Stream Quality Monitoring 2013 Annual Report
Little Miami State & National Scenic River

Contents

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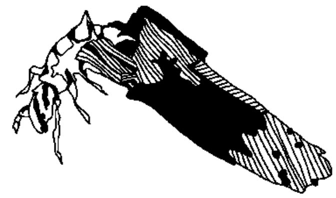
Ohio Scenic Rivers Program



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

Stream Quality Monitoring Project

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

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

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

SQM Project Relies on Volunteers

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

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

SQM Annual Report

The information collected by volunteers has become a critical tool for documenting the health of Ohio's state scenic, wild and recreational rivers. This report is a compilation of field data collected during 2013 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

On April 23, 1969, the Little Miami River earned the distinction of becoming Ohio's first designated State Scenic River. From its headwaters in Clark County, the Little Miami flows southwesterly for more than 100 miles, traversing five counties before arriving at its confluence with the Ohio River. The Little Miami River was also the first Ohio stream to be designated as a National Scenic River.

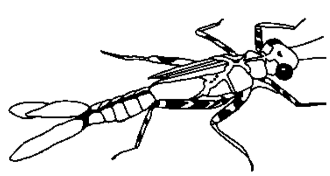
Noted for breathtaking vistas and scenery, the Little Miami River supports rich and abundant aquatic life. More than 87 species of fish, 36 species of mussels (including five state endangered species) and untold species of breeding birds reside within the river valley. Exceptional water quality in the Little Miami also supports diverse populations of pollution-intolerant macroinvertebrates, such as dobsonfly larvae, water penny beetles and many others.

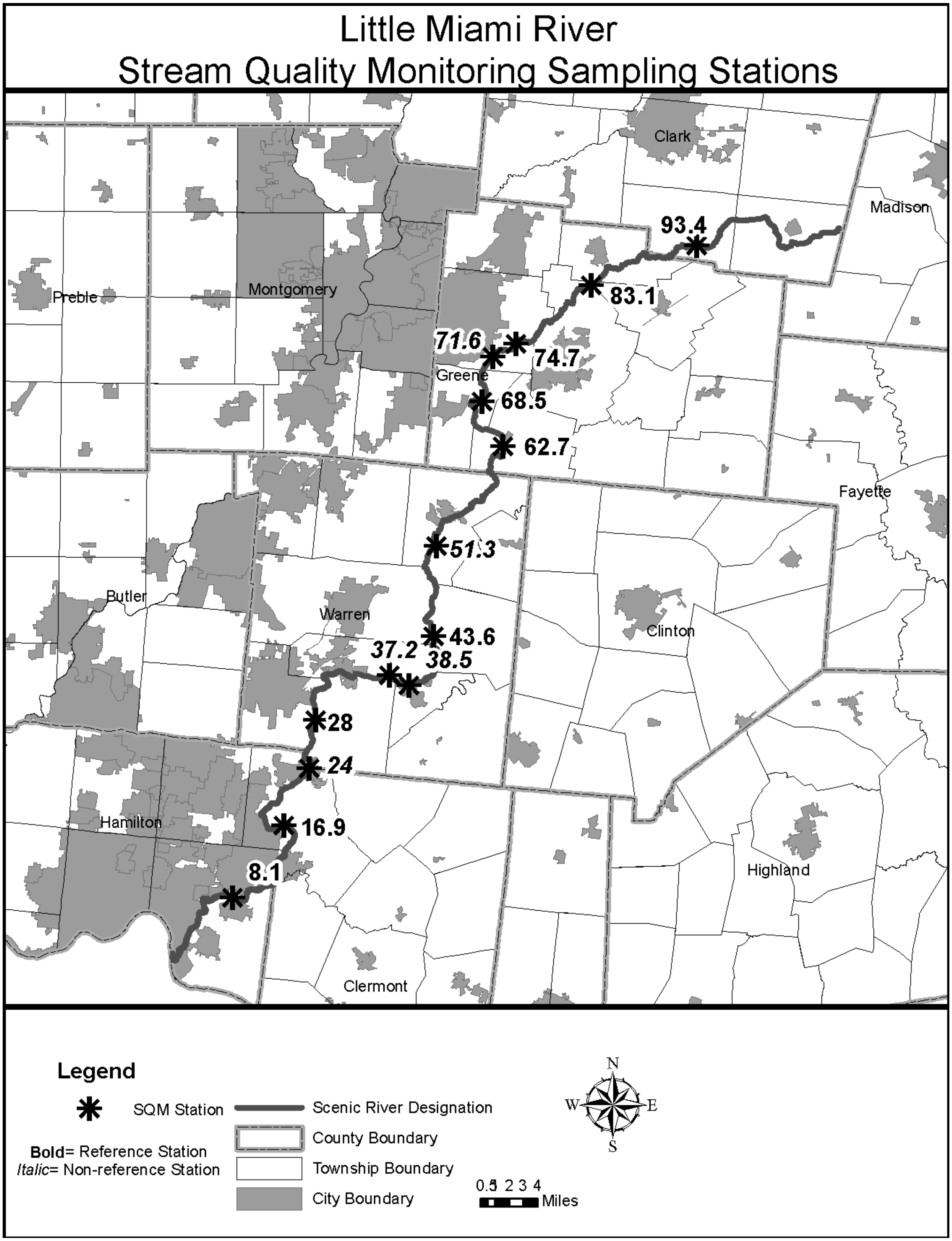
Public access to the Little Miami Scenic River is readily available through a variety of facilities including Clifton Gorge State Nature Preserve, John Bryan State Park, several Greene County parks, the Little Miami State Park and several scenic river access sites. Additionally, numerous private campgrounds and canoe liveries offer a variety of activities for enjoying the river. Due to its unique combination of spectacular beauty and easy access, the Little Miami Scenic River is a popular venue for hikers, canoeists, fishermen and bicyclists.

The Little Miami River valley is also home to many of Ohio's significant historical and archaeological sites. Fort Ancient, located in Warren County and managed by the Ohio Historical Society, was home to at least two of Ohio's prehistoric mound-building tribes. The Little Miami valley was also home to the Shawnee Indians and the influential chief, Tecumseh. Arrowheads, pottery shards and many other Indian artifacts are commonly found along the river.

The Little Miami flows through several natural areas which highlight the wide diversity of Ohio's ecology. For instance at Clifton Gorge State Nature Preserve, the high dolomite cliffs of the narrow gorge provide an exceptional display of plants commonly seen in climates much farther north. Boreal relicts, such as hemlocks and white cedars, provide an interesting view into Ohio's glacial past. Additionally, more than 340 species of wildflowers are found in the preserve during the spring and summer months.

The Little Miami Scenic River is one of Ohio's exceptional waterways and an ideal place to spend a weekend exploring the natural heritage of our state. For more information about public access and facilities along the river, contact the Southwest Ohio Regional Scenic River Manager at 513-934-0751.




Little Miami River
Stream Quality Monitoring Sampling Stations
Clark
Madison
93.4
83.1
Preble
Montgomery
71.6
74.7
Greene
68.5
62.7
Fayette
51.3
Butler
Warren
Clinton
43.6
37.2
38.5
28
24
Hamilton
16.9
8.1
Highland
Clermont
Legend
SQM Station
Scenic River Designation
County Boundary
Township Boundary
City Boundary
Bold= Reference Station
Italic= Non-reference Station
0.5 1 2 3 4
Miles
N
S
E
W

2013 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 Little Miami River. Their time and dedication to this river and the Ohio SQM Project is greatly appreciated. Special thanks are extended to the Little Miami Scenic River Advisory Council for their continued support and assistance.

River Mile 8.1 - Bass Island Park Access
Steve Long,
Mike Raulston,
Rob Aders
Jim Schengber

River Mile 16.9 - Rock Pit Access
Steve Long
Matt Pettys

River Mile 24.0 – Nesbit Park Access *(non-reference station)*
Bryan Jones: Sycamore Junior High School

River Mile 28.0 - Carl Rahe Memorial Access
Friends of Simpson Creek
Diana Halligan
Brittany Campbell

River Mile 37.2 - Hall's Creek Access *(non-reference station)*
Volunteer Needed

River Mile 38.5 – Confluence of Todd's Fork *(non-reference station)*
Volunteer Needed

River Mile 43.6 - Fort Ancient Access
Molly Conley
Travis Luncan

River Mile 51.3 - Caesar Creek Access
Emily and Bill Goodlick
Travis Luncan

River Mile 62.7 Constitution Park
Hope Taft
Jessica Stevens
Don Erwine

River Mile 68.5 - Washington Mills Access
Beth and Matt Owens
Don Erwine
Paul Daugherty

River Mile 71.6 - The Narrows Reserve *(non-reference station)*
Christine Evans: St Albert's the Great

River Mile 74.7 - Glen Thompson Reserve
Bill Schieman
Paul Dagherty
Christine Evans: St Albert's the Great

River Mile 83.1 - Jacoby Road Access
Josh Rogers

River Mile 93.4 - Garlough Road Access
Josh Rogers

The continued success of the Stream Quality Monitoring Project is dependent upon the commitment and dedication of these (and other) volunteers and participants. We would like to acknowledge volunteers *Matt Petteys; Steve Long; Mike Raulston; Rob Aders; Brittany Campbell; Molly Conley; Travis Luncan; Emily and Bill Goodlick; Beth and Matt Owens; Hope Taft; Jessica Stevens; Don Erwine; Paul Daugherty; and Bill Schieman* for monitoring 3 times or more during the 2013 season. If you would like to participate in Ohio's volunteer Stream Quality Monitoring Project, please contact the Southwest Ohio Stream Quality Monitoring Coordinator 513-934-0751.

Station Descriptions

Public access to the Little Miami River is widely available. As a result, many stream quality monitoring stations are located on public property and present little difficulty for volunteers to access and regularly monitor. The following are brief summaries of selected stream quality monitoring sites along the Little Miami River.

River Mile 8.1 - Bass Island Park Access

Bass Island is managed and maintained by the Hamilton County Park District. The area is heavily used and easily accessed by fishermen, cyclists, hikers and canoeists. It is an excellent site to access the lower stretch of the Little Miami. The riffle is very deep at this station and is comprised of mostly cobbles and gravel, providing excellent habitat for dobsonfly larvae and stonefly nymphs.

River Mile 16.9 - Rock Pit Access

An excellent sampling station on the Little Miami, the riffle area here is approximately 100 feet wide. A high diversity of macroinvertebrates inhabit this site with damselfly nymphs being quite common.

River Mile 28.0 - Carl Rahe Memorial Access (Glenn Island)

This monitoring station is easily accessible with ample parking available. The Carl Rahe Memorial Access, once called Glen Island, is one of the more popular fishing sites along the Little Miami in Warren County. Large cobbles, gravel and boulders make up the river bottom with a wide variety of macroinvertebrates inhabiting this riffle. Many pollution-intolerant species are found here, including a large number of caddis fly larvae.

River Mile 43.6 - Fort Ancient Access

Famous for the nearby Indian burial mound site administered by the Ohio Historical Society, the Fort Ancient station provides access to a variety of activities along the Little Miami River. Used heavily by fishermen and canoeists, this access provides plenty of parking and well-established trails to the sampling area. The riffle area is composed mainly of gravel and cobbles, which provide excellent habitat for a wide variety of macroinvertebrates.

River Mile 51.3 - Caesar Creek Access

Due in part to the shallowness of this riffle area, water penny beetle larvae are found abundantly at this site. The site is found just upstream from one of Warren County covered bridges.

River Mile 62.7 - Constitution Park

This riffle is shallow and mostly sand, gravel and some cobblestones. Numerous water penny larvae can be found at this site along with a large variety of other pollution-intolerant species, contributing to high CIVs..

River Mile 68.5 - Washington Mills Access

This sampling station is located adjacent to Stewart Road in the small town of Bellbrook. The riffle area is located under and immediately downstream from the bridge. Large gravel and cobbles comprise the majority of the river bottom and macroinvertebrate habitat at this site is generally good.

River Mile 74.7 - Glen Thompson Reserve

Glen Thompson Reserve is a small park area owned by the Division of Natural Areas and Preserves; it is located immediately adjacent to State Route 35 and managed by the Greene County Park District. The riffle area, located about 200 yards upstream from the State Route 35 bridge crossing is composed primarily of gravel and cobbles and is considerably deep. This composition results in excellent habitat for dobsonfly larvae (hellgrammites) which are known to prefer deep, swift-moving riffles.

River Mile 83.1 - Jacoby Road Access

Located northwest of the City of Xenia, the Jacoby Road Access area is both easily accessible and an excellent site to sample. It is also a popular canoe access. Adequate parking is available for school groups wishing to utilize the river for the study of the macroinvertebrates and water quality relationship. The heavily forested river corridor in this area, when combined with a riverbed comprised of sand, gravel, cobble and boulders results in exceptional aquatic habitat. Within the 40-foot-wide riffle area, nearly all pollution-intolerant organisms may be collected at this sampling station.

River Mile 93.4 - Garlough Road Access

The northern most sampling station on the Little Miami, this area is located on Garlough Road in southern Clark County. Access is difficult due to thick brush and undergrowth and parking is restricted to the bridge area. Caution must be exercised when sampling this station. The riffle area is quite narrow and the riverbed is comprised mostly of sand and gravel. At times in the late summer and fall, the water is so clear that it is difficult to determine the depth of the water.

Sampling Results and General Trends

The 2013 field-monitoring season saw weather conditions very close to normal (data from the National Oceanic and Atmospheric Administration). Due to these weather conditions, volunteers had little difficulty accessing the ten designated reference sites during much of the year. However, during the month of July, rainfall amounts made sampling difficult. The month saw an increase of 1.7 inches of rainfall (NOAA). Many volunteers encountered high water conditions and had to use caution while accessing certain reference sites on the Little Miami River.

The Scenic Rivers Program staff were pleased to add 32 new volunteers to the Southwest Region during the 2013 sampling season. The volunteers worked hard to see to it that that all reference sites were sampled 3 times during the season and that each sampling was done 30 days apart. These volunteers were responsible for monitoring all 23 reference sites on the 3 Scenic Rivers in Southwest Ohio. This was a departure from 2012 where weather and staffing changes at ODNR left several reference sites unmonitored during the period.

With continued development along the Little Miami River, there comes immense pressure on the river ecosystem. Deforesting of stream banks, runoff, alteration of the riverbed, changes to riffle structures and the increase of impermeable surfaces are all examples of the impacts of development. Despite development pressures, sampling results on the Little Miami River during the 2013 season showed an increase of the average CIV at four stations, with six stations showing a decline. The average CIV of the ten stations sampled for 2013 was 26.1 while the average of the same stations for 2011 was 26.5. 2011 was the last season in which all 10 reference sites were monitored and therefore is used here for comparison. The 26.1 average CIV for 2013 corresponds to an excellent water quality rating. The Little Miami River's average taxonomic diversity for these stations per assessment was 11.4 macroinvertebrate orders (e.g. Stonefly, Damselfly, Mayfly, etc.) which is a decrease of 1.6 taxonomic orders. One reference site on the Little Miami River, River Mile 74.7 tied an all-time CIV record with a score of 34.

The once plentiful hellgrammite or dobsonfly larva has become less and less common over the years at most reference sites on The Little Miami River. The data collected shows a general downward trend for this pollution intolerant macroinvertebrate over the last several years. Scenic Rivers staff will pay close attention to the numbers of hellgrammites reported by our volunteers during the 2014 monitoring season.

Attention should be paid to the increasing percentage of impermeable surfaces within this watershed. Impermeable surfaces create an increase of non-point source pollution through stormwater runoff. This can affect soil and tree root systems that would normally absorb and filter water, forcing the unfiltered water and sediments to enter directly into the river system. Furthermore, new developments have minimized the existing forest corridor along the river. The forest corridor plays many important roles in the watershed community. It acts as a large buffer system that filters incoming non-point source pollution. The root system of the trees prevents erosion by holding the soil in place. The shade cast by the forest canopy sustains a generally constant water temperature. Also the forest corridor provides organic matter as a food source for many organisms in the river system.

Volunteer and ODNR staff data are used for the Ohio Stream Quality Monitoring 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. Working together we have 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 Southwest Ohio Scenic River SQM Coordinator at 937-481-4510.

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 Total Suspended Solids (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 (or slope) 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 total suspended solid 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

2013 TSS Results: A total of 35 TSS readings were taken in the Little Miami River. The river had a median value of 10.6 mg/L of TSS, corresponding to the normal range. Based on scale above, a TSS rating under 10 mg/l would have placed the river in the excellent range for water quality. The data set ranged from 5 to 45.3 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 the 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)	Damselfly Nymphs (DA)	Black Fly Larvae (BF)
Mayfly Nymphs (MF)	Dragonfly Nymphs (DR)	Aquatic Worms (AW)
Stonefly Nymphs (ST)	Crane Fly Larvae (CR)	Midge Larvae (MI)
Dobsonfly Larvae (DO)	Beetle Larvae (BL)	Pouch Snails (PS)
Caddis fly Larvae (CD)	Crayfish (CF)	Leeches (LE)
Riffle Beetle Adult (RI)	Scuds (SC)	
Other Snails (OS)	Clams (CL)	
	Aquatic Sowbugs (SW)	

Table 2 represents the mean Cumulative Index Values (CIVs) for each Stream Quality Monitoring reference station sampled on the river during 2013. 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 year's 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 Miami River 2013 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
8.1	◆	◆	◆		◆	◆	◆	◆		◆	◆			◆		◆	◆	◆			20-
16.9	◆	◆			◆	◆	◆		◆	◆	◆			◆			◆			◆	20-
28.0	◆	◆			◆	◆	◆	◆		◆	◆			◆	◆	◆	◆			◆	27+
43.6	◆	◆	◆		◆	◆	◆	◆		◆	◆	◆		◆			◆			◆	26-
51.3	◆	◆	◆		◆	◆	◆	◆	◆	◆	◆	◆		◆	◆	◆	◆	◆		◆	32+
62.7	◆	◆	◆	◆	◆	◆	◆	◆		◆	◆		◆	◆	◆		◆	◆		◆	23+
68.5	◆	◆	◆		◆	◆	◆	◆	◆	◆	◆	◆		◆	◆		◆	◆	◆	◆	25-
74.7	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆		◆	◆		◆	◆		◆	31+
83.1	◆	◆	◆	◆	◆	◆	◆	◆		◆	◆	◆		◆	◆	◆	◆				29+
93.4	◆	◆	◆		◆	◆	◆	◆	◆	◆	◆	◆		◆	◆	◆	◆				28-

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

Figure 1. Little Miami River 2013 CIV Maximum and Minimum Ranges

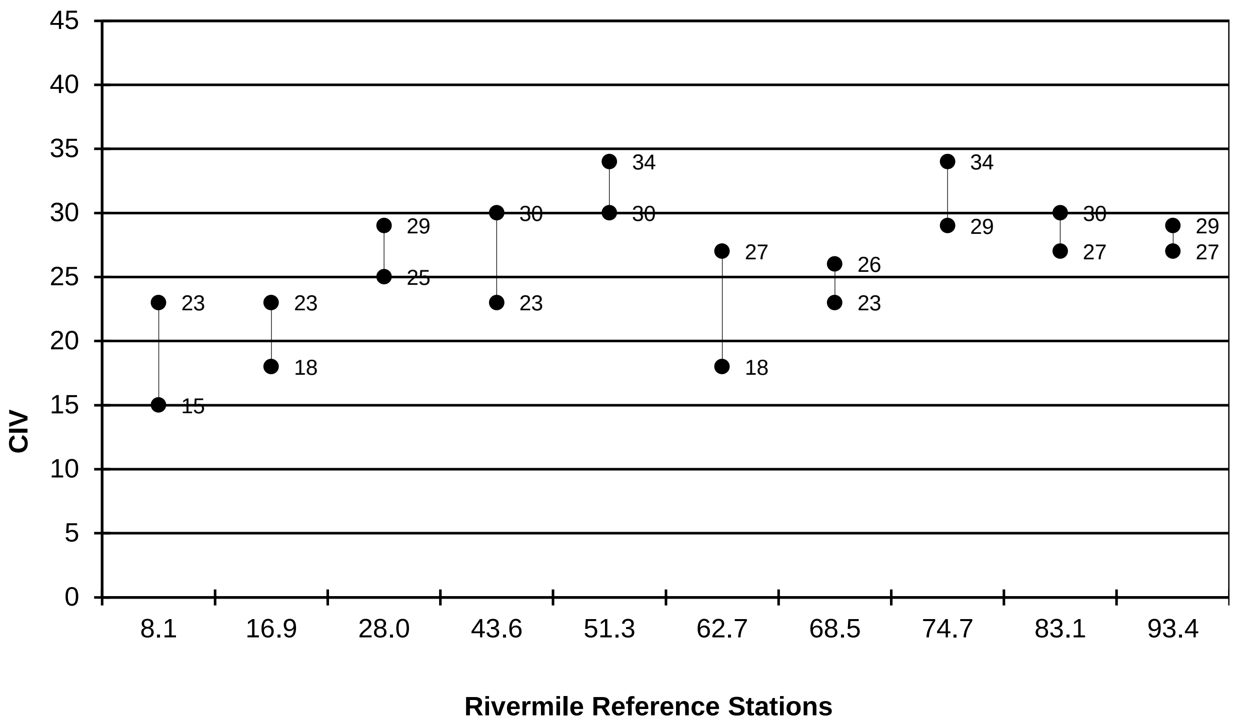
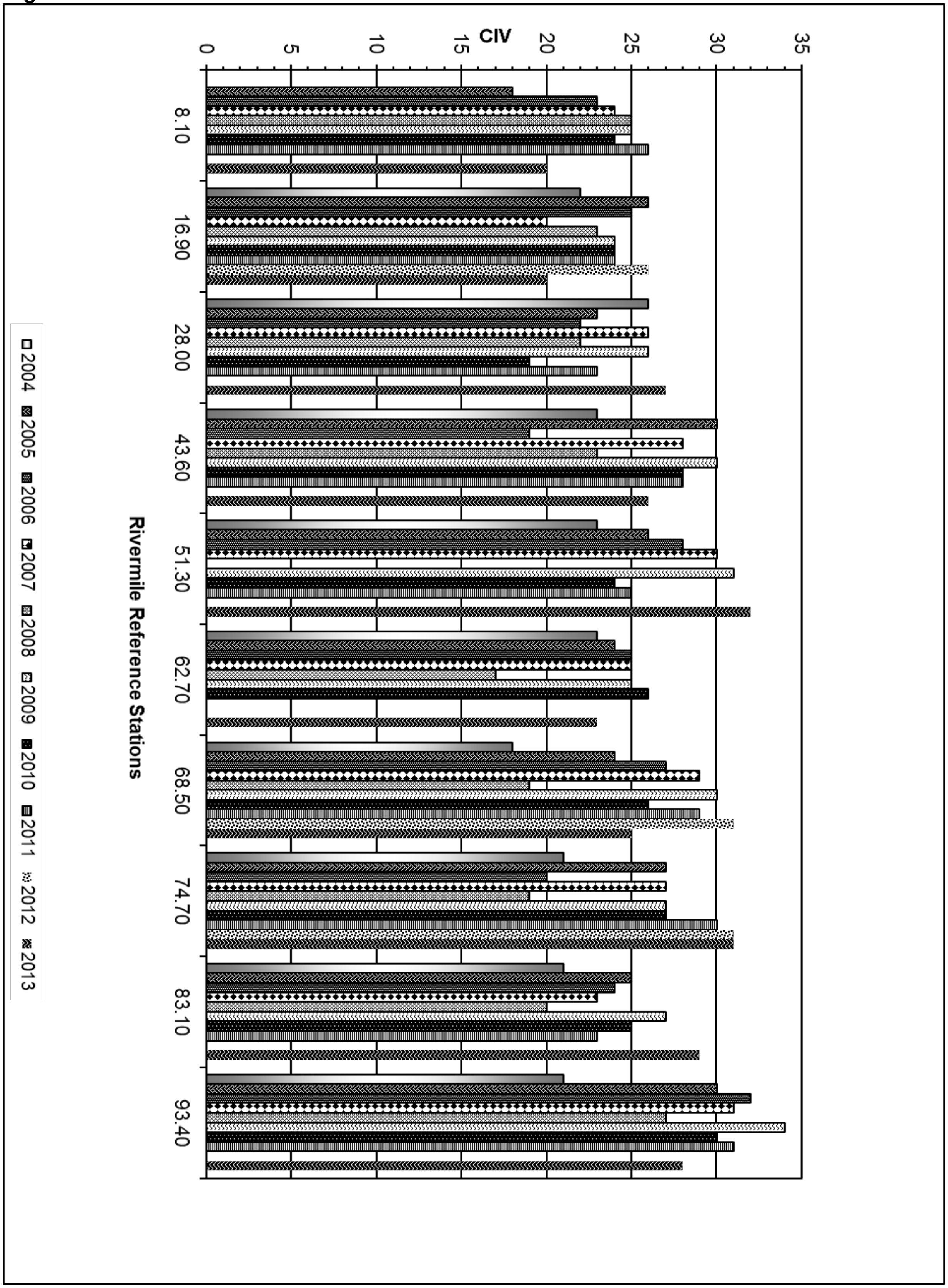


Figure 2: Little Miami River 2004- 2013 Mean CIV's



Appendix
2013 Data by Monitoring Station

LITTLE MIAMI RIVER																						
RM	DATE	WP	MF	ST	DO	CD	RI	OS	DA	DR	CR	BL	CF	SC	CL	SW	BF	AW	MI	PS	LE	CIV
8.10	7/16/2013		A			C	B		A			A					A	A				15
8.10	8/24/2013		A	A		A	A		A		A				A		A	A	A			21
8.10	9/25/2013	A	B	A		C	B	A				A					C	A	A			23
16.90	6/26/2013	A				C	B	B				C			A			C			A	18
16.90	7/28/2013	A	A			B	B	A				A						A			A	19
16.90	8/30/2013	A	A			A	A	A		A	A				A			A				23
28.00	6/20/2013	B	A			C	B	C	A		A	C			B	A		C			A	27
28.00	8/2/2013	B	B			C	B	C	A		A	A			B			C			A	25
28.00	9/5/2013	A	B	A		B	B	B	B		A	B			B		A	C			B	29
43.60	6/26/2013	A	A	A		C	C	B	A		A	B	A		B			C			A	30
43.60	7/28/2013	A	B	A		C	B	B				A						B				23
43.60	10/20/2013	B	A	B		C	B	B			B	B			B			B				25
51.30	7/1/2013	A	A			C	A	C	A		A	A	B		C	A		C	A		B	30
51.30	8/2/2013	A	B			C	B	B	A		A	B	A		B	A	B	C	A		B	31
51.30	9/5/2013	B	B	B		B	B	B	A	A		B	A		B	A	A	B	A		A	34
62.70	6/23/2013	B	A			C	C	B			A	B			C			B			A	23
62.70	8/18/2013		B	B	A	B	B	A	A					A	A			B	A		A	27
62.70	10/20/2013		B	B			B	B	A						A			A	A			18
68.50	6/29/2013	B	A	A		C	B	C				B			C	A		A			A	26
68.50	7/31/2013	B	A			C	A	B			A	A	A		B	A	A					26
68.50	10/14/2013	A	A	A		A		A	A		A				A			A			A	23
74.70	6/15/2013	A	B	A		C	B	B	A	A	A	A	A		B	A		A	A			34
74.70	8/20/2013	A	B		A	C	B	B	A		A		A		B			A	A		A	29
74.70	10/26/2013	B	B	A		C	A	A	A	A	A		A		B			A	A		A	31
83.10	6/26/2013	B	C		A	C	B	B			A	A	B		A			C				27
83.10	7/28/2013	A	B		A	B	B	B			A	A	A		A	A		C				29
83.10	10/28/2013	B	C	B	A	B		B	A		A	A	B		A		A	A				30
93.40	6/26/2013	B	A	A		B	B	B		A	A	B	B			A		B				29
93.40	7/28/2013	B	A	B		B	A	B	A		A	A	B			A		A				29
93.40	10/28/2013	B	C	B		B		A	A		A	A	A		A	A	A					27