

DISCUSSION

Water Quality

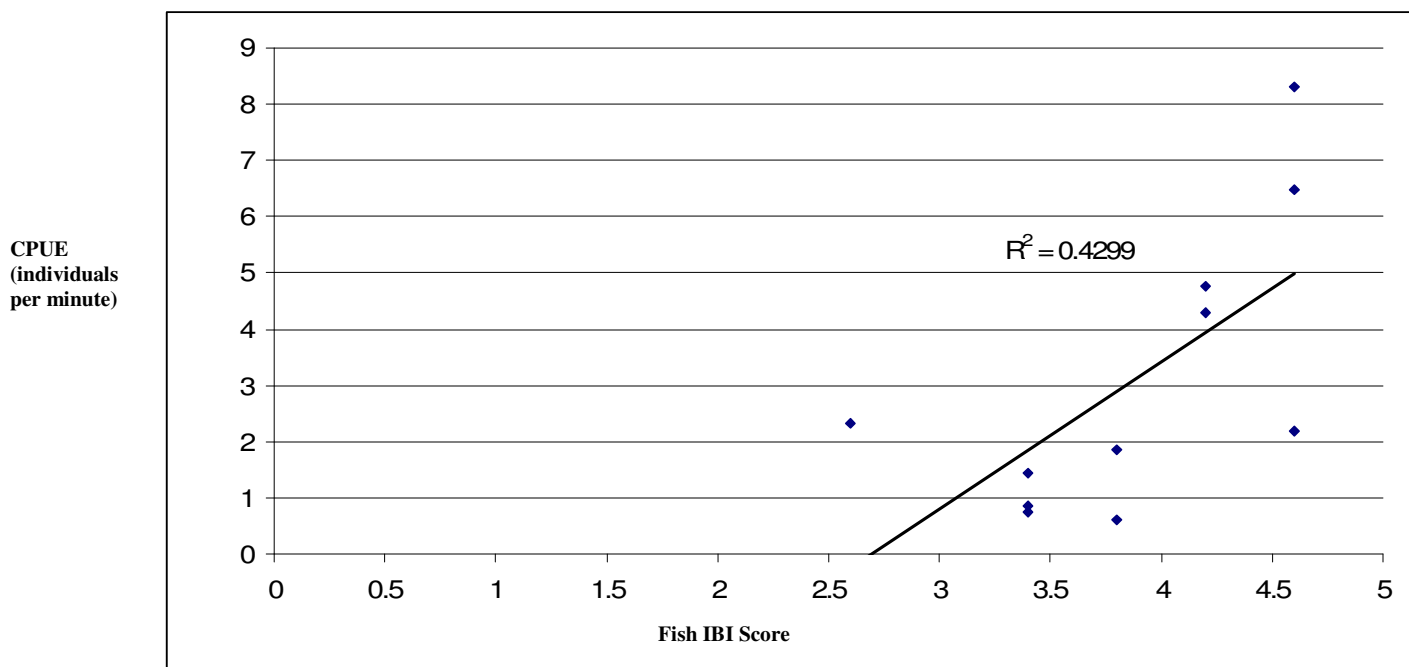
Year after year, total iron and total aluminum continue to exceed water quality standards most frequently, especially in PA-NY interstate streams. Future areas of study could address the affects of these constituents on the biological communities inhabiting interstate streams and the potential sources of contamination.

For PA-MD interstate streams, organic pollution is the largest concern surrounding water quality, due to the prevalent agricultural land use in the southern portions of the basin. Trends analysis available in this report shows that for the most part, nutrient concentrations continue to decline. Future reports also could investigate how the trends analysis available in this report relates to changing land use, point source pollution, and other factors.

Biological Communities

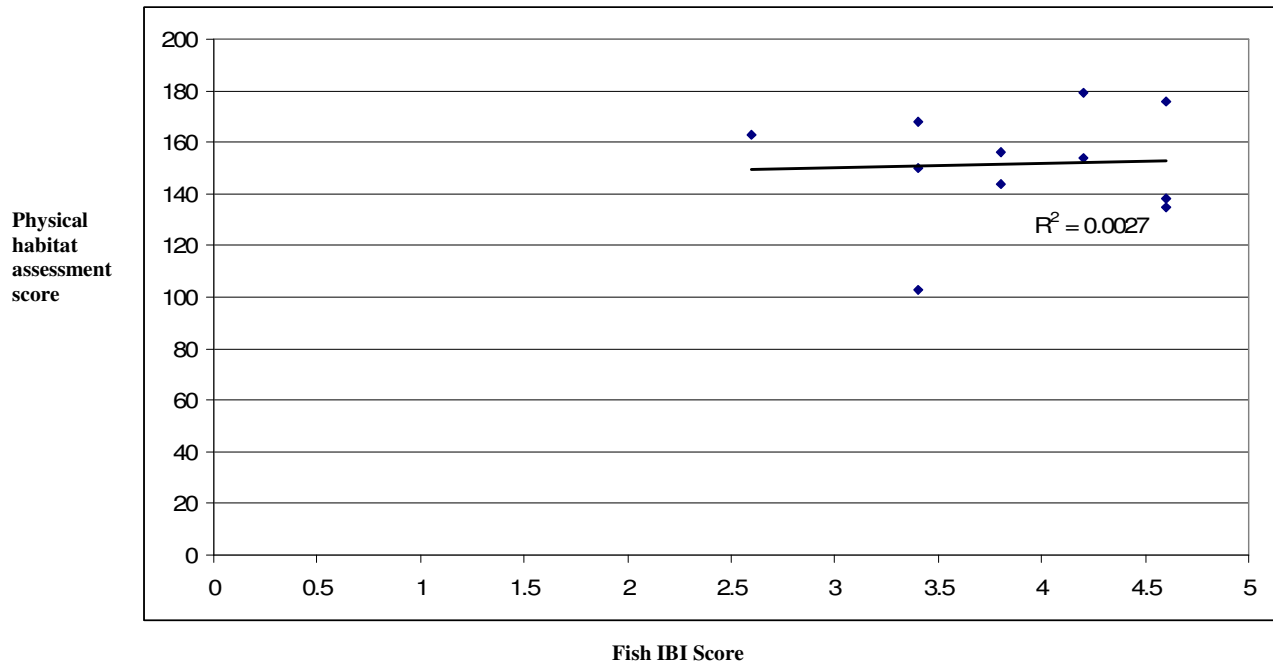
Fish

Correlation between Fish IBI score and CPUE for Pennsylvania-New York interstate stream stations



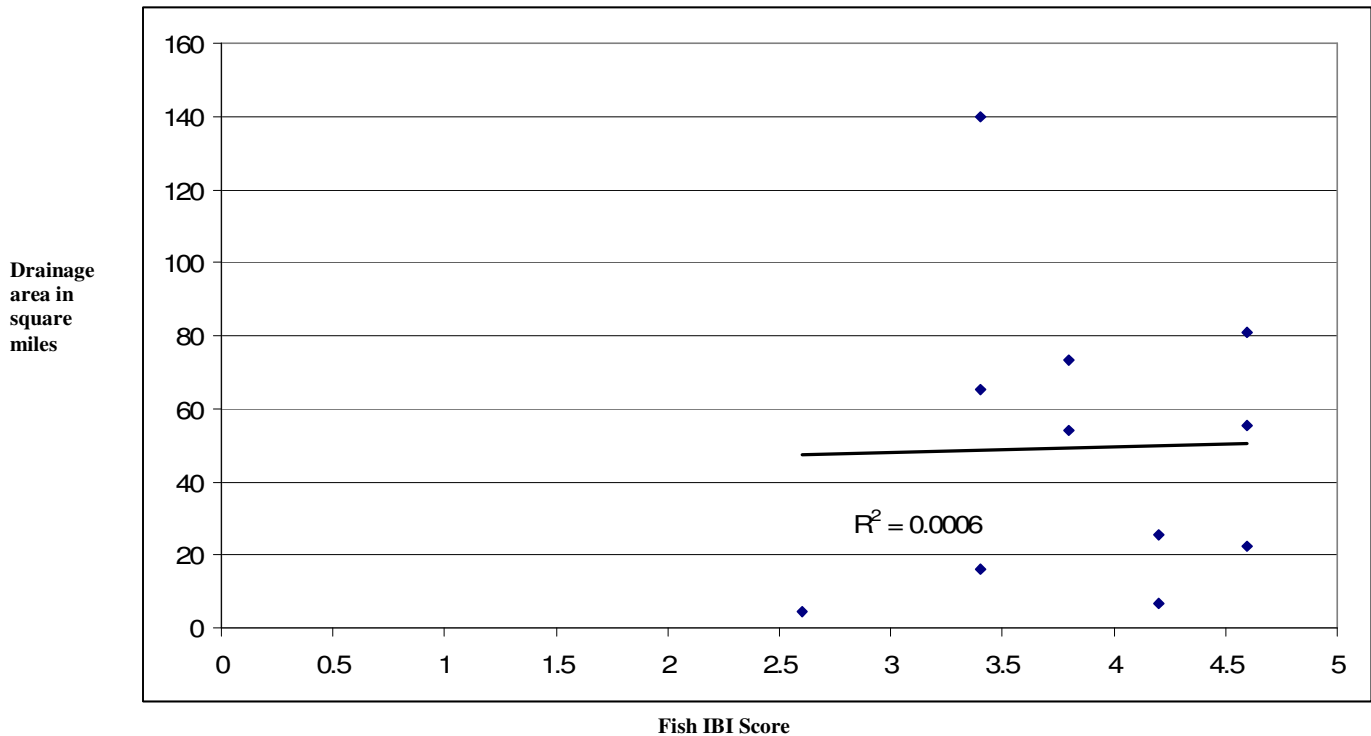
Fish IBI score was positively correlated with CPUE for PA-NY interstate stream stations. However, the correlation was not strong, as the R^2 value was 0.430.

Correlation between Fish IBI score and physical habitat score for Pennsylvania-New York interstate stream stations



Fish IBI score was not correlated with habitat assessment score, as the R^2 value was 0.003.

**Correlation between Fish IBI score and drainage area for
Pennsylvania-New York interstate stream stations**



No significant correlation existed between fish IBI score and drainage area, as the R^2 value was 0.0006 for PA-NY stations. This indicates that fish IBI scores were not biased towards stream size.

Additionally, comparisons of fish IBI scores with CPUE, habitat scores, and drainage areas of PA-MD interstate stream stations yielded similar results. A slight positive correlation between fish IBI score and CPUE was observed, with an R^2 value of 0.10. Fish IBI score compared with habitat scores and drainage area for PA-MD stations showed no significant correlation, with R^2 values of 0.006 and 0.049, respectively.

These analyses indicate that CPUE, a measure of abundance, is a better predictor of fish IBI scores than habitat or drainage area of streams. A measure of abundance is included in one of the five fish IBI metrics (individuals per square meter). However, that abundance measurement accounts for area of stream sampled, while CPUE standardizes abundance by effort (in minutes) of electroshocking time during sampling.

There are many more complex and interconnected factors to consider. Water quality, land use in the watershed, geology, introductions of non-native species, and many other variables could also significantly influence the biotic integrity of the fish community. Staff will attempt to determine how these factors influence the biotic integrity of fish at interstate stream stations in future reports.

Macroinvertebrates

For PA-NY interstate streams, investigation of macroinvertebrate IBI scores reveal interesting results. For Group 1 and 2 stations, the metrics that most often scored poorly were percent Chironomidae and percent dominant taxa. However, in Group 3 streams, the most common reasons for impairment of the macroinvertebrate community were poor Hilsenhoff Index values, low numbers of EPT taxa, and low taxonomic richness. It could prove useful to devote future studies to see why the reasons for impairment of the macroinvertebrate communities differ, when these streams are located in close proximity and are subjected to similar anthropogenic and environmental factors.

It appears that high nutrient concentrations, the culprit of the majority of water quality impairments in PA-MD stations, also influence impairment of the macroinvertebrate community. The Hilsenhoff Biotic Index, an indicator of macroinvertebrate community impacts based on organic pollution tolerances of taxa, was the metric that most often scored poorly for PA-MD stations. The metric that accounted for numbers of EPT taxa was the second lowest scoring metric of PA-MD interstate streams. Most EPT taxa are sensitive to organic pollution.

Future Areas of Study

Future study and remediation efforts should focus on those streams that had moderately or severely impaired macroinvertebrate communities, poor or very poor fish IBI scores, or exceeded water quality standards. In 2009, moderately impaired macroinvertebrate communities were found at Apalachin Creek, Seeley Creek, Trowbridge Creek, Troups Creek, Scott Creek, Cowanesque River, Biscuit Hollow, Camp Brook, Dry Brook, Prince Hollow Run, Strait Creek, and White Branch Cowanesque River. No stations were found to have severely impaired macroinvertebrate communities. In 2009, Cascade Creek was the only station to receive a poor fish IBI score.

As previously mentioned, 19 out of 32 stations sampled in 2009 were found to have one or more water quality parameters exceeding acceptable limits. Specific data, such as number and type of parameters exceeding standards, can be found on the individual station pages. The water quality conditions of these streams should be monitored for future violations. Furthermore, the source of the pollutants should be identified. State water quality standards vary across state lines, and remediation or restoration problems may arise when the source of these pollutants is located in an adjacent state.

Although chemical and physical data are useful in their own right, biological information has proven to be a more robust and comprehensive indication of the health of aquatic environments. Fish are indicator organisms that reveal details about aquatic system health when fish community data are analyzed. Specifically, fish provide a comprehensive picture of the state of stream environments because within a community of fishes, there is a large range of species that represents a variety of trophic levels and pollution tolerances (Karr, 1981). For these reasons, fish sampling will continue in CY-

10, with electrofishing scheduled to occur at Group 1 and 2 stations that were not sampled in 2009.

The current and historical data contained in this report provide a database that enables SRBC staff and others to better manage water quality, water quantity, and biological resources of interstate streams in the Susquehanna River Basin. The data can be used by SRBC's member states and local interest groups to better understand water quality in upstream and downstream areas outside of their jurisdiction. Information in this report also can serve as a starting point for more detailed assessments and remediation efforts that may be planned on these streams.

All water quality data from interstate streams sampling from the mid-1980s to the present are available from SRBC upon request.