

Little Beaver Creek State Wild and Scenic River and National Scenic River



Ohio
Stream Quality Monitoring
2008 Annual Report



Little Beaver Creek State Wild & Scenic River National Scenic River 2008 Stream Quality Monitoring Annual Report

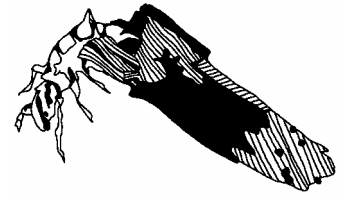
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Introduction

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 Natural Areas and Preserves, the Ohio Scenic Rivers 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 in size 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 Natural Areas and Preserves, 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, three times during the monitoring season. Volunteers complete field assessment forms which document taxonomy, tolerance and abundance of collected organisms.

SQM Annual Report

The information collected by volunteers has become a critical tool for the documenting of the health of Ohio's state scenic, wild and recreational rivers. This report is a compilation of field data collected during 2008 by volunteers and staff. It also represents a year of dedication and commitment shown to Ohio's special waterways by thousands of SQM volunteers.

Little Beaver Creek

State and National Wild & Scenic River

Overview

Flowing through some of Ohio's wildest and most scenic areas, Little Beaver Creek in Columbiana County was the first in Ohio to be designated a wild river by the Ohio Department of Natural Resources on January 15, 1974. Little Beaver Creek is one of only three rivers in Ohio that have also been designated as National Scenic Rivers.

Little Beaver Creek is a river of deep valleys, wooded slopes and occasional rock outcroppings. The river is boulder-strewn, consisting of fast-flowing rapids and riffles, quiet pools and fed by clear swift-flowing tributaries. It is a river of great diversity and is relatively untouched by development. In addition to a diverse macroinvertebrate population, Little Beaver Creek supports 63 species of fish, 49 mammal species, 140 types of birds and 46 species of reptiles and amphibians. Ohio's largest population of the endangered Hellbender salamander resides in Little Beaver Creek.

Glaciers once covered the northern-most portion of the watershed. The varying depths of deposited glacial drift create the impression of a high, flat plain and bedrock is exposed only along eroded stream valleys and on former ridge tops. Glacial moraines, those "ridges" that mark the southern-most advance of the glaciers, influenced topography in the middle portion of the watershed. These moraines are evident today as gentle upper slopes and steep lower slopes leading to the river. The river valley appears gorge-like, with visible sandstone, shale and coal bedrock.

Unaffected by glaciers, the southern portion of the watershed is very different. The landscape is hilly and rugged with the stream flowing 300-400 feet below. Steep topography in the region inhibits development and allows the river to retain its wild and natural character. However, the abundance of coal in the region is evidenced by strip mines. Fortunately, few of the mining areas are visible from the river.

History abounds in the Little Beaver Creek Valley. A historical marker now identifies the spot where in 1785, Thomas Hutchins began the first U.S. Public Land Survey. At the time, this was the greatest subdivision of land in America and represented the first time that land was actually surveyed prior to being sold. In 1848, the Sandy and Beaver Canal, linking the Ohio River with the Ohio-Erie Canal, was completed with 30 dams, 90 locks and two tunnels. Remnants of the once thriving canal system are well preserved throughout the region.

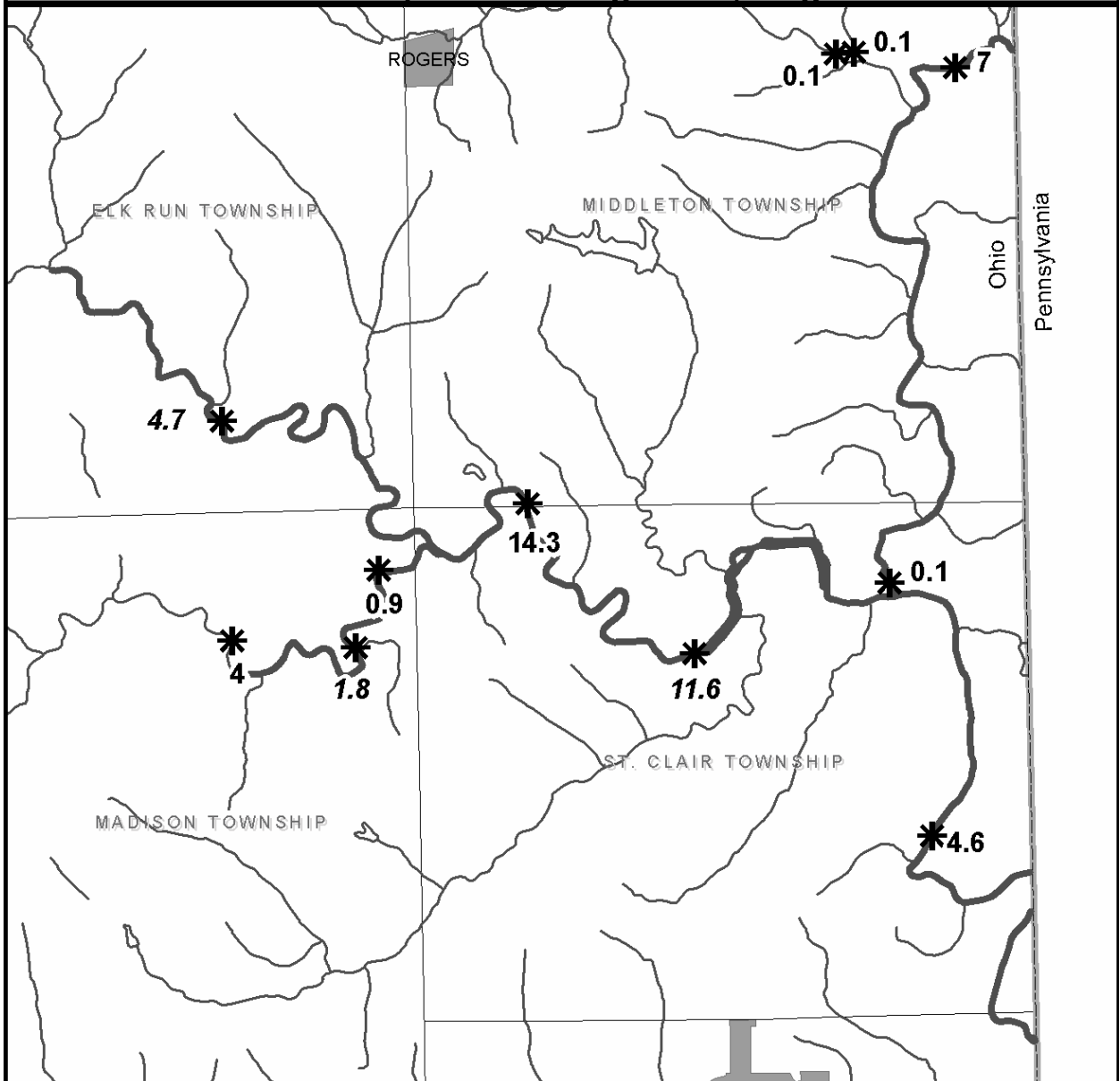
Recent efforts to protect the Little Beaver Creek include the acquisition and protection of Sheepskin Hollow State Nature Preserve by the Ohio Division of Natural Areas & Preserves (DNAP). An additional 1,350 acres of conservation easement were purchased in 2001 through a cooperative effort of DNAP and the Columbiana Soil and Water Conservation District. In 1999, the ODNR Division of Forestry purchased 1,100 acres in the watershed to create Beaver Creek State Forest. Beaver Creek State Park consists of more than 3,000 acres and is managed by the ODNR, Division of Parks and Recreation. Beaver Creek State Park provides numerous recreational opportunities and much needed protection for the Little Beaver Creek watershed. Additional preservation partners include the Little Beaver Creek Land Foundation, a non-profit land trust that has successfully protected several properties in the watershed.

These partners along with the Ohio Division of Natural Areas and Preserves are working together with landowners to acquire additional conservation easements that will also be invaluable for the future preservation of this wild and scenic river known as Little Beaver Creek.

For more information about Little Beaver Creek, please contact the Northeast Ohio Regional Scenic River Manager at 330-527-4184 or the Division of Natural Areas and Preserves at 614-265-6453. Also visit the division's web site at www.ohiodnr.com/dnap.

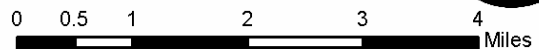
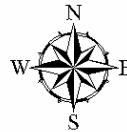


Little Beaver Creek Stream Quality Monitoring Sampling Stations



Legend

- *** SQM Station
- Bold**= Reference Station
- Italic*= Non-reference Station
- Scenic River Designation
- Streams
- County Boundary
- Township Boundary
- City Boundary



2008 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 Little Beaver Creek. Their time and dedication to this river and the Ohio SQM Project is greatly appreciated. A special thanks goes to the Little Beaver Creek Wild & Scenic River Advisory Council for their continued support and assistance.

Little Beaver Creek - Main Stem

River Mile 4.6 - Grimm's Bridge

Barb, Rick, & Aaron Slagle
Jim & Diana Pryor

River Mile 11.6 - Sprucevale (non-reference site)

Gregg Melfe, Pete Moss & Sons

River Mile 14.3 - Gaston's Mill

Janet and Rich Williams
DNAP SQM Volunteer Training Workshop
Jim Dolan
Little Beaver Creek Land Foundation

Little Beaver Creek - Bull Creek

River Mile 1.0 - S.R. 154 Bridge Crossing

Crestview High School Biology - K. Cattrell

Little Beaver Creek - Leslie Run

River Mile 0.1 - S.R. 154 Bridge Crossing

The Guy Family

Little Beaver Creek - North Fork

River Mile 0.1 - Fredericktown Bridge

Debbie Brown
DNAP Staff

River Mile 7.0 – S.R. 154 Bridge Crossing

Ron Novak
BLHS Environmental Science - Jodi Haylett

Little Beaver Creek - West Fork

River Mile 0.9 – S.R. 7 Bridge
BLHS Environmental Science - Jodi Haylett

River Mile 1.8 - Beaver Local High School (non-reference site)
No samples were recorded at this site during 2008.

River Mile 4.0 – VFW Camp
Lisbon Junior Farmers 4-H Club - Cathy French

Little Beaver Creek - Middle Fork

River Mile 0.7 - Route 7 Bridge (non-reference site)
BLHS Environmental Science - Jodi Haylett

River Mile 4.7 - Lusk Lock (non-reference site)
George Pricher

River Mile 0.4 - Mill Creek (non-reference site)
No samples were recorded at this site during 2008.

The continued success of the Ohio SQM Project depends on the commitment and dedication of these (and other) volunteers and participants. If you would like to become a volunteer, please contact the Northeast Ohio Regional Scenic River Manager at 330-527-4184 or the Division of Natural Areas and Preserves at 614-265-6453.

Station Descriptions

Due to the remoteness of Little Beaver Creek, public access is somewhat limited. Most of the SQM stations along Little Beaver Creek are located on either public property or in areas adjacent to bridge crossings. Generally, monitoring stations have been selected due to their suitable macroinvertebrate habitat and public access. The following are brief descriptions of the selected stream quality monitoring sites along the Little Beaver Creek.

Little Beaver Creek - Main Stem

River Mile 4.6 - Grimm's Bridge

This station is located approximately 300 yards upstream from Grimm's Bridge and represents the furthest downstream sampling station on Little Beaver Creek. Parking for a few cars is limited to a wide spot on Grimm's Bridge Rd and access to the river is difficult due to the steep riverbank.

The riffle is about 100 feet wide and comprised mainly of cobblestones and small moveable boulders. Areas with the highest biodiversity are located in the deeper parts of the riffle, sustaining a relatively constant flow throughout the year. Seven SQM assessments were performed during the 2008 sampling season. Results show water quality ranged from good to excellent throughout the year.

River Mile 11.6 - Sprucevale, Beaver Creek State Park (non-reference site)

Located within Beaver Creek State Park, this new monitoring site was added in 2003. There is ample parking and access to the river is ideal. The area is similar in character to the upstream sampling site also located within the park.

A medium percentage of gravel and cobblestones provide excellent habitat for aquatic insects. A total of three macroinvertebrate samples were recorded at this station during 2008 resulting in excellent water quality at the time of the tests.

River Mile 14.3 - Gaston's Mill, Beaver Creek State Park

Located in the first riffle area downstream from the iron bridge, this sampling station is located in the Gaston's Mill area of Beaver Creek State Park. Parking and public access to the river is excellent. Annually, the Division of Natural Areas and Preserves conducts its SQM Training Workshop and Stream Life Day activities at this location.

The streambed composition is comprised of cobbles and boulders, as well as a mixture of sand and gravel, creating an ideal location for the macroinvertebrate community. Seven SQM samples were recorded at this site during 2008. Results ranged from good to excellent throughout the year with a wide variety of organisms represented in all samples.

Little Beaver Creek - North Fork

River Mile 0.1 - Fredericktown Bridge

The riffle area at this sampling station is located under the iron bridge in historic Fredericktown. The area is privately owned and permission must be acquired prior to parking and accessing the river. If you are interested in visiting this site, please contact the NE Ohio Regional Scenic River Manager at 330-527-4184 at least seven days prior to your visit.

The riffle area differs from others on the Little Beaver Creek in that sampling can only be done where cobbles and boulders have collected in the depression of bedrock furrows. The remainder of the riffle is smooth bedrock. Although habitat is less than ideal, good to excellent ratings are consistently obtained from this station. Due to slippery bedrock and high water velocity in the riffles, samplers must exercise caution when wading here. The three readings taken at this site in 2008 were found to be in the excellent range.

River Mile 7.0 - State Route 154 Bridge Crossing, East of Negley

S.R. 154 crosses Little Beaver Creek east of Negley near the Ohio-Pennsylvania state line. The highway right-of-way provides a place to park for access to the riffle area upstream from the bridge. Access down the steep embankment can be difficult so use caution.

The riffle area is comprised mainly of cobbles, gravel and some fine sand and silt. While samples in previous years had found indicators of organic enrichment at this sampling station, the samples taken from 2003 through 2008 indicate an improvement as evidenced by good to excellent readings for all samples taken.

Little Beaver Creek - West Fork

River Mile 0.9 - State Route 7 Crossing

This sampling station is located approximately one-third of a mile upstream from the S.R. 7 bridge crossing. Parking is available on the highway right-of-way and access to the creek is down a very steep embankment. Unusually large stonefly nymphs (very pollution intolerant organisms) have been collected at this site.

The riffle is comprised mostly of large cobblestones and gravel. The aquatic sampler can expect to find a wide variety of organisms at this location. The three samples taken at this site during 2008 showed excellent water quality throughout the year.

River Mile 4.0 - VFW Camp, Twp Road 914

This site is located on private property, and permission from the VFW is required. This sampling station also marks the beginning of the "wild" designation for the Little Beaver Creek. During normal to low flow, the riffle area is only 15-20 feet wide.

The streambed composition is made up of boulders and cobblestones along with a small percentage of sand and gravel. Samples from this station consistently rank in the good to excellent category. During 2008, CIVs from five samples ranged from good to excellent. Very large dobsonfly larvae ranging from 3-4 inches are consistently found at this location, which is an indicator of excellent water quality.

Little Beaver Creek - Middle Fork

River Mile 4.7 - Lusk Lock, Beaver Creek State Park (non-reference site)

This station was first sampled during 2000. The station is located upstream of the historic Lusk Lock in Beaver Creek State Park. A relatively long walk is involved to arrive at this area. Cobblestones are the dominant substrate at this location. The CIV results for four samples performed during 2008 fell within the fair to good range.

Little Beaver Creek - Leslie Run

River Mile 0.10 - State Route 154 Crossing

Leslie Run is a tributary to Bull Creek, which parallels S.R.170 as it runs from East Palestine to the south towards Negley. The monitoring station is located immediately upstream of the S.R.154 bridge crossing. At low flow, the stream is approximately 6 inches deep.

The riffle area is comprised mostly of gravel and sand, and historically has received very low CIVs. However, since improvements were completed at the East Palestine Wastewater Treatment Plant, water quality in Leslie Run is gradually improving. SQM results in 2008 varied between fair and excellent, depending upon stream flows and operational efficiency of the plant.

Little Beaver Creek - Bull Creek

River Mile 1.0 - State Route 154 Bridge Crossing

Bull Creek is a tributary to the North Fork of Little Beaver Creek. The sampling station is located immediately downstream of the S.R.154 Bridge. Parking and access to the river is from the highway right-of-way.

Although some bedrock is evident on the stream bottom, the riffle area also possesses a good mixture of cobblestones and gravel. SQM sampling in Bull Creek throughout the years has been excellent. Fair to excellent results were recorded throughout 2008.

2008 Sampling Results and General Trends

During 2008, Stream Quality Monitoring samples were consistently performed on Little Beaver Creek despite fluctuations in weather conditions. These conditions ranged from a prolonged period of wet weather to a prolonged period of dry weather. According to the National Oceanic and Atmospheric Administration (NOAA), the National Weather Service in Cleveland received 454 reports of severe weather from thunderstorms during 2008 as compared to 294 events in 2007. Although early summer was significantly wet, portions of Northern Ohio were subjected to moderate drought conditions from mid-July to mid-September when precipitation fell below average. Despite these fluctuations in weather conditions, the majority of stream samples completed ranged from good to excellent with CIVs (Cumulative Index Values) being consistent with those obtained in previous years. TSS (Total Suspended Solids) values throughout the sampling year fell in the normal to excellent range as well with limited impaired readings. The average taxonomic diversity on the Main Stem, North Fork, and Bull Creek of the Little Beaver Creek per assessment was 10 macroinvertebrate orders (e.g. stonefly, damselfly, mayfly, etc.). The average taxonomic diversity for the Little Beaver Creek -West Fork per assessment was 11 macroinvertebrate orders. And finally, the Middle Fork had an average taxonomic diversity of nine orders per assessment.

Results from Leslie Run were in the fair to excellent range during 2008. Closer attention has been paid to this station due to significant environmental impacts in recent years. Prior to the 2008 sampling season, the East Palestine wastewater treatment plant appeared to be operating more effectively than in previous years, according to the Ohio Environmental Protection Agency. Several major upgrades to the plant will be made to ensure that untreated discharges of that magnitude will be prevented in the future. The average taxonomic diversity for the Little Beaver Creek – Leslie Run per assessment was nine macroinvertebrate orders.

Overall, the surveyed portion of Little Beaver Creek has good to excellent diversity of macroinvertebrates. Continued efforts from local and state officials are needed to protect the water quality and aquatic diversity of Little Beaver Creek. Individuals are also encouraged to work closely with their local officials towards protecting the wild and scenic Little Beaver Creek.

The staff of the Ohio Scenic Rivers Program appreciates the assistance received from its dedicated volunteer monitors. Working together has produced significant results, but even more help is needed. For more information, please contact the Northeast SQM Coordinator at 330-527-2961 or Northeast Ohio Regional Scenic River Manager at 330-527-4184.

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.

Total Suspended Solids (TSS)

In 1999, the Scenic River Program added Total Suspended Solids (TSS) monitoring to the Ohio SQM Project. The purpose of this addition is to estimate the amount of soil sediments impacting 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.

Precipitation amount 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 impact TSS values because some soil types erode faster than others. 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 a 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 through the use of the following scale:

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

2008 TSS Results: Overall there were a total of 51 TSS readings taken on Little Beaver Creek.

- **Little Beaver Creek - Main Stem** had a median of 6.0 mg/L, which corresponds to the excellent range. The data set ranged from < 6.0 mg/L to 9.0 mg/L of total suspended solids.
- **Little Beaver Creek - West Fork** had a median of 6.0 mg/L, which corresponds to the excellent range. A data set range for this station did not exist in 2008 as every sample performed resulted in < 6.0 mg/L of TSS.
- **Little Beaver Creek - Leslie Run** had a median of 6.0 mg/L of TSS, which corresponds to the excellent range. A data set range for this station did not exist in 2008 as every sample performed resulted in < 6.0 mg/L of total suspended solids.

- **Little Beaver Creek - North Fork** had a median of 6.0 mg/L, which corresponds to the excellent range. A data set range for this station did not exist in 2008 as every sample performed resulted in < 6.0 mg/L of total suspended solids.
- **Little Beaver Creek - Middle Fork** had a median of 12.5 mg/L, which corresponds to the normal range. The data set ranged from 6.0 mg/L to as high as 30.0 mg/L of total suspended solids.
- **Little Beaver Creek - Bull Creek** had a median of 6.0 mg/L of TSS, which corresponds to the excellent range. A data set range for this station did not exist as every sample performed resulted in < 6.0 mg/L of total suspended solids.

Comparisons of Collected Stream Quality Monitoring Data

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.

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 through 6 represents the average CIVs for each SQM reference station sampled on the river during 2008. 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 from Table 1. CIV values of 23 or greater indicate Excellent stream quality; CIV values of 17-22 indicate Good stream quality; CIV values ranging from 11-16 suggest Fair stream quality; and CIV of 10 or less reflect Poor stream quality. Situated beside the CIV are the symbols + (improved), = (equal), or - (lower) indicating the relationship to the previous years CIV.

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

Table 2. Little Beaver Creek - Main Stem 2008 Mean CIV by Reference Station

STATION	W P	M F	S T	D O	C R	O S	D A	D R	C R	B L	C F	S C	S C	S W	B F	A W	M I	P S	L E	CIV
4.6	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆		◆	◆	◆	◆		24=
14.3	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆		◆	◆	◆	◆	◆	25=

Table 3. Little Beaver Creek - Bull Creek 2008 Mean CIV 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	C C	S L	S W	B F	A W	M I	P S	L E	CIV
1.0	◆	◆		◆	◆	◆	◆		◆	◆	◆	◆				◆	◆	◆	◆	◆	20=

Table 4. Little Beaver Creek - Leslie Run 2008 Mean CIV 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	C C	S L	S W	B F	A W	M I	P S	L E	CIV
0.1	◆	◆	◆	◆	◆	◆	◆		◆	◆		◆	◆			◆	◆	◆	◆		20+

Table 5. Little Beaver Creek - North Fork 2008 Mean CIV 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	C C	S L	S W	B F	A W	M I	P S	L E	CIV
0.1	◆	◆	◆	◆	◆	◆	◆		◆	◆		◆	◆			◆	◆	◆		◆	28+
7.0	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆		◆		◆	21-

Table 6. Little Beaver Creek - West Fork 2008 Mean CIV 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	C C	S L	S W	B F	A W	M I	P S	L E	CIV
0.9	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆			◆	◆	◆	◆		26-
4.0	◆	◆	◆	◆	◆	◆	◆		◆	◆	◆	◆	◆	◆			◆	◆	◆		24=

Figures 1.1 – 5.1 represents the maximum and minimum range of CIV recorded during the year for each reference station. Figures 1.2 – 5.2 represents mean CIV at each reference station over many years.

Figure 1.1 Little Beaver Creek - Main Stem 2008 CIV Max and Min Ranges

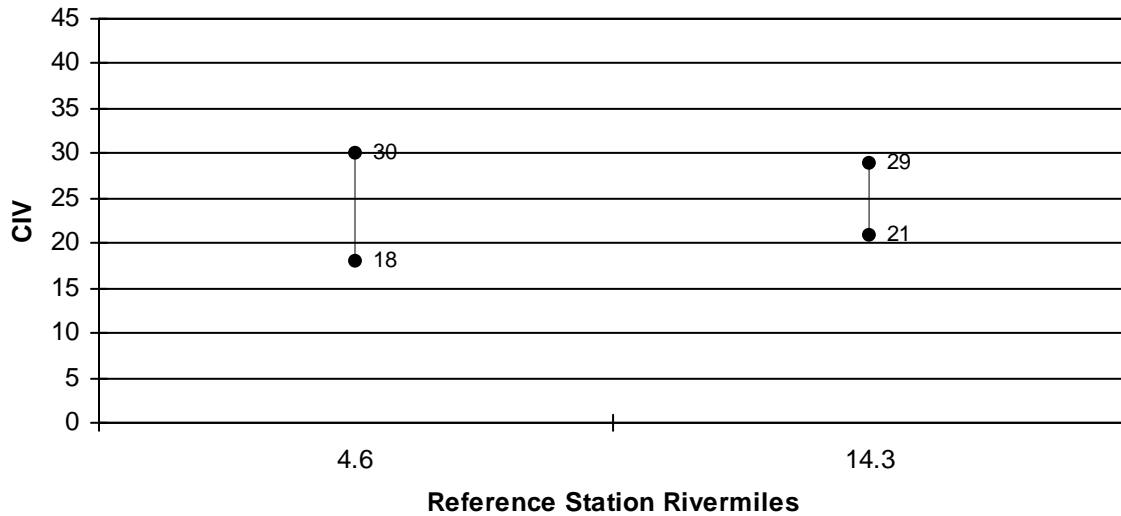


Figure 1.2 Little Beaver Creek - Main Stem Mean CIV 1999 - 2008

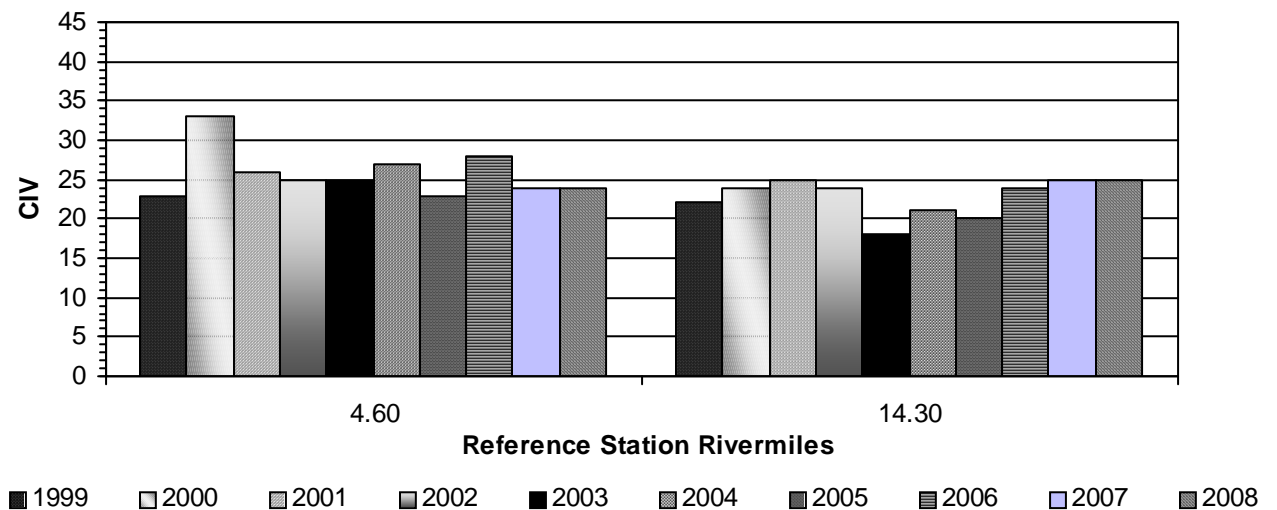


Figure 2.1 Little Beaver Creek - Bull Creek Max and Min 2008 CIV Range

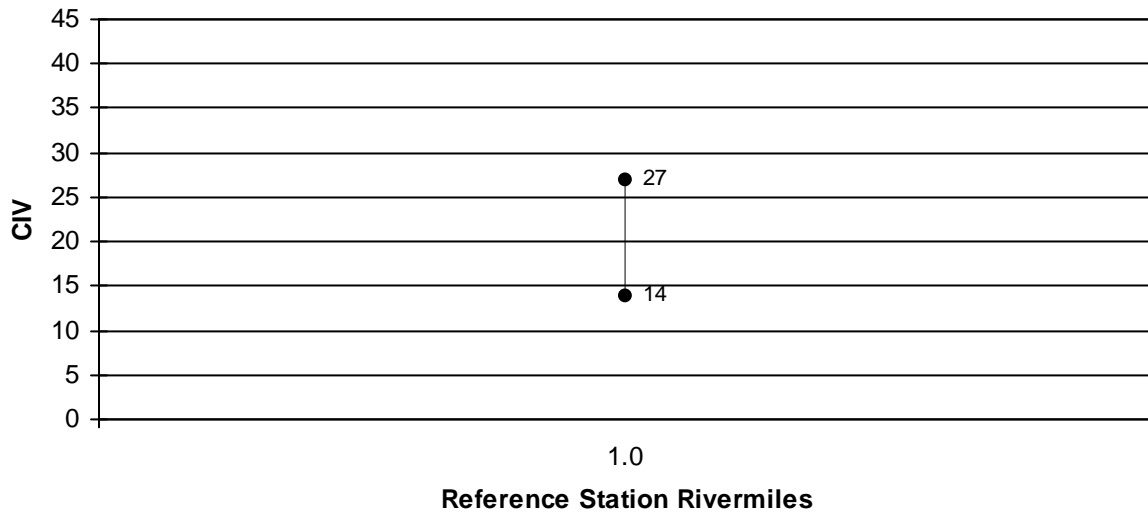
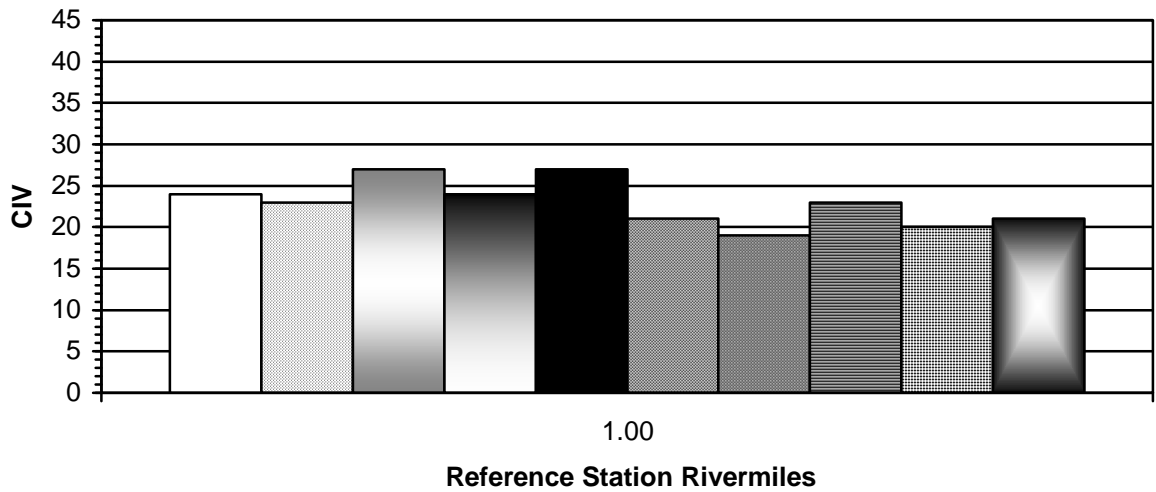


Figure 2.2 Little Beaver Creek - Bull Creek Mean CIV 1999 - 2008



1999
 2000
 2001
 2002
 2003
 2004
 2005
 2006
 2007
 2008

Figure 3.1 Little Beaver Creek - Leslie Run Max and Min 2008 CIV Range

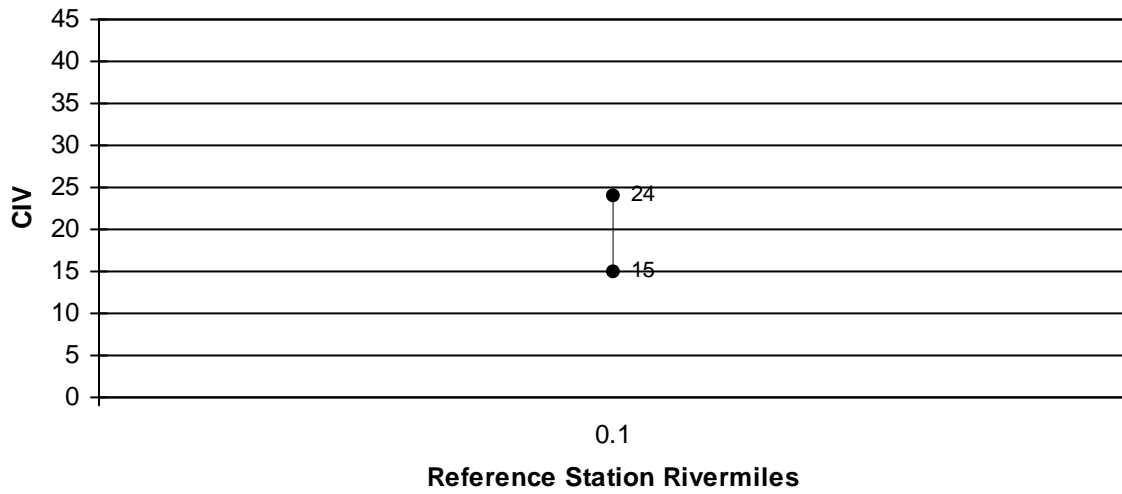


Figure 3.2 Little Beaver Creek - Leslie Run Mean CIV 1999 - 2008

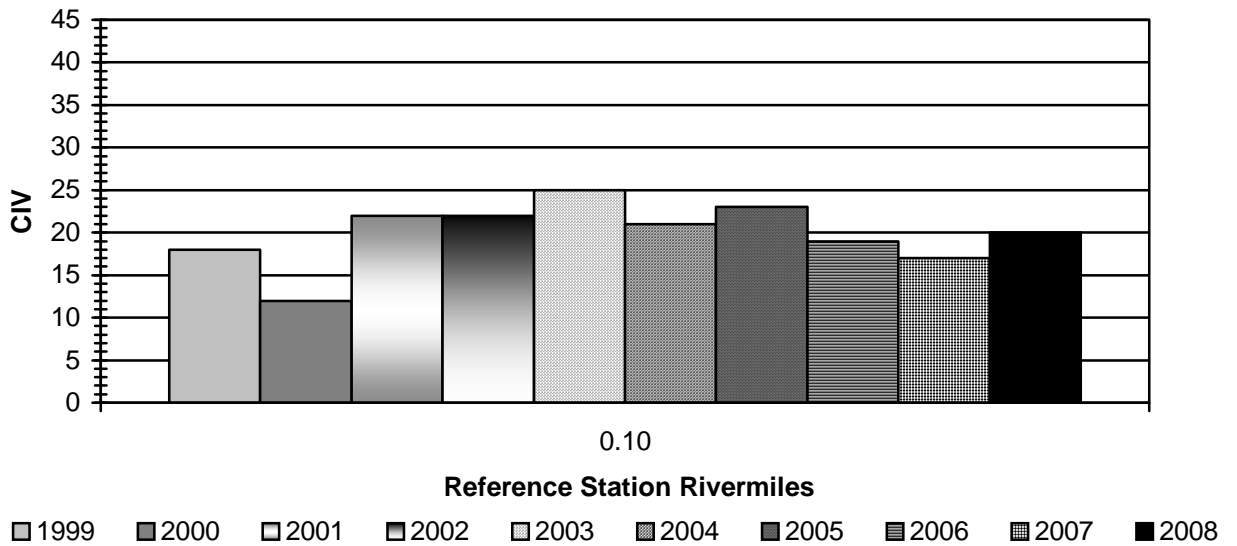


Figure 4.1 Little Beaver Creek - North Fork Max and Min 2008 CIV Ranges

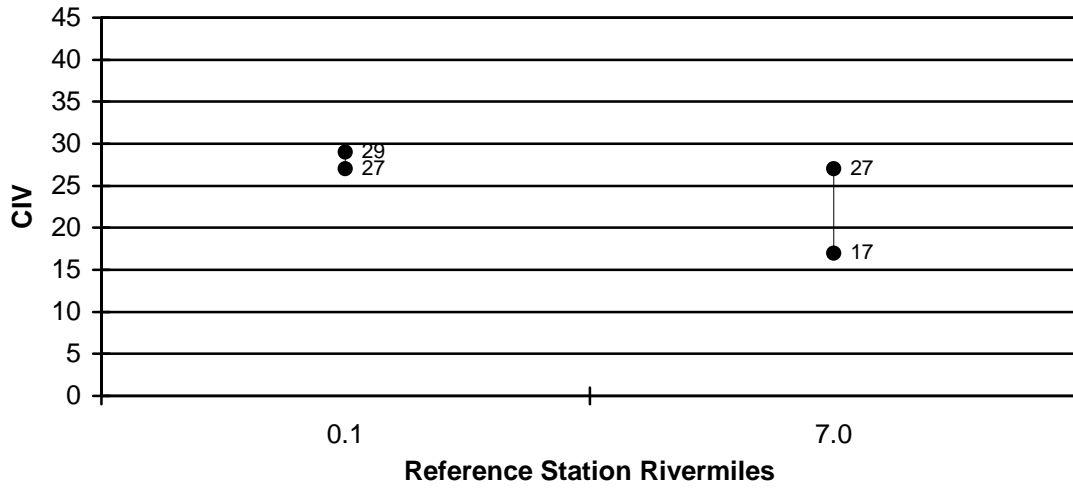
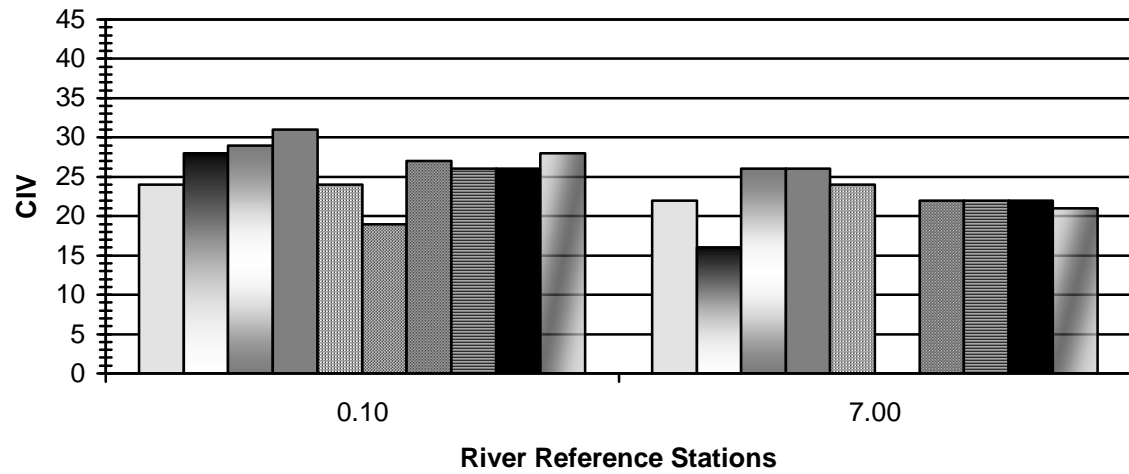


Figure 4.2 Little Beaver Creek - North Fork Mean CIV 1999 - 2008



1999
 2000
 2001
 2002
 2003
 2004
 2005
 2006
 2007
 2008

Figure 5.1 Little Beaver Creek - West Fork Max and Min 2008 CIV Ranges

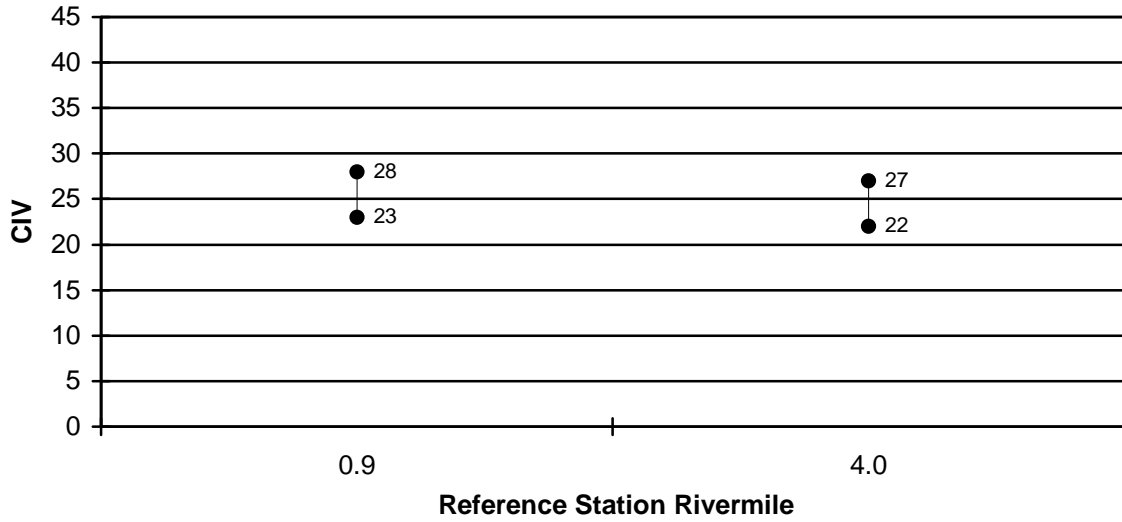
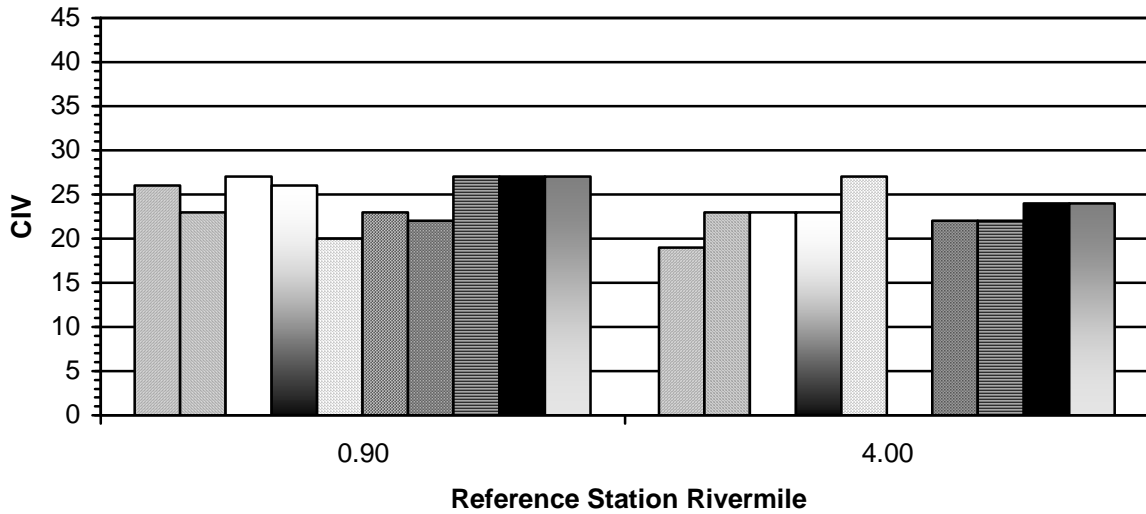


Figure 5.2 Little Beaver Creek - West Fork Mean CIV 1999 - 2008



1999
 2000
 2001
 2002
 2003
 2004
 2005
 2006
 2007
 2008

Qualitative Habitat Evaluation Index (QHEI)

The Qualitative Habitat Evaluation Index (QHEI) is a system developed and employed by the Ohio Environmental Protection Agency (OEPA) to measure physical habitat conditions in and around rivers and streams in Ohio. During 2008, the Ohio SQM Program staff tested the QHEI to gather 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.

Habitat conditions are re-evaluated every five years. SQM staff and volunteers are scheduled to perform evaluations next in 2013. Until then, results from 2008 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 warmwater 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 80 are generally believed to contain exceptional habitat conditions for warmwater communities.

The following table has 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 7. LITTLE BEAVER CREEK - Main Stem 2008 QHEI and SQM Assessment Data

Reference Station	QHEI	Attainment Status	2008 Average CIV	SQM Assessment
RM 4.6	82	FULL	24	EXCELLENT
RM 14.3	83	FULL	25	EXCELLENT

Table 8. LITTLE BEAVER CREEK - LESLIE RUN 2008 QHEI and SQM Assessment Data

Reference Station	QHEI	Attainment Status	2008 Average CIV	SQM Assessment
RM 0.1	68	FULL	20	GOOD

Table 9. LITTLE BEAVER CREEK - NORTH FORK 2008 QHEI and SQM Assessment Data

Reference Station	QHEI	Attainment Status	2008 Average CIV	SQM Assessment
RM 0.1	76	FULL	28	EXCELLENT
RM 7.0	82	FULL	21	GOOD

Table 10. LITTLE BEAVER CREEK - WEST FORK 2008 QHEI and SQM Assessment Data

Reference Station	QHEI	Attainment Status	2008 Average CIV	SQM Assessment
RM 0.9	81	FULL	26	EXCELLENT
RM 4.0	83	FULL	24	EXCELLENT

Appendix

Stream Quality Monitoring Data by Monitoring Station

2008 CIVs by Monitoring Station																						
LITTLE BEAVER CREEK																						
STATION	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
4.60	5/23/2008	A	A	B	B	B	A			A	A	A	A		A		A	A				30.00
4.60	7/7/2008	A	B	A		A	B				A		A				A	A	B			22.00
4.60	7/28/2008	A	A			B	A	A	A		A	A	A					A	A	A		26.00
4.60	8/29/2008	B	B	A	A	B	A	A	A				A		B			A	A			29.00
4.60	9/1/2008	B		A			A	A		A			A		A			A	A			20.00
4.60	10/12/2008	B	A	A	A	A			A		A		A		A							23.00
4.60	10/13/2008	A	A		A			B	A						B			A		A		18.00
11.60	6/19/2008		B	B	A	B	A			A		B			A			A	A			23.00
11.60	8/29/2008	A	A	A	A	B	B		B	A	B		A		A			A				29.00
11.60	10/20/2008	A	B	A	A	A	B	A		A		A			A				A			28.00
14.30	5/12/2008		B	A	A	B	A	A	A	A				A	A			A	C	A		29.00
14.30	6/16/2008	A	B	B	A	B	A	A				A	A		A		A		B			29.00
14.30	6/21/2008	A	A	A		A	A		A			A	A					B				22.00
14.30	8/9/2008		A	A	A	C		A			A	A	A		A							23.00
14.30	8/9/2008		B	B	B	B	A					A	A		A				A		A	23.00
14.30	8/9/2008	A	B	A		B	A		A	A		A	A		A				A			26.00
14.30	8/22/2008	A	B	A	A	C	A	A	A				A		A			A	A			29.00
14.30	9/17/2008		B	A	A	B	A			A	A				A							21.00

2008 CIVs by Monitoring Station																						
LITTLE BEAVER CREEK-BULL CREEK																						
STATION	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
1.00	5/23/2008	A	A		A	A	A	A		A		A	A				A	A	A			27.0
1.00	7/17/2008		B		A	B		A			B	A	A					A			A	20.0
1.00	9/5/2008		B			A					B	A	A						A	A		14.0
1.00	9/29/2008	A	A		A	B	B	A			A		A					A		A		24.0

**2008 CIVs by Monitoring Station
LITTLE BEAVER CREEK-MIDDLE FORK**

STATION	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
0.70	5/2/2008		C	B		A	A					A		B		A		C				18.00
4.70	5/7/2008		B			B					A	A					C	C	C			13.00
4.70	8/9/2008		B		A	C	B					A	A				B	B	B			19.00
4.70	9/5/2008		B		A	A	A		A	A	A						A	A	A			21.00

**2008 CIVs by Monitoring Station
LITTLE BEAVER CREEK-LESLIE RUN**

STATION	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
0.10	5/23/2008	A	A		A	B	A			A			A	A			A	A	A			24.0
0.10	7/28/2008	A	A			B	A			A			A	A				A	A			20.0
0.10	8/29/2008	A	B			B	A						A					A				15.0
0.10	9/29/2008	A	A			B	A	A			A		A					A		A		21.0
0.10	11/17/2008		B	A	A	B	A				A							A		A		19.0

**2008 CIVs by Monitoring Station
LITTLE BEAVER CREEK-NORTH FORK**

STATION	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
0.10	5/27/2008	B	B	B		B	B	A			A	A		A				A	C		A	27.00
0.10	7/17/2008	A	A	A	B	B	A			A	A		A				A		A			28.00
0.10	9/29/2008	B	A	A	B	B	B	A		A	A			A				A	A			29.00
7.00	5/2/2008	A	C	C		B	A					A		A		B	B		C			23.00
7.00	6/25/2008		A			B	A		A		A	A	A									17.00
7.00	8/26/2008		B			B	A	A	A			A	B	A								20.00
7.00	9/2/2008	A	B		A	B	A	A		A	A		A		A						A	27.00
7.00	10/24/2008		B	B		B	A		A				A		A							18.00

**2008 CIVs by Monitoring Station
LITTLE BEAVER CREEK-WEST FORK**

STATION	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
0.90	5/2/2008	A	C	A	A	C			A			A			B				A		A	23.00
0.90	7/17/2008	A	B	A	B	A	A			A	A		A			A	A					28.00
0.90	9/2/2008	A	A		A	A	A	A		A	A		A				A	A				28.00
4.00	6/23/2008		B	A		B	B			A	A	A	A					B	A			22.00
4.00	7/7/2008		B	A	A	A	B					A	A				A	A	B		A	25.00
4.00	7/21/2008	A	A	A		B	B	A				A	A				A	B	A			27.00
4.00	9/22/2008	A		A	A	B						A	A	A	B		A		A			24.00
4.00	9/29/2008	A	B		A	B	B					A		A				A	A			23.00