Stream Quality Monitoring 2012 Annual Report
Sandusky State Scenic River

Contents

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 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, which 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 detect and address 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, 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 which 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 2012 by volunteers and staff. It also represents a year of dedication and commitment shown to Ohio's special waterways by thousands of SQM volunteers.

Overview

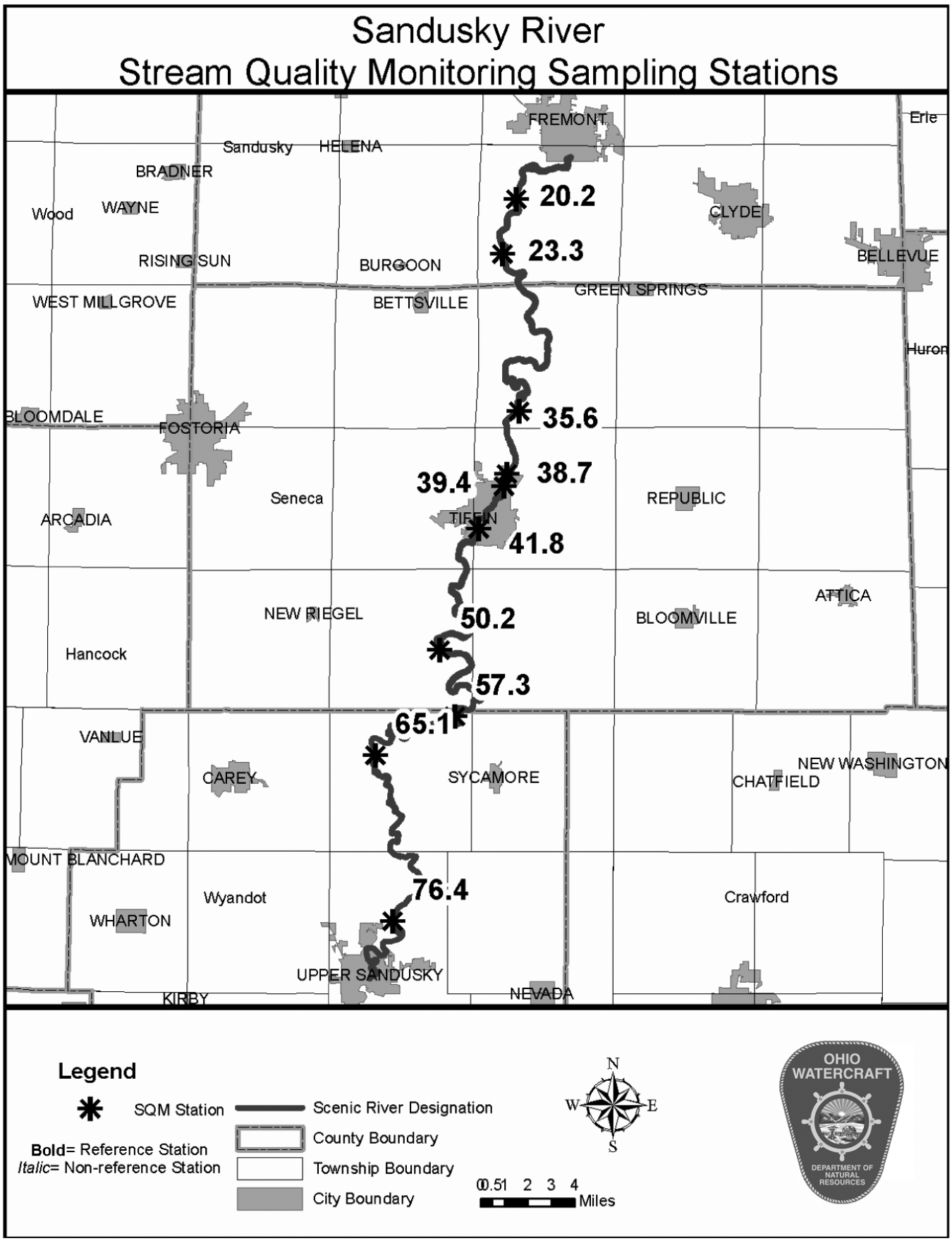
In January 1970, the Director of the Ohio Department of Natural Resources designated approximately 70 miles of the Sandusky River as Ohio's second scenic river from U.S. Route 30 in Upper Sandusky to the Roger Young Memorial Park in Fremont. The southern two-thirds of the designated portion of the river flow through the farmlands of Wyandot and Seneca counties, carving its valley through 10 to 50-foot-high dolomite and limestone outcroppings. The northern portion of the Sandusky River flows through bedrock scoured by receding glaciers more than 13,000 years ago. North of Fremont, the Sandusky River flows approximately 15 miles before emptying into Sandusky Bay and Lake Erie.

Deriving its name from the native *"sa-un-dustee"* or *"water within pools",* the Sandusky River is remote and scenic. As a result, the Sandusky is home to Ohio's largest inland nesting bald eagle population. While canoeing during the summer and fall months, it is not uncommon to observe a number of eagles fishing and resting along the heavily forested river corridor.

The Sandusky River valley also played an important role in Ohio's history. Several forts were constructed in the valley, including Fort Stephenson, site of an important victory in the War of 1812. The Sandusky was also home to the Seneca and Wyandot Indians. In gratitude for the Wyandot's support during the war, the Federal Government constructed Indian Mills in 1820 in what was then, the last native reservation in Ohio. One of the two mills is restored and maintained for public visitation by the Ohio Historical Society.

Aquatic life within the Sandusky is rich and diverse. In addition to numerous macroinvertebrates, such as dobsonfly larva, mayfly nymphs and many others, the Sandusky River is home to 68 species of fish, including large spring spawning runs of white bass and walleye. The Sandusky River also possesses healthy populations of pollution-sensitive fish, such as rainbow and fantail darters. Additionally, the Sandusky is the only river in Ohio that supports all six species of redhorse suckers. Redhorse suckers are further indicators of exceptional water quality.

Public access to the Sandusky River is available at several scenic river access areas administered by the Division of Watercraft and the Sandusky County Park District. Information about public access facilities on the Sandusky State Scenic River is available by contacting the Northwest Ohio Scenic River Manager at 419-429-8306 or visiting *watercraft.ohiodnr.gov* online.


Sandusky River
Stream Quality Monitoring Sampling Stations
FREMONT
Erie
Sandusky
HELENA
BRADNER
Wood
WAYNE
20.2
CLYDE
23.3
RISING SUN
BURGOON
BELLEVUE
GREEN SPRINGS
WEST MILLGROVE
BETTSVILLE
Huron
BLOOMDALE
FOSTORIA
35.6
39.4
38.7
Seneca
REPUBLIC
ARCADIA
TIFFIN
41.8
ATTICA
NEW RIEGEL
50.2
BLOOMVILLE
Hancock
57.3
65.1
VANLUE
NEW WASHINGTON
CAREY
SYCAMORE
CHATFIELD
MOUNT BLANCHARD
76.4
Wyandot
Crawford
WHARTON
UPPER SANDUSKY
KIRBY
NEVADA
Legend
SQM Station
Scenic River Designation
County Boundary
Township Boundary
City Boundary
Bold= Reference Station
Italic= Non-reference Station
N
W
E
S
0 0.5 1 2 3 4
Miles
OHIO WATERCRAFT
DEPARTMENT OF NATURAL RESOURCES

2012 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 Sandusky River. Their time and dedication to this river and the Ohio SQM Project are greatly appreciated.

River Mile 20.2 - Tindall Bridge
Volunteers Needed

River Mile 23.3 - Wolf Creek Park Picnic Area/Canoe Launch
Volunteers Needed

River Mile 35.6 – Izaak Walton League River Access (*non-reference site*)
Izaak Walton League Members

River Mile 39.4 - Pioneer Mill
Volunteers Needed

River Mile 41.8 - Ella Street Bridge
Volunteers Needed

River Mile 50.2 - St. John's Bridge
Volunteers Needed

River Mile 57.3 - Mexico Bridge
Volunteer Needed

River Mile 76.4 - Indian Mill Scenic River Access
Volunteers Needed

River Mile 0.0 - Forrest Preserve on Honey Creek (*non-reference site*)
Volunteers Needed

The continued success of the Ohio SQM Project is dependent upon the dedication of our volunteers. To become a volunteer, please contact the Northwest Ohio Scenic Rivers Manager at 419-429-8306.

Station Descriptions

Stream Quality Monitoring sites along the Sandusky River have been selected based upon their ease of access, macroinvertebrate habitat and adequate sampling areas. Many riffle areas on the upper segment of the Sandusky River, are widely dispersed, with many sites on private property or are inaccessible. The lower Sandusky River (from Tiffin south) is much more accessible, lending itself more readily to SQM activities. The following are brief descriptions of selected SQM stations on the Sandusky Scenic River.

River Mile 20.2 - Tindall Bridge
This site replaced Fremont's Hayes Avenue Bridge as the northern-most reference station on the Sandusky River, as Hayes Avenue Bridge was outside the Scenic River designation. It was previously a non-reference site as access hazardous due to refuse left by weekend and nocturnal recreators, Tindall Bridge and the surrounding area were reclaimed by officials when the bridge was restored in 2000.

Although years of flooding have scoured cobblestones and gravel from the area, shallow rapids on stepped bedrock make for provide habitat for aquatic macroinvertebrates. Historically, the site teamed with such pollution-intolerant species as dobsonfly larvae.

River Mile 23.3 - Wolf Creek Park, Sandusky County Park District
Wolf Creek Park is a scenic river area managed by the Sandusky County Park District. In addition to providing ideal habitat, this area is well maintained and a safe access point for enjoying the river. The extensive riffle can be located by entering the boat launch entrance, walking a short distance down the footpath and traversing the thick riparian shrubbery to the river's edge.

The river bottom is a mixture of sand, gravel, cobblestones and occasional boulders.

River Mile 35.6 - Izaak Walton League River Access *(non-reference site)*
Located on grounds preserved by the Izaak Walton League, this site is monitored by its members and may be accessed by permission only.

River Mile 39.4 – Pioneer Mill, City of Tiffin
Although Pioneer Mill stopped grinding flour and meal in 1950, human activity has combined with the natural cycle of the Sandusky River to set the stage for good and safe stream quality monitoring. A major flood in 1913 created a "stone island", a two acre mound of bricks and paving stones that were deposited in the Sandusky River downstream from the mill's stone dam (c. 1921) and an existing island. Although these bricks and stones were crushed with grinders powered by the mill and used to repave the streets of Tiffin, remnants still mix with cobbles and gravel to house a diverse population of pollution tolerant and intolerant macroinvertebrates.

Pioneer Mill itself became a restaurant in 1974 and was placed on the national register of historic places in recognition of its background. This site has been sampled in recent years for public education events.

River Mile 41.8 - Ella Street, City of Tiffin
The Ella Street sampling site is the last of three sampling stations within the City of Tiffin. Access to this particular site is difficult due to steep banks and riprap erosion control installed by the City of Tiffin. Caution is required when sampling in this area. To find adequate riffle areas, it is advantageous to search just upstream from the bridge from the western bank.

The stream bottom is a good mixture of sand, gravel, cobblestones and boulders, providing excellent habitat for mayfly nymphs, stoneflies, caddisflies and numerous other insect larvae.

River Mile 50.2 - St. John's Bridge (former site of St. John's Dam)
This site is located on Seneca County Road 6 between State Routes 231 and 53 immediately downstream from the former St. John's Dam which was removed in the fall of 2003. This area has excellent smallmouth bass fishing, aided no doubt, by the diverse and abundant macroinvertebrate population found here. A small parking lot provides easy access, although the area is undeveloped and poorly maintained.

This sampling site is a well-proportioned mixture of sand, gravel and cobblestones. During periods of low to moderate flow, this site has at least five riffle areas housing a thriving and diverse macroinvertebrate population.

River Mile 57.3 - Mexico Bridge
The removal of St. John's Dam in 2003 restored river areas upstream of the site to more natural levels and exposed new riffle areas which were previously inaccessible due to deep water. A series of riffles directly downstream from Mexico Bridge offers good habitat shaded on both banks by hardwood trees. The best access to the sand, cobble and boulder riffles is found below the steep bank on the west side of the river.

River Mile 76.4 - Indian Mill
Indian Mill is a restored gristmill owned by the Ohio Historical Society. Constructed by the Federal Government for the Wyandot Indians in 1820, Indian Mill and the adjacent timber dam are popular fishing, picnicking and tourist attractions. Canoe and fishing access is readily available in the scenic river access area across from Indian Mill.

The river bottom is quite diverse, with sand, gravel and cobblestones covering the riffle area just below the bridge. Samples from this site are consistently excellent with a wide variety of macroinvertebrates.

Honey Creek Tributary - Forrest Nature Preserve *(non-reference site)*
This jewel of the Seneca County Park District is located on County Road 6 just a few miles east of the St. John's Bridge Sandusky River Access. A spacious gravel parking lot is available for public access but Honey Creek itself is buffered by hardwood riparian corridor. Maintained trails lead to easy-flowing riffles teaming with pollution-intolerant macroinvertebrates, such as stonefly and dobsonfly larvae.

Sampling Results and General Trends

Despite a decrease in precipitation, weather conditions for the 2012 field-monitoring season were somewhat favorable for the Sandusky River SQM region. Ohio went from above normal conditions in 2011 to much below normal precipitation into May 2012 with an average of 1.50 inches of rain, 2.01 inches below normal for the Northwest Region (data from the National Oceanic and Atmospheric Administration). Although mild drought conditions lasted for most of the summer, scattered showers and thunderstorms into late summer and autumn kept river levels at a rate high enough for sampling for most of the 2012 SQM season. Conversely, because the early season was so dry, stagnant water conditions and increased levels of algae were present at some sites and hindered sampling.

Staff on the Sandusky River conducted a total of 20 assessments at seven official monitoring sites in 2012. The Sandusky River recorded an average CIV of 23.6, corresponding to the excellent range for stream quality. The average taxonomic diversity per assessment was 13 macroinvertebrate orders (e.g. stonefly, damselfly, mayfly, etc.).

The average CIV for the Sandusky River is up from the 2011 average of 20.9. All reference stations scored in the excellent range at least once during the season. Regardless of causing less than optimal conditions, mild droughts often cause higher diversity within the riffles as habitat along the river's edge dries up, pushing macroinvertebrates to a smaller area. Additionally, all samples were collected by Scenic Rivers Program staff and may account for some of the slight deviation in season average.

Despite high CIV averages, development and agriculture continue to put pressure throughout the watershed. The Natural Resources Conservation Service states that, in recent years there has been a documented increase in soluble phosphorus (dissolved reactive phosphorus (DRP)) exported from Ohio watersheds. According to references cited by the National Center for Water Quality Lab, the Sandusky River had extremely high DRP loading in 2011 and similar annual levels in 2012. Such concentrations of nutrients can cause algae growth and low oxygen levels in the waterways.

Volunteer and ODNR 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 receive from our dedicated volunteer monitors. 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 Northwest Ohio Scenic Rivers Manager at 419-429-8306.

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.

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 water quality
TSS >133 mg/l = severely impacted water quality

2012 Results: A total of 20 TSS readings were taken in the Sandusky River. The Sandusky River had a median reading of 29 mg/L of TSS, which corresponds to the normal water quality range. The data set ranged from 15 mg/L to 53 mg/L of total suspended solids.

Comparison 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 on following page represents the mean CIV for each Stream Quality Monitoring reference station sampled on the river during 2012. 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 2-letter code given in Table 1. CIVs of 23 or greater indicate *Excellent* stream quality; CIVs of 17-22 indicate *Good* stream quality; CIVs ranging from 11-16 suggest *Fair* stream quality; and CIVs of 10 or less reflect *Poor* stream quality. Situated beside the CIV are the symbols + (improved), = (equal), or – (declined) 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. Sandusky River 2012 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
20.2	◆	◆	◆	◆	◆	◆	◆				◆	◆		◆			◆	◆	◆		21+
23.3	◆	◆			◆	◆	◆	◆	◆		◆	◆		◆		◆	◆	◆	◆	◆	27+
39.4	◆	◆			◆	◆	◆	◆			◆	◆		◆			◆	◆	◆		23+
41.8	◆	◆		◆	◆	◆	◆	◆			◆	◆		◆		◆	◆	◆	◆		22-
50.2		◆			◆	◆	◆				◆	◆		◆			◆	◆	◆	◆	19-
57.3		◆	◆	◆	◆	◆	◆				◆	◆	◆	◆		◆	◆	◆			24+
76.4	◆	◆	◆	◆	◆	◆	◆	◆			◆	◆	◆	◆		◆	◆	◆		◆	22=

Figure 1 represents the maximum and minimum range of CIVs recorded during the year for each reference station. Figure 2 represents mean CIVs at each reference station over many years.

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

Figure 1. Sandusky River 2012 CIV Maximum & Minimum Ranges

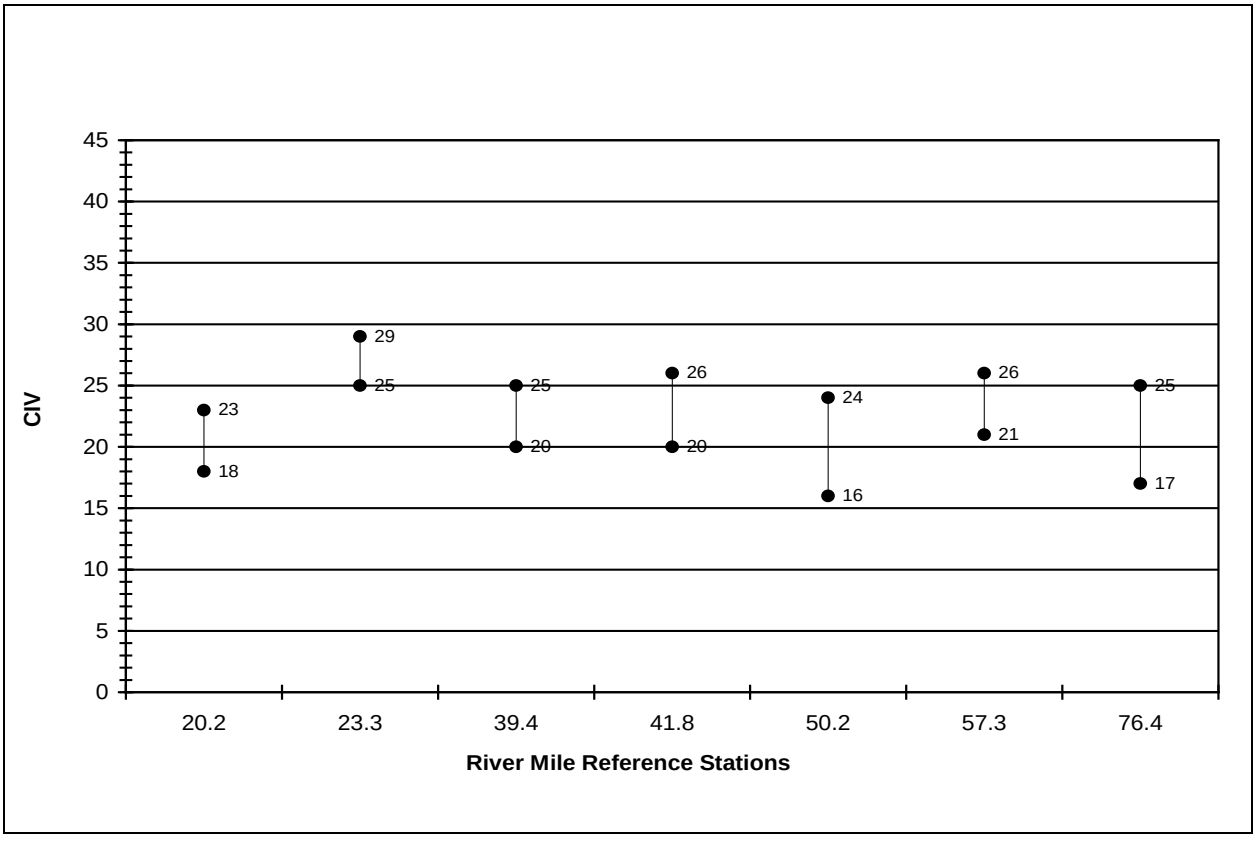
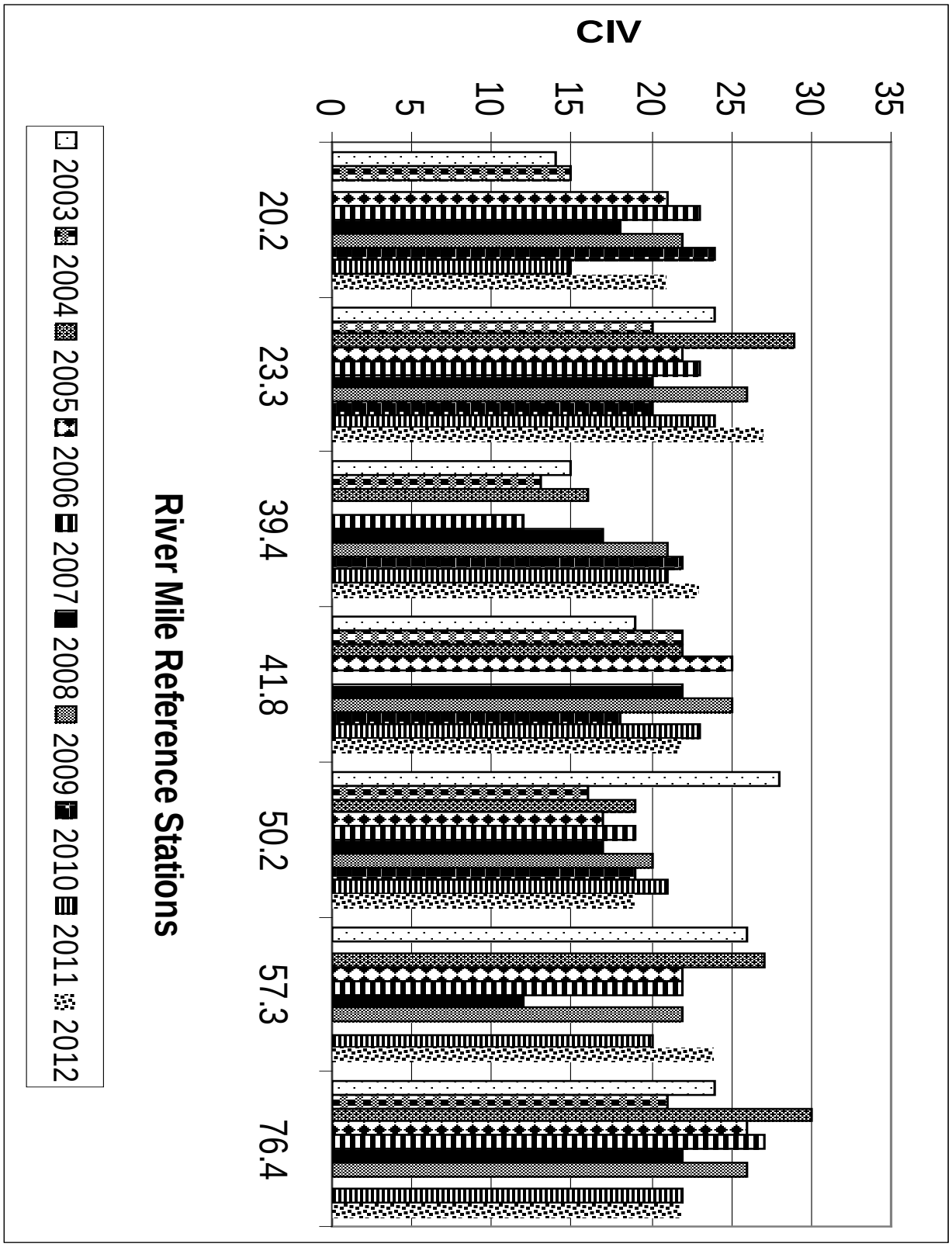


Figure 2. Sandusky River 2003 – 2012 Mean CIVs



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, SQM 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.These habitat conditions will be re-evaluated every five years.

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 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. Sandusky River 2010 QHEI and SQM Assessment Data

Reference Station	QHEI	2010 Average CIV	SQM Assessment
RM 20.2	67	24	Excellent
RM 39.4	70	22	Good
RM 41.8	62	18	Good
RM 50.2	70	19	Good
RM 57.3	60	23	Excellent
RM 76.4	75	23	Excellent

Appendix

2012 Data by Monitoring Station

Sandusky River																					
RM	DATE	WP	MF	ST	DO	CD	RI	OS	DA	DR	CR	BL	CF	SC	CL	SW	BF	AW	MI	PS	LE	CIV
20.2	7/5/12		A		A	A	A	A					A						A			18
20.2	9/1/12	A	A		B	B	A	A					A						A	A		22
20.2	11/19/12	A	A		B	B	B	B				A	A						A			23
23.3	7/5/12	A	B			C	B	A	A			A	A		A		A	A	B			26
23.3	8/18/12		B			C	B	A	A	A		B	A		B			A	B	A		25
23.3	11/19/12		A	A		B	B	B	A	A		B	A		A			A	B	A	A	29
39.4	7/5/12		B	A		C	B		A			A	A					A	B			20
39.4	8/31/12	A	A	A		B	B	B				B			B			B	B	A		25
39.4	11/19/12	A	A	A		B		B				A	A		A			A	A	A		24
41.8	7/5/12		B			C	C	A					A		C		C	B	B	A		20
41.8	8/31/12		B		A	B	B	B	A			B	A		B			A	A	A		26
41.8	11/19/12		A			B	A	A				A	A		A				A	A		20
50.2	7/5/12		B			C	B						A		B			A	A		A	16
50.2	8/31/12		B		B	B	A	B				B	A		B			B	B	A		24
50.2	11/19/12					B	A	A					A		A			A	B	A	A	17
57.3	7/5/12	A	B			C	B					A		A	A		A	A	B			21
57.3	8/31/12	A	B		A	C	B	A				A	A					A	B			24
57.3	11/19/12	A	A	A		B	B	A				A	A		A			A	A			26
76.4	7/5/12	A	B	A		C	B		A				A		C		A	A	B		A	25
76.4	8/18/12		A			C	B					B	A		B			C	B			17
76.4	11/19/12	A	A			B	A	A	A			A	A	A				A	A			25