SUSQUEHANNA RIVER MONITORING:

Monitoring the water quality of the upper Susquehanna River, summer 1996.

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INTRODUCTION

During the summer of 1996 the water quality of the Upper Susquehanna River was monitored between Otsego Lake and the River's confluence with Oaks Creek. This study was conducted to ensure that the water quality, particularly dissolved oxygen, remains at acceptable levels in this area of the Susquehanna. As the River's ability to assimilate pollution is restricted, it is critical to limit unauthorized point and non-point sources of contamination so that water quality below the point of discharge by the Cooperstown Sewage Treatment Plant remains adequate. Monitoring also entailed the possible identification of point sources of pollution. This information would be useful in identifying areas requiring mitigation.

METHODS

Monitoring was conducted weekly at nine locations along the River (Figure 1; 1, 3, 6, 8, 12, 16, 16a, 17, 18) over a period of ten weeks. At each site data were collected, using a digital microprocessor, a Hydrolab Scout 2 Recorder Water Quality Multiprobe. Water samples taken were tested at the Biological Field Station for chloride, nitrate + nitrite and total phosphorus concentrations. The mercuric nitrate method was used to find chloride levels (APHA, 1989), nitrate + nitrite concentrations were found using the cadmium reduction technique (APHA, 1989), and by using the persulfate digestion followed by single reagent ascorbic acid procedure, the total phosphorus concentration was attained (APHA, 1989). Temperature, pH, dissolved oxygen and conductivity readings were recorded in the field. In conjunction with this work, biweekly samples were taken to test for fecal coliform bacteria (Miller, 1996). If a site demonstrates consistently high levels of bacteria and/or nutrients, such as phosphorus, it may indicate excessive agricultural runoff or faulty septic systems requiring attention.


**Village of Cooperstown upper Susquehanna River Intern, summer 1996. Present Address: Cooperstown Central High School, Cooperstown, NY.
Figure 1. Susquehanna River collection sites.
RESULTS AND DISCUSSION

Temperature

In contrast to the summer of 1995 (Austin and Harman, 1996), the summer of 1996 was relatively cooler and significantly wetter. This could be one reason why water temperatures were lower. Compared to past data, the average temperatures of this year were also cooler than 1994 (Moriarty et al., 1995), but warmer than 1992 (Vatovec et al., 1993). The temperatures in 1993 (Hahn, 1994) were very similar to those recorded this summer. The highest temperature recorded during monitoring this year was 23.33 °C, taken at Site 6 on August 7. The low was noted at Site 12, on June 12 as being 16.01 °C (See Figure 2).

pH

The pH remained constant throughout the summer. The pH probe on the Hydrolab was damaged during the week of August 12, thus pH readings could not be taken on August 14. The high reading for this summer was 8.89, taken at Site 3 on the 12 of June. The low was recorded as 7.66 at 16a on August 7. This summer’s pH levels were higher than those pH of 1992-93 and 1995, but were comparable to the levels of 1994. Even though the pH has varied annually, it remained basic throughout the duration of the study. This buffering may be due to the fact that the source of the Susquehanna River, Otsego Lake, lies in a limestone basin (Harman et al., 1997). As the Lake empties into the river, high concentrations of calcium carbonate are dissolved, causing the water to be slightly basic (see Figure 3).

Dissolved Oxygen

The dissolved oxygen levels remained stable throughout the summer. The first three sites seemed to have a higher dissolved oxygen concentration than the other six sites. This pattern may be due to the point at which the effluent from the Sewage Treatment Plant was discharged and the farm land which surrounds Site 16 (Clark property). The highest recorded reading during monitoring period was 12.65 mg/L on July 10 at Site 1. The lowest reading was recorded at Site 12 on August 7 as 5.9 mg/L. The dissolved oxygen levels recorded in 1996 were higher than in 1993-95 and similar to the data collected in 1992. The fact that it is higher than the last two years can be the attributed to the increased rain which was experienced this summer (see Figure 4).

Dissolved oxygen is a very important factor in water quality. Water with adequate dissolved oxygen will be able to support healthy aquatic fauna and flora. Decreases in dissolved oxygen are indicative of organic decomposition, a process which utilizes oxygen. This is a concern regarding the Cooperstown Sewage Treatment Plant, which discharges such organic material into the River. The dissolved oxygen must exceed 5 mg/L to maintain acceptable standards.
Figure 2. Average temperatures in the upper Susquehanna River.

Figure 3. Average pH in the upper Susquehanna River.
Figure 4. Average oxygen concentrations in the upper Susquehanna River.
Conductivity

The conductivity varied little during monitoring with few exceptions. The higher readings can be associated with increased rainfall and runoff, which may carry highly soluble salts into the water. Higher concentrations of salts cause a higher conductivity reading. The highest reading was 309 (umho/cm), recorded at Site 16 on the 3rd of July. The lowest reading was 119, taken on July 23 at Site 18. This extremely low reading may be due to the rapid water causing the Hydrolab probe to report an inaccurate reading (see Figure 5).

Total Phosphorus

The level of phosphorus remained low and constant between Sites 1-8, but after a noticeable increase, it continued to escalate steadily. This increase might also be contributed to the Sewage Treatment Plant. The highest phosphorus concentration noted was 264ug/L, recorded on July 23 at Site 18. The low was 2ug/L taken at Site 1 on June 19. This year's phosphorus levels were much lower than last year's levels. This change can be attributed to the increased precipitation and discharge. Assuming a constant release of effluent to the River, higher discharge would result in greater dilution of point-source derived nutrients.

Chlorides

The chloride concentrations seemed to be comparable to the data from previous years. The highest reading was 36.5 mg/L recorded at Site 16 on July 3. The lowest chloride level recorded was 7.7 mg/L at Site 1 on July 29 (see Figure 7).

Nitrate + Nitrite Concentrations

This was the first year that nitrate + nitrite analyses were performed on Susquehanna River samples. The readings varied from site to site, showing little to no noticeable patterns. In future monitoring of the Susquehanna, a pattern might emerge. The highest reading recorded was 1.03 mg/L on June 12 at Site 3. The low was 0.4 mg/L recorded on July 10 at Site 8 and at Sites 3 and 12 on August 7. These readings also will vary depending on rainfall and discharge (see Figure 8).

SUMMARY

The data collected this year remains consistent with past reports, though variations existed. The differing weather conditions and discharge rates should be taken into consideration. The duration of monitoring period might also have an effect on the outcome. This study lasted for ten weeks whereas the 1995 study only lasted for 7 weeks. The earlier reports were based on a monitoring period lasting into fall or even early winter.
Figure 5. Average conductivity in the upper Susquehanna River.

Figure 6. Average phosphorus concentrations in the upper Susquehanna River.
Figure 7. Average chloride concentrations in the upper Susquehanna River.

Figure 8. Average nitrate + nitrite concentrations in the upper Susquehanna River.
Previous studies, and the research conducted this year, indicate that the assimilative capacity of the Susquehanna River is sufficient to handle the stress of the Sewage Treatment Plant providing that no additional sources of loading exist. The project is a safeguard which ensures that such loading does not occur.

REFERENCES

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