

Figure 3. Biological Conditions in 2008

## DISCUSSION

### Water Quality

A comparison of water quality samples from the present large river assessment project (August-September 2007) to water quality samples collected for the most recent interstate streams survey (Steffy, 2007), Upper Susquehanna Subbasin Survey (Buda, 2008), Chemung Subbasin Survey (Buda, 2007), Middle Susquehanna Subbasin Survey (LeFevre, 2002), West Branch Subbasin Survey (LeFevre, 2003), Juniata River Subbasin Survey (LeFevre, 2005), and Lower Susquehanna Subbasin Survey (LeFevre, 2006) indicates that water quality conditions on the Susquehanna River

between Sidney, N.Y., and Marietta, Pa., and at the mouths of its major tributaries, are stable and generally below limits, although temperatures were greater than 25 degrees Celsius at several stations and total sodium exceeded the level of concern in many samples. From the data analysis, it appears that the Susquehanna River, in the stretch encompassed by this study, contains fairly good water quality, with some slightly elevated parameters.

### Macroinvertebrate Communities Upper Susquehanna River

The upper Susquehanna River starts at Otsego Lake in Cooperstown, N.Y., and continues to the confluence

with the Chemung River in Sayre, Pa. This is a fairly rural area that mostly consists of forest and agricultural land, with the exception of one large population center, Binghamton, N.Y. Only two sites were sampled this year in the upper Susquehanna due to weather and high flows. The most upstream site in the survey was at Great Bend, Pa. (SUSQ356), where the river flows south into Pennsylvania before turning north and back into New York. Great Bend was rated as nonimpaired, with the highest number of EPT taxa (16) and diversity of taxa (31) in the entire river; a condition that continued from the studies of 2005 and 2007. The site at Apalachin, N.Y. (SUSQ327), is located downstream of Binghamton, N.Y., and may show the effects of the population center. The site received a slightly impaired rating; due to a significant reduction in EPT taxa (9) and lower ratings for percent dominant taxa and taxonomic richness.

“Great Bend was rated as nonimpaired, with the highest number of EPT taxa (16) and diversity of taxa (31) in the entire river; a condition that continued from the studies of 2005 and 2007.”

### Middle Susquehanna River and the West Branch Susquehanna River

The middle Susquehanna River stretches from Sayre, Pa., to the confluence with the West Branch Susquehanna River at Sunbury, Pa. The northern part of the middle Susquehanna River is heavily forested with plots of agricultural land, which continues to the largely urbanized Scranton/Wilkes-Barre, Pa. This area was heavily mined in the past and

abandoned mine drainage (AMD) is an issue from the Scranton/Wilkes-Barre area continuing downstream. Nine sites were sampled throughout the middle Susquehanna River for this survey.

The sites at Wyalusing (SUSQ256), Meshoppen (SUSQ234), and Tunkhannock (SUSQ219), Pa., were designated as slightly impaired as in previous years. All of the stations had low ratings for the number of EPT taxa, but received good to high ratings for all other metrics. SUSQ 219 received the highest rating for percent dominant taxa and Shannon-Wiener diversity. The last site in the heavily forested hill area is located in West Falls, Pa. (SUSQ207). This site was designated as nonimpaired and received the highest ratings for taxonomic richness, Hilsenhoff Biotic Index, number of EPT taxa, and percent Chironomidae.

The site at Wilkes-Barre, Pa. (SUSQ192), was rated slightly impaired with the number of EPT taxa dropping off significantly from the upstream site. The site at Shickshinny, Pa. (SUSQ174), was designated moderately impaired, with some of the lowest ratings for the entire study in many categories. The river is deeper at this station than at other sites, and sample collections were challenging, which may have negatively influenced the macroinvertebrate sample. Additionally, SUSQ174 is downstream of not only a heavily urbanized area but also severely AMD-impacted streams such as Solomons, Newport, and Nanticoke Creeks. All of these factors may play a significant role in the degradation of the site. The sites near Berwick (SUSQ157), Bloomsburg (SUSQ149), and Danville (SUSQ138), Pa., are located near developed and agricultural areas. SUSQ 157 and SUSQ 149 were both moderately impaired with low numbers of EPT taxa and some of the lowest ratings for percent dominant taxa in the study. SUSQ 138 had a low number of EPT taxa; however, many other metrics improved so the site was designated only slightly impaired.

The West Branch Susquehanna River drains approximately 6,982 square

miles and is the largest tributary to the Susquehanna River. The watershed is very diverse, from huge areas of undeveloped forests, to areas of heavy mining activity causing many AMD-impacted streams in the headwaters, to some developed areas and agricultural lands towards the mouth. One site is located on the West Branch Susquehanna River near the mouth at Lewisburg, Pa. (WBSR8). The station was designated as slightly impaired with a high rating in Shannon-Wiener Diversity, but a low number of EPT taxa.

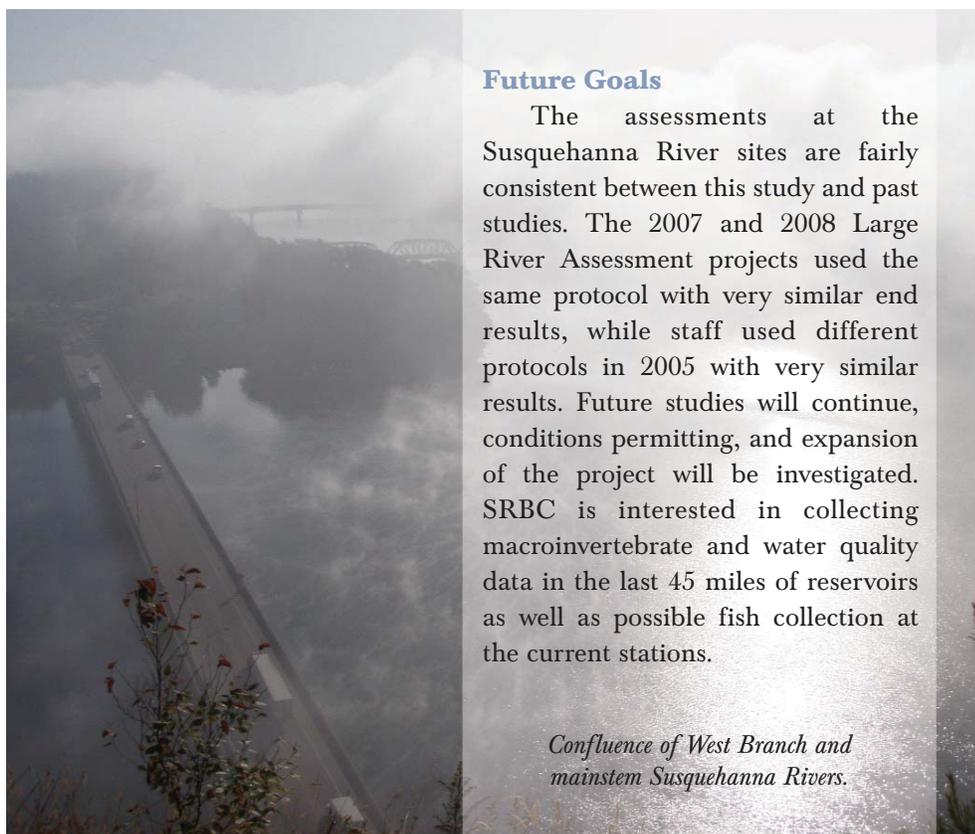
### Lower Susquehanna River and the Juniata River

The lower Susquehanna River flows from the confluence with the West Branch and mainstem in Sunbury, Pa., to where the river meets the Chesapeake Bay in Havre de Grace, Md. This portion of the watershed contains a significant amount of agricultural land along with a few densely developed areas, including Harrisburg, Pa., which lies directly adjacent to the river. Four sites are located within this reach, with the most downstream site located 45 miles upstream from the Chesapeake Bay. Hydroelectric dams turn the river

into a series of pooled reservoirs on this last stretch, which staff are unable to assess with the current protocols.

The site at Hummels Wharf (SUSQ122), Pa., was designated as moderately impaired with a low number of EPT and two of the worst metric ratings for taxonomic richness and Hilsenhoff Biotic Index. The last three sites on the river, McKees Half Falls (SUSQ94), Fort Hunter (SUSQ77), and Marietta (SUSQ45), Pa., were slightly impaired. The SUSQ94 Hilsenhoff Biotic Index rebounds to a higher rating than the upstream site, but the EPT taxa metric was still low. Higher quality streams such as Shermans, Clark, and Stony Creeks enter the Susquehanna River upstream of SUSQ77, possibly increasing the metrics ratings. SUSQ45 is a long-term interstate stream survey station, with a current and historical assessment of slightly impaired.

The Juniata River Watershed contains forested and agricultural land with a large population center in the headwaters at Altoona, Pa. One site at the mouth near Duncannon (JUNR2), Pa., was moderately impaired, with lowest ratings for percent dominant taxa and number of EPT taxa.



### Future Goals

The assessments at the Susquehanna River sites are fairly consistent between this study and past studies. The 2007 and 2008 Large River Assessment projects used the same protocol with very similar end results, while staff used different protocols in 2005 with very similar results. Future studies will continue, conditions permitting, and expansion of the project will be investigated. SRBC is interested in collecting macroinvertebrate and water quality data in the last 45 miles of reservoirs as well as possible fish collection at the current stations.

*Confluence of West Branch and mainstem Susquehanna Rivers.*

## References

- Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency, Office of Water, Washington, D.C.
- Buda, S.L. 2009. Middle Susquehanna Subbasin Survey: A Water Quality and Biological Assessment, June-September 2008. Publication 263. Susquehanna River Basin Commission, Harrisburg, Pennsylvania.
- \_\_\_\_\_. 2008. Upper Susquehanna Subbasin Survey: A Water Quality and Biological Assessment, June-September 2007. Publication 260. Susquehanna River Basin Commission, Harrisburg, Pennsylvania.
- \_\_\_\_\_. 2007. Chemung Subbasin Survey: A Water Quality and Biological Assessment, June - August 2006. Publication 251. Susquehanna River Basin Commission, Harrisburg, Pennsylvania.
- Cooper, S.D. and L.A. Barmuta. 1993. Field Experiments in Biomonitoring. In *Freshwater Biomonitoring and Benthic Macroinvertebrates*. Ed. by D.M. Rosenbert and V.H. Resh. Chapman and Hall, New York. 488 pp.
- Flotemersch, J.E., B.C. Autrey, and S.M. Cormier. 2000a. Comparisons of Boating and Wading Methods Used to Assess the Status of Flowing Waters. EPA/600/R-00/108. U.S. Environmental Protection Agency, Cincinnati, Ohio.
- Flotemersch, J.E., B.C. Autrey, and S.M. Cormier, eds. 2000b. Logistics of Ecological Sampling on Large Rivers. EPA/600/R-00/109. U.S. Environmental Protection Agency, Cincinnati, OH.
- Hoffman, J.L.R. 2008. Susquehanna Large River Assessment Project. Publication 261. Susquehanna River Basin Commission, Harrisburg, Pennsylvania.
- \_\_\_\_\_. 2006. Susquehanna Large River Assessment Project. Publication 245. Susquehanna River Basin Commission, Harrisburg, Pennsylvania.
- \_\_\_\_\_. 2003. Susquehanna River Pilot Study: Large River Assessment Project. Publication 228. Susquehanna River Basin Commission, Harrisburg, Pennsylvania.
- Klemm, D.J., P.A. Lewis, F. Fulk, and J.M. Lazorchak. 1990. Macroinvertebrate Field and Laboratory Methods for Evaluating the Biological Integrity of Surface Waters. EPA/600/4-90/030. U.S. Environmental Protection Agency, Office of Research and Development, Cincinnati, Ohio.
- LeFevre, S.R. 2006. Lower Susquehanna Subbasin Survey: A Water Quality and Biological Assessment, June - November, 2005. Publication 247. Susquehanna River Basin Commission, Harrisburg, Pennsylvania.
- \_\_\_\_\_. 2005. Juniata River Subbasin Survey: A Water Quality and Biological Assessment, July-November 2004. Publication 240. Susquehanna River Basin Commission, Harrisburg, Pennsylvania.
- \_\_\_\_\_. 2003. West Branch Susquehanna Subbasin Survey: A Water Quality and Biological Assessment, July - November 2002. Publication 226. Susquehanna River Basin Commission, Harrisburg, Pennsylvania.
- \_\_\_\_\_. 2002. Middle Susquehanna Subbasin: A Water Quality and Biological Assessment, July - September 2001. Publication 222. Susquehanna River Basin Commission, Harrisburg, Pennsylvania.
- LeFevre, S.R. and D.L. Sitlinger. 2003. Assessment of Interstate Streams in the Susquehanna River Basin: Monitoring Report No. 16, July 1, 2001, through June 30, 2002. Publication 227. Susquehanna River Basin Commission, Harrisburg, Pennsylvania.
- Parsons, M. and R.H. Norris. 1996. The effect of habitat-specific sampling on biological assessment of water quality using a predictive model. *Freshwater Biology*, 36: 419-434.
- Resh, V.H. and E.P. McElravy. 1993. Contemporary Quantitative Approaches to Biomonitoring Using Benthic Macroinvertebrates. In *Freshwater Biomonitoring and Benthic Macroinvertebrates*. Ed. by D.M. Rosenbert and V.H. Resh. Chapman and Hall, N.Y. 488 pp.
- Resh, V.H. and J.K. Jackson. 1993. Rapid Assessment Approaches to Biomonitoring Using Benthic Macroinvertebrates. In *Freshwater Biomonitoring and Benthic Macroinvertebrates*. Ed. by D.M. Rosenbert and V.H. Resh. Chapman and Hall, N.Y. 488 pp.
- Steffy, L.Y. 2007. Assessment of Interstate Streams in the Susquehanna River Basin, July 1, 2005 - June 30, 2006. Publication 249. [http://www.srbc.net/interstate\\_streams](http://www.srbc.net/interstate_streams).
- Steffy, L.Y. and D.L. Sitlinger. 2006. Assessment of Interstate Streams in the Susquehanna River Basin. Publication 244. Susquehanna River Basin Commission, Harrisburg, Pennsylvania.
- United States Environmental Protection Agency. 2008. National Rivers and Streams Assessment: Field Operations Manual. Office of Water, Office of Environmental Information, Washington, D.C. EPA-841-B-07-009.
- United States Geological Survey. Methods for Collecting Benthic Invertebrate Samples as part of the National Water Quality Assessment Program. Open File Report 93-406. <http://water.usgs.gov/nawqa/protocols/OFR-93-406/inv1.html>.

