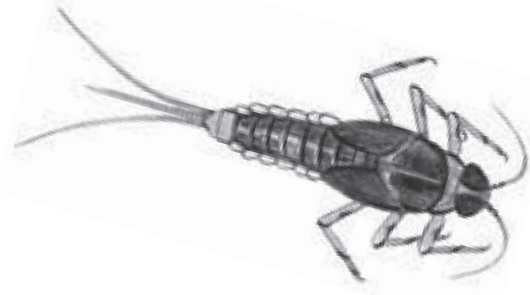


Stream Quality Monitoring 2009 Annual Report



Chagrin River State Scenic River



Department of Natural Resources
Division of Watercraft



Stream Quality Monitoring 2009 Annual Report

Chagrin State Scenic River

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Introduction

Ohio Scenic Rivers Program

With more than 60,000 miles of streams, Ohio is a water-rich state. Many of Ohio's streams support thriving plant and animal communities, including Ohio's state designated scenic rivers. Administered by the Ohio Division of Watercraft, the Ohio Scenic 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 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, 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 2009 by volunteers and staff. It also represents a year of dedication and commitment shown to Ohio's special waterways by thousands of SQM volunteers.

Chagrin State Scenic River Overview

A total of 71 miles of the Chagrin River have been designated as an Ohio Scenic River as the result of two separate designations. The Ohio Department of Natural Resources designated approximately 49 miles of the Chagrin River as Ohio's ninth scenic river on July 2, 1979. The Aurora Branch of the Chagrin is designated from State Route 82 downstream to the confluence of the main stem in Bentleyville. The main stem of the Chagrin River is designated from the confluence of the Aurora Branch downstream to the State Route 6 Bridge crossing in Willoughby Hills. The East Branch is designated for 15 miles from the Heath Road Bridge on the Lake-Geauga county line downstream to its confluence with the mainstem of the Chagrin River in Willoughby. The second designation, which added 22 miles to the initial designation, occurred in October 2002. This most recent designation added the mainstem of the Chagrin River from Woodiebrook Road Bridge near Bass Lake, downstream to the confluence with the Aurora Branch in Bentleyville. During 2002, new volunteers stepped forward to assist with establishing new monitoring locations on the recently designated portion of the Chagrin State Scenic River.

It is likely the Chagrin River obtained its name from the native "shagarin," which means clear water. However, some historians argue the river was named when General Moses Cleveland mistook the Chagrin for the Cuyahoga while sailing from Conneaut to the present-day Cleveland. Some believe the name was borne in the "chagrin" he experienced upon discovering his mistake.

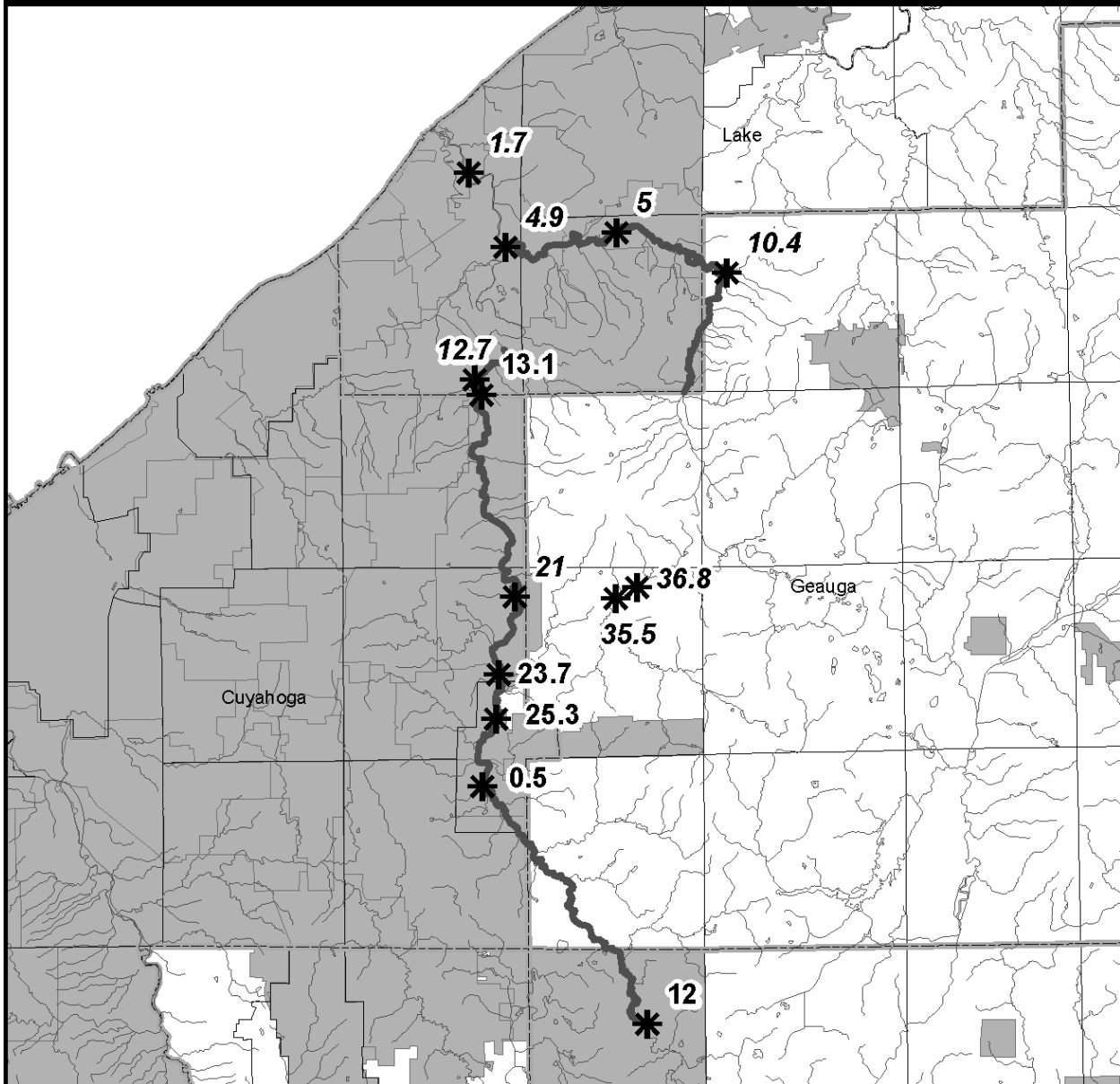
The Chagrin River flows largely through municipalities, however, only a small portion of the river is urban in character. Land adjacent to the river benefits from low density, residential, agriculture and open space use zoning. As a result, the river corridor retains much of its forest cover. Steep shale cliffs and rock outcroppings also highlight many areas of the river valley. Significant portions of the river flow through Holden Arboretum, and the North and South Chagrin Reservations of Cleveland Metroparks, each of which further protects and retains the natural beauty of the river. Several private land trusts also actively encourage landowners to further preserve the natural character of the river.

The Chagrin Valley offers a diverse variety of both terrestrial and aquatic wildlife. Recent surveys of aquatic life, including the efforts of SQM volunteers, indicate the Chagrin River has a healthy and diverse macroinvertebrate population, supporting 49 different species of fish. The Chagrin is one of the few streams in Ohio known to support the American brook lamprey. A riparian breeding bird survey conducted in 1994 identified 90 species of birds along the Chagrin River. Much like macroinvertebrates and fish populations, the diversity of bird species along a river is an effective indicator of the natural condition of a watershed.

The numerous efforts of agencies and groups, such as the Chagrin River Watershed Partners and the Western Reserve Land Conservancy, are making great strides in protecting the natural beauty, water quality and aquatic biodiversity of the Chagrin State Scenic River. However, much remains to be done. For more information about protecting the Chagrin River or to learn more about volunteer and participation opportunities, please contact the Northeast Ohio Regional Scenic River Manager at 330-872-0040 or the Northeast SQM Coordinator at 330-527-2961. For information online, visit www.ohiodnr.com/watercraft.

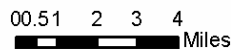


Chagrin River Stream Quality Monitoring Sampling Stations



Legend

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



2009 Stream Quality Monitoring Participants

Whether their contribution was a one-time event or a recurring adventure in stream exploration, the individuals and organizations listed below played a significant role in monitoring the Chagrin River. Their time and dedication to this river and the Ohio SQM Project are greatly appreciated. Special thanks go to the Chagrin Scenic River Advisory Council and the Lake and Geauga County Soil and Water Conservation Districts for their continued support and assistance.

Chagrin River - Mainstem

River Mile 1.7 - Near Eastlake Landfill (non-reference site)

The Fraley Family - Bruce Fraley

River Mile 4.9 - Daniel's Park (non-reference site)

Lake Academy - Donna Temple
Grant Elementary School - Mrs. George
Grant Elementary School - Mr. Sulik
Grant Elementary School - Mrs. Gibson
Lake County Soil & Water Conservation District - Beth Landers

River Mile 12.7 - North Chagrin Reservation (non-reference site)

LHS Field Ecology - Alice Hubbard
Watercraft SQM Volunteer Training Workshop
Peaceful Children Montessori School

River Mile 13.1 - Rogers Road Bridge

Cuyahoga County Board of Health - N. McConoughey and C. Bauer

River Mile 21.0 - Hunting Valley, Fairmount Road Bridge (non-reference site)

Cuyahoga County Board of Health - N. McConoughey and C. Bauer
Millennium Youth Conservationists - Geauga SWCD - Ron Etling

River Mile 23.7 - Cleveland Metroparks Polo Field

Cuyahoga County Board of Health - N. McConoughey and C. Bauer

River Mile 25.3 - Chagrin Blvd., Moreland Hills

David and Sandra Cobb

River Mile 28.5 - River Run Park (non-reference site)

Steven E. Patton

River Mile 28.8 - Chagrin Falls, Whitesberg Park (non-reference site)

Steven E. Patton
Millennium Youth Conservationists - Geauga SWCD - Ron Etling
Millennium Youth Conservationists - Clemons - Manke - Welling Families

River Mile 30.7 - Chagrin Falls, Miles Road (non-reference site)

No samples were recorded at this station during 2009.

River Mile 35.5 – West Geauga Commons – Route 306 (non-reference site)

Millennium Youth Conservationists - Geauga SWCD - Ron Etling
Millennium Youth Conservationists - Clemons - DiNicolae - Welling
Newbury H.S. - Joe Intellsano

River Mile 36.8 - Beechwood Drive – Upper Chagrin Preserve (non-reference site)

West Geauga High School Environmental Ed. Class - Mike Taurasi - Mike Sustin

Chagrin River - Aurora Branch

River Mile 0.5 - Squaw Rock, South Chagrin Reservation
Cuyahoga County Board of Health - C. Bauer - N. McConoughey

River Mile 12.0 - SR 82 Bridge, Aurora
Aurora Conservation Councils' Moebius Nature Center - Rob Swaney

Chagrin River - East Branch

River Mile 5.0 - Baldwin Road, Kirtland Hills (non-reference site)
This location is temporarily inaccessible.

River Mile 6.7 - Booth Road Bridge (non-reference site)
Lakeland Community College - Dr. David Pierce

River Mile 10.4 - Mitchell Mills Road Bridge, Geauga County (non-reference site)
Fred & Jean Dively
Holly Bollin - Booth
Chincapin Camp - Karen Rayl
MYC - Geauga SWCD - Ron Etling

River Mile 11.4-11.8 – Riverwood Farms, Geauga County
Holden Arboretum - Becky Thompson & Julie Dougherty
Chardon Park Elementary - Maple Elementary - Chestnut Davis Elementary
Euclid Memorial Park Elementary - Hambden Elementary - Munson Elementary
Painesville Elementary Schools - Red Oak Adventure Camp - Roosevelt Elementary
Euclid Schools - Thomas Jefferson Elementary - Upson Elementary
West Geauga Westwoods Elementary - Wiggins Elementary

River Mile 13.7 – Lakebrook Drive, Lake County (non-reference site)
The Meek Family

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 Scenic River Manager at 330-872-0040 or the Northeast SQM Coordinator at 330-527-2961.

Station Descriptions

Public access to the Chagrin River is widely available through a variety of park areas owned and administered by the Cleveland Metroparks system. Many of the SQM sites on the Chagrin are located in park areas. Others are located at highway bridge crossings where volunteers can access and monitor the sites without difficulty. The following are brief descriptions of the selected SQM sites along the Chagrin River.

Chagrin - Mainstem

River Mile 1.7 - Near Eastlake Landfill (non-reference site)

A very popular area for fishing, this station is located between the Eastlake Landfill, which is accessed off Rural Drive in Eastlake, and DeMilta Sand and Gravel. This monitoring station is of particular importance due to the proximity of a closed demolition debris and municipal waste landfill upstream. Long-term data collected at this site is helpful in determining what, if any, impact this may have on water quality within the area.

This site has a limited riffle area, but the macroinvertebrate population is adequate. Two samples were taken during 2009 that showed water quality ranging from fair to good.

River Mile 4.9 - Daniel's Park (non-reference site)

Although this site is not located within the designated segment of the Chagrin River, data from this sampling station is important nonetheless. Daniel's Park is a heavily used and widely accessible facility along the Chagrin. Many large steelheads were historically caught at this site until a heavy surge of snowmelt runoff and rain breached the dam's concrete structure on January 2, 2004. Judging by the results of samples taken over the last five years, it has been determined that no negative effects have occurred because of the breach. Initially it was not known how this event would affect the riffle area or the effects it would have on future Cumulative Index Values (CIVs).

Located 100 yards downstream from the dam, the sampling area is comprised mostly of cobblestones, sand and gravel. The river at this location provides a number of riffle areas to sample. CIVs were consistently in the fair to excellent range in 2009. At this site, many pollution-intolerant organisms were collected during sampling.

River Mile 12.7 - North Chagrin Reservation, Willoughby Hills (non-reference site)

This station is located in the Old River Farm Park Area within the North Chagrin Reservation of the Cleveland Metroparks system. The sampling station may be reached by walking from River Road or from the shelter house, which is open only by reservation. The riffles at this location provide a number of different sampling areas from which to choose.

The stream bottom is comprised of cobblestones, gravel, sand and some boulders. Excellent habitat for macroinvertebrates exists at this site and CIVs for the station are consistently high. Results from the 2009 sampling season ranged from good to excellent. A wide variety of organisms from all three taxa groups are frequently collected here.

River Mile 13.1 - Rogers Road Bridge, Cleveland Metroparks

Easily accessible through the Cleveland Metropark facilities nearby, this site has been an SQM reference station on the Chagrin River for many years. It is a good location for introducing groups, particularly schools, to stream quality monitoring since there is ample parking and other nearby facilities. However, caution must be exercised when wading in the river due to slippery bedrock in some areas.

There is a number of different riffle areas from which to sample, however, CIVs for this area vary due to the shifting nature of the substrate. Following periods of high water and flooding, disruption to the streambed may result in decreased CIVs. As with other rivers with bedrock bottoms, macroinvertebrate populations may be found where there is adequate habitat of gravel and cobblestones. Results from sampling throughout the year yielded one good and five excellent readings.

River Mile 21.0 - Hunting Valley, Fairmount Road Bridge (non-reference site)

This sampling station is located on private property. Access is by special permission only. As a result, this site is monitored exclusively by the Cleveland Museum of Natural History.

Although sampling frequency is limited, CIVs for this station are consistently high with an abundance of pollution-intolerant organisms, such as stonefly nymphs and dobsonfly larvae. In 2001, Dr. Joe Keiper of the Cleveland Museum of Natural History found Ohio's first-known occurrence at this location of the caddisfly species *Leucotrichia pictipes* in the family Hydroptilidae. This species had been found previously in Pennsylvania. Seven samples were performed during 2009 ranging from good to excellent.

River Mile 23.7 - Cleveland Metroparks Polo Field

Volunteers monitoring this site may have the occasion to watch a polo match while collecting macroinvertebrates. The sampling area is in the river immediately adjacent to the Cleveland Metroparks Polo Field, the site of numerous polo matches, dog shows and other activities. There is ample parking and nearby picnic facilities for groups wishing to monitor this area. Access to the river is safe and convenient.

The river bottom is mostly bedrock with cobblestones, sand and gravel deposited during periods of high flow. The stream bottom is subject to shifting during periods of flooding and high water, so the habitat that existed on one visit may no longer be intact upon follow-up trips to this site. When conditions are good, CIVs for this site are good to excellent. However, prior to sampling at this area, it is wise to check the water conditions. Bedrock stream bottoms are treacherous during high water conditions. Five samples were completed in 2009 resulting in good to excellent water quality at the time of the testing.

River Mile 25.3 - Chagrin Blvd., Moreland Hills

This station is located several miles from Chagrin Falls with the South Chagrin Reservation of Cleveland Metroparks. Access to the river is down a gently sloping path leading through the woods. The path is well defined and heavily used by horseback riders.

Several riffle areas provide a large number of sites to sample. The streambed comprises a mixture of boulders, cobblestones, gravel and sand creating excellent habitat. The diligent sampler can find a wide variety of organisms. CIVs for this site ranged between fair and good in 2009.

River Mile 28.8 - Chagrin Falls, Whitesberg Park (non-reference site)

This sampling site is located at Whitesberg Park immediately upstream from River Run Park, (River Mile 28.5), in downtown Chagrin Falls. It represents one of several new stations added following the river designation extension in 2002. Owned by the village of Chagrin Falls, the park is open to the public. Parking is ample with easy access to the river down a gentle sloping bank.

The riffle in this area consists of a high percentage of gravel with a relatively even mixture of sand and cobblestones, providing ideal habitat for the aquatic insect community. A small number of boulders can also be seen here. High CIVs in the good to excellent range were recorded during the sampling season at this site.

River Mile 35.5 - West Geauga Commons - Route 306 (non-reference site)

This sampling station is located directly off Route 306 at the recreation park owned by the Geauga County Board of Commissioners. This too is one of the stations added following the Chagrin designation extension in October 2002. To access the sampling site, drive to the back parking lot near the baseball field.

Access to the riffle area is safe and convenient, making this station ideal for school groups. The riverbed is comprised mainly of cobblestones and gravel with a moderate amount of sand providing ideal habitat for aquatic insects. Four samples were taken here during the 2009 season resulting in good and excellent readings.

River Mile 36.8 - Beechwood Drive (non-reference site)

This site is located on property owned by the Russell Township Board of Trustees. It represents the most upstream SQM site on the Chagrin River from Lake Erie. To access this site, take Route 306 to Beechwood Drive. Parking is limited to the side of the road so use caution when exiting your vehicle. Those wishing to sample at this location should be physically fit as the hike is approximately .5 mile down the power-line and through the preserve. The riverbank is very steep here requiring caution when entering the river.

The riffle area is a mixture of cobblestones, sand and gravel, which makes excellent macroinvertebrate habitat. The aquatic sampler can expect to find a wide variety of organisms at this location. Two samples were recorded at this site during 2009 showing good to excellent water quality.

Chagrin River - Aurora Branch

River Mile 0.5 - Squaw Rock, South Chagrin Reservation

Squaw Rock is a large formation at water's edge with large native carvings of a serpent and bow and arrow etched into the rock. The carvings are easily seen from the river. Steep banks emerging from the river are covered with hemlock trees and numerous waterfalls spilling down the cliffs of chagrin shale.

Access to this site is difficult, requiring a hike of nearly one-half mile before reaching the sampling area. The path is well marked and the area well maintained. The hike is somewhat vigorous and the banks steep. Once arriving at the river, samplers may expect very good results with high CIVs and a wide variety of macroinvertebrates. Five good to excellent readings were recorded during the 2009 sampling season.

River Mile 12.0 - State Route 82 Bridge, Aurora

This sampling station is located on private property and public access is restricted. Located downstream from the Route 82 Bridge, the riffle is comprised of cobblestones and gravel. What otherwise would be excellent habitat is affected by seasonably low flows during the summer months. CIVs for the site are generally good, with most of the collections made up predominately from Group I and II taxa. Five samples were performed throughout the season ranging from fair to good.

Chagrin River - East Branch

River Mile 5.0 - Baldwin Road, Village of Kirtland Hills (non-reference site)

Public access to this station is limited; special permission is required from the Kirtland Hills Police Department before driving back to the river area. Despite a predominately bedrock river bottom, sampling results from this station are quite good with mayfly and stonefly nymphs, as well as dobsonfly and caddisfly larvae comprising much of the collection. No samples were recorded during 2009 due to restricted access to the sampling site.

River Mile 6.7 - Booth Road Bridge (non-reference site)

The Booth Road Bridge is located 1.5 miles from Kirtland Chardon Road. The location of the sampling area is 100 yards upstream of the bridge. This site is located on private property so special permission is required before entering the area.

Bed composition of the riffle is made up of a large percentage of boulders with a medium percentage of cobblestones. Sand and gravel make up only a small percentage of the total substrate. Macroinvertebrate data consistently ranges from good to excellent. Samples recorded during 2009 fell within the fair to excellent range for relative water quality.

River Mile 10.4 - Mitchell Mills Road Bridge, Geauga County (non-reference site)

The final sampling station on the East Branch of the Chagrin River is located upstream of the Mitchell Mills Road Bridge in Geauga County. Numerous riffle areas are found upstream of the bridge, providing excellent macroinvertebrate habitat and a variety of sites from which to sample.

The riverbed is comprised of a relatively equal mixture of cobbles, sand, gravel and boulders. CIVs for this site throughout 2009 ranged from good to excellent with a variety of Group I and II taxa present.

Sampling Results and General Trends

Stream Quality Monitoring results for the Chagrin River in 2009 were consistent with those obtained in the past decade. The majority of stream samples completed to test relative water quality ranged from good to excellent with limited exceptions. According to monthly water inventory reports compiled by ODNR's Division of Water, stream flow in the spring of 2009 in eastern Ohio was below normal until mid-June when flows increased statewide following widespread precipitation. Overall, water levels fluctuated throughout the sampling season but never rose to what is considered excessive levels. Aquatic organisms also benefited from the significantly cooler than normal air temperatures across the region in July. The water temperature never exceeded 79 degrees throughout the sampling season where normal temperatures range from the lower to mid 80s during July and August. The average taxonomic diversity on the mainstem and Aurora Branch of the Chagrin River per assessment was ten macroinvertebrate orders (e.g. stonefly, damselfly, mayfly, etc.). The average taxonomic diversity on the East Branch per assessment was eight macroinvertebrate orders.

The relatively steep gradient of the Chagrin River results in rapid runoff of surface water. Increased residential and commercial development within the watershed contributes greatly to this increased flow due to an increased abundance of paved areas and compacted soil. High water velocity also disrupts the macroinvertebrate community by tumbling the cobbles and gravel on the river bottom. After episodes of high water, several weeks may pass before disturbed riffle areas are re-colonized by macroinvertebrates.

Overall, the results of the 2009 sampling on the Chagrin Scenic River indicate a good to excellent diversity of macroinvertebrates. There is still a concern about possible stresses being experienced by the aquatic ecosystem from the expanding development in the watershed. The residents and communities need to work together to protect riparian forest buffers, reduce impacts from stormwater runoff and promote environmentally sensitive designs for future developments. Individuals are encouraged to actively participate in local land trusts such as the Western Reserve Land Conservancy. The Ohio Scenic Rivers Program also supports the efforts of the Chagrin River Watershed Partners and encourages all communities in the Chagrin River watershed to become members.

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 Chagrin River watershed during 2009. Working together has produced significant results but more volunteer monitors are always needed. For more information, please contact the Northeast SQM Coordinator at 330-527-2961 or the Northeast Ohio Scenic River Manager at 330-872-0040.

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 Rivers 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 impact 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 $\frac{1}{4}$ 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

2009 TSS Results: A total of 37 TSS readings were taken on the main stem of the Chagrin River. The Chagrin River had a median of 10.0 mg/l of TSS, which corresponds to the normal range. The data set ranged from < 6.2 mg/l to as high as 84.0 mg/l of TSS. The Chagrin River - Aurora Branch had 10 TSS readings with a median of 23.0 mg/l, which corresponds to the normal range. The data set ranged from < 6.2 mg/l to as high as 30.0 mg/l of TSS. The Chagrin River - East Branch had a total of 46 TSS readings with a median of 6.2 mg/l, which corresponds to the excellent range. The data set ranged from < 6.2 mg/l to 17.0 mg/l of TSS in the Chagrin River mainstem.

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 and 3 represent the mean CIVs for each SQM reference station sampled on the river during 2009. In addition, the table uses symbols (♦) to indicate those macroinvertebrates found to be present at least once during the year at the respective reference station. Each macroinvertebrate is identified by a two-letter code given in Table 1. 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 CIVs attained at all sites monitored during the year, including non-reference stations, please see the *Appendix*.

Table 2. Chagrin River Mainstem 2009 Mean CIVs by Reference Station

STATION	W P	M F	S T	D O	C D	R I	O S	D A	D R	C R	B L	C F	S C	C L	S W	B F	A W	M I	P S	L E	CIV
13.1	♦	♦	♦	♦	♦	♦		♦		♦	♦	♦		♦		♦	♦	♦		♦	25=
23.7	♦	♦	♦	♦	♦	♦		♦		♦	♦	♦				♦	♦	♦			25-
25.3	♦	♦		♦	♦	♦		♦	♦	♦	♦	♦	♦			♦	♦				19-

Table 3. Chagrin River – Aurora Branch 2009 Mean CIVs by Reference Station

STATION	W P	M F	S T	D O	C D	R I	O S	D A	D R	C R	B L	C F	S C	S L	S W	B F	A W	M I	P S	L E	CIV
0.5	◆	◆		◆	◆	◆		◆		◆	◆	◆	◆	◆	◆	◆	◆	◆		◆	25-
12.0		◆	◆	◆	◆	◆				◆	◆	◆		◆		◆	◆	◆			18=

Figures 1.1 and 1.2 represent the maximum and minimum range of CIVs recorded during the year for each reference station. Figures 2.1 and 2.2 represent mean CIVs at each reference station over many years.

Figure 1.1 Chagrin River Mainstem 2009 Maximum and Minimum CIV Ranges

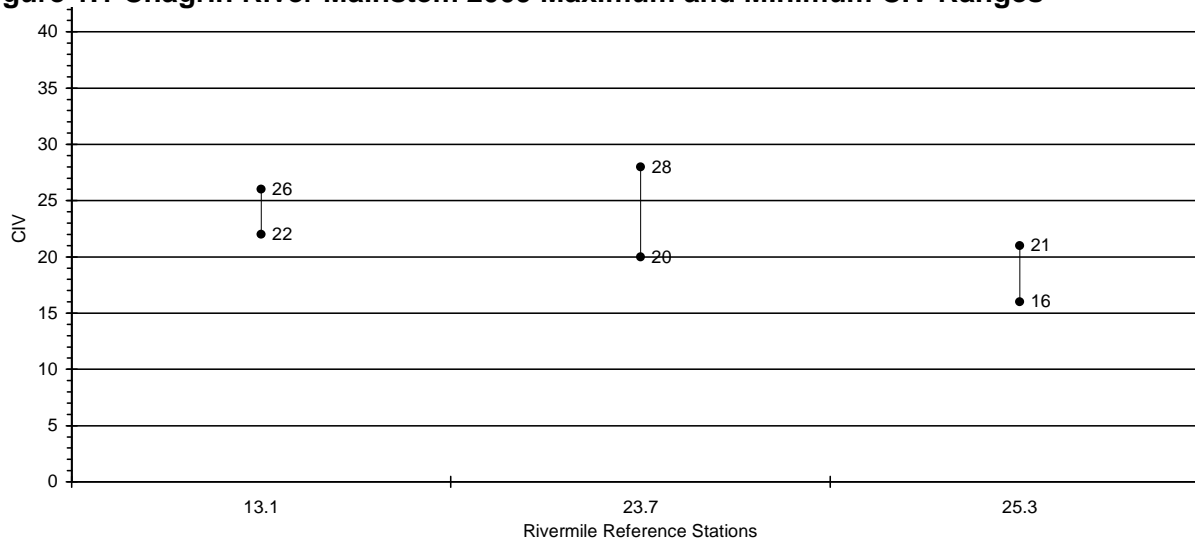


Figure 2.1 Chagrin River Mainstem 2000 – 2009 Mean CIVs

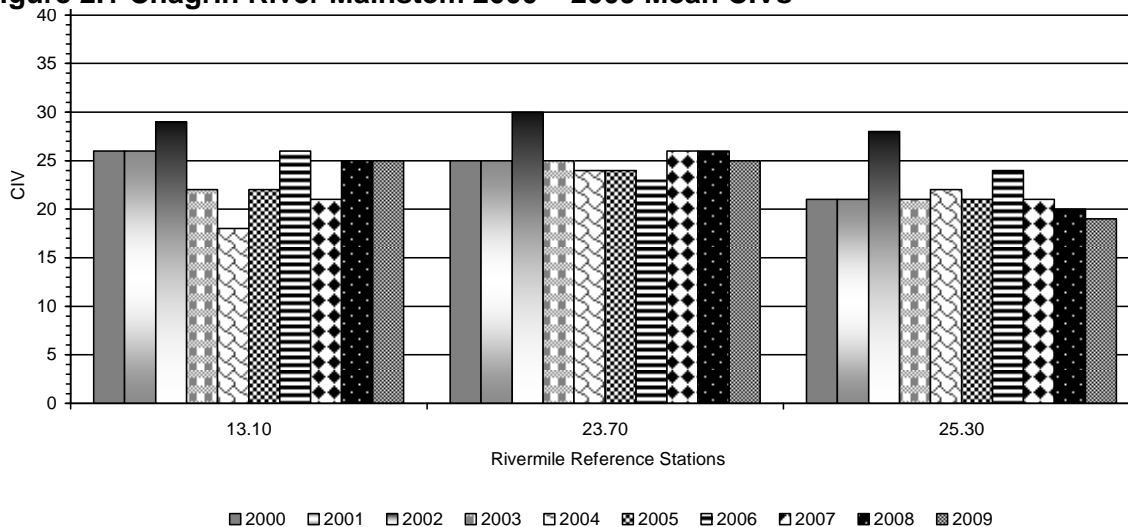


Figure 1.2 Chagrin River - Aurora Branch 2009 Maximum and Minimum CIV Ranges

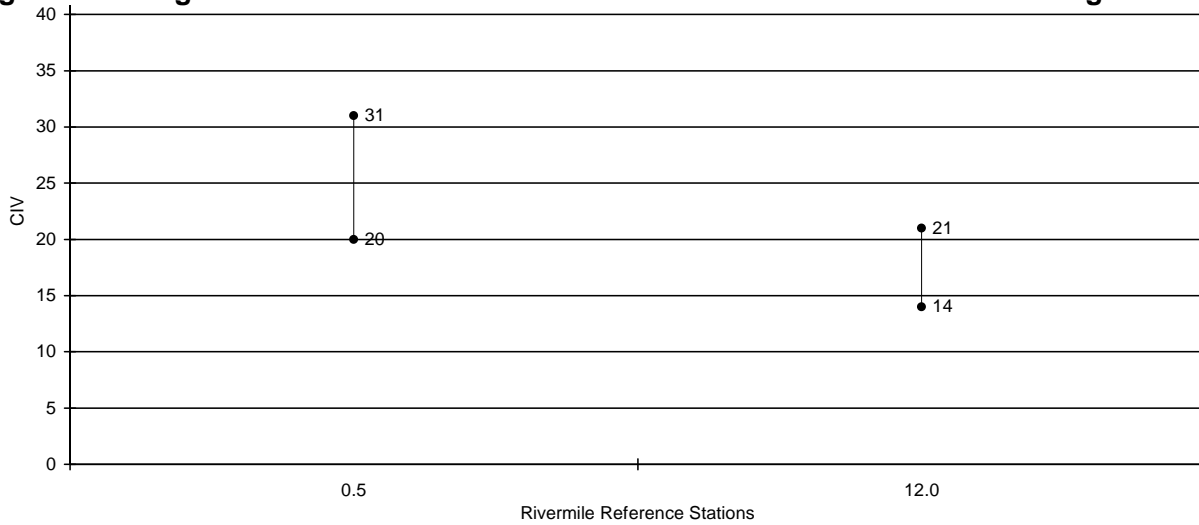
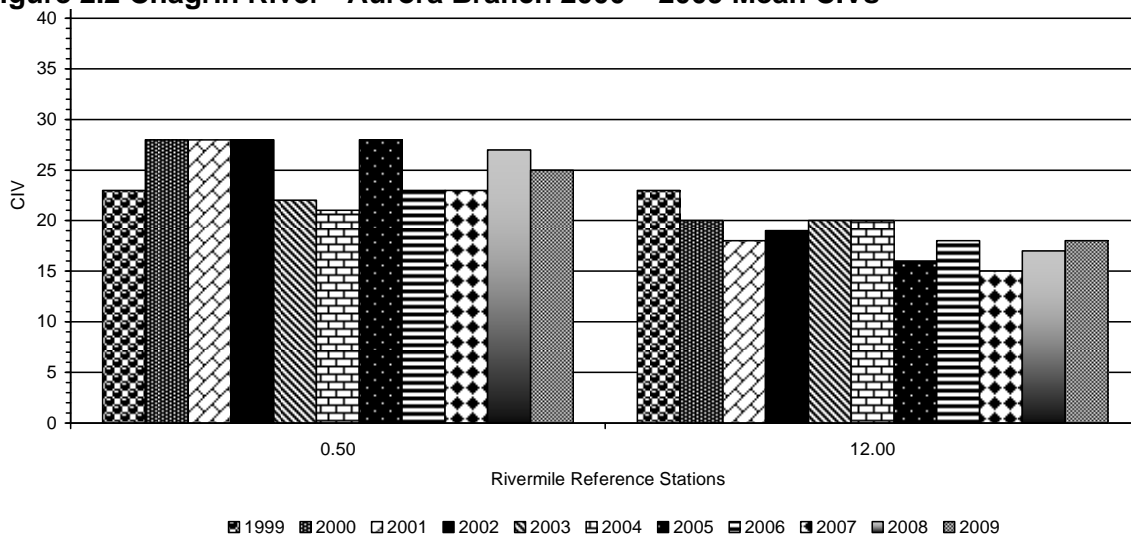


Figure 2.2 Chagrin River - Aurora Branch 2000 – 2009 Mean CIVs



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 2009, SQM staff tested the QHEI to gather measurements at reference stations on the Chagrin state scenic river. 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 2014. Results from the 2009 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 tables have 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 4. Chagrin River - Mainstem 2009 QHEI and SQM Assessment Data

Reference Station	QHEI	Attainment Status	2009 Average CIV	SQM Assessment
RM 13.1	81	FULL	25	EXCELLENT
RM 23.7	82	FULL	25	EXCELLENT
RM 25.3	79	FULL	19	GOOD

Table 5. Chagrin River - Aurora Branch 2009 QHEI & SQM Assessment Data

Reference Station	QHEI	Attainment Status	2009 Average CIV	SQM Assessment
RM 0.50	82	FULL	25	EXCELLENT
RM 12.0	78	FULL	18	GOOD

Appendix

Stream Quality Monitoring Data by Monitoring Station

2009 CIVs by Monitoring Station																							
Chagrin River																							
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	
1.70	8/28/2008		A			C	A					A								C			12.00
1.70	10/11/2008	A	A			B	A					A					A	A	A				17.00
4.90	5/13/2008	A	A		A	A	A	A				A	A			A	A	A	A				27.00
4.90	5/13/2008		A		A	B	A					A				A	A	A	A				19.00
4.90	5/16/2008		A	A		B	A		A								A	B	A				17.00
4.90	5/16/2008	A	A		A	A						A					B	A	A				17.00
4.90	5/16/2008	A	A			A	A					A					A		B				16.00
4.90	5/16/2008	A	A	A	A	B	A		A			A	A				B	B	B		A		28.00
4.90	5/16/2008		A			A						A	A			A	A	A	B				15.00
4.90	5/16/2008	A	A		A	A	A					A	A				A						20.00
4.90	5/16/2008		A	A		A						A		A		A	B		A				17.00
4.90	5/16/2008	A	A		A	A	A					A					A		A				19.00
4.90	5/16/2008	A	A	A	A	B	A					A	A			A	A	B	B				27.00
4.90	6/1/2008		C	B		B						B				A	C	C	C		A		17.00
4.90	9/17/2008	A	A		B	B	A					A	A				A	A		A			22.00
4.90	9/17/2008	A	B		B	B	A		A			A	A										21.00
4.90	9/17/2008	A	A		B	B	A					A	A	A					A				22.00
4.90	9/17/2008		A	A		C						A	A					A			A		15.00
4.90	9/17/2008	A	A		B	B	A		A			A	A	A				A	A				25.00
4.90	9/17/2008	A	A	A	A	C	A		A			A	A			A	A	A			A		29.00
4.90	9/17/2008	A	A	A	A	C						B	A					A			A		21.00
4.90	9/17/2008	A	A		B	B	A										A		A				17.00
4.90	9/17/2008	A	A	A	C	A	A														A		19.00
4.90	9/17/2008		A		C	A	A					B							A		A		16.00
4.90	9/17/2008		A		B	A	A					A							A				15.00
4.90	9/17/2008	A	A		A	B	A		A			A	A			A						A	24.00
4.90	9/25/2008	A	B		B	B	A		A	A		A	A	A				A	A	A			28.00
4.90	9/25/2008	A	A		B	B	A		A	A		A	A					A		A			25.00
12.70	5/7/2008	A	A	A		B	A					A							A	B			19.00
12.70	6/27/2008		B	A		C	A	A				B		A		A	B	C	C	A			25.00
13.10	6/25/2008	A	A		A	B	A					A	B	A		A	A	A	B	A			28.00
13.10	7/31/2008	A	B			C	A					B	A	A		A		A	A	A			22.00
13.10	10/10/2008	B	A		A	B	A		A			A	A					A	A	A		A	25.00
21.00	6/5/2008	A	A			B	A			A		B						A	A	C		A	19.00
21.00	6/26/2008	B	B	A	B	C	B					A	B		A				A				25.00
21.00	6/26/2008	A	A			C	A						A							C			15.00

2009 CIVs by Monitoring Station																						
Chagrin River																						
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	S L	S W	B F	A W	M I	P S	L E	CIV
21.00	10/10/2008	B	B		B	B	A				A	B	A				A	B	A			24.00
23.70	6/5/2008	A	B	A	A	B	B				A	B	A		A		A	A	C			29.00
23.70	7/25/2008	A	B		A	C	A			A		A					A	B	B			22.00
23.70	10/10/2008	B	A		B	C	B		A		A	A	A				B	A	B			26.00
25.30	6/11/2008	B		A			B					B	A				A	A	A			16.00
25.30	7/25/2008	A	B		B	C	B				A	B	A				A	A	B			24.00
25.30	8/7/2008	A	A	B			B					B	A				A	B				18.00
25.30	10/9/2008	B	B		A	A	A		A		B	B							A			22.00
28.50	6/30/2008	A	A		A	A	A					A						A	A			19.00
28.50	8/31/2008	A	B			B	A					A						A			A	16.00
28.50	10/12/2008	A	A	A		B						A									A	15.00
28.80	5/30/2008	B	B	B	A	B	A		A				A		A							24.00
28.80	6/23/2008	A	A	A		C			A		A	A	B					A	A			22.00
28.80	6/30/2008	A	B	A	A	B	A				A		A									22.00
28.80	7/17/2008	B	A	B	A	B	A				A	B	B		A				B			27.00
28.80	8/31/2008	B	B	A	A	B	A		A			A						A			A	24.00
28.80	10/5/2008	B	B	A		A			A			A	A			A		A	A		A	23.00
35.50	4/22/2008	A	B	A		A					A	B	A		A		A	A	A			23.00
35.50	6/17/2008	B	B	B		C	B					A	B		A							21.00
41.00	9/18/2008	B	A	B	A	A					A		A		A			A	A			23.00

2009 CIVs by Monitoring Station																						
Chagrin River - Aurora Branch																						
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	S L	S W	B F	A W	M I	P S	L E	CIV
0.50	6/5/2008		B	A		B	A					A	B	A	A	A	A	B	C			25.00
0.50	7/25/2008		C	A		B	A			A	A	B	A	A		A		B	C	A		27.00
0.50	9/23/2008	A	A		A	C	B		A		A	A	A		A	A	A	C	A			30.00
12.00	6/17/2008		A		A	B	A	A		A			A				A	A	A			22.00
12.00	8/23/2008		A				A				A	A	B					B				13.00
12.00	9/10/2008		A			B	A				A	A	A				A	A	A			18.00
12.00	10/11/2008		A	A		A						A	A					B	A		A	16.00

2009 CIVs by Monitoring Station Chagrin River - East Branch																						
RM	DATE	W P	M F	S T	D O	C D	R I	O S	D A	D R	C R	B L	C F	S C	C L	S W	B F	A W	M I	P S	L E	CIV
6.70	10/13/2008		A	A	A	A					A	A						A				17.00
6.70	10/14/2008		A	B	A	B				A	A	A					A					19.00
10.40	4/22/2008	A	A	A		B	A				A	B	A									21.00
10.40	6/6/2008		A	A		A			A			A	A						A			16.00
10.40	6/21/2008	A	B	A	A	B						A	A		A			A				22.00
10.40	7/19/2008		A	A	A	B				A	A	A	A					A				21.00
10.40	7/21/2008	A	A	A	A	C	A				A		A				A	B	A			25.00
10.40	7/24/2008		A	A		B					A	A							A			14.00
10.40	7/25/2008			A	A	A						B	A								A	14.00
10.40	8/30/2008	A	A	A	A	B	A			A	B	A	A					A	A			28.00
10.40	9/11/2008			A	A	A		A				B		A				A				17.00
10.40	10/30/2008	A	A	A		B	A				B							A				18.00