Upper Cuyahoga State Scenic River

OHIO

Stream Quality Monitoring

2007 Annual Report

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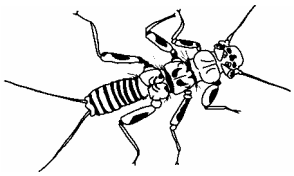


Ohio Scenic Rivers Program
With more than 60,000 miles of streams, Ohio is a water-rich state. Many of Ohio's streams support thriving plant and animal communities, including Ohio's state designated scenic rivers. Administered by the Ohio Division of Natural Areas and Preserves, the Ohio Scenic Rivers Program oversees 13 state designated scenic river systems, comprising 754 river miles along 23 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 stream health. When negative impacts to a stream occur, the result may show a decline or absence of certain macroinvertebrate species. Through consistent monitoring in the SQM Project, 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 2007 by volunteers and staff. It also represents a year of dedication and commitment shown to Ohio's special waterways by thousands of SQM volunteers.

Upper Cuyahoga State Scenic River Overview

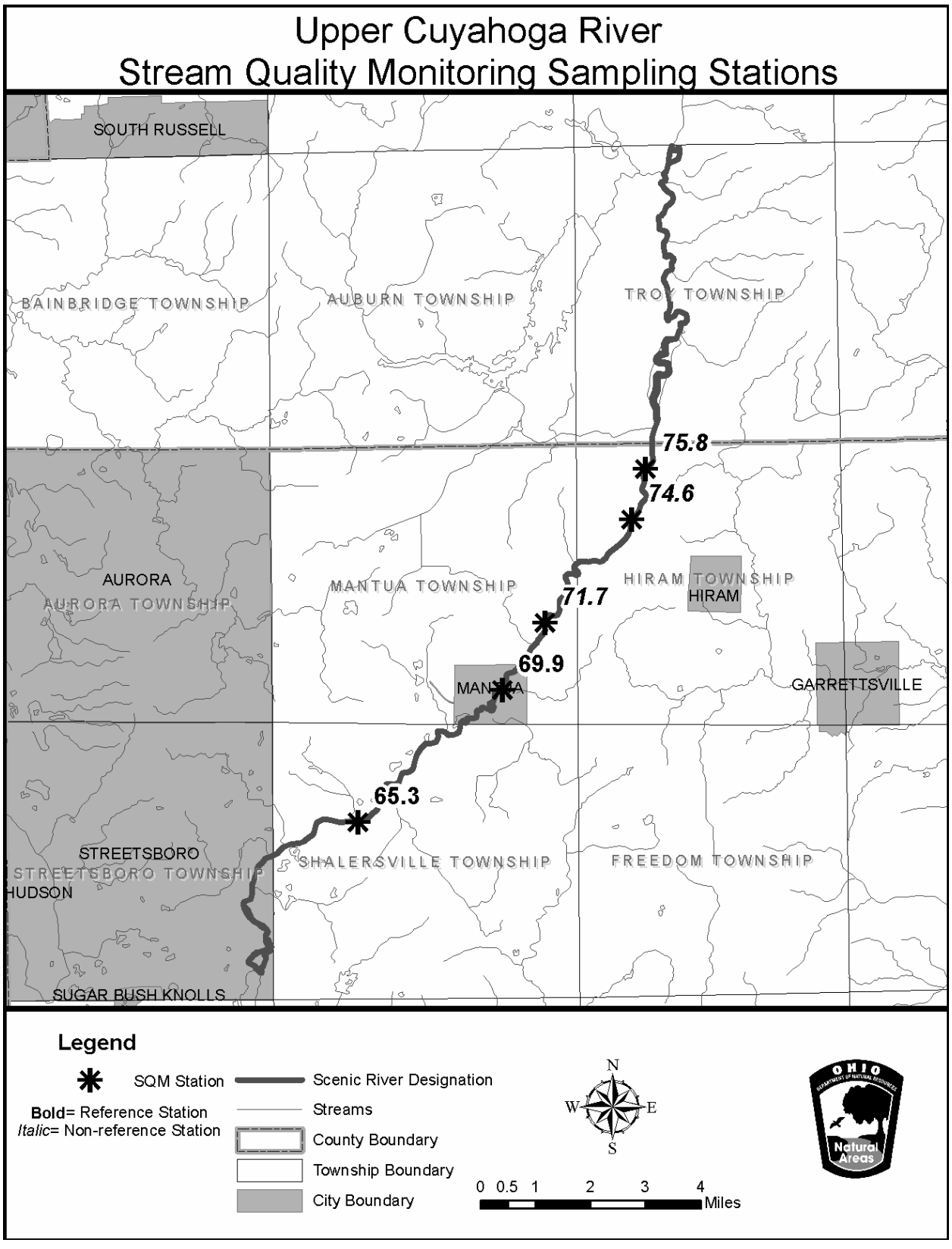
On June 26, 1974, the Upper Cuyahoga was designated a state scenic river by the Ohio Department of Natural Resources, beginning at the Troy-Burton township line in Geauga County and continuing downstream to S.R. 14 in Portage County. The Illinoisan and Wisconsinan glaciers shaped the topography of the Upper Cuyahoga watershed more than 13,000 years ago. Glacial tills deposited by receding glaciers in preglacial valleys provide a plentiful source of ground water throughout the region. It is this abundant ground water that helps to sustain the flow and quality of the Upper Cuyahoga during dry weather conditions.

The Upper Cuyahoga is a river with two distinct segments. Near the start of the designation, the river is rather straight and narrow, having been affected by a channelization project that was started and then quickly abandoned near the turn of the 20th century. This gives way to a rather undisturbed natural river channel meandering through virtual wilderness. An extensive network of high quality wetlands throughout this section of the river provides excellent habitat for the diverse plant and animal life inhabiting the region. Water quality throughout this stretch of the river is typically excellent, except in those regions where low stream gradients contribute to depress dissolved oxygen levels.

Below Hiram Rapids, the character of the river changes as it meanders through moderate to steep hillsides blanketed in beech-maple forests, oak, ash and hickory. Wetlands are also common below Hiram and contribute to the unique character and high quality of the river. The Division of Natural Areas and Preserves protects several wetlands including Mantua Bog and the Charles Tummonds Scenic River Preserve.

Aquatic biodiversity in the Upper Cuyahoga is excellent, with numerous pollution intolerant macroinvertebrates. More than 50 species of fish and many mammals, birds, reptiles and amphibians are present. Due to its constant flow and gentle currents, the Upper Cuyahoga River is a popular stream in northeast Ohio for fishing and canoeing. Two canoe liveries operate on the river and numerous public and private access sites provide ample opportunities for the public to enjoy the Upper Cuyahoga.

For additional information about the Upper Cuyahoga State Scenic River, including conservation options for landowners and ways that you may participate in the preservation of this important resource, contact the Northeast Ohio Regional Scenic River Manager at 330-527-4184, Northeast Ohio SQM Coordinator at 330-527-2961 or the Division of Natural Areas and Preserves at 614-265-6453. Also visit our website at *www.ohiodnr.com/dnap* for more information.


Upper Cuyahoga River
Stream Quality Monitoring Sampling Stations
SOUTH RUSSELL
BAINBRIDGE TOWNSHIP
AUBURN TOWNSHIP
TROY TOWNSHIP
75.8
74.6
AURORA
AURORA TOWNSHIP
MANTUA TOWNSHIP
HIRAM TOWNSHIP
HIRAM
71.7
69.9
MANTUA
GARRETTSVILLE
65.3
STREETSBORO
STREETSBORO TOWNSHIP
HUDSON
SHALERSVILLE TOWNSHIP
FREEDOM TOWNSHIP
SUGAR BUSH KNOLLS
Legend
SQM Station
Bold= Reference Station
Italic= Non-reference Station
Scenic River Designation
Streams
County Boundary
Township Boundary
City Boundary
N
W
E
S
0 0.5 1 2 3 4
Miles
OHIO
Natural Areas

2007 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 Upper Cuyahoga River. Their time and dedication to this river and the Ohio SQM Project is greatly appreciated. A special thanks goes to the Upper Cuyahoga Scenic River Advisory Council for their continued support and assistance.

River Mile 64.20 - State Route 303 Bridge
Rick Chiera - Debbie Fabian - Eric & Kelly Delier

River Mile 65.30 - Coit Road Bridge
Charles Chlysta III
Water Nymphs - Maia & Pat O'Meara - Jamie Ausperk

River Mile 69.90-– Mantua Village Park
DNAP SQM Volunteer Training Workshop
The Kirk Family
Blake Tayerle - Girl Scout Troup 740
Portage County SWCD Educator Workshop

River Mile 74.60 - Camp Hi Canoe Livery, Abbott Road (non-reference site)
Lynn Vogel
Ben Piazza & Kimberly Huter

River Mile 75.80 - Hiram Rapids, Winchell Bridge (non-reference site)
MariLane B. Spencer
Barb Sizemore
Charles Chlysta III

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 SQM Coordinator at 330-527-2961, Northeast Ohio Regional Scenic River Manager at 330-527-4184 or the Division of Natural Areas and Preserves at 614-265-6453.

Station Descriptions

Stream Quality Monitoring (SQM) stations along the Upper Cuyahoga River have been selected based upon their ease of access, macroinvertebrate habitat and adequate sampling areas. Where possible, sampling stations are located on public property or where public access to the riffle areas is convenient and safe. The following are brief summaries of the SQM stations located on the Upper Cuyahoga River.

River Mile 64.20 - State Route 303 Bridge, Shalersville
The sampling area at this station is located approximately 100 yards downstream from the S.R. 303 bridge. Access to the river is not difficult, however the bank is rather narrow. This site is a particularly important monitoring station on the Upper Cuyahoga due to the proximity of a large storm water drain and wastewater treatment plant upstream. Long-term data collected at this site is helpful in determining what (if any) impact these two outfalls are having on water quality within the area.

The streambed is comprised largely of cobblestones and gravel, with occasional boulders. This habitat is quite good and contributes to the wide variety of organisms usually collected here. Cumulative Index Values (CIVs) at this site are usually in the good to excellent ranges with pollution-intolerant organisms making up the bulk of the samples. Overall, five samples were taken during the 2007 season resulting in good to excellent CIVs.

River Mile 65.30 - Coit Road Bridge
Access to this sampling station is down a rather steep path leading to the river. The site is a popular fishing area and is heavily used by the public despite the challenging terrain.

Although the streambed is largely comprised of road asphalt rubble, the site also contains cobblestones and gravel. Habitat in the area is very good as reflected by the large number of mayfly nymphs and dobsonfly larvae that are collected at this site. Six assessments were performed during the season resulting in good to excellent CIVs at this station.

River Mile 69.90 - Mantua Village Park
The riffle area at this site is located slightly downstream of the parking lot at Mantua Village Park in Mantua. This location became a reference site in 2003 replacing River Mile 71.70 (Pioneer Trail Bridge). Determining factors in this change included access that was becoming too dangerous and a riffle area that was no longer visible.

The streambed is comprised of a relatively equal mixture of cobblestones and gravel where the sampler can find a diverse macroinvertebrate population. There is ample parking with easy access to the river. The six samples completed at this station during 2007 resulted in fair to excellent CIVs.

River Mile 71.7 - Pioneer Trail Bridge (non-reference site)
Due to hazards with accessing the river and a riffle area that is no longer visible, sampling at this location has been discontinued.

River Mile 74.6 - Camp Hi Canoe Livery, Abbott Road (non-reference site)
To reach this site, follow the small trail leading from the canoe livery lot to the launching area at the river. A small low-head dam can be seen immediately downstream. The sampling area is below the face of the dam. Easy access to the river makes this particular site suitable for introducing small groups to stream quality monitoring.

Large amounts of boulders, cobblestones and a sandy river bottom combined with the velocity of the current flowing over the dam results in a high quality macroinvertebrate habitat. Macroinvertebrate diversity at this site is typically good to excellent with a wide variety of organisms represented.

River Mile 75.8 - Hiram Rapids, Winchell Bridge (non-reference site)
This site is being monitored to determine what (if any) effect increasing development in this small village is having on water quality. The riffle area is approximately 20 yards downstream from the bridge. Parking is limited to the side of the road and permission must be obtained before crossing private property to access the sampling site.

The majority of the substrate in the sampling area consists of cobblestones and gravel. Sampling results are consistently excellent with nearly all species represented. Although pollution-intolerant taxa in Group I are represented here, the majority of organisms collected are Group II taxa. Group II taxa are those species that have a moderate tolerance to pollution.

Sampling Results and General Trends

Stream Quality Monitoring sample results for the Upper Cuyahoga River in 2007 ranged from fair to excellent. The majority of the sampling season proved to be dryer than normal resulting in prolonged periods of low water and increased water temperatures. These two factors resulted in a few lower SQM scores. According to the National Oceanic and Atmospheric Administration (NOAA), below average levels of precipitation were experienced in Northern Ohio beginning in early May and continued until mid-August when heavy rains arrived. Portions of the region were subsequently placed in the moderate drought category on the U.S. Drought Monitor in July. Precipitation for the month of September also fell well below average but recovered in October. Despite the harsh conditions, these small aquatic organisms proved their resiliency. Overall, the majority of the assessments performed during the year show excellent Cumulative Index Values with pollution sensitive organisms well represented.

During and after heavy rain events, the relatively low gradient and abundance of wetlands surrounding this portion of the river moderates water velocity. Lower water velocity minimizes the tumbling of cobblestones and gravel on the river bottom limiting the number of displaced aquatic insects. This factor alone is the reason why monitoring results are usually predictable and consistent during the sampling season. Total Suspended Solids (TSS) values consistently rated in the normal to excellent range with some exceptions. The impaired readings were due to increased sediment loads as a result of recent rain events and higher than average temperatures during summer months. The average taxonomic diversity on the Upper Cuyahoga per assessment was 12 macroinvertebrate orders (e.g. stonefly, damselfly, mayfly, etc.). Generally, the Upper Cuyahoga continues to maintain a very diverse population of macroinvertebrates. Wetlands and reservoirs in the headwaters supplement river flow during periods of low water, thereby maintaining flow and healthy habitat for macroinvertebrates.

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 Upper Cuyahoga River Watershed during 2007. Working together has produced significant results but more help is always needed. For more information, please contact the Northeast Ohio SQM Coordinator at 330-527-2961 or Northeast Ohio Regional Scenic River Manager at 330-527-4184.

Volunteer and staff data results are used by 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 Stream Quality Monitoring (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. 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 have an effect on the TSS value.

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

2007 TSS Results: A total of 26 TSS readings were taken on the Upper Cuyahoga River. The Upper Cuyahoga River had an average of 12.9 mg/l of TSS, which corresponds to the normal range. The median was 11.5 mg/l of TSS, which also 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.

Comparisons Of Collected Stream Quality Monitoring Data

Frequent 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)

Table 2 represents the mean CIV for each SQM reference station sampled on the river during 2007. 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. 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. Mean CIV by Reference Station Upper Cuyahoga River

STATION	WP	MF	ST	DO	CD	RI	OS	DA	DR	CR	BL	CF	SC	CL	SW	BF	AW	MI	PS	LE	CIV
64.2	◆	◆	◆	◆	◆	◆	◆	◆		◆	◆	◆	◆	◆	◆	◆	◆	◆		◆	27+
65.3	◆	◆	◆	◆	◆	◆	◆	◆	◆		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	27=
69.9	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	`	◆	24-

Figure 1.1 represents the maximum and minimum range of CIV recorded during the year for each reference station. Figure 1B represents mean CIV at each reference station over many years.

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

Figure 1.1 Upper Cuyahoga River Max and Min CIV Ranges 2007

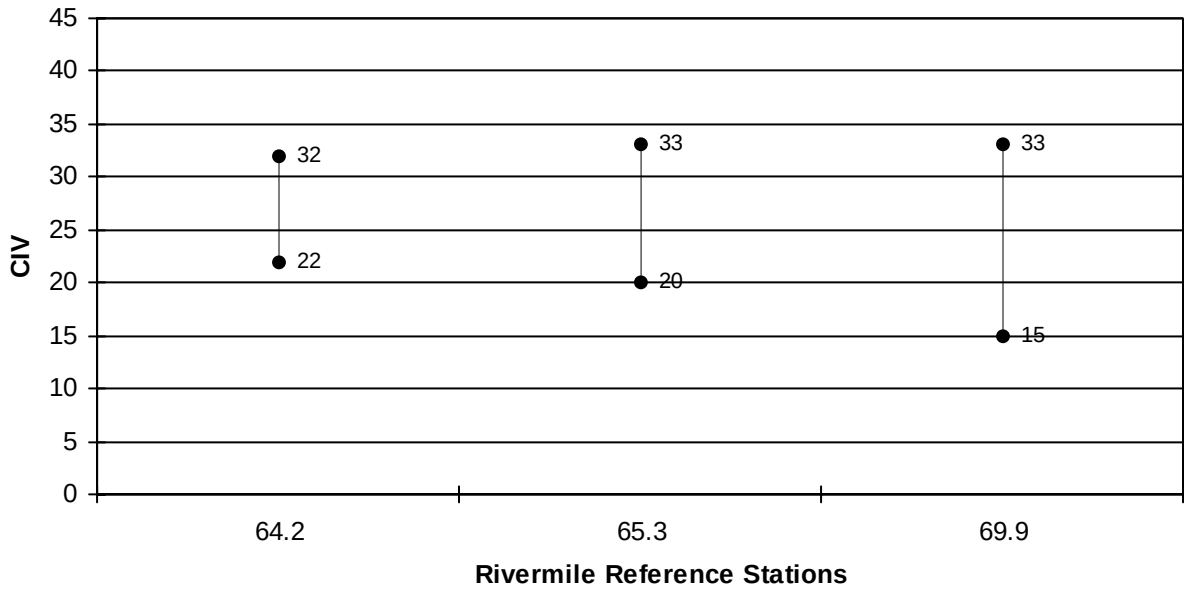
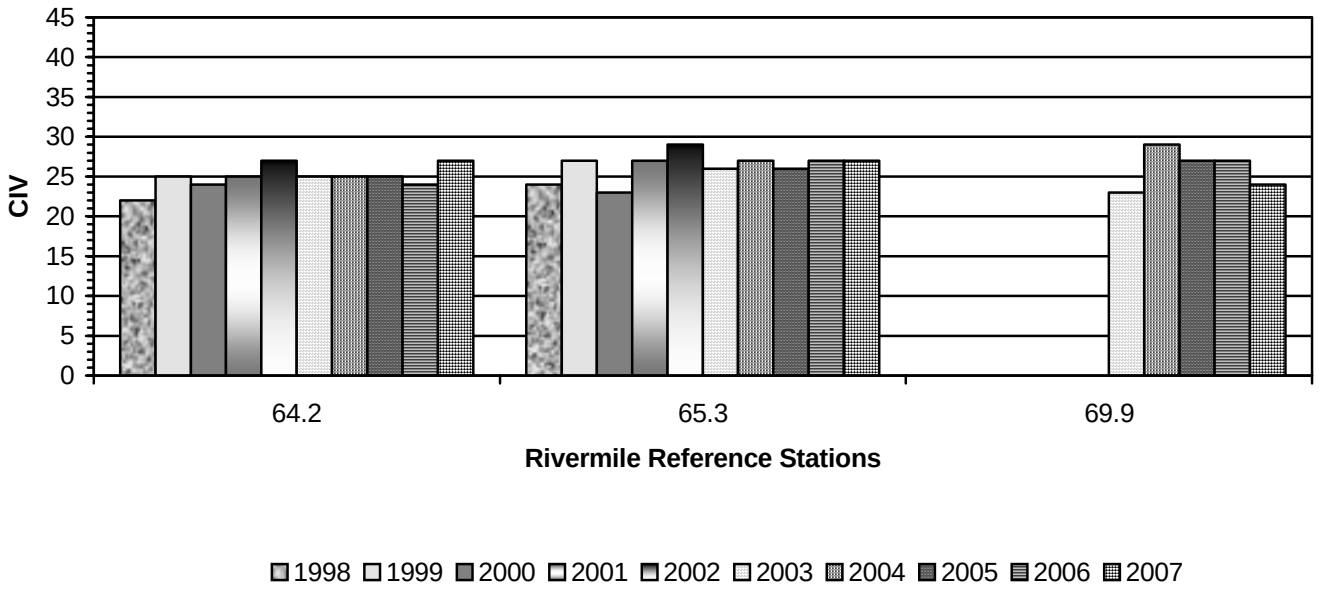


Figure 1.2 Upper Cuyahoga River Mean CIV 1998 - 2007



Qualitive 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 2003, SQM staff tested the 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.

Habitat conditions are re-evaluated every five years. SQM staff and volunteers are scheduled to perform evaluations next in 2008. Until then, results from the 2003 Citizen's 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 3. QHEI & SQM Assessment Data
UPPER CUYAHOGA SCENIC RIVER

Reference Station	QHEI	Attainment Status	2003 Average CIV	SQM Assessment
RM 64.20	87	FULL	25	EXCELLENT
RM 65.30	86.5	FULL	26	EXCELLENT
RM 69.90	78	FULL	23	EXCELLENT

Appendix

Stream Quality Monitoring Data by Monitoring Station

2007 CIVs by Monitoring Station UPPER CUYAHOGA RIVER																						
RM	DATE	WP	MF	ST	DO	CD	RI	OS	DA	DR	CR	BL	CF	SC	CL	SW	BF	AW	MI	PS	LE	CIV
64.20	6/8/2007	B	B	B		B	B	A	A			A	A		B	A			B			29.00
64.20	6/23/2007	A	C		A	C	A	A				A	A		B			A	A			26.00
64.20	8/8/2007	B	B		A	B	A	A			A	A	B	A	B		A	A	A		A	32.00
64.20	8/28/2007	B	A			B	A	B	A			A			B		A					22.00
64.20	10/2/2007	A	A	A		B	B	B	A			B			B							24.00
65.30	4/3/2007		B	A	A	A	A	A		A		B	B	A	B							28.00
65.30	6/8/2007	A	B	B	A	B	B	A	A			A	A		B	A		A	B			33.00
65.30	7/28/2007	A	B	A		C	B	A		A		A	A					A	A	A	A	28.00
65.30	8/8/2007	A	A			A	A	A	A			A	A		B		A	A	A			26.00
65.30	9/16/2007		B	B	B	C	B	B	A	A		B	B		B				A			29.00
65.30	10/30/2007		B		A	B			B			B	A		A	A		A				20.00
69.90	5/7/2007	A	A		A	A	A		A			A	A	A		A	A		A			27.00
69.90	5/14/2007	A	A		A	A	A		A			A	A	A		A	A		A			27.00
69.90	6/25/2007	A	B	A		A	A					A	A		A		A	A	B		A	25.00
69.90	8/31/2007	A	B		A	B	A	A	A	A			A	A	A	A	A	A	A			33.00
69.90	9/2/2007		A		A	B	A							A				A				15.00
69.90	10/29/2007		A		A	A	A				A	A			A			A				19.00
74.60	5/22/2007	A	A	A	A	B	A	A		A		A	A	A	A		A	A	A			34.00
74.60	6/8/2007		A	A		B	A					B	A	B	A	B	B	B	B	A	A	27.00
74.60	6/20/2007		A	A	A	A		A			B	A	B	A	A	A		A		A	A	30.00
74.60	8/18/2007		A	A		A	A	A	B	A	A		B	B	A		A	A	A	A	A	32.00
74.60	9/17/2007		A			A		A	A	A	A		B	B	A			A	A	A	A	25.00
74.60	9/19/2007	A	A	A	A	B	A	A	A				A	A	A		A	A	A			32.00
75.80	4/3/2007		B		B	C			A			B	B	A	C	B		A	A			23.00
75.80	8/8/2007	A	B		A	B	A	A						A	B	B		A	B		A	27.00
75.80	10/30/2007		C		A	B		A	B	A		A	A	B	B	C		A	A			28.00