

WHAT DOES SRBC MONITOR?

The Susquehanna River Basin Commission (Commission) monitors biological, physical, and chemical traits of streams and rivers to determine water quality conditions.

Biological monitoring includes the collection of fish, benthic macroinvertebrates, and algae to characterize and to assess the health of the stream communities. Terrestrial and aquatic invasive species are documented that are found in or around the stream.

Evaluations are made of streambank conditions, the presence of instream features, extent of sedimentation, and availability of desirable habitat. These physical characteristics often influence the biological communities that live in the

stream. Stream flow is also evaluated to determine instantaneous discharge, develop rating curves, and calculate pollutant loading to a stream.

Water samples are taken from a stream and analyzed by a laboratory for several different parameters. Field measurements of certain water quality parameters give instant data. Continuous monitoring equipment is used for certain projects to record the values of certain parameters on a much more frequent basis.

The Commission also looks at other environmental conditions such as stream gages, surrounding land use, and precipitation gauges to yield information about stream conditions.

The Susquehanna River Basin Commission's mission is "...to enhance public welfare through comprehensive planning, water supply allocation, and management of the water resources of the Susquehanna River Basin."

To fulfill the Commission's mission, Monitoring and Protection (M&P) scientists work to better understand the interactions of biological, chemical, and physical traits of streams throughout the Basin.

Although the Commission does not regulate water quality, it fulfills a critical role in monitoring conditions in a consistent, watershed-based manner, across jurisdictional boundaries. As such, M&P scientists collect and analyze data from streams to address a range of water quality challenges in the Basin, coordinating with agencies and other stakeholders to ensure the scientific data and interpretations generated by M&P scientists best inform decision makers on the sound management actions needed to prevent or resolve water quality issues.

The Susquehanna River is among the largest river systems in the United States, running 444 miles from Cooperstown, NY, to Havre de Grace, MD. The Susquehanna River Basin contains more than 49,000 miles of waterways, is 27,510 square miles in size, and includes all or parts of 66 counties in three states. The Susquehanna River provides about half of the freshwater to the Chesapeake Bay.





Long-term monitoring is critical in order to distinguish natural, short-term fluctuations from long-term changes in streams and rivers.

M&P PROJECTS AND PROGRAMS

M&P scientists monitor streams for a diverse set of projects and purposes. Several projects are funded largely through U.S. Environmental Protection Agency (USEPA) grants to study the health of streams within the Basin, including broad assessments of water quality within each of the six subbasins, evaluations of Basin streams that cross state lines, and investigations of large river systems and reservoirs in the lower portion of the Basin. The Commission also monitors the river in real-time for water chemistry changes that could affect public water suppliers.

USEPA funding is also used to investigate local or regional issues of concern or to identify and fill identified data gaps. A combination of federal and state funding is used to support monitoring that estimates and tracks nutrient and sediment loadings from the Susquehanna River Basin to the Chesapeake Bay.

With funding from member states New York, Pennsylvania, and Maryland, the Commission focuses on activities that are aimed to improve water quality along impaired streams. M&P scientists work to restore streams affected by mine drainage in the Basin. The Commission supports

a web portal that contains mine drainage data collected by several different agencies and organizations. M&P scientists have developed Total Maximum Daily Loads for more than 50 watersheds in Pennsylvania and have worked with agencies to identify sources and causes of impairments of Basin watersheds in Maryland.

M&P scientists conduct research projects funded internally by Commission user fees or through awarded grants. Current research projects focus on effects of natural low flow on stream habitat and aquatic life, presence and distribution of aquatic invasive species, effects of the reintroduction of American eel throughout the Basin, proposed flow releases to improve downstream conditions during periods of low flow, and implementation of Best Management Practices (BMPs) for stormwater control and improvement.

M&P scientists also help provide science-based results to guide regulatory decisions regarding shale gas drilling activities within the Basin. Scientists routinely assess streams proposed for water withdrawals and reassess streams when a water withdrawal permit is due for renewal. Scientists also research how established water withdrawals affect the habitat and aquatic life of the streams.

The Commission continuously monitors water quality conditions at about 60 sites on a real-time basis to track changes that might be related to natural gas drilling activities (mdw.srbc.net/remotewaterquality/data_viewer.aspx). The Commission supports a website that presents these data in real-time for public access. M&P scientists also routinely study the biological, physical, and more extensive chemical characteristics of these sites through regularly scheduled sampling.

M&P scientists regularly provide support to member jurisdiction agencies for projects aimed to fulfill their goals. These agencies include USEPA, Maryland Department of the Environment, Maryland Department of Natural Resources, New York Department of Environmental Conservation, Pennsylvania Department of Conservation and Natural Resources, Pennsylvania Department of Environmental Protection, and Pennsylvania Fish and Boat Commission.

The Commission also assists county and local governments and other organizations with technical experience and participates in community outreach and educational events.

WHAT DOES MONITORING SHOW?

M&P scientists have collected a great deal of data since the Commission's inception in 1970, with some datasets spanning several decades. Some datasets yield data for regional areas, while others target small-scale issues or questions. Generalized results can be grouped as follows:

- Long-term trend analyses indicate nutrient and sediment loadings from the Susquehanna Basin have either leveled out or continue to decrease.** Better water quality is observed in years with normal flow events. Extremely high loads of phosphorus and sediment are driven by high flow events. Monitoring identifies those sites with high or low nutrient and sediment loadings.
- Water quality in most of the larger tributaries are within acceptable limits established through standards or other research.** Real-time monitoring on the larger systems help clarify the cause of problematic readings. The Commission continues to assist state agencies tackle larger issues, such as the problems with the smallmouth bass population.
- Monitoring of mine drainage-affected streams helps isolate sources and document restoration of the streams after treatment is initiated.** Currently, the Commission is working to restore and delist 41 mine drainage-affected stream miles from the Pennsylvania Integrated Water Quality Monitoring and Assessment Report.
- Natural gas water withdrawals do not appear at this time to be affecting stream biology.** Based on available data, mandatory passby flow restrictions, maximum withdrawal limits, and short-term withdrawal allowances are protecting aquatic life.

- Continuous monitoring allows for analysis of water quality changes over time.** Continuous monitoring sondes are placed throughout the Basin.



Figure 2. Continuous monitoring results of temperature (blue line), pH (red line), and dissolved oxygen (green line) from July – Oct 2013 on the Susquehanna River at Kirkwood, NY.

- Analyses of continuous monitoring data in watersheds with natural gas drilling activity indicate mixed results.** Based on available data, land use, permitted dischargers, and geology appear to play the greatest role in influencing turbidity and specific conductance.

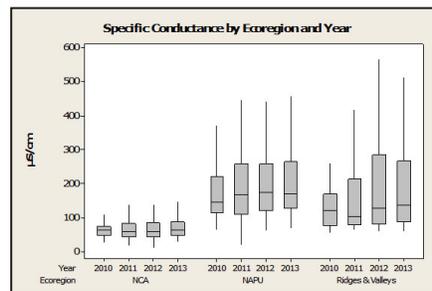


Figure 3. The Northern Appalachian Plateau and Uplands (NAPU) ecoregion's variability is affected by the natural geology. The Ridges and Valleys ecoregion has fewer sites and is affected by mine drainage.

SRBC DATA PORTALS

The Commission's website (www.srbc.net) houses several portals that provide public access to data collected as part of the Commission's programs to assess and track water quality conditions in the Basin.

WATER QUALITY PORTAL

mdw.srbc.net/waterqualityportal

Users can find chemical, biological, and habitat data for rivers and streams in the Basin. Users can submit queries for water chemistry, fish, macroinvertebrate, and habitat data.

MINE DRAINAGE PORTAL

mdw.srbc.net/minedrainageviewer

Users will find water chemistry data for parameters typically associated with mine drainage impacts at points of discharge and monitoring sites within the Basin.

WATER RESOURCE PORTAL

www.srbc.net/wrp/Default.aspx

The Commission's Water Resource Portal was established to enhance public access to information on projects regulated by SRBC. Through this portal, users have the ability to find the status of pending and approved projects, view and download certain pending applications and all Commission approvals, find the list of approved water sources for the natural gas industry, search by project sponsor, and sign up to receive electronic notices of pending projects.

- **Studies show surrounding land use can affect the health of a stream's physical characteristics or biological integrity.** Increasing percentages of agricultural land or forest cover can proportionately affect the populations of brown and brook trout. See Figure 4.
- **Widespread monitoring allows for characterization of different water quality conditions.** Geology and land use greatly affect the chemical profile of a stream. Understanding natural conditions helps frame interpretation of changes observed through monitoring activities. See Figure 5.
- **Multi-seasonal biological sampling identifies different biological communities.** Understanding natural shifts in a stream's biological community helps scientists recognize when observed changes may be linked to land use or other causes. See Figure 6.

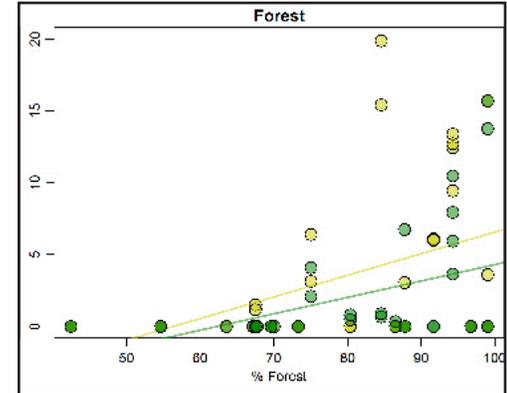
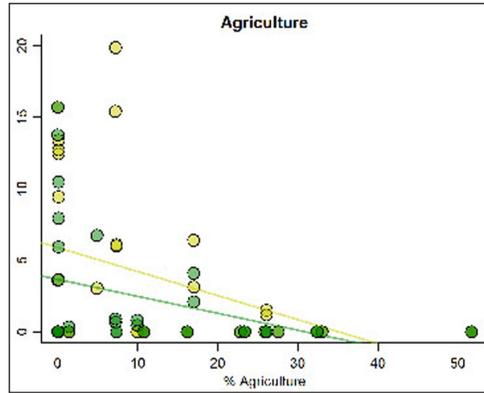


Figure 4. The graphs above compare the effects of agricultural land and forest cover on the populations of brown trout (in yellow) and brook trout (in green). The abundance of trout increases with more forest cover and decreases with more intense agricultural land uses.

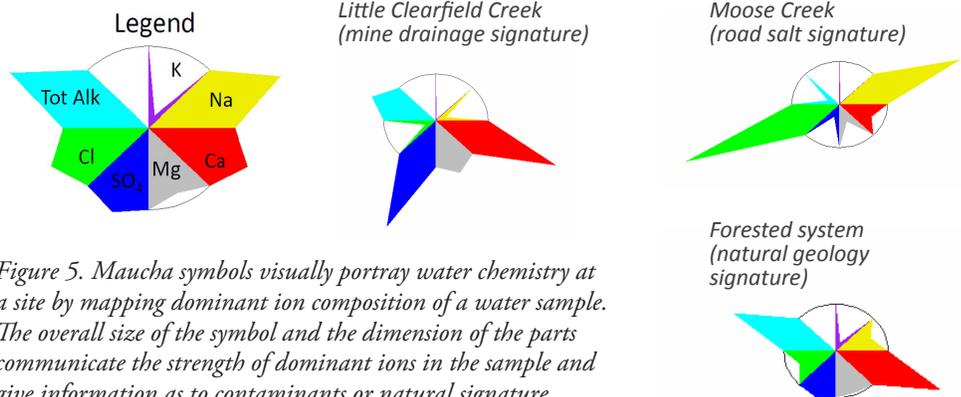


Figure 5. Maucha symbols visually portray water chemistry at a site by mapping dominant ion composition of a water sample. The overall size of the symbol and the dimension of the parts communicate the strength of dominant ions in the sample and give information as to contaminants or natural signature.

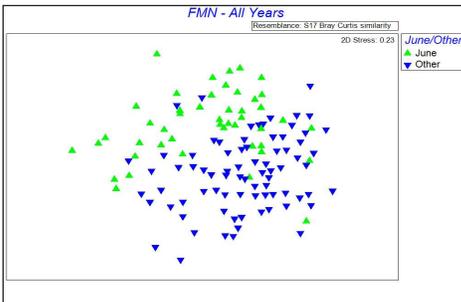


Figure 6. NMDS plots illustrate that the benthic macroinvertebrate community in early summer differs from the community in the same stream in late summer and early fall.

CONCLUSIONS

M&P scientists have the capability to sample various stream conditions for physical, chemical, and biological data. Data are then analyzed using various statistical and graphical methods to derive meaningful

conclusions about the processes occurring in the Basin. Many reports are released annually and can be found at www.srbc.net/pubinfo/techdocs/Publications/techreports.htm.

