How Clean the Green? Part II

Report dated 11/15/01 prepared by monitoring coordinator Dick Schlesinger

The Hoosic River Watershed Association has been conducting water quality sampling within the Hoosic River and its tributaries for the past several years. The objectives of the monitoring program include identifying areas of concern, establishing baseline conditions, and following up on previous sampling efforts. This report documents the results from the year 2001 sampling for bacteria within the Green River, one of the primary tributaries to the Hoosic River in Massachusetts.

Background.

The Green River is classified as suitable for a cold water fishery and for primary recreational activities such as swimming, wading, and fishing (Hudson River Basin 1997 Water Quality Assessment Report, 2000). The levels of fecal coliform bacteria are an indicator of water quality for these uses, although these bacteria are not in themselves necessarily hazardous to human health. Massachusetts has established specific levels/thresholds that are used to judge whether the water quality is good enough for the classified uses (Massachusetts Surface Water Quality Standards, 314 CMR 4.00).

Fecal Coliform Bacteria - Shall not exceed a geometric mean of 200 organisms per 100 milliliters (ml) in any representative set of samples nor shall more than 10% of the samples exceed 400 organisms per 100 ml. This criterion may be applied on a seasonal basis at the discretion of the Department. The Department of Environmental Protection (DEP) gives the following guidance in the Hudson River Basin 1997 Water Quality Assessment Report, 2000.

1. Dry weather guidance – for less than 5 samples within a 1 month period, less than or equal to 400 colonies per 100 ml sample. Dry weather can be defined as: no or trace antecedent precipitation that causes no more than a slight increase in stream flow.

2. Wet weather guidance – dry weather samples meet the above and wet samples less than or equal to 2000 colonies per 100 ml. Wet weather can be defined as; precipitation antecedent to sampling that results in a marked increase in stream flow.

The following sixteen sites were sampled on five dates. (See also Fig. 1 for site locations). GN01.15 downstream of the USGS flow gage and upstream of the Route 2 bridge. GN01.63 downstream of the confluence with Christmas Brook. GC00 00 confluence of Christmas Brook with the Green River. GC00.34 on Christmas Brook just upstream of where it enters the pipe that carries it the last 340 meters to the Green River. GN01.74 just upstream of the confluence with Christmas Brook. GN04.32 just upstream of the last house on the Town sewer system. GN05.23 downstream of the Blair Rd. bridge. GN05.29 upstream of the Blair Rd. bridge and a minor tributary that enters from the east. GH00.03 near the old dam on Hopper Brook. GN06.15 upstream of the confluence with Hopper Brook. GN08.28 downstream of unfenced pasture areas at the 2^{nd.} Route 43 bridge north of Steele's Corner. GN09.16 upstream of the unfenced pasture areas at the 1^{st.} Route 43 bridge north of Steele's Corner. GN10.01 downstream of a fenced pasture area, downstream of the confluence of the West Branch of the Green River.

GN10.62 upstream of the fenced pasture area, opposite Southlawn Cemetery.

GW00.39 upstream of the fenced pasture area on the West Branch, opposite Bloedel Park and downstream of the Waubeeka Golf Course. GW01.74 upstream of the Waubeeka Golf Course at Old Mill Rd.



Figure 1. Locations of monitoring sites.

Samples were collected in May, June, July, August, and September. During the week prior to the 5/15/01 sample, the rainfall was 0.50" on 5/12 and 0.04" on 5/14. The USGS gage on the Hoosic River opposite Treet Cleaners in North Adams showed a peak flow of about 210 cfs (cubic feet per second) on 5/12, dropping to about 140 cfs on 5/15, which is below the median flow for the date. Based on the rainfall and flow records, the sample would be a dry weather sample.

There was 0.64" of rain on 6/11 and an additional 0.08" on 6/12, prior to the sampling on 6/13. The USGS gage showed the peak flow on 6/12 at 750 cfs. The flow was down to 270 cfs at the time of sampling, which was still slightly above the median for the date. The field notes state that the weather for the 24 hours prior to sampling were clear, with no rainfall, and seasonable temperatures. Based on the notes and the flow data, this sample was classified as a dry weather sample.

During the week prior to the 7/9/01 sample, the rainfall was 0.23" on 7/4 and 0.79" on 7/8. The

Hoosic gage showed the peak flow to be about 360 cfs on 7/8, dropping to about 210 cfs at the time of sampling. This flow level was above the median for that date. The field notes describe the 24 hours prior to sampling as partly cloudy with moderate rain and seasonable temperatures. Thus the sample was considered a wet weather sample.

There was 0.62" of rain on 8/12 prior to the 8/15/01 sample. The USGS gage showed the peak flow of 280cfs on 8/12. At the time of sampling, the flow was only 80cfs and below the median for that date. Thus the sample was a dry weather sample. Conditions were similar for the 9/17 sampling. There was 0.53" of rain on 9/14 with the peak flow for that date at 100 cfs. The flow on 9/17 was at 70 cfs, below the median. Thus this sample too was a dry weather sample.

Methods

Water samples were collected in sterile bottles provided by Berkshire Enviro-Labs, Inc. Each crew of two people collected samples at eight sites on the morning of the sample day. At one of the eight sites, a second replicate/quality control sample was taken. The samples were transported in a cooler to the laboratory in Lee and dropped off at or before noon the same day. The samples were processed by the laboratory for total coliforms (using Standard Methods 9222 B) and fecal coliforms (using Standard Methods 9222 D). Our analyses of the laboratory results focus on fecal coliforms.

Results and Discussion

The fecal coliform levels in most cases were below the dry weather threshold on the 4 dry weather sample days (Fig. 2). Six out of a total 63 samples exceeded the threshold (site GN09.16 was not sampled in September as a one additional quality control sample was submitted with these September samples). Four of these came from the August samples, while the other two were in September. Compared with the available data from previous years, several of the locations show improvement.

Green River 2001



Figure 2. Fecal coliform for the 4 dry weather samples.

At site GN01.15, all four samples were below the dry weather threshold in 2001. The previous year, three out of five of HooRWA's dry weather samples were above the threshold. And in 1997, DEP reported one of their two samples above the threshold at this site (their site GN01) (Hudson River Basin 1997 Water Quality Assessment Report, 2000).

Just upstream within the area of concern at the Christmas Brook confluence, the water quality appears to considerably improved compared with previous years' results. In 2001, none of the 16 dry weather samples exceeded the threshold for primary recreation. In 2000, the Christmas Brook outfall (GC00.00) was way above the threshold at all five dry weather dates, with values of 15900, 37300, TNTC (too numerous to count), 2418, and 1732 colonies per 100ml. The upstream site (GN01.74) was below the threshold for all five samples, but the downstream site (GN01.63) exceeded the threshold on one of the five dates (the one when GC00.00 was TNTC). This site was also monitored by Riggs (her site S10) in 1998 and found to be above the threshold on four of the seven dates sampled. It appears that the reconstruction of the sewer and storm drain infrastructure beneath Spring St., completed in late 2000, and the connections of the Gale Rd. residences and Buxton School to the Town sewer system, completed in late 1999, have substantially improved the water quality of Christmas Brook and the Green River downstream of Christmas Brook.

At GN04.32, just upstream of the Town sewer and downstream of the agricultural and residential activities around and adjacent to Blair Rd., the water quality was within acceptable limits. Just downstream of the Blair Rd. bridge (GN05.23), the August fecal coliform value was far in excess of the threshold. And just upstream of the bridge (GN05.29), the September value was slightly above the threshold. HooRWA's monitoring in 2000 was at just GN04.32 and GN05.23 and showed a higher level at the downstream site on only one occasion (1080 vs. 220). Also, the upstream site was much higher once (1320 vs. 149). On the other three sample dates, the two sites were nearly equal, although the upstream site was, surprisingly, always slightly higher. Site

GN05.29 was added in 2001 to determine whether a small tributary from the east, which drains an area with several older houses, might be of concern. The August 2001 results support that concern, but overall, the land uses in the area north of Blair Rd. appear to have little effect on bacteria levels.

The Hopper Brook had very low levels of bacteria in 2001, confirming the results from 2000. However, just upstream of the Hopper Brook confluence (GN06.15) the fecal coliform levels exceeded the threshold in both August and September. In 2000 at this site, the threshold was exceeded one time out of five dry weather samples dates. The site was also samples by Riggs in 1998 (her S8 site), with unclear results. Three of the four dry weather samples showed above threshold levels based on the Williams College laboratory results. However, on two of the dates, replicate samples were sent to Berkshire Envio-Labs, where the results were determined to be slightly below the threshold. In any case, this area continues to be an area of concern, especially since it is used as an unofficial swimming/wading area by local folks.

The two sites that bracket two areas of pasture within which farm animals have direct access to the river (GN08.28 downstream and GN09.16 upstream) were both above the threshold in August. Although the downstream site was consistently higher than the upstream one, our sampling did not clearly show that the lack of fencing is significantly lowering water quality. Our upstream site was Riggs site S7 in 1998 and Johnson's site #4 in 1997, selected as the "recovery" site from the farming operations upstream near Steele's Corner. In 1998, on 3 of the 5 sample dates, the fecal coliform levels exceeded the threshold, while in 1997, both of the dates with useable data exceeded the threshold.

Sites GN10.01 (Riggs S6, Johnson #3), GN10.62 (Johnson #2), and GW00.39 (Riggs S5, Johnson #1) bracket an area that previously was of concern because of a dairy herd that had direct access to the river upstream of GN10.01. This area was monitored for fecal coliform by HooRWA in 1997, 1998, 2000, and 2001. During this period of

time, the dairy operation has ended and the beef cattle and horses are partially fenced off from the river although a crossing does permit periodic access by the animals. All four of our samples from 2001 both downstream and upstream of this area were well below the threshold for primary recreation. In 2000, this was not the case. Two of the five samples at both GN10.01 and GN10.62 exceeded the threshold. The two useable 1997 sample days showed below threshold levels upstream but very high levels downstream of the dairy herd. The 1998 were similar, with the exception of one date on which levels were below the threshold at both of the Riggs sites. Thus it would appear that the changes at the farm have benefited the river.

The final site (GW01.74) is upstream of the golf course, and, paired with GW00.39, brackets that area of interest. Both sites were well below the threshold for primary recreation. Thus there is no indication of problems at this location.

On the one wet weather sample day, only Christmas Brook exceeded the wet weather threshold for primary recreation (Fig. 3). Indeed, all of the other sites, with the exception of GN01.15 just upstream of the Route 2 bridge, were still below the dry weather threshold. The field notes state that Christmas Brook was very cloudy/muddy. It was later determined that the silt fence at the construction site just upstream was not functioning properly, and was the probable cause of the high levels.

The wet weather sampling in 2000 and in 1998 showed much higher levels of bacteria at the several locations in common. The variability for "wet weather" sampling would likely be much higher than for dry weather. And the single wet weather sample date for 2001 does not provide a strong basis for drawing conclusions as to any changes from previous years. But the results are encouraging, if not definitive.



Figure 3. Wet weather sample results.

When monitoring bacteria levels, sampling variability is of concern as are the difficulties in obtaining consistent results from the laboratory procedures. The replicate samples collected during the monitoring provide information on the combined effects of the two. The standard of comparison is the relative percent difference (RPD), calculated as the difference between the logarithms of two samples divided by the mean of the two logarithms. For the samples from the Green River, the RPD for 9 of the 11 replicate samples was less than the 30% standard used in the Hudson River Basin 1997 Water Quality Assessment Report (Fig. 4).



Figure 4. Quality control results.

Conclusions

The 2001 monitoring results for fecal coliform show a definite improvement over the year 2000 results. The downstream site near the Rt. 2 bridge met the bacteria standard for primary recreation on all five sample days. The Christmas Brook area was much improved, with the only documented excursion above the threshold apparently associated with the breach of a silt fence. The data from the Hopper Brook continued to be well below both the dry and wet weather thresholds. The recent changes at the farm north of Steele's Corner has improved conditions in the fenced areas. And there does not appear to be water quality problems resulting from the golf course operation on the West Branch of the Green River.

There are ongoing concerns within the section of the river from GN09.16 downstream to GN04.32. The unfenced pasture areas continue to show fecal coliform levels above the primary recreation threshold. And there may be one or more problem areas within the segment near the Blair Rd. bridge. Concerns about non-point source pollution suggest the need for more information on water quality during and immediately after storm events. The 2001 monitoring season was considerably drier than the 2000 season, and thus the one "wet weather" sample does not provide a strong basis for drawing conclusions.

As we continue to increase our information base on the Green River, we will try to more finely focus our monitoring efforts toward the locations and times most likely to be of significance for threats to water quality. In any case, it is quite encouraging to see that the recent Spring St. and Gale Rd. infrastructure improvements have apparently improved the water quality conditions in Christmas Brook. And that improved onsite waste disposal systems and fencing of farm animals have apparently reduced these impacts to water quality in several segments of the Green River. We hope that an increasing awareness of the interactions between human activities and the health of the watershed will continue to result in improvements in water quality such that the Green River will fully meet its goals for primary recreation.

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