sharing your experience and expertise with us!

And last but not least, many thanks to all our volunteers! You have suffered through picayune training sessions, rainy days, cold water and cold weather, to bring us good quality data about our river. We couldn't do this without you, and we will be forever grateful!

Hilary Bashara
Laurie Galok
Raisa Kachevsky
Michael Makes
David Pelletier

Ted Potter
Henry Rose
Holly Stover
Mark Watkins
Jane Winn

Respectfully Submitted,

Carolyn W. Sibner
Water Quality Coordinator

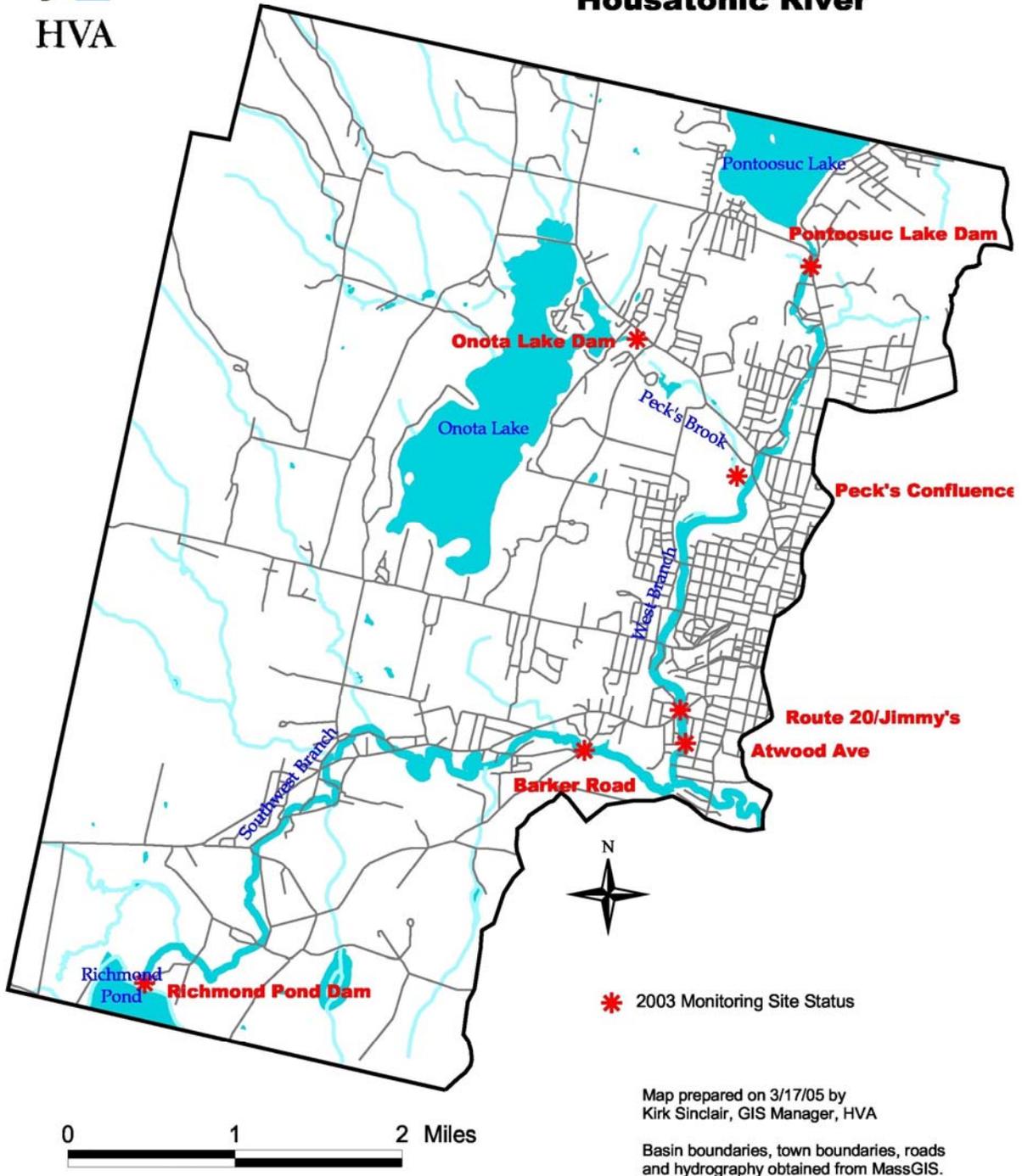
Many thanks again to all our generous donors for funding this project!



Appendix A:



Water Quality Monitoring Sites West and Southwest Branches Housatonic River



Appendix B:

2003 Water Quality Monitoring Results in Tables

West Branch of the Housatonic River

Site Tables from 2003..... Pages 14 - 17

Parameter Tables from 2003..... Pages 18 - 22

Weather Notes from the Sampling Days..... Page 23

Massachusetts' State Water Quality Standards

All sites in the West and Southwest Branches are classified as Class B Cold Water fisheries. This means the water quality must meet the following standards set by the state DEP.

Dissolved Oxygen: Massachusetts' state standards require at least 6 mg/l of dissolved oxygen for cold water fisheries.

pH: Massachusetts' state standards require the pH remain between 6.5 and 8.3.

Alkalinity, or "Acid Neutralizing Capacity": There are no state standards for alkalinity, but if the levels are below 20 mg/l then that water is vulnerable to acid rain.

Bacteria (Fecal Coliform, and E-Coli): Massachusetts' state standards require that for safe swimming, known as "primary contact", the fecal coliform bacteria levels must remain below 200 colonies per 100ml of sample water. For safe "secondary contact" (i.e. fishing or boating) the levels need to remain below 1000 colonies of fecal coliform per 100 ml sample. There are no state standards yet for E-coli bacteria levels in our rivers.

Total Phosphorous and Nitrate-Nitrogen: There are no state standards for either of these two nutrients, but high levels of nutrients may indicate the presence of a potential pollution source.

Water Temperature: Massachusetts' state standards require the cold water fisheries in the East, West and Southwest Branches remain below 20 degrees Celsius.

Total Suspended Solids: State standards do not specify numerical levels.

2003 West Branch - Results From Each Site:

West Branch 2003 - Pontoosuc Dam Monitoring Results

Parameter	April '03	May '03	June '03	July '03	Aug. '03	Sept. '03	Oct. '03
Dissolved Oxygen in mg/l	10.22	9.38	8.34	7.62	8.28	7.92	10.14
pH	8.02						7.83
Alkalinity in mg/l	89						99
Fecal Coliform in colonies/100 ml	9	9	90	150	9	140	9
E-coli in colonies/100 ml	9	9	40	60	9	110	9
Total Phosphorus in mg/l	0.021	0.036	0.019	0.019	0.018	0.019	0.032
Nitrate Nitrogen in mg/l	0.328	0.010	0.010	0.010	0.009	0.040	0.050
Water Temp in degrees Celsius	9.5	13	20.0	22.0	23.0	19.0	9.0
Total Suspended Solids in mg/l	1	2	2	1	6	1	4

West Branch 2003 - Onota Dam Monitoring Results

Parameter	April '03	May '03	June '03	July '03	Aug. '03	Sept. '03	Oct. '03
Dissolved Oxygen in mg/l	10.06	9.06	7.72	6.84	7.54	7.46	9.76
pH	8.11						7.89
Alkalinity in mg/l	71						73
Fecal Coliform in colonies/100 ml**	9	130	9	20	10	190	30
E-coli in colonies/100 ml**	9	110	9	9	9	140	30
Total Phosphorus in mg/l*	0.026	0.038	0.022	0.032	0.018	<0.010	0.011
Nitrate Nitrogen in mg/l*	0.081	0.020	0.020	0.020	0.020	0.090	0.010
Water Temp in degrees Celsius	12.0	14	21.0	24.0	22.0	20.5	10.0
Total Suspended Solids in mg/l***	0.9	2	1	9	5	8	1

* Values of "0.009" are used to graph those results below the detection limit of 0.01 mg/l.

** Bacteria values of "9" represent those results below the detection limit of 10 colonies.

*** TSS values below the detection limit 1 mg/l are graphed as "0.9" mg/l.

West Branch 2003 - Peck's Confluence Monitoring Results

Parameter	April '03	May '03	June '03	July '03	Aug. '03	Sept. '03	Oct. '03
Dissolved Oxygen in mg/l	9.48	9.32	8.04	7.44	7.76	7.74	9.96
pH	8.02						7.75
Alkalinity in mg/l	85						85
Fecal Coliform in colonies/100 ml	30	100	70	1,001	30	200	40
E-coli in colonies/100 ml	20	100	40	1,001	20	160	30
Total Phosphorus in mg/l	0.027	0.025	0.022	0.142	0.018	0.035	0.021
Nitrate Nitrogen in mg/l	0.181	0.100	0.090	0.200	0.120	0.300	0.080
Water Temp in degrees Celsius	8.0	13.5	20.5	21.0	20.5	18.0	10.0
Total Suspended Solids in mg/l	2	2	2	47	4	2	1

West Branch 2003 - Jimmy's & Rt. 20 Monitoring Results

Parameter	April '03	May '03	June '03	July '03	Aug. '03	Sept. '03	Oct. '03
Dissolved Oxygen in mg/l	9.88	9.34	7.70	7.48	7.40	7.88	10.04
pH	8.01						7.80
Alkalinity in mg/l	93						104
Fecal Coliform in colonies/100 ml**	50	320	350	1,001	310	2,450	300
E-coli in colonies/100 ml**	50	290	300	1,001	280	1,670	210
Total Phosphorus in mg/l*	0.019	0.050	0.030	0.123	0.026	0.051	0.042
Nitrate Nitrogen in mg/l*	0.297	0.080	0.070	0.200	0.100	0.150	0.090
Water Temp in degrees Celsius	11.0	13	20.0	20.0	20.0	17.0	9.0
Total Suspended Solids in mg/l***	2	5	3	34	8	21	5

* Values of "0.009" are used to graph those results below the detection limit of 0.01 mg/l.

** Bacteria values of "9" represent those results below the detection limit of 10 colonies.

*** TSS values below the detection limit 1 mg/l are graphed as "0.9" mg/l.

West Branch 2003 - Atwood Ave. Monitoring Results

Parameter	April '03	May '03	June '03	July '03	Aug. '03	Sept. '03	Oct. '03
Dissolved Oxygen in mg/l	10.08	9.34	7.86	7.30	7.52	7.74	10.08
pH	8.04						7.80
Alkalinity in mg/l	97						104
Fecal Coliform in colonies/100 ml**	50	290	840	1,001	200	3,960	290
E-coli in colonies/100 ml**	40	280	610	1,001	160	3,250	250
Total Phosphorus in mg/l*	0.027	0.022	0.038	0.120	0.024	<0.010	0.032
Nitrate Nitrogen in mg/l*	0.304	0.090	0.070	0.210	0.120	0.160	0.090
Water Temp in degrees Celsius	10.5	12	20.0	20.0	20.0	17.0	9.0
Total Suspended Solids in mg/l***	1	4	5	30	7	21	3

West Branch 2003 - Richmond Dam Monitoring Results

Parameter	April '03	May '03	June '03	July '03	Aug. '03	Sept. '03	Oct. '03
Dissolved Oxygen in mg/l	10.04	9.16	8.46	7.46	6.84	8.14	9.56
pH	8.15						7.91
Alkalinity in mg/l	115						116
Fecal Coliform in colonies/100 ml**	9	9	10	10	10	30	9
E-coli in colonies/100 ml**	9	9	9	9	10	20	9
Total Phosphorus in mg/l*	0.024	0.028	0.016	0.009	0.010	0.011	0.024
Nitrate Nitrogen in mg/l*	0.189	0.010	0.009	0.009	0.010	0.010	0.020
Water Temp in degrees Celsius	11.5	14.5	21.0	22.5	22.0	18.5	9.0
Total Suspended Solids in mg/l***	0.9	0.9	2	<1	4	2	3

* Values of "0.009" are used to graph those results below the detection limit of 0.01 mg/l.
 ** Bacteria values of "9" represent those results below the detection limit of 10 colonies.
 *** TSS values below the detection limit 1 mg/l are graphed as "0.9" mg/l.

West Branch 2003 - Barker Road Monitoring Results

Parameter	April '03	May '03	June '03	July '03	Aug. '03	Sept. '03	Oct. '03
Dissolved Oxygen in mg/l	9.48	9.44	8.26	7.50	7.62	8.08	9.66
pH	8.13						7.75
Alkalinity in mg/l	137						96
Fecal Coliform in colonies/100 ml**	50	340	400	1,001	350	600	290
E-coli in colonies/100 ml**	40	310	360	780	290	520	210
Total Phosphorus in mg/l*	0.016	0.050	0.030	0.147	0.021	0.075	0.042
Nitrate Nitrogen in mg/l*	0.256	0.120	0.110	0.240	0.260	0.220	0.060
Water Temp in degrees Celsius	10.5	12.5	18.0	19.5	18.0	16.0	10.0
Total Suspended Solids in mg/l***	1	10	8	63	3	8	9

* Values of "0.009" are used to graph those results below the detection limit of 0.01 mg/l.

** Bacteria values of "9" represent those results below the detection limit of 10 colonies.

*** TSS values below the detection limit 1 mg/l are graphed as "0.9" mg/l.

2003 West Branch Results - Shown by Parameter:

2003 West Branch - Dissolved Oxygen Results in mg/l

SITE	April '03	May '03	June '03	July '03	Aug. '03	Sept. '03	Oct. '03
Pontoosuc Lake Dam	10.22	9.38	8.34	7.62	8.28	7.92	10.14
Onota Lake Dam	10.06	9.06	7.72	6.84	7.54	7.46	9.76
Pecks Confluence	9.48	9.32	8.04	7.44	7.76	7.74	9.96
Jimmy's & Rt. 20	9.88	9.34	7.70	7.48	7.40	7.88	10.04
Atwood Ave.	10.08	9.34	7.86	7.30	7.52	7.74	10.08
Richmond Pond Dam	10.04	9.16	8.46	7.46	6.84	8.14	9.56
Barker Rd	9.48	9.44	8.26	7.50	7.62	8.08	9.66

2003 West Branch - pH Results

SITE	April '03	May '03	June '03	July '03	Aug. '03	Sept. '03	Oct. '03
Pontoosuc Lake Dam	8.02						7.83
Onota Lake Dam	8.11						7.89
Pecks Confluence	8.02						7.75
Jimmy's & Rt. 20	8.01						7.80
Atwood Ave.	8.04						7.80
Richmond Pond Dam	8.15						7.91
Barker Rd	8.13						7.75

2003 West Branch - Alkalinity Results in mg/l

SITE	April '03	May '03	June '03	July '03	Aug. '03	Sept. '03	Oct. '03
Pontoosuc Lake Dam	89						99
Onota Lake Dam	71						73
Pecks Confluence	85						85
Jimmy's & Rt. 20	93						104
Atwood Ave.	97						104
Richmond Pond Dam	115						116
Barker Rd	137						96

2003 West Branch - Fecal Coliform Bacteria Results in colonies per 100 ml

SITE	April '03	May '03	June '03	July '03	Aug. '03	Sept. '03	Oct. '03
Pontoosuc Lake Dam	9	9	90	150	9	140	9
Onota Lake Dam	9	130	9	20	10	190	30
Pecks Confluence	30	100	70	1,001	30	200	40
Jimmy's & Rt. 20	50	320	350	1,001	310	2,450	300
Atwood Ave.	50	290	840	1,001	200	3,960	290
Richmond Pond Dam	9	9	10	10	10	30	9
Barker Rd	50	340	400	1,001	350	600	290

2003 West Branch - E-Coli Bacteria Results in colonies per 100 ml

SITE	April '03	May '03	June '03	July '03	Aug. '03	Sept. '03	Oct. '03
Pontoosuc Lake Dam	9	9	40	60	9	110	9
Onota Lake Dam	9	110	9	9	9	140	30
Pecks Confluence	20	100	40	1,001	20	160	30
Jimmy's & Rt. 20	50	290	300	1,001	280	1,670	210
Atwood Ave.	40	280	610	1,001	160	3,250	250
Richmond Pond Dam	9	9	9	9	10	20	9
Barker Rd	40	310	360	780	290	520	210

2003 West Branch - Total Phosphorous Results in mg/l

SITE	April '03	May '03	June '03	July '03	Aug. '03	Sept. '03	Oct. '03
Pontoosuc Lake Dam	0.021	0.036	0.019	0.019	0.018	0.019	0.032
Onota Lake Dam	0.026	0.038	0.022	0.032	0.018	<0.010	0.011
Pecks Confluence	0.027	0.025	0.022	0.142	0.018	0.035	0.021
Jimmy's & Rt. 20	0.019	0.050	0.030	0.123	0.026	0.051	0.042
Atwood Ave.	0.027	0.022	0.038	0.120	0.024	<0.010	0.032
Richmond Pond Dam	0.024	0.028	0.016	0.009	0.010	0.011	0.024
Barker Rd	0.016	0.050	0.030	0.147	0.021	0.075	0.042

2003 West Branch - Nitrate-Nitrogen Results in mg/l

SITE	April '03	May '03	June '03	July '03	Aug. '03	Sept. '03	Oct. '03
Pontoosuc Lake Dam	0.328	0.010	0.010	0.010	0.009	0.040	0.050
Onota Lake Dam	0.081	0.020	0.020	0.020	0.020	0.090	0.010
Pecks Confluence	0.181	0.100	0.090	0.200	0.120	0.300	0.080
Jimmy's & Rt. 20	0.297	0.080	0.070	0.200	0.100	0.150	0.090
Atwood Ave.	0.304	0.090	0.070	0.210	0.120	0.160	0.090
Richmond Pond Dam	0.189	0.010	0.009	0.009	0.010	0.010	0.020
Barker Rd	0.256	0.120	0.110	0.240	0.260	0.220	0.060

2003 West Branch - Temperature Results in degrees Celsius

SITE	April '03	May '03	June '03	July '03	Aug. '03	Sept. '03	Oct. '03
Pontoosuc Lake Dam	9.5	13	20.0	22.0	23.0	19.0	9.0
Onota Lake Dam	12.0	14	21.0	24.0	22.0	20.5	10.0
Pecks Confluence	8.0	13.5	20.5	21.0	20.5	18.0	10.0
Jimmy's & Rt. 20	11.0	13	20.0	20.0	20.0	17.0	9.0
Atwood Ave.	10.5	12	20.0	20.0	20.0	17.0	9.0
Richmond Pond Dam	11.5	14.5	21.0	22.5	22.0	18.5	9.0
Barker Rd	10.5	12.5	18.0	19.5	18.0	16.0	10.0

2003 West Branch - Total Suspended Solids in mg/l

SITE	April '03	May '03	June '03	July '03	Aug. '03	Sept. '03	Oct. '03
Pontoosuc Lake Dam	1	2	2	1	6	1	4
Onota Lake Dam	0.9	2	1	9	5	8	1
Pecks Confluence	2	2	2	47	4	2	1
Jimmy's & Rt. 20	2	5	3	34	8	21	5
Atwood Ave.	1	4	5	30	7	21	3
Richmond Pond Dam	0.9	0.9	2	0.9	4	2	3
Barker Rd	1	10	8	63	3	8	9

Weather and Notes Regarding the 2003 West Branch Sampling Days:

April 29, 2003: A little rain (about 0.2 ") on the 22nd, and 0.1 inches on Saturday, the 26th, but it has been mostly sunny and warm.

There was no flow over the dam at Pontoosuc but there was some water in the main channel (from the storm drains??). There was some flow coming from the storm drain under Rte. 7, just upstream from the sampling site, but whether it mixes with the flow in the middle where the samples are taken is doubtful. The flow was so fast it was hard to fill the bottles without creating turbulence. A few tiny bubbles were visible in the bottle.

Onota Lake's: water level at the dam was 6" (0.5) on the plaque. Water flowing strongly over the dam. Water much higher than most of last year. The "little tributary" coming in below the sampling location was flowing strongly. Lots of street sand along its edges and building up in pools in the tributary, and at the mouth. Water is coming into the tributary from both the little white 8" pipe and the large 24" pipe. The little one has lots of algae along it and watercress, too. The big one is cleaner but has a pool of street sand below it. Trash.

Peck's Confluence: Water flowing clear with no odor.

Atwood Ave: The flow was shallow but all the way from bank to bank. Deep, grey, sandy sediments in the corner/cove by the big storm drain. Water was trickling out of the storm drain. There was a brownish growth on most of the rest of the pebbly bottom.

May 27, 2003: Mostly cloudy when sampling this morning. Rain (about 0.9 inches) yesterday (the 26th). Has been cool with some drizzle off and on this week.

There was a brown foam on the water at Pontoosuc, between the rocks. Most of the flow was coming over the dam, not down the bypass. A fair amount of algae was on the bottom of the bypass. Some water coming out of the storm drains. The D.O. flocculent settled quickly.

Onota Dam: Lake level +6". Area above dam full of weeds. Lots of water over dam and in tributary. Lots of purple loosestrife growing in & along stream.

Pecks Brook Confluence: Fast flowing, clear water. Tire tracks present at site.

Jimmy's above Route 20: Water tea color but clear.

Atwood: Musky odor by storm drain. Deep, fine, light-colored sediment in corner cove. Water in corner is clear and area looks healthy again. Water in main channel clear and deep from bank to bank.

Richmond Dam: Water clear.

Barker Road: Mean water level. Water is moving fast.

June 24, 2003: Rained on 2-3 days ago (~0.9 inches), but was dry yesterday and is clear this morning.

Pontoosuc: Fishy smell in air, saw dead fish on sides and cut milfoil.

Onota Dam: Green algae strands.

Jimmy's Rt 20 at bridge: Water tea colored but clear.

Atwood: Water clear with suspended sediment.

Barker Road: Water was tea colored but clear and appeared clear in the bottle.

July 22, 2003: All samples collected this morning were taken while it was raining, with heavy rain falling from around 6 to 7 a.m. About an inch total fell through the night and into this morning. Was hot, humid and dry for the 5 days leading up to today.

Pontoosuc: Water clear with some sediment and fast moving over dam and through bypass.

Onota Dam: Water level +1 inch at spill way, water over dam and through rocks. Loosestrife blooming, swallows and ground trash. Silt accumulated along side of stream.

Pecks Confluence: Heavy rain, water muddy. Trash on site.

Jimmy's & Rt. 20 at bridge: Water muddy with deep sediments on edges, rocky substrate in middle were water flows. Water knee deep in most places except edges. Water had a musky odor.

Atwood Ave: Water in "cove" by storm drain shallow but clear enough to see minnows. Clear, cold (17° C) water coming out of storm drain. Water in main channel muddy and fast and warm (20° C in shade). Area had musky odor.

Richmond Pond Dam: Water was clear.

Barker Road: It was raining while taking samples. Water was brown. Banks full with swift moving flow with air bubbles.

August 26, 2003: Clear and dry today, with warm, humid days and cool nights lately. Some rain last week.

Pontoosuc: Water flowing over dam & coming into stream from bypass a strong flow. Water is tea colored, but clear.

Onota Dam: Clear water with musky odor. 2 inches over dam, green algae and dead milfoil and dried silt on rocks below dam.

Pecks Confluence: Floc took a long time to settle.

Atwood: Crystal clear water.

Richmond Pond Dam: Clear, windy weather and clear water.

Barker Road: Low and moderate water level and flow. DO floc dropped to shoulders and below rapidly; light amber and clear after pillow #3 and marble.

September 23, 2003: Light rain in the night, with rain this morning, light at times, and very heavy at times (heaviest around 7:30 a.m.). Has been clear the past few days. About a quarter inch of rain 4 days ago.

Pontoosuc: Main channel almost dry (no water over the dam?!).

Onota Dam: Lake being drawn down, at 3" water under dam and rocks – not over. Little tributary very muddy and flowing HARD; had to sample farther out to avoid it.

Pecks Confluence: Rain picked up considerably while monitoring.

Jimmy's Rt 20 at bridge: Light rain at 8:30, has been heavy this morning (@ 1 hour ago).

Atwood Ave: Dark plume of water seen entering the main channel from the storm drain (photos taken). Muddy water in main channel. Air smells bad at times (musky/sewage??).

Barker Road: Light rain when started sampling but became heavy before done (~ 7:30 a.m.). Storm drain under bridge pouring water. Speck in thermometer column – result off by 1° C?

October 28, 2003: Two inches of rain fell yesterday! Partly cloudy but dry this morning. River running very high today. Was dry for at least six days before yesterday's downpour.

Pontoosuc: Small, steady stream of water coming into river from road (Rt. 7) culvert. This was directly above test site and not part of flow test.

Onota Dam: Dam level -1 inch. Water coming full force out of pipe below dam. Couldn't get to usual spot to monitor below the rocks. Monitored about 20 feet upstream. Rocks mostly covered. Strange rows of large bubbles, almost foam, along waterline at top of dam. Water clear.

Pecks Confluence: River running very high. Water clear.

Jimmy's on Rt. 20 at bridge: Water tea colored but clear.

Atwood: River high everywhere, bank to bank. Water clear but with sediments.

Richmond Pond Dam: Heavy rain yesterday, but water clear today.

Barker Road: Clear water with specks. High water to top of banks moving swiftly. Storm drain or sewer line at edge of path above testing site, no observable outlet.