Stream Quality Monitoring 2011 Annual Report

Mohican River
State Scenic River

Ohio

Department of Natural Resources
Division of Watercraft

Ohio Department of Natural Resources Division of Watercraft Scenic Rivers Program

Stream Quality Monitoring 2011 Annual Report Mohican State Scenic River

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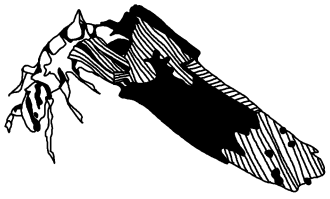


Ohio Scenic Rivers Program

With more than 60,000 miles of streams, Ohio is a water-rich state. Many of Ohio's streams support thriving plant and animal communities, including Ohio's state designated scenic rivers. Administered by the Ohio Division of Watercraft, the Ohio Scenic River Program oversees 14 state designated scenic river systems, comprising 800 river miles along 26 stream segments. These streams represent some of the best of Ohio's waterways.

Stream Quality Monitoring Project

Developed in 1983, the Ohio Stream Quality Monitoring (SQM) Project uses volunteers who assist in aquatic macroinvertebrate monitoring to compile biological and water quality data on the state's scenic rivers. The Ohio SQM Project is an excellent, simple, and cost-effective method of assessing a stream's health.

Aquatic macroinvertebrate organisms lack a backbone (invertebrate), are large enough to view with the naked eye (macro), and spend at least a portion of their lives in the water (aquatic). Macroinvertebrates, such as various aquatic insects (e.g. mayfly, stonefly), are good indicators of stream health. When negative impacts to a stream occur, the result may show a decline or absence of certain macroinvertebrate species.

Through consistent monitoring, changes observed in the macroinvertebrate community help the Ohio Scenic Rivers Program in detecting and addressing potential impacts to a stream. The Ohio Scenic Rivers Program compiles volunteer field assessment information into a statewide database. The database serves as a tool to track short- and long-term changes and trends over time.

SQM Project Relies on Volunteers

Coordinated by the Division of Watercraft's Scenic River Program, the Ohio SQM Project provides opportunities for public participation in scenic river protection efforts. Many local, youth and conservation organizations, individuals, and families are committed to monitoring more than 150 stations along Ohio's scenic rivers.

SQM volunteers collect macroinvertebrate data from selected monitoring stations, also referred to as monitoring sites or reference stations, at least three times during the monitoring season. Volunteers complete field assessment forms that document taxonomy, tolerance, and abundance of collected organisms.

SQM Annual Report

The information collected by volunteers has become a critical tool for documenting the health of Ohio's state scenic, wild and recreational rivers. This report is a compilation of field data collected during 2011 by volunteers and staff. It also represents a year of dedication and commitment shown to Ohio's special waterways by thousands of SQM volunteers.

Mohican State Scenic River Overview

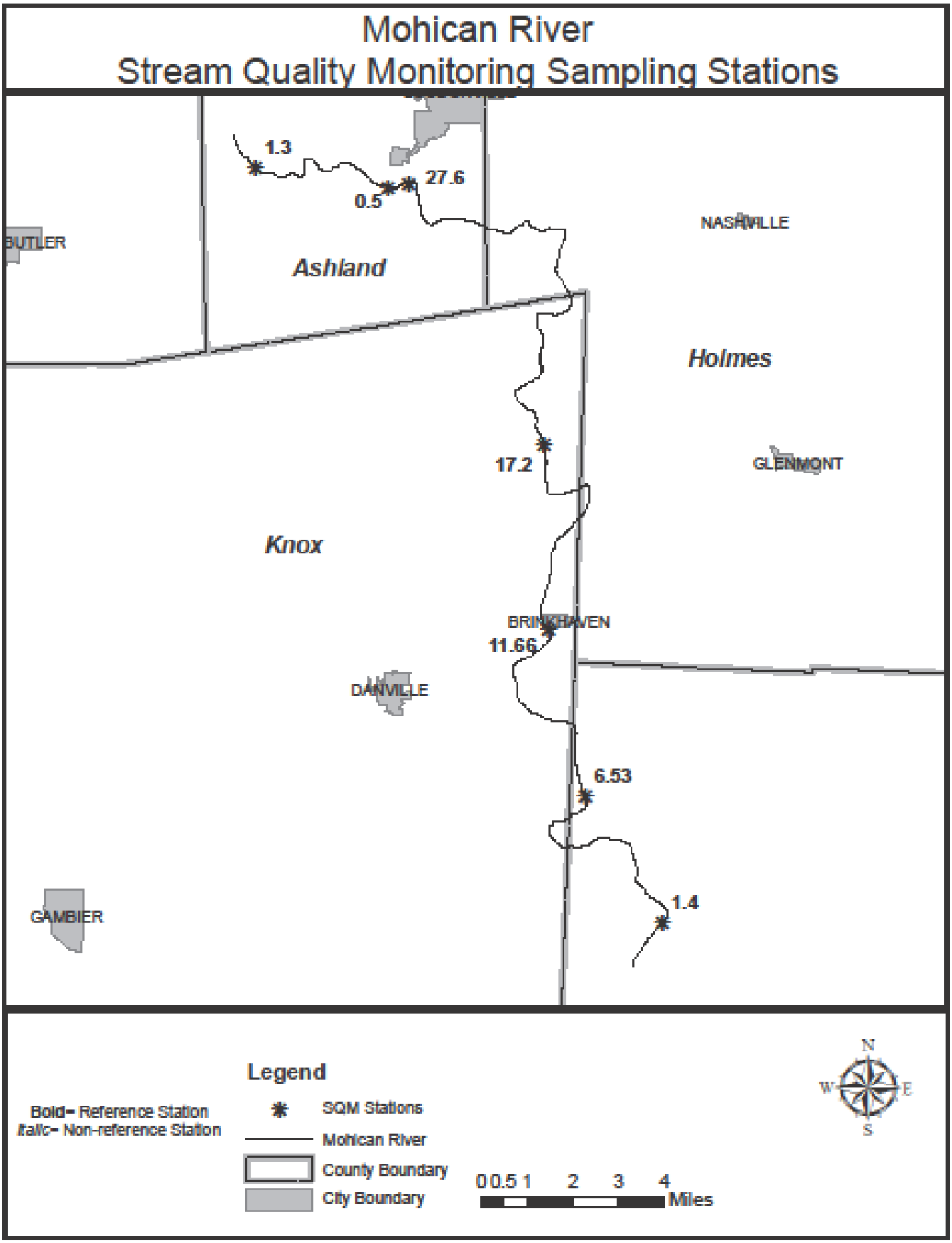
The Mohican River is located between Columbus and Cleveland, making it a favorite centralized retreat for many Ohioans. Draining nearly 1,000 square acres, the designated stretches of river are nestled within a narrow gorge running through Ashland, Holmes, Knox, and Coshocton counties. Three main tributaries flow together to form the main stem of the Mohican River; the Clear Fork (the lower portion of which is included in the designation), the Black Fork, and the Lake Fork.

The main stem of the Mohican River, totaling 27.6 miles, and the lower portion of the Clear Fork, totaling 4.8 miles, were designated the 13th state scenic river in 2006. When the Illinoian glacier pushed through the region 130,000 years ago, a significant change in the direction of the flow occurred. The ancient pre-glacial Mohican River pushed south, altering it from its original southwesterly flow. Carved by the Wisconsin glacier about 13,000 years ago, the Clear Fork Basin originally was divided into two watersheds. Both areas are comprised mainly of Black Hand sandstone, sand, and gravel. The soft composition allowed for debris from the receding glaciers to erode away the land forming the narrow valleys that the rivers flow through today. Large populations of hemlocks remain in the region as evidence of the last glacial advance.

Historically, the Mohican River valley was a popular area for several Native American tribes such as the Delaware and Mohegan. With lush forest, abundant game, fertile land, and waters that are easy to navigate year round, the region was also popular for European settlers. The Delaware tribe laid claim to the region until the signing of the Greenville Treaty in 1795 when they moved to the northwestern portion of the Ohio territory.

When European settlers moved into the area, several towns flourished with the construction of canals and railroads. The easily navigated waters and the connection with the Muskingum River allowed settlers to move goods such as lumber, wheat, and whiskey all the way down to New Orleans. John Chapman, also known as “Johnny Appleseed,” carved his name (now faded with time) in the sandstone wall at Lyons Falls at the upper end of the Clear Fork gorge. A regular visitor to the area, he spread nurseries throughout the valley.

With the desertion of the canals and railroads, the local economy has come to depend mainly on agriculture and tourism. A variety of outdoor activities are offered including canoeing, horseback riding, hiking, fishing, hunting, and camping. Additional information about public access facilities on the Mohican and Clear Fork Rivers are available through ODNR Division of Watercraft by calling 740-548-5490 or visiting ohiodnr.com/watercraft.


Mohican River
Stream Quality Monitoring Sampling Stations
1.3
27.6
0.5
NASHVILLE
BUTLER
Ashland
Holmes
17.2
GLENMONT
Knox
BRINKHAVEN
11.66
DANVILLE
6.53
1.4
GAMBIER
Legend
Bold= Reference Station
Italic= Non-reference Station
SQM Stations
Mohican River
County Boundary
City Boundary
0 0.5 1 2 3 4
Miles
N
W
E
S

2011 Stream Quality Monitoring Participants

Whether their contribution was a one-time event or a recurring adventure in stream exploration, the individuals and organizations listed below played a significant role in protecting the Mohican River and Clear Fork. Their time and dedication to this river and the Ohio SQM Program are greatly appreciated. Special thanks are also extended to the Mohican State Park, River Run Campground, private landowners and to all of the Mohican River partners for their continued efforts. These reference stations are also closely monitored by the Division of Watercraft staff.

Mohican River

River Mile 1.4 - County Rd 366
Volunteer Needed

River Mile 6.53 - County Rd 365, Mickley Property
Lincoln Scott

River Mile 11.6 - Main St, Brinkhaven
Lincoln Scott

River Mile 17.2 - Greer, Golovchenko Property
Mary and Johnny Golovchenko

River Mile 27.3 - County Rd 366, River Run Campground
Jeff Avalon
Discovery School
Ben Phillips

Clear Fork

River Mile 0.5 - Loudonville, Mohican State Park
Jeff Avalon
Ben Phillips

River Mile 1.3 - Covered Bridge, Mohican State Forest
Heironimus Family
Steve James
Jeremy Snyder
Cassie Huvler

The continued success of the Ohio SQM Project is dependent upon the commitment and dedication of these (and past) volunteers. We would like to recognize volunteers *Ben Phillips, Steve James, the Discovery School and Lincoln Scott* for monitoring three times or more during the season. If you are interested in becoming a volunteer, please contact the Central Ohio SQM Coordinator at 740-548-5490.

Station Descriptions

Stream quality monitoring (SQM) sites along the Mohican and Clear Fork Rivers were selected based on suitable macroinvertebrate habitat and access. Sites are located approximately every five river miles along the designated segments. There are other suitable riffle sites but most are on private property and are generally inaccessible. Brief descriptions of the Mohican and Clear Fork Scenic River SQM stations follow.

Mohican River

River Mile 1.4 - County Rd 366, New Castle Township

Located directly off County Road 366 in Coshocton County, this site is accessed from the west side of the road. An easement owned by the US Army Corps of Engineers, this land sits below the 890-foot elevation and subsequently falls within the “storage area” for the Mohawk Dam. Organic debris in trees 50 feet above the riffle are evidence of past flood control by the dam.

River Mile 6.53 - County Rd 365, Mickley Property, Triverton Township

This riffle is located just north of the County Road 365 Bridge in Coshocton County and is accessed by private property along the west side of the river. Permission from the landowner is necessary to access the property.

River Mile 11.6 - Main Street, Village of Brinkhaven

This site is located north of the Mohican Trail’s Bridge of Dreams just off Main Street in Brinkhaven within Knox County. Access to the riffle is from the ODNR Division of Wildlife’s property, the Mohican River Wildlife Area. An island divides the riffle at this location; the riffle west of the island is monitored. The riffle is large offering a variety of habitats for several species of macroinvertebrates. The giant stonefly is frequently collected at this site.

River Mile 17.2 – State Route 514, Golovchenko Property, Unincorporated Town of Greer

Located north of the State Route 514 Bridge in Knox County, this reference site is accessed by private property along the east side of the river. Permission from the landowner is necessary to access the property. The riffle at this site offers a variety of substrate and habitats making this an ideal site for macroinvertebrate collection.

River Mile 27.3 - Wally Road, River Run Camp Grounds, Hanover Township

This riffle is located just south of the confluence of the Black Fork and the Clear Fork. Access to the riffle is through the River Run Campground on Wally Road in Ashland County. All volunteers must give notice to the office or to the owner of the campground before accessing the site. The riffle at this site spans the river; however, the length is short, providing little diversity in habitat for the mmacroinvertebrates.

Clear Fork

River Mile 0.5 - State Route 3, Mohican State Park, City of Loudonville

This riffle is located in the Mohican State Park Campground. Access to the site is through the main entrance. Turn left on the drive before the park check-in; public parking is located at the end of the drive. Enter on river left and the riffle is located just upstream next to a patch of water willow. The substrate is diverse ranging from sand to boulders. The variation in the substrate creates ideal habitats for a large number of species. This site scores consistently in the excellent range of our assessment.

River Mile 1.3 - Covered Bridge, Mohican State Forest, State Route 97

Less than a mile south of the Pleasant Hill Dam, this riffle is located in the Mohican State Park near the modern covered bridge. The site is easily accessible by using unnamed park roads, following the signs for the covered bridge off State Route 97. Public parking and picnic sites make this is a great site for larger groups. The substrate at this site mainly comprises boulders and gravel. The ease of public access to this site makes the riffle vulnerable to human disruption. People often move the large rocks to make small dams for tubing. The regular movement disrupts the macroinvertebrate communities, forcing some of the more sensitive species downstream.

Sampling Results and General Trends

The 2011 field-monitoring season was the third wettest year on record (data from the National Oceanic and Atmospheric Administration). The increased amount of precipitation made accessing the rivers for sampling a challenge in the spring and fall. In several cases the spring samples could not be taken until July. The Scenic Rivers SQM Project requires that each assessment be conducted a minimum of 30 days apart. Because of this year's wet weather and SQM Project requirements for the 30-day minimum, samples were often conducted later in the season than normal. Additionally, the SQM Project requires a minimum of three readings to calculate a Cumulative Index Value (CIV). All sites were monitored at least three times for the 2011 monitoring season.

Volunteers and ODNR staff on the mainstem of the Mohican River conducted 17 assessments at five official monitoring sites in 2011. The Mohican River recorded an average CIV of 25.53, corresponding to the excellent range for stream quality. The 2011 CIV average has decreased over four points from the 2010 average CIV of 29.65. The decrease is a result of the decline of the CIVs at River Miles 17.2 and 27.3, the two most northern sites on the mainstem. River Mile 17.2 dropped 8 points and River Mile 27.3 dropped 9 points. Increased precipitation may have played a role in the decline of the two sites; both sites are subject to increased amounts of sedimentation during times of flooding. Volunteers and staff will closely monitor the riffles in 2012 to better assess the reason for the decline in the macroinvertebrate community. The average taxonomic diversity per assessment was 11 macroinvertebrate orders (e.g. stonefly, damselfly, mayfly, etc.), a decrease of two orders from 2010.

Volunteers and ODNR staff on the Clear Fork conducted 11 assessments at two official monitoring sites in 2011. The Clear Fork recorded an average CIV of 26.82, meeting the excellent range of stream quality. The 2011 CIV average is a slight decrease from the 2010 average CIV of 27.9; however, the decrease does not represent a significant change in water quality.. The average taxonomic diversity per assessment was 12 macroinvertebrate orders, the same average found in 2010.

Data collected by SQM Project volunteers and ODNR staff is used as a water quality-screening method. The data helps to detect significant changes in stream quality based on CIV data from sites monitored for many years. If there is a significant decline in the average CIV, potential problems that may be causing stream degradation can be investigated and addressed.

The staff of the Ohio Scenic Rivers Program appreciates the assistance we received from our dedicated volunteer monitors. It is only through their efforts that it was possible to complete the SQM samples on the Mohican River and Clear Fork during 2011. Working together has produced significant results but additional Scenic Rivers volunteers are needed to monitor reference sites, ensuring accurate and thorough data collection. For more information, please contact the Central Ohio SQM Coordinator at 740-548-5490.

Total Suspended Solids (TSS)

In 1999, the Scenic River Program added Total Suspended Solids (TSS) monitoring to the Stream Quality Monitoring (SQM) Project. The purpose of this addition is to estimate the amount of soil sediments affecting a stream by estimating the turbidity of the water. These sediments are attributed to problems originating upstream of the sampling site. The equipment is calibrated to predict TSS at 90% accuracy. The measurements are accurate enough to determine the changes in sediment rates in a stream at a given location and time.

Variables such as amount of precipitation, slope, and gradient of the river system, soil type, time of year data is collected, amount of development, amount of riparian corridor, velocity of the river flow, and the amount of waste water effluent within the stream have an effect on the TSS value.

Precipitation is important because of the increased potential for sediments to be carried into the river during a rain event. The TSS value may appear higher than normal if precipitation amounts are not taken into account. Since large rain events usually happen in the spring and early summer, the time of year the samples are taken could affect the TSS score. The gradient of the stream is important as well. Sediments do not settle out as easily in high gradient streams because the velocity of the water washes it downstream. In low gradient streams, sediment has a chance to settle out, resulting in a lower TSS value. Soil types affect TSS values because some soil types erode faster than others do. A better understanding of the types of soils within the watershed may give way to a better understanding of the baseline TSS values for a stream.

Development in an area can cause changes in the TSS score. Areas cleared for new buildings are often not covered, causing an acute rise in the amount of suspended solids in nearby streams. Impermeable surfaces can also cause chronic elevation of TSS values because there is no buffer to absorb or trap runoff. Wastewater treatment plant effluent would only affect TSS scores in low flow situations, and only if the plant employs only primary or secondary treatment.

The actual process of taking a sample is simple. Using a clear Lucite sediment stick developed by the Lake Soil and Water Conservation District, a water sample is collected from the stream. Keeping the sample materials suspended, water is then poured out of the tube until the 0.4-inch target dot is visible on the tube bottom. A reading of the water column height is taken from the markings on the stick to the nearest ¼ inch. A conversion table is then used to convert the sediment stick reading to total suspended solids measurement in the form of an estimate of the weight of solids suspended in the water column (mg/l).

The TSS measurement can be used to estimate water quality with the following scale:

TSS <10 mg/l = excellent water quality
TSS 10-28 mg/l = normal water quality
TSS 29-133 mg/l = impaired water quality
TSS >133 mg/l = severely impacted water quality

2011 Results: A total of nine TSS readings were taken in the Mohican River. The river had a median value of 16 mg/l of TSS, which corresponds to the normal range. The data set ranged from 11 mg/l to 49 mg/l of total suspended solids. Eleven TSS readings were taken in the Clear Fork. The Clear Fork had a median value of 9 mg/l of TSS, which corresponds to the excellent range. The data set ranged from <6.2 mg/l to 19 mg/l of total suspended solids.

Comparisons of Collected Stream Quality Monitoring Data

Typically, monitoring of the same reference station is performed a minimum of three times per year consistently year after year. An assessment of the diversity and tolerance levels of taxonomy collected generates the Cumulative Index Value (CIV) for the site on a given date. Field assessment results are used as basic indicators of long-term changes in a stream's macroinvertebrate community and help Scenic Rivers staff identify pronounced stream quality problems.

The following Table 1 identifies the 20 macroinvertebrates assessed and their general tolerance to pollutants. Pollution-intolerant organisms, such as those listed in Group I, require unpolluted, high quality water in order to survive. Pollution-tolerant organisms, such as those listed in Group III, are extremely tolerant of deteriorated water conditions.

Table 1. Macroinvertebrate Pollution Tolerance

Group I Taxa Pollution Intolerant	Group II Taxa Moderately Tolerant	Group III Taxa Pollution Tolerant
Water Penny Beetle Larvae (WP)	Damselfly Nymphs (DA)	Black Fly Larvae (BF)
Mayfly Nymphs (MF)	Dragonfly Nymphs (DR)	Aquatic Worms (AW)
Stonefly Nymphs (ST)	Crane Fly Larvae (CR)	Midge Larvae (MI)
Dobsonfly Larvae (DO)	Beetle Larvae (BL)	Pouch Snails (PS)
Caddisfly Larvae (CD)	Crayfish (CF)	Leeches (LE)
Riffle Beetle Adult (RI)	Scuds (SC)	
Other Snails (OS)	Clams (CL)	
	Aquatic Sowbugs (SW)	

Tables 2 and 3 represent the mean CIV for each SQM reference station sampled on the river during 2011. In addition, the table uses symbols (◆) to indicate those macroinvertebrates found to be present at least once during the year at the respective reference station. Each macroinvertebrate is identified by a two-letter code given in Table 1. A CIV of 23 or greater indicates *Excellent* stream quality; a CIV of 17-22 indicates *Good* stream quality; a CIV of 11-16 suggests *Fair* stream quality; and a CIV of 10 or less reflects *Poor* stream quality. Situated beside the CIVs are the symbols + (improved), = (equal), or – (declined) indicating the relationship to the previous year's CIV.

For the full range of CIVs attained at all sites monitored during the year including non-reference stations, please see the *Appendix*.

Table 2. Mohican River 2011 Mean CIVs by Reference Station

STATION	WP	MF	ST	DO	CD	RI	OS	DA	DR	CR	BL	CF	SC	CL	SW	BF	AW	MI	PS	LE	CIV
1.4	◆	◆	◆	◆	◆	◆	◆	◆	◆		◆	◆		◆		◆	◆	◆		◆	31-
6.53	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆		◆			◆	◆		◆	30-
11.6	◆	◆	◆	◆	◆	◆	◆	◆	◆		◆	◆		◆	◆	◆	◆	◆	◆		31+
17.2	◆	◆	◆	◆	◆	◆	◆		◆	◆	◆	◆		◆	◆	◆	◆	◆			22-
27.3	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆		◆	18-

Table 3. Clear Fork 2011 Mean CIVs by Reference Station

STATION	WP	MF	ST	DO	CD	RI	OS	DA	DR	CR	BL	CF	SC	CL	SW	BF	AW	MI	PS	LE	CIV
0.5	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆		◆	◆			26-
1.3	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	28+

Figures 1.1 and 1.2 represent the maximum and minimum range of CIVs recorded during the year for each reference station. Figures 2.1 and 2.2 represent the mean CIV at each reference station.

Figure 1.1 Mohican River 2011 CIV Maximum and Minimum Ranges

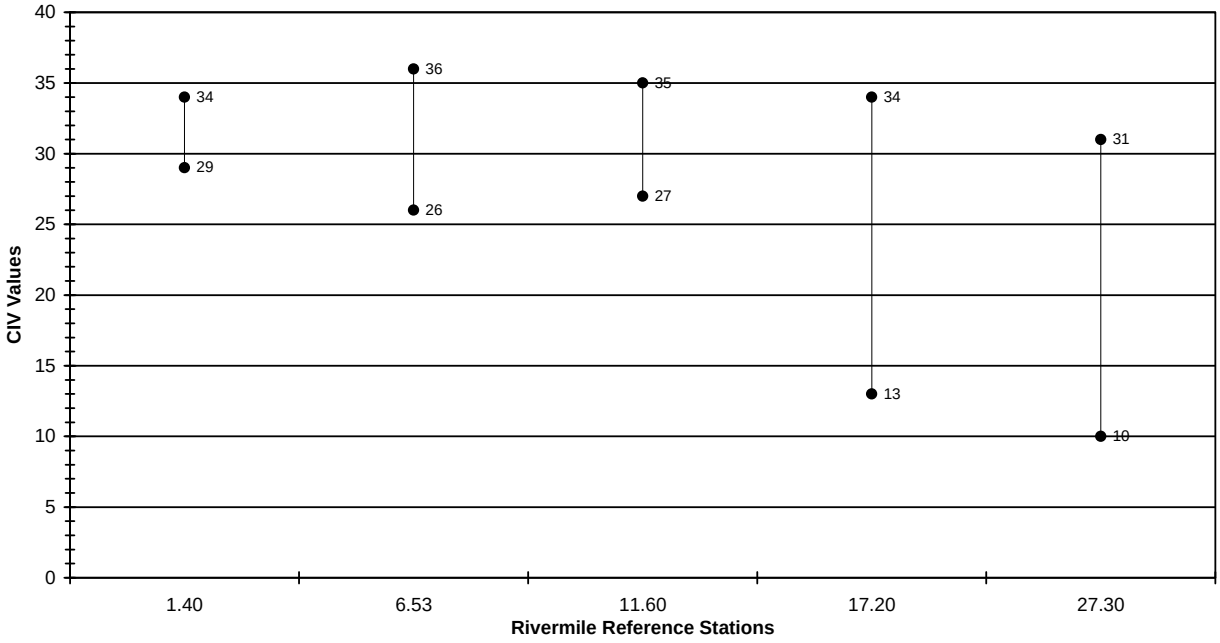


Figure 2.1 Mohican River 2008-2011 Mean CIVs

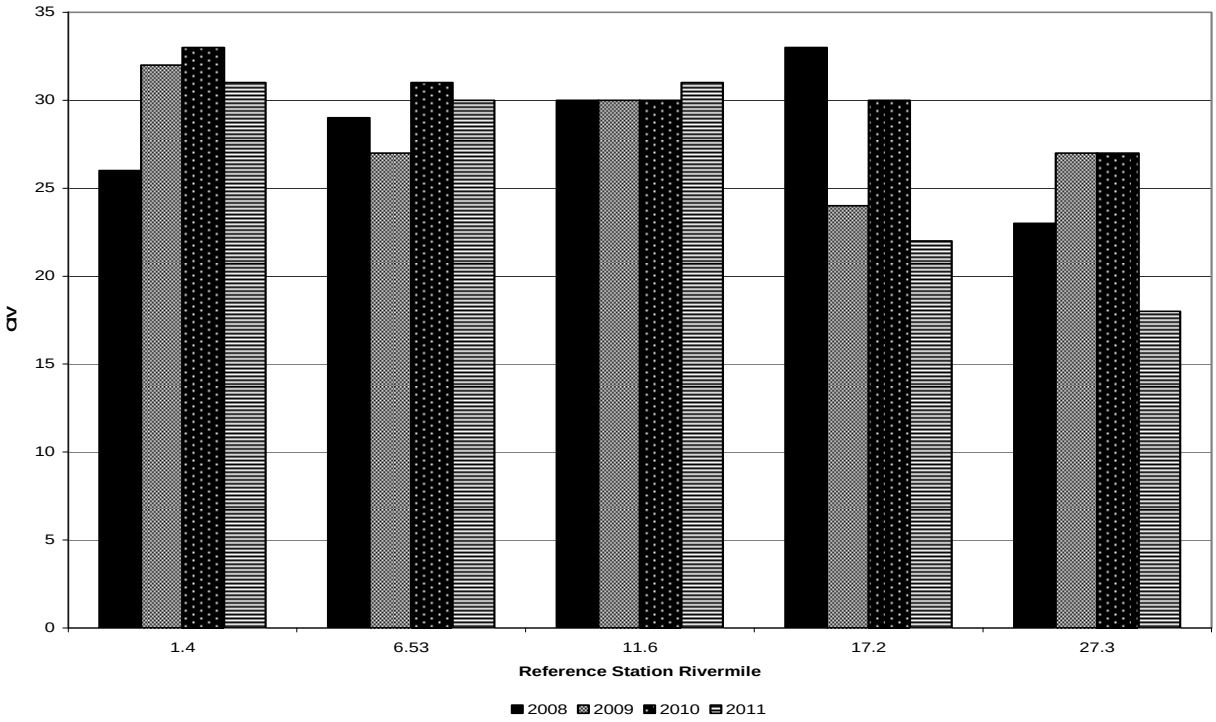


Figure 1.2 Clear Fork 2011 CIV Maximum and Minimum Ranges

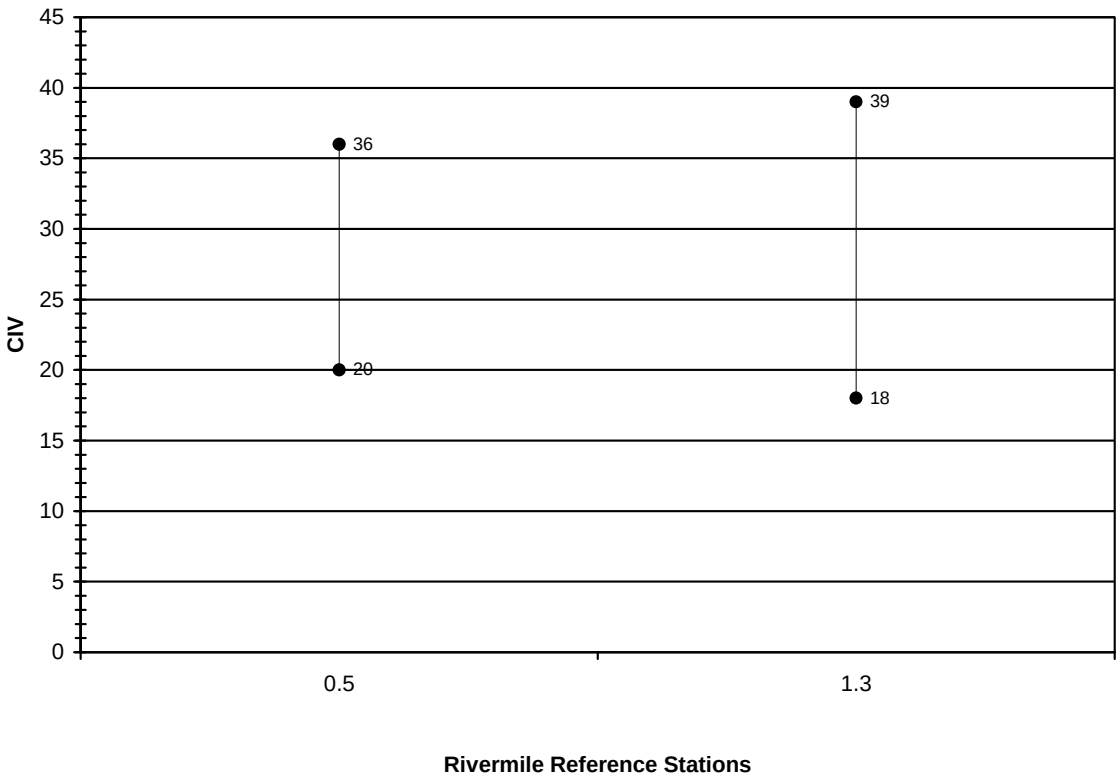
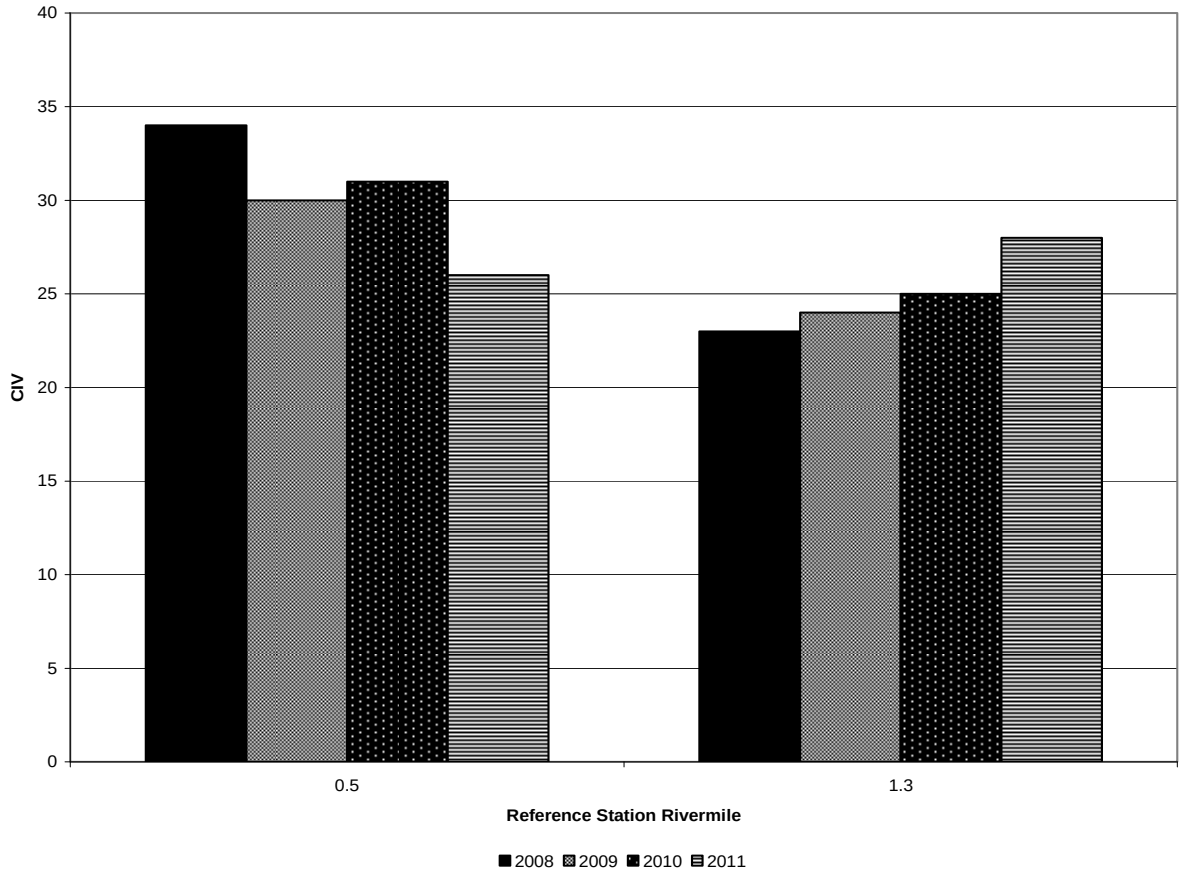


Figure 2.2 Clear Fork 2008-2011 Mean CIVs



Qualitative Habitat Evaluation Index (QHEI)

The Qualitative Habitat Evaluation Index (QHEI) is a system developed and employed by the Ohio Enironmental Protection Agency (OEPA) to measure physical habitat conditions in and around rivers and streams in Ohio. During 1998, the Stream Quality Monitoring Project staff tested a modified version of the QHEI, referred to as *Citizen's QHEI,* to gather baseline measurements at reference stations on several of Ohio's scenic rivers. It is anticipated that such measurements will become yet another annual tool that will be used to monitor habitat and water quality conditions on all Ohio scenic rivers.

Results from 2010 QHEI are included below. When attempting to interpret this data, it is important to recognize that OEPA generally concludes that any site receiving a QHEI value greater than 60 meets current warm water habitat (WWH) standards. Meeting WWH standards suggests that such locations should be adequate for supporting reproducing communities of fish and macroinvertebrate life. Sites attaining QHEI scores of greater than 75 are generally believed to contain exceptional habitat conditions for warm water communities.

Table 4 and 5 have been prepared to assist with determining the relationship between habitat conditions (measured by the QHEI) and macroinvertebrate community performance (measured by the Cumulative Index Value), at each of the reference stations on selected rivers.

Table 4 - Mohican Mainstem 2010 QHEI and SQM Assessment Data

Reference Station	QHEI	Attainment Status	2010 Average CIV	SQM Assessment
RM 1.4	85	FULL	33	Excellent
RM 6.53	84.5	FULL	31	Excellent
RM 11.6	86.5	FULL	31	Excellent
RM 17.2	83	FULL	30	Excellent
RM 27.3	83.5	FULL	28	Excellent

Table 5 - Clear Fork - Mohican QHEI and SQM Assessment Data

Reference Station	QHEI	Attainment Status	2010 Average CIV	SQM Assessment
RM 0.5	78.5	FULL	31	Excellent
RM 1.3	79	FULL	25	Excellent

Appendix

Stream Quality Monitoring Data by Monitoring Station

2011 CIVs by Monitoring Station
MOHICAN RIVER

RM	DATE	WP	MF	ST	DO	CD	RI	OS	DA	DR	CR	BL	CF	SC	CL	SW	BF	AW	MI	PS	LE	CIV
1.40	7/21/2011	B	B	B		C	B	B		A		B	A		B			A	A		A	29.00
1.40	9/14/2011	B	B	B	A	C	B	B	B	A		B	B		B		B	B	B			34.00
1.40	11/10/2011	B	C	B	A	C	A	B	A			B			B			B	A			29.00
6.53	7/21/2011	B	B	A		C	B	B		A		A	A		B			A	A			28.00
6.53	8/28/2011	B	C	B		C	A	C		A			B		A			A	A			26.00
6.53	11/10/2011	B	C	B	A	C	A	B	A	A	A	B	A		B			B	B		A	36.00
11.60	7/21/2011	B	B	A		C	A	B	A	A		A	A		A		A	B	B			31.00
11.60	8/28/2011	B	C	B	A	C	A	A		A			A		B			B	A			27.00
11.60	11/10/2011	B	B	B	B	C	A	B	A			A	A		B	B	A	A	A	A		35.00
17.20	7/5/2011		A	A			A	A											B			13.00
17.20	10/9/2011		A	A	A	A		A		A							A	A	A			20.00
17.20	11/10/2011	A	B	A	A	B	A	B			B	B	A		A	A	B	B	B			34.00
27.30	6/12/2011		A	A		B	A	A					A	A		A		A	A			23.00
27.30	6/30/2011	A		A									A	B								10.00
27.30	8/20/2011	A	B	B		B	A								A			A				17.00
27.30	8/29/2011	A		A				A						A								11.00
27.30	10/9/2011		C		A	C	A	A	A	A	B	A	A		A		B	B	A		A	31.00

2011 CIVs by Monitoring Station
CLEAR FORK-MOHICAN RIVER

RM	DATE	WP	MF	ST	DO	CD	RI	OS	DA	DR	CR	BL	CF	SC	CL	SW	BF	AW	MI	PS	LE	CIV
0.50	6/12/2011	B	C	C		A	A	C	A			A	A			B		A	A			28.00
0.50	6/30/2011	A	A	A				A		A			A	A	A			B				21.00
0.50	8/20/2011	C	B	C		C	A	C	A		A		A					A				24.00
0.50	8/29/2011	A	A	A				A			A	A						A				20.00
0.50	10/9/2011	B	C	B	A	C	A	B	B	A	A	A	A		A	A		A				36.00
1.30	6/20/2011		B	B		A		A	A	A	A	A	A			A		B	A	A		27.00
1.30	6/22/2011	A	A	B	B	C	A	B		B	A	A	A	A	A	A	B	A	C		A	39.00
1.30	6/25/2011		C		B	C	B	B		A		A	B		A			B	B			26.00
1.30	7/15/2011		B			C		A		A	A	A	A					A	A			19.00
1.30	8/28/2011		B	B	A	C	B	B	A	A	A	A	B	A	B	A		B		A	A	37.00
1.30	8/30/2011		B		B	C		A					A					B	A	A	B	18.00