

Russell Run (RUSS)

Russell Run near Windham, Pa., was designated slightly impaired after being nonimpaired the previous year. Poor metric scores were given for taxonomic richness, EPT Index, and percent dominant taxon. However, the dominant taxon was pollution-intolerant *Epeorus*. The habitat was considered excellent, with high scores given for sediment deposition, channel alteration, and frequency of riffles. All field chemistry parameters were normal.

Sackett Creek (SACK)

The biological condition of Sackett Creek near Nichols, N.Y., was designated slightly impaired, and the physical habitat was excellent. SACK had the lowest Hilsenhoff Biotic Index of all Group 3 sites, as well as a high percent Ephemeroptera, and a low percent Chironomidae. The percent dominant taxon was high, but the taxon in question was the pollution-intolerant mayfly, *Epeorus*. All field chemistry parameters were within normal ranges. High flows due to recent rain events were noted at the time of sampling.

Smith Creek (SMIT)

Smith Creek near East Lawrence, Pa., served as the reference site for the Group 3 streams during May 2004. This site had the best combination of biological, habitat, and field chemistry conditions of the Group 3 streams. This small stream drains a wetland area and mixed coniferous forest, and the habitat was rated excellent, with high scores for a number of parameters, including channel alteration, frequency of riffles, and condition of banks. There were no extreme values in the field chemistry parameters.

Strait Creek (STRA)

A nonimpaired biological community existed at Strait Creek near Nelson, Pa., during fiscal year 2004. The site had a high EPT Index, but a large number of Chironomidae. The physical habitat was designated excellent and all field chemistry parameters were within normal limits.

White Branch Cowanesque River (WBCO)

In May 2004, White Branch Cowanesque River near North Fork, Pa., was designated moderately impaired with the worst metric scores in taxonomic richness, diversity index, Hilsenhoff Biotic Index, and EPT Index. This site had been nonimpaired in May 2000 with a number of pollution intolerant taxa, and then it degraded to moderately impaired during May 2001 and May 2002, and severely impaired in May 2003. The sample was dominated by the pollution tolerant caddisfly taxon, *Cheumatopsyche* (Trichoptera: Hydropsychidae), comprising 55.4 percent of the sample. The habitat was partially supporting due to low scores in embeddedness, vegetative protective cover, and riparian vegetative zone width. Cows had direct access to the stream in a pasture upstream of the sampling site, and sediment was deep in spots. Field chemistry measurements were within acceptable ranges.

White Hollow (WHIT)

White Hollow near Wellsburg, N.Y., was designated slightly impaired in fiscal year 2004, after serving as the reference site in May 2003. This site had a high percent Ephemeroptera, and a low Hilsenhoff Biotic Index and percent Chironomidae, but a high percent dominant taxon and a low EPT Index, when compared to other Group 3 streams. However, the dominant taxon in this sample was pollution-intolerant *Epeorus*. The physical habitat was excellent, with a large amount of woody debris, in this mostly forested stream. All water chemistry parameters were normal.

MANAGEMENT IMPLICATIONS

Long-term studies of this nature are critical to establish water quality trends and understand biological conditions. To effectively manage the resources, officials and local interest groups must have a true picture of ecological dynamics and possible problem areas, which can only be obtained through long-term studies such as this one.

Several management implications can be extracted from the chemical water quality, macroinvertebrate community, and physical habitat data collected from sampling areas. These observations, although based on a small sample size, are presented as possible subject areas for future research and as issues to be considered by aquatic resource managers, local interest groups, elected officials, and other policy-makers.

New York – Pennsylvania Sites

The sites in this reference category have shown and continue to show a large degree of variability in water quality; however, they do not vary much in biological or habitat condition. The biological conditions overall are nonimpaired or only slightly impaired and habitat degradation at numerous sites continues to be due to dredging in the stream and the unstable nature of these glacial streams. Fiscal year 2004 sampling was characterized by higher than normal flow situations throughout the sampling period. These high flows may have contributed to fluctuations in water chemistry parameters and increased streambank erosion. Of particular interest is the prevalence of elevated total iron and total aluminum values throughout the sampling period.

Pennsylvania – Maryland Sites

In fiscal year 2004, total nitrogen and total nitrate concentrations continued to be elevated in the Pennsylvania-Maryland sites. The area surrounding the Pennsylvania-Maryland border sites was largely agricultural. Intensive agricultural activities without proper best management practices often result in streambank erosion and sedimentation, contributing to poor instream habitat quality and to nutrient enrichment. Nutrient enrichment encourages excessive plant growth, which can depress dissolved oxygen levels during plant decomposition. Erosion also may contribute metals that were present in the soil to the stream water.

River Sites

Due to high river flows, staff collected biological samples at only two of the river stations

during summer 2003. SUSQ 340.0 and SUSQ 365.0 have continuously exhibited higher quality conditions than other river stations in the ISWQN. Overall, high total iron and total aluminum concentrations were prevalent in the water quality conditions of the river sites during fiscal year 2004.

Group 3 Streams

The Group 3 streams were located on the New York-Pennsylvania border, so many of them were glacial streams that were dredged for gravel. These disturbances in habitat may have attributed to degradation in the biological community. Conversely, many of the Group 3 streams were small order streams that were largely forested. These protective habitat conditions may have attributed to nonimpaired biological conditions.

Future Study

Future study and remediation efforts should focus on those streams that had moderately impaired macroinvertebrate communities or exceeded water quality standards. Moderately impaired biological conditions were found at Dry Brook, White Branch Cowanesque River, Denton Creek, Ebaughs Creek, Long Arm Creek, and Scott Creek. Although, the biological community was not sampled at the Cowanesque River stations (COWN 1.0 and COWN 2.2) in fiscal year 2004, in previous years, these stations also have exhibited moderately impaired conditions. Additional study of stream water chemistry, biology, and habitat at varying flows may help explain some impairment problems.

During this sampling period, a large number of streams had water quality parameters that exceeded standards. These streams included: Apalachin Creek, Bentley Creek, Cascade Creek, Cayuta Creek, Little Snake Creek, North Fork Cowanesque River, Seeley Creek, South Creek, Troups Creek, Trowbridge Creek, Big Branch Deer Creek, Conowingo Creek, Ebaughs Creek, Falling Branch Deer Creek, Octoraro Creek, Chemung River, Cowanesque River (1.0 and 2.2), the Susquehanna River (289.1, 340.0, and 365.0), Tioga River, Deep Hollow Brook, Denton Creek, and Prince Hollow Run. The water quality

conditions of these streams should be monitored for future violations. Furthermore, the source of these pollutants should be identified. State water quality standards vary across state lines, and problems may arise when the source of these pollutants is located in an adjacent state.

CONCLUSIONS

Nineteen (41.3 percent) of the 46 interstate streams sites at which macroinvertebrate samples were collected contained nonimpaired biological communities. Biological conditions at another 21 sites (45.7 percent) were slightly impaired, while six sites (13.0 percent) were moderately impaired. No sites were designated severely impaired. Seven sites (SUSQ 10.0, SUSQ 44.5, SUSQ 289.1, COWN 2.2, COWN 1.0, TIOG, and CHEM) were not sampled using RBP III techniques and, thus, were not averaged into the final scores. Thirty-five sites (76.1 percent) had excellent habitats. Nine sites (19.6 percent) had supporting habitats, and two sites (4.3 percent) had partially supporting habitats.

Overall, 99 observations (9.9 percent) of water chemistry parameters exceeded state standards, which is a dramatic increase from the previous year. Total iron exceeded standards most frequently with 46 violations (46.5 percent). Total and dissolved iron appears to be naturally high in some of these watersheds. Tioga River is the only stream that has documented abandoned mine discharge, indicated by high metals and high acidity. Elevated aluminum and depressed alkalinity may be due to acid precipitation, especially in the New York-Pennsylvania border streams. Total dissolved solids, nitrate plus nitrite, and dissolved oxygen are all indicators of organic pollution.

Of the New York-Pennsylvania border streams, the biological community of six (42.9 percent) of these streams was nonimpaired, and eight sites (57.1 percent) were slightly impaired. Nine sites had excellent habitats (64.3 percent), and five sites (35.7 percent) had supporting habitats. Overall, biological conditions degraded at seven stations, while they improved at three sites. High metal concentrations, particularly total

iron and total aluminum, appeared to be the most common sources of water quality degradation in this region. The parameters that exceeded New York and Pennsylvania state standards were total and dissolved iron, total aluminum, total chlorine, pH, and alkalinity. Iron standards were exceeded at Apalachin Creek, Bentley Creek, Cascade Creek, Cayuta Creek, Little Snake Creek, North Fork Cowanesque River, Seeley Creek, South Creek, and Troups Creek. Aluminum standards were exceeded at Bentley Creek, Cascade Creek, Cayuta Creek, Little Snake Creek, Seeley Creek, and Troups Creek. Total chlorine was exceeded at Cayuta Creek; pH was exceeded at Cascade Creek and Troups Creek, while Cascade Creek, Little Snake Creek, and Trowbridge Creek exceeded alkalinity standards. In fiscal year 2004, high flows may have impacted the water quality and biological conditions at the New York-Pennsylvania border streams.

Nonimpaired biological conditions existed at four (44.4 percent) of the nine Pennsylvania-Maryland interstate streams. Two sites (22.2 percent) were slightly impaired, and three (33.3 percent) were moderately impaired. Seven (77.8 percent) of the Pennsylvania-Maryland border sites had excellent habitats, and two (22.2 percent) had supporting habitats. Biological conditions at Pennsylvania-Maryland sites appeared to improve during fiscal year 2004, with the exception of Ebaughs Creek, which continued to degrade. Water quality at several sites exceeded Pennsylvania and Maryland water quality standards, including: nitrite plus nitrate, total iron, and turbidity at CNWG 4.4; total chlorine at EBAU 1.5; total iron at OCTO 6.6; and alkalinity at BBDC 4.1 and FBDC 4.1. The Pennsylvania-Maryland border streams are located in a heavily agricultural region, and many of the parameters that exceeded the 90th percentile at these sites were nutrients. Also, streambank erosion and sedimentation created instream habitat problems in this region.

River sites consisted of nine stations located on the Susquehanna River, Chemung River, Cowanesque River, and Tioga River. One station (SUSQ 10.0) is never sampled for macroinvertebrates due to a lack of riffle habitat at the site, while six stations were not sampled for