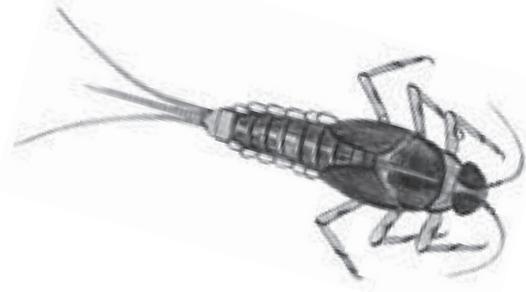


Stream Quality Monitoring 2009 Annual Report



Mohican River State Scenic River



Department of Natural Resources
Division of Watercraft



Stream Quality Monitoring 2009 Annual Report

Mohican State Scenic River

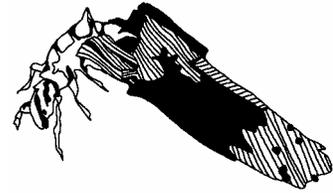
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Introduction

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 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 macroinvertebrates are organisms that 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 Ohio 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 the documentation of the health of Ohio's state scenic, wild and recreational rivers. This report is a compilation of field data collected during 2009 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

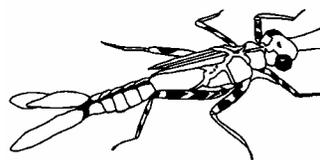
The Mohican River is located between Columbus and Cleveland, making it a favorite centralized retreat for many Ohioans. Draining nearly 1000 square acres, the designated stretches of river are nestled within a narrow gorge running through Ashland, Holmes, Knox and Coshocton counties. Three main tributaries 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 was pushed south, altering it from its original southwesterly flow. The Clear Fork is a younger river, forming only a few thousand years ago. Originally a divide between two watersheds, the Clear Fork was carved by the Wisconsin glacier about 13,000 years ago. Both areas are comprised mainly of Black Hand sandstone, sand, and gravel. The soft composition allowed for the debris from the receding glaciers to easily 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 were 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 in the sandstone wall at Lyon Falls at the upper end of the Clear Fork gorge (now faded with time). 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.



2009 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 1.7 - County Rd 366

Carolyn and Rich Hagopian

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, Johnny and Dimitry Golovchenko

River Mile 27.3 - County Rd 366, River Run Campground

Jeff Avalon
Discovery School

Clear Fork

River Mile 0.5 - Loudonville, Mohican State Park

Lincoln Scott
Jeff Avalon

River Mile 4.03 - Covered Bridge, Mohican State Forest

Heironimus Family

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 *Carolyn and Rich Hagopian; Lincoln Scott; and Mary, Johnny and Dimitry Golovchenko* for monitoring at least three times during the season. If you are interested in becoming a volunteer, please contact the Central Ohio SQM Coordinator at 740-548-5490.

Stream Quality Monitoring 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 1.7 - County Rd 366, New Castle Twp

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

River Mile 6.53 - County Rd 365, Mickley Property, Triverton Twp.

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 land owner is necessary to access the property.

River Mile 11.6 - Main St, 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 – ST RT 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 land owner 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 Rd., River Run Camp Grounds, Hanover Twp.

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 macroinvertebrates.

Clear Fork

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

This riffle is located in the Mohican State Park Campgrounds. Access to the site is through the main entrance and turning 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 4.03 - Covered Bridge, Mohican State Forest, St. Rt. 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. There is plenty of public parking as well as a picnic area making 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 a small dam. The regular movement disrupts the macroinvertebrate communities moving some of the more sensitive species downstream.

Sampling Results and General Trends

Weather conditions for the 2009 field monitoring season were favorable. Precipitation levels were near normal and the record low temperatures in July (data from the National Oceanic and Atmospheric Administration) supported a diverse macroinvertebrate community. We require three readings to calculate a Cumulative Index Value (CIV). All sites were monitored at least three times for the 2009 monitoring season.

Volunteers and staff on the main stem of the Mohican River conducted a total of 22 assessments at five official monitoring sites in 2009. The Mohican River recorded an average CIV of 27.77, corresponding to the excellent range for stream quality. However, the average was slightly decreased from the 2008 average CIV of 28.4. The average taxonomic diversity per assessment was 12 macroinvertebrate orders (e.g. stonefly, damselfly, mayfly, etc.).

Volunteers and staff on the Clear Fork conducted a total of nine assessments at two official monitoring sites in 2009. The Clear Fork recorded an average CIV of 27.22, also meeting the excellent range of stream quality. Again, the average was slightly lower than the 2008 average CIV of 28.5. The average taxonomic diversity per assessment was 11 macroinvertebrate orders.

Although the CIV scores are down from the previous year the overall averages are still in the high excellent range. All reference stations had an average CIV of excellent. We will continue to monitor all areas and strive to improve the stream quality.

Volunteer and staff data are used for the Ohio SQM Project as a water quality-screening method. The data helps in detecting significant changes in stream quality based on CIV data from sites that have been monitored for many years over time by staff and trained volunteers. In the event that significant CIV declines are noticed for a particular site, potential problems that may be causing stream degradation can be further 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 in the Mohican and Clear Fork Rivers during 2009. Working together has produced significant results but additional volunteers are needed to monitor at all reference sites to ensure accurate and thorough data. 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 $\frac{1}{4}$ 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 further 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

2009 Results: A total of four TSS readings were taken on the Mohican River. The river had a median value of 30 mg/l of TSS, which corresponds to the impaired range. The data set ranged from 26 mg/l to as high as 347 mg/l of total suspended solids. Three TSS readings were taken on the Clear Fork. The Clear Fork had a median value of <6.2 mg/l of TSS, which corresponds to the excellent range. The data set ranged from <6.2 mg/l to 8.2 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) Mayfly Nymphs (MF) Stonefly Nymphs (ST) Dobsonfly Larvae (DO) Caddisfly Larvae (CD) Riffle Beetle Adult (RI) Other Snails (OS)	Damselfly Nymphs (DA) Dragonfly Nymphs (DR) Crane Fly Larvae (CR) Beetle Larvae (BL) Crayfish (CF) Scuds (SC) Clams (CL) Aquatic Sowbugs (SW)	Black Fly Larvae (BF) Aquatic Worms (AW) Midge Larvae (MI) Pouch Snails (PS) Leeches (LE)

Tables 2 and 3 represent the mean CIV for each SQM reference station sampled on the river during 2009. 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 2009 Mean CIVs by Reference Station

STATION	W P	M F	S T	D O	C D	R I	O S	D A	D R	C R	B L	C F	S C	C L	S W	B F	A W	M I	P S	L E	CIV
1.7	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆		◆	◆	◆	◆	32+
6.53	◆	◆	◆	◆	◆	◆	◆		◆	◆	◆	◆		◆	◆	◆	◆		◆		27-
11.6	◆	◆	◆	◆	◆	◆	◆	◆	◆		◆	◆		◆	◆	◆	◆		◆		30=
17.2	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆		◆		◆	◆	◆	◆		◆		24-
27.6	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	27+

Table 3. Clear Fork 2009 Mean CIVs by Reference Station

STATION	W P	M F	S T	D O	C D	R I	O S	D A	D R	C R	B L	C F	S C	C L	S W	B F	A W	M I	P S	L E	CIV
0.5	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	30-
4.03		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	24+

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 2009 Mohican River CIV Maximum and Minimum Ranges

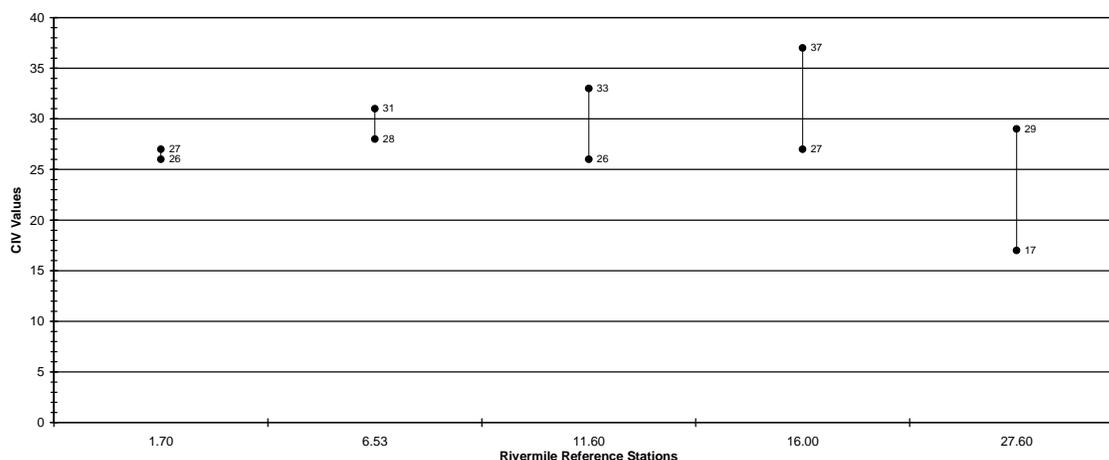


Figure 2.1 2009 Mohican River Mean CIVs

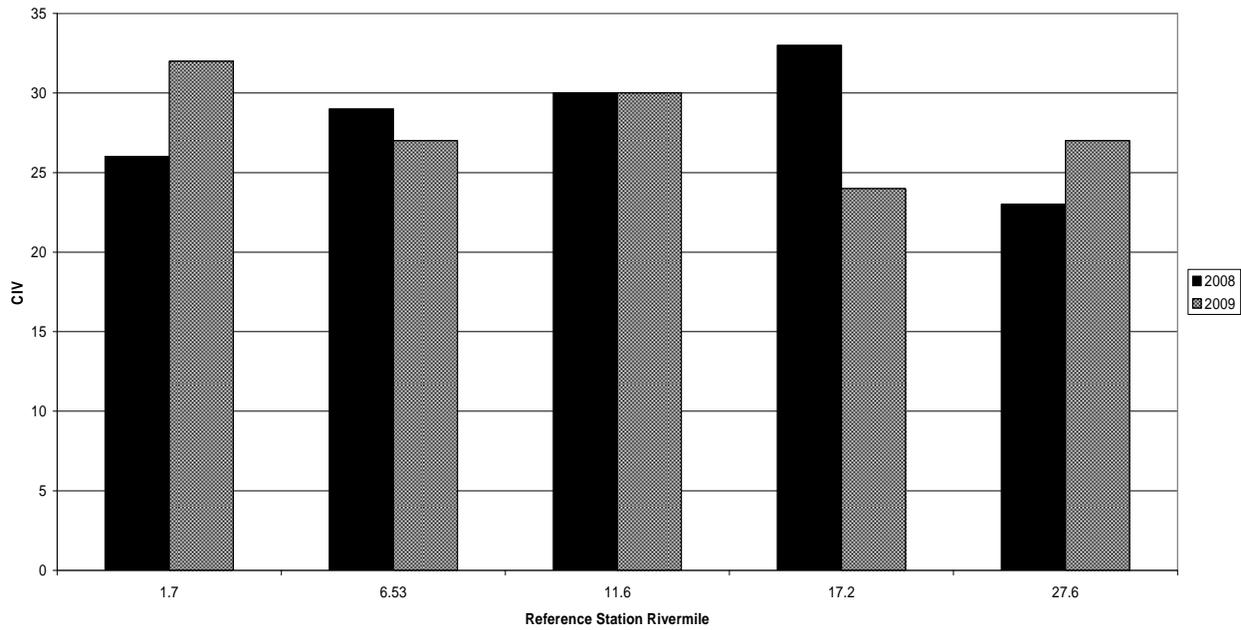


Figure 1.2 2009 Clear Fork CIV Maximum and Minimum Ranges

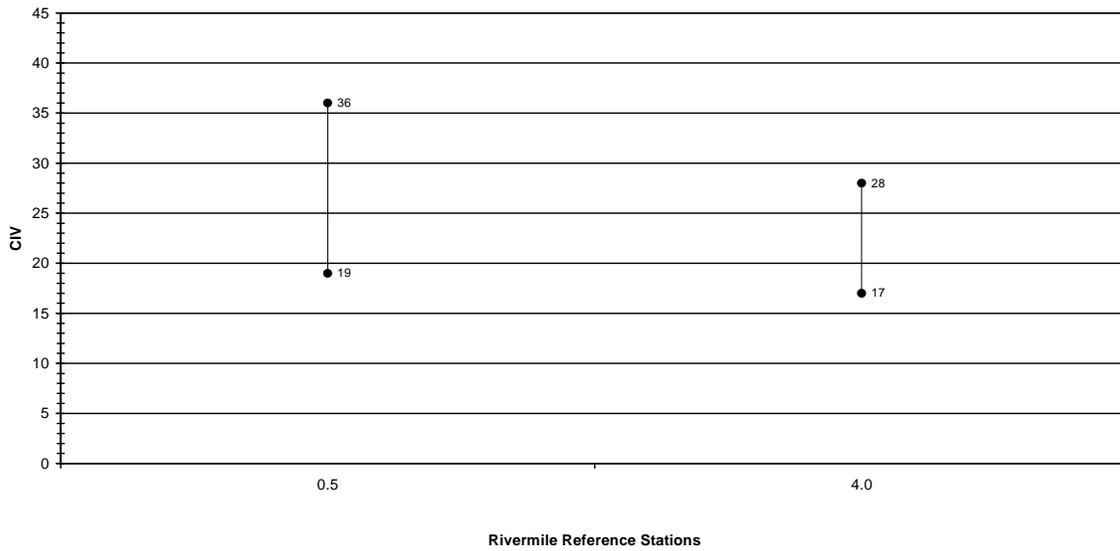
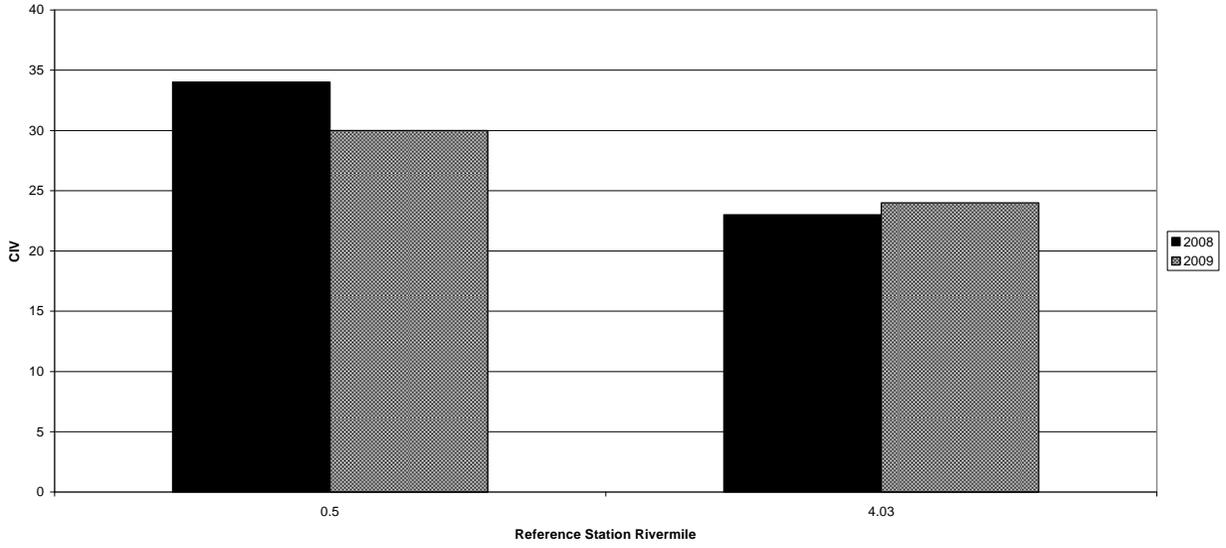


Figure 2.2 2009 Clear Fork Mean CIVs



Appendix

Stream Quality Monitoring Data by Monitoring Station

2009 CIVs by Monitoring Station																						
MOHICAN RIVER																						
RM	DATE	W P	M F	S T	D O	C D	R I	O S	D A	D R	C R	B L	C F	S C	C L	S W	B F	A W	M I	P S	L E	CIV
1.70	6/27/2009	B	A	B		A	B	A			A	A	A		B	B		B	A	B		31.00
1.70	8/22/2009	C	C	B		B	B	B	A	A	A		B		C			B	A		B	31.00
1.70	11/9/2009	B	B	B	A	C	A	B	A		A	B	A		B			B	A		A	34.00
6.53	6/9/2009	B	B	B		C	A	B		A	A	B			B		A	A	B		A	30.00
6.53	7/11/2009	A	B	B	A	B		A				B	A		B		B	A	B			27.00
6.53	9/3/2009	B	C	B	A	B	B	B				B	A		A			B	A			29.00
6.53	10/14/2009	B		B		C		B		A			A			A		B	A			20.00
11.60	6/9/2009	B	B	B	A	B	A	B		A		A	A		A	B	A	A	B		A	35.00
11.60	7/11/2009	B	B	B	A	B	B	B		B		A	A		A	B	B	A	B			34.00
11.60	9/3/2009	B	B	B	A	B	B	B				B	A		B		A	B	B			30.00
11.60	10/14/2009	A		A		C		B	A	B			A		A			A	A			22.00
17.20	6/17/2009	A	B	B		C	A	A		A					B			A	B	A		25.00
17.20	8/24/2009		B	B	A			B	B		B		A		A	A	B		B			24.00
17.20	10/10/2009		A	A	A		A	B			A		A		A				B			22.00
27.30	5/20/2009		A	A		B	A	A		A	A		A			A		A	A			25.00
27.30	5/20/2009		A	A	A	B	A	A			A		A			A		A	A			26.00
27.30	5/20/2009		A	B		A	A		A	A	A		A			A		A				23.00
27.30	5/20/2009		A	A	A	B	A				A		A					B				20.00
27.30	7/19/2009	A	B	A		C	A	A				A	A			A	A	A	A	A		28.00
27.30	9/25/2009		B	A		B	A	A			A	A	A	A	A	A	A	B	A		A	31.00
27.30	9/25/2009	A	B	A		B	A			A		B	A		A	B		B	B			27.00
27.30	9/25/2009	A	B	A	A	C	A	A	A			A	A	A	A	C	A	A	B		A	37.00

2009 CIVs by Monitoring Station CLEAR FORK-MOHICAN RIVER																						
RM	DATE	W P	M F	S T	D O	C D	R I	O S	D A	D R	C R	B L	C F	S C	C L	S W	B F	A W	M I	P S	L E	CIV
0.50	6/9/2009	B	B	C	A	B	A	B			A	A	B			B	A	A	B			32.00
0.50	6/27/2009	B	B	B	A	C	A	B	A		A	B	B			B		A	B			33.00
0.50	7/11/2009	A	B	C		B	A	B			A	A	A			B	A	A	B			29.00
0.50	7/19/2009	B	B	B	A	B	A	B		A	A	B	A		B	B		A	B	A		36.00
0.50	10/14/2009	C		B		B		B						B	A	B		A				19.00
4.03	6/27/2009		A	A		B		A		A		A	A			B	C	A	B			23.00
4.03	8/30/2009		B		A	C		B	A	A	C	A	A	A	B		B			B		28.00
4.03	9/3/2009		B		A	B	B	B	A	A		A	A				B	B	B	A	A	28.00
4.03	11/9/2009		B		B	C		A			A						A	B	B			17.00