Stream Quality Monitoring 2015 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 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 Rivers 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, 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 the documenting of the health of Ohio's state scenic, wild and recreational rivers. This report is a compilation of field data collected during 2015 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

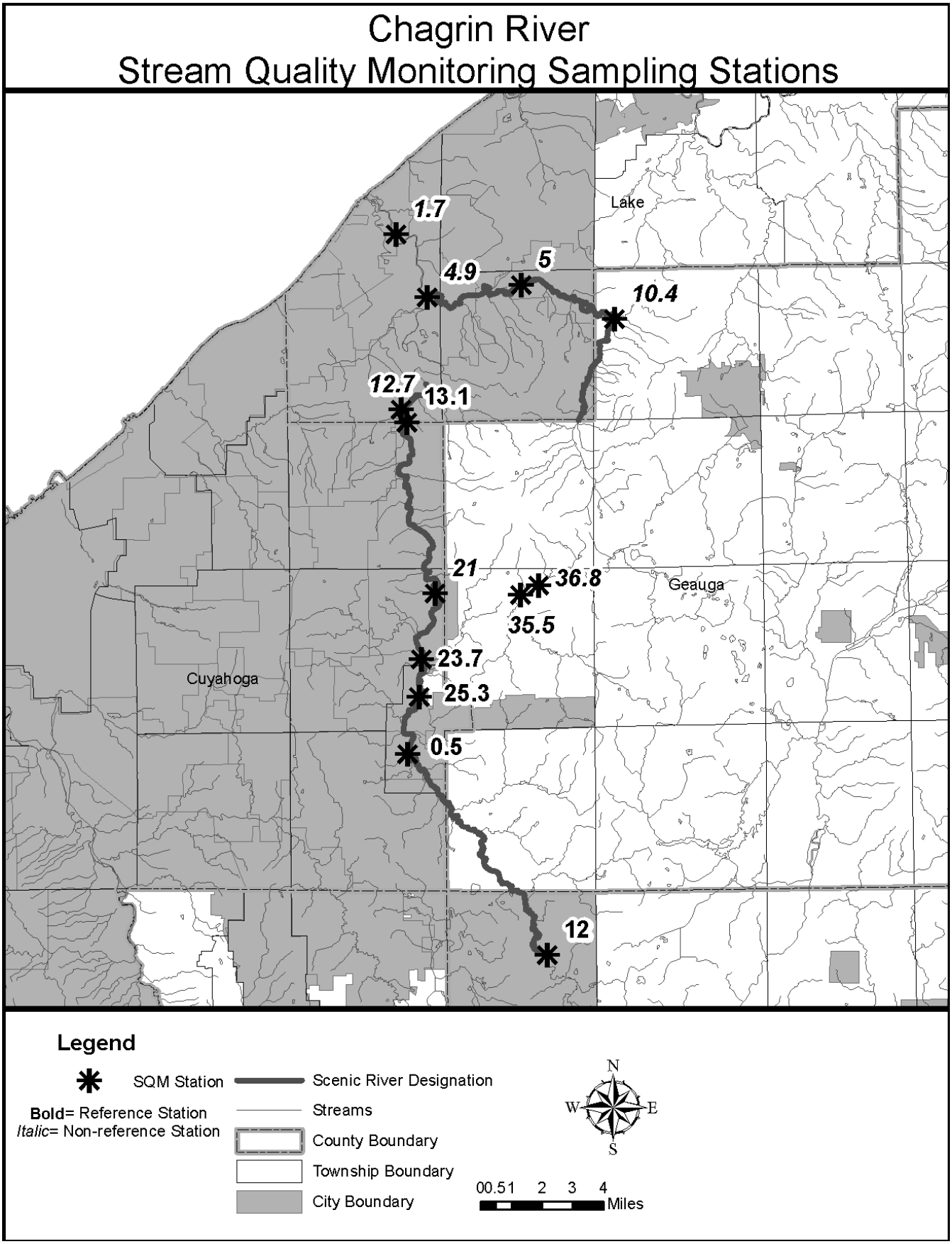
A total of 71 miles of the Chagrin River have been designated as an Ohio Scenic River as the result of two separate designations. The Ohio Department of Natural Resources designated approximately 49 miles of the Chagrin River as Ohio's ninth scenic river on July 2, 1979. The Aurora Branch of the Chagrin is designated from State Route 82 downstream to the confluence of the mainstem 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.

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 born 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 330-298-9195. For information online, visit watercraft.ohiodnr.gov.


Chagrin River
Stream Quality Monitoring Sampling Stations
1.7
4.9
5
10.4
12.7
13.1
21
36.8
35.5
23.7
25.3
0.5
12
Lake
Geauga
Cuyahoga
Legend
SQM Station
Bold= Reference Station
Italic= Non-reference Station
Scenic River Designation
Streams
County Boundary
Township Boundary
City Boundary
N
W
E
S
0 0.5 1 2 3 4
Miles

2015 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 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 station*)
The Fraley Family: Bruce Fraley

River Mile 4.9 - Daniel's Park (*non-reference station*)
Volunteers Needed

River Mile 12.7 - North Chagrin Reservation
Cleveland Metroparks: Claire Weldon

River Mile 13.1 - Rogers Road Bridge
Cuyahoga County Board of Health: N. McConoughey

River Mile 21.0 - Hunting Valley, Fairmount Road Bridge (*non-reference station*)
Cleveland Museum of Natural History: Julia Swanson

River Mile 23.7 - Cleveland Metroparks Polo Field
Cuyahoga County Board of Health: N. McConoughey
Cleveland Museum of Natural History: Julia Swanson

River Mile 25.3 - Chagrin Blvd., Moreland Hills
David and Sandra Cobb
Cuyahoga County Board of Health: N. McConoughey
Bittany Dalton

River Mile 28.5 - River Run Park (*non-reference station*)
Volunteers Needed

River Mile 28.8 - Chagrin Falls, Whitesberg Park (*non-reference station*)
Millennium Youth Conservationists/Geauga SWCD

River Mile 35.5 – West Geauga Commons – Route 306 (*non-reference station*)
Millennium Youth Conservationists/Geauga SWCD
West Geauga High School: Mike Sustin

River Mile 36.8 - Beechwood Drive – Upper Chagrin Preserve (*non-reference station*)
Volunteers Needed

Chagrin River - Aurora Branch

River Mile 0.5 - Squaw Rock, South Chagrin Reservation
Cuyahoga County Board of Health: N. McConoughey
Brendan Tisch
Linda New

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

Chagrin River - East Branch

River Mile 5.0 - Baldwin Road, Kirtland Hills *(non-reference station)*
Shawn Parker

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

River Mile 10.4 - Mitchell Mills Road Bridge, Geauga County (*non-reference station*)
MYC Geauga SWCD

River Mile 11.4-11.9 – Riverwood Farms, Geauga County (*non-reference station)*
The Holden Arboretum

The continued success of the Ohio SQM Project depends on the commitment and dedication of these (and other) volunteers and participants. We would like to recognize volunteers *Nate McConoughey; Claire Weldon; Colleen Sharp; Brittany Dalton; Rob Swaney; Dr. David Pierce; Becky Thompson: The Holden Arboretum* for monitoring three times or more during the season. If you would like to become a volunteer, please contact the Northeast Ohio SQM Coordinator at 330-872-0040 or find more information online at watercraft.ohiodnr.gov/SQM.

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 station*)

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.

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

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 steelhead were historically caught at this site until a heavy surge of snowmelt runoff and rain breached the dam's concrete structure in 2004. Judging by the results of samples taken over the last several 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 samples.

Located 100 yards downstream from the dam, the sampling area is composed mostly of cobblestones, sand and gravel. The river at this location provides a number of riffle areas to sample. At this site, many pollution-intolerant organisms are usually collected during sampling.

River Mile 12.7 - North Chagrin Reservation, Willoughby Hills (*2015 reference station*)

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. In 2016, this station will replace river mile 13.1 as a reference station due to a better sample area. It will also be considered a reference station for the 2015 season.

The stream bottom is comprised of cobblestones, gravel, sand, and some boulders. Excellent habitat for macroinvertebrates exists at this site. A wide variety of organisms from all three taxa are frequently collected here.

River Mile 13.1 - Rogers Road Bridge, Cleveland Metroparks (

Easily accessible through the Cleveland Metropark facilities nearby, this site is a good location for introducing groups, particularly schools, to SQM 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 are a number of different riffle areas from which to sample; subsequently, CIVs for this area vary due to the shifting nature of the substrate. Due to a lack of an adequate sample area, river mile 12.7 will replace Rogers Road as a reference station for the 2016 sampling season. Rogers Road will remain a reference station through 2015 and become a non-reference station for 2016.

River Mile 21.0 - Hunting Valley, Fairmount Road Bridge (*non-reference station*)
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. At this location, Dr. Joe Keiper of the Cleveland Museum of Natural History found Ohio's first-known occurrence of the caddisfly species *Leucotrichia pictipes* in the family Hydroptilidae. This species had only been found previously in Pennsylvania.

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.

River Mile 25.3 - Chagrin Boulevard, Moreland Hills
This station is located several miles from Chagrin Falls within 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.

River Mile 28.8 - Chagrin Falls, Whitesberg Park (*non-reference station*)
This sampling site is located at Whitesberg Park immediately upstream from River Run Park, (River Mile 28.5), in downtown Chagrin Falls. 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 also can be found at the sample site. No samples were taken at this location during the 2015 sampling season.

River Mile 35.5 - West Geauga Commons - Route 306 (*non-reference station*)
This sampling station is located directly off Route 306 at the recreation park owned by the Geauga County Board of Commissioners. 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. No samples were taken at this location during the 2015 sampling season.

River Mile 36.8 - Beechwood Drive (*non-reference station*)
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 a half mile down the power-line grassway 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. No samples were taken at this location during the 2015 sampling season.

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 seen easily 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 a 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 are steep..

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.

Chagrin River - East Branch

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

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 taken at this location during the 2015 sampling season.

River Mile 6.7 - Booth Road Bridge (*non-reference station*)

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 a large percentage of boulders with a medium percentage of cobblestones. Sand and gravel make up only a small percentage of the total substrate. No samples were taken at this location during the 2015 sampling season.

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

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 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.

Sampling Results and General Trends

During the 2015 SQM season, assessments were consistently taken despite heavy precipitation during the spring and summer seasons. According to the National Oceanic and Atmospheric Administration (NOAA), Northeast Ohio received 13 inches of precipitation between the months of May-June, setting the record for highest recorded precipitation for northeast Ohio. Rainfall amounts totaled 6 inches over average precipitation between the months of May-June alone. Despite poor sampling conditions to start, northeast Ohio received around average precipitation between late summer and fall seasons making it easy on volunteers and ODNR staff to complete assessments. Stream Quality Monitoring sample results for the Chagrin River ranged from fair to excellent. Overall, the 2015 sampling results from the Chagrin River indicate a good diversity of insects, especially the pollution sensitive species (e.g. stonefly, damselfly, mayfly, etc.).

On the Chagrin River volunteers and ODNR staff conducted a total of 59 assessments at 13 official monitoring sites in 2015. The Chagrin River recorded an average CIV of 21.50, which falls within the good range for water quality. The 2015 average is slightly higher than the 2014 average of 20.42. The average taxonomic diversity on the mainstem, the Aurora Branch and the East Branch of the Chagrin River per assessment was 10 macroinvertebrate orders.

Overall, the results of the 2015 sampling on the Chagrin Scenic River indicate a good to excellent diversity of macroinvertebrates. There is still concern about possible stresses being experienced by the aquatic ecosystem from the expanding development in the watershed. The watershed community must work together to protect riparian forest buffers, reduce impacts from storm water runoff and promote environmentally sensitive designs for future developments. Individuals are encouraged to participate actively 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.

Additionally, 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.

Data collected by SQM Project volunteers and ODNR staff is used as a water quality-screening method. The data helps to detect significant changes in stream quality based on CIV data from sites monitored for many years. If there is a significant decline in the average CIV, potential problems that may be causing stream degradation can be investigated and addressed.

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 2015. Working together has produced significant results but more help is needed. For more information please contact the Northeast Stream Quality Monitoring Coordinator 330-298-9195 or find more information online at watercraft.ohiodnr.gov/SQM.

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 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 be used to estimate water quality with 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

2015 TSS Results: A total of 19 TSS readings were taken in the mainstem of the Chagrin River. The Chagrin River had a median of 7.0 mg/L of TSS, which corresponds to the excellent range. The data set ranged from < 6.2 mg/L to 113.0 mg/L of TSS. The Aurora Branch of the Chagrin River had 7 TSS readings with a median of 22.4 mg/L, which corresponds to the normal range. The data set ranged from < 6.2 mg/L to 165.0 mg/L of TSS. The East Branch of the Chagrin River had a total of 33 TSS readings at non-reference stations with a median of 8 mg/L, which corresponds to the excellent range. The data set ranged from < 6.2 mg/L to 282.0 mg/L of TSS.

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 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)
Caddisfly Larvae (CD)	Crayfish (CF)	Leeches (LE)
Riffle Beetle Adult (RI)	Scuds (SC)	
Other Snails (OS)	Clams (CL)	
	Aquatic Sowbugs (SW)	

Tables 2 and 3 represent the mean CIVs for each SQM reference station sampled on the river during 2015. 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 2015 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
12.7	♦	♦	♦		♦	♦		♦	♦	♦	♦	♦	♦			♦	♦	♦	♦		24
13.1	♦	♦	♦	♦	♦	♦		♦	♦		♦				♦	♦	♦	♦		♦	22+
23.7	♦	♦	♦	♦	♦	♦					♦	♦				♦	♦	♦		♦	19=
25.3	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦				♦	♦	♦		♦	21+

Table 3. Chagrin River – Aurora Branch 2015 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
0.5	♦	♦	♦	♦	♦	♦		♦		♦	♦	♦	♦		♦	♦	♦	♦			22-
12.0	♦	♦	♦		♦	♦		♦		♦	♦	♦	♦		♦	♦	♦	♦	♦	♦	22+

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 2015 Maximum and Minimum CIV Ranges

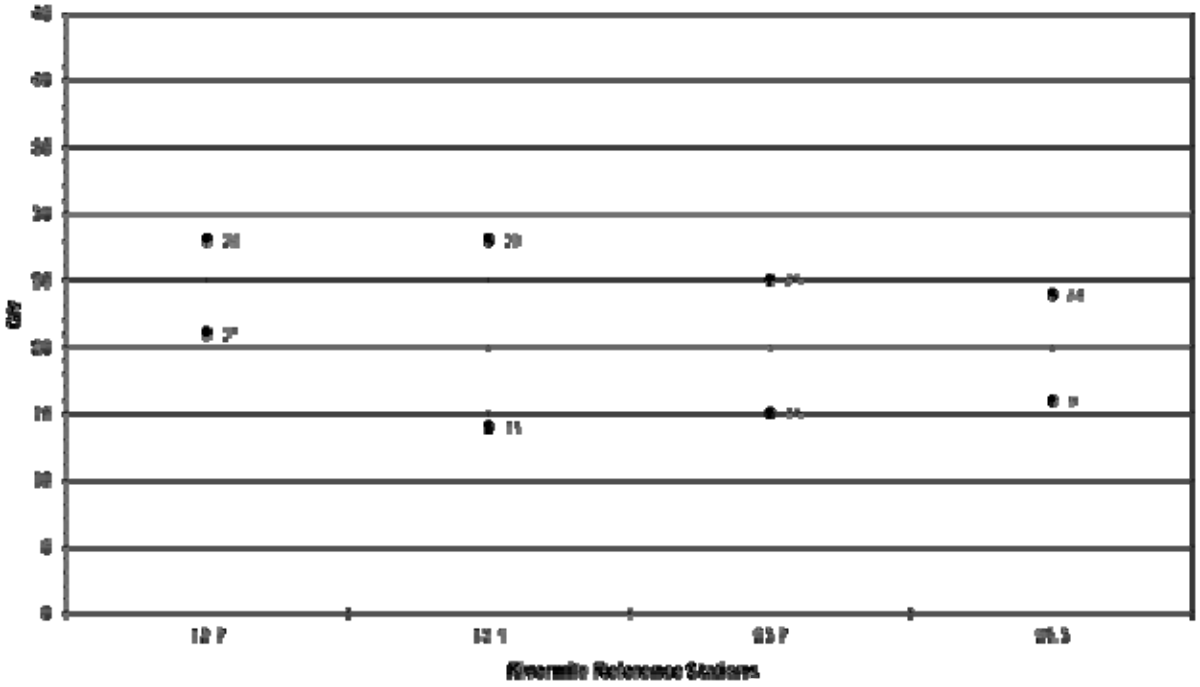


Figure 2.1 Chagrin River Mainstem 2006 – 2015 Mean CIVs

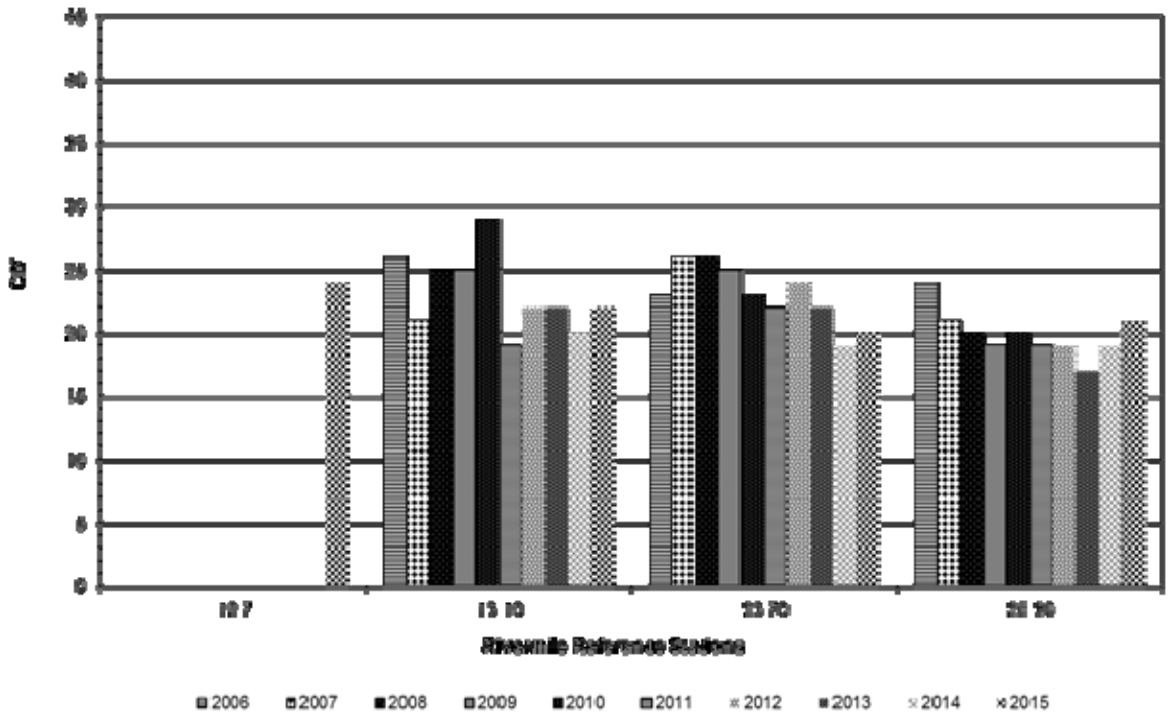


Figure 1.2 Chagrin River - Aurora Branch 2015 Maximum and Minimum CIV Ranges

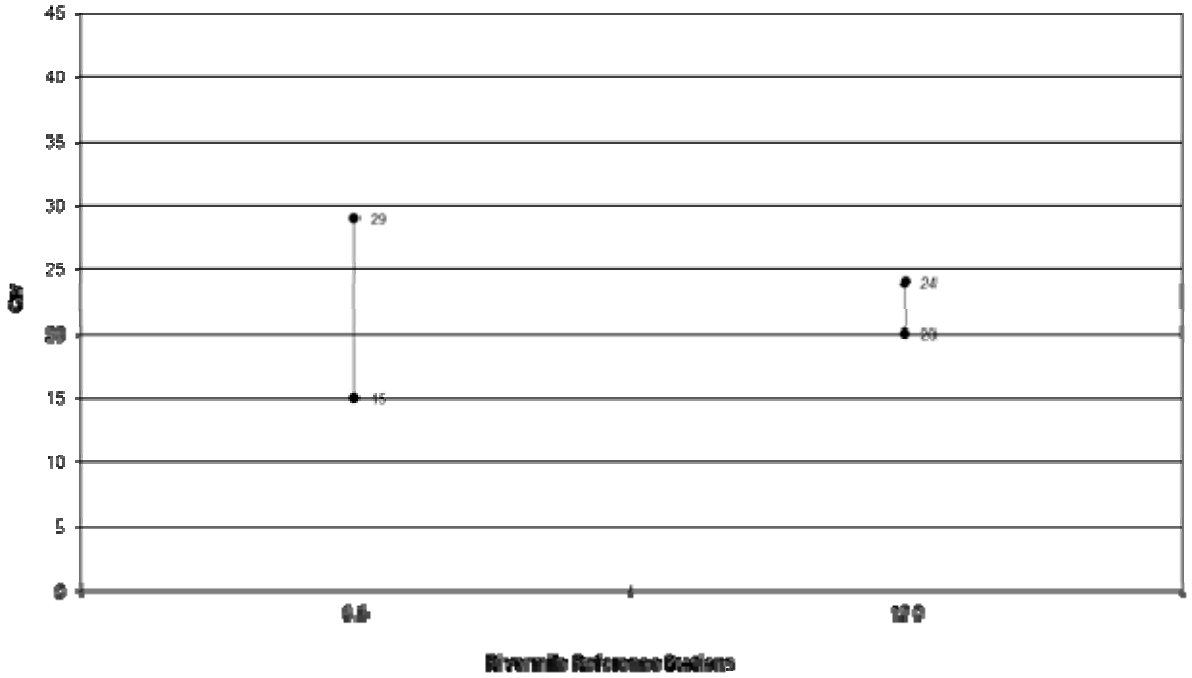
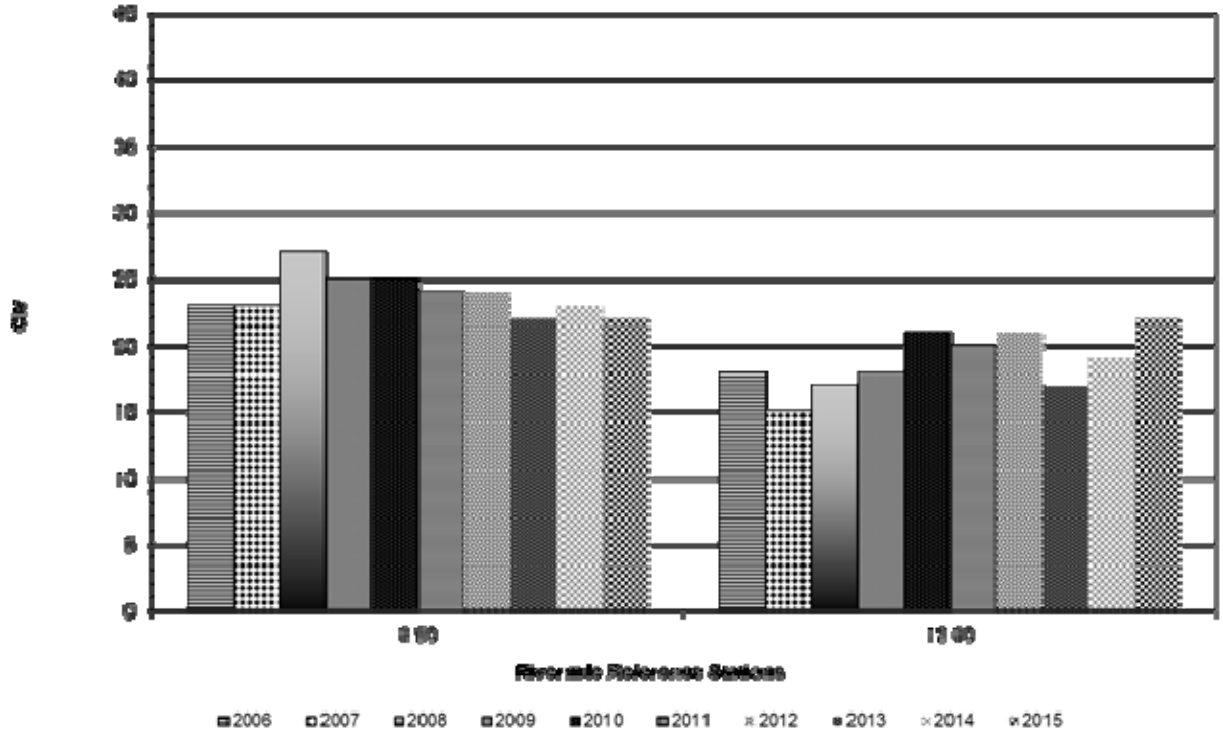


Figure 2.2 Chagrin River - Aurora Branch 2006 – 2015 Mean CIVs



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 2014, 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 2019. Results from the 2014 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 warm water 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 warm water 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 2014 QHEI and SQM Assessment Data

Reference Station	QHEI	2014 Average CIV	SQM Assessment
RM 12.7	N/A	N/A	N/A
RM 13.1	N/A	19	Good
RM 23.7	65.5	19	Good
RM 25.3	86.5	19	Good

Table 5. Chagrin River - Aurora Branch 2014 QHEI & SQM Assessment Data

Reference Station	QHEI	2014 Average CIV	SQM Assessment
RM 0.50	76	23	Excellent
RM 12.0	76.5	19	Good

Appendix - 2015 Data by Monitoring Station

CHAGRIN RIVER																						
RM	DATE	WP	MF	ST	DO	CD	RI	OS	DA	DR	CR	BL	CF	SC	CL	SW	BF	AW	MI	PS	LE	CIV
10.40	6/25/2015		A	B	A	B				A	A	A						A	A		A	21
10.40	8/13/2015		A	A	A	B	A					A					A	A				19
12.70	5/8/2015		B	A		B	A		B	A	A			A			A	C	B			23
12.70	7/20/2015	A	C	A		B	B		B		A	A	A	B			B	A	B			28
12.70	9/9/2015		C			C	A		B	A		A	A				B	B	A	A		21
13.10	6/26/2015	A				B					A	A					A	A	A		A	14
13.10	8/7/2015	A	B	A		C	A		A			A					A	A	B		A	23
13.10	10/7/2015	B	B	A	B	C	A		A	A		A				A		A	A			28
23.70	6/26/2015	A	B			B					A	A					A	A	B			16
23.70	7/6/2015		A			B	A				A	A					A	A				15
23.70	8/7/2015		A	A	A	C	A				A	A					B	A	B			22
23.70	10/7/2015	A	B	A	A	B	A				A	A					B	B	A			25
25.30	6/22/2015	B	A	A	A	B	B				A						A		A			22
25.30	8/5/2015	A	C	A		C	B					A					A	A	C			20
25.30	8/6/2015		B			C	B					A	A				B	A	C			16
25.30	9/23/2015	B	B		A	B	B	A	A			A					A		B			24
25.30	10/2/2015	B	A	A		C	B		A	A	A							A			A	23
28.80	6/11/2015	B	A	B		B	B				A	A	A	A			A	A	A		A	27
28.80	8/6/2015	A	B	A		B	A					A	B				B	A				21

CHAGRIN RIVER - AURORA BRANCH																						
RM	DATE	WP	MF	ST	DO	CD	RI	OS	DA	DR	CR	BL	CF	SC	CL	SW	BF	AW	MI	PS	LE	CIV
0.50	6/22/2015	A	A	A	A	B	A					B	A	A		B	A	B	B			29
0.50	8/5/2015		B		A	C	B										C	A	C			15
0.50	9/23/2015		A		A	C	A				A	A				A	C	C	A			21
12.00	5/23/2015	A	B	B		B	B						A					A	B		A	20
12.00	6/17/2015		B	A		B	A					A	A	A			A	B	A			21
12.00	8/11/2015		B	B		B	B				A	A	A			A	B	B	A	A		24
12.00	10/6/2015		A	A		B	A		A		B	C	A				C	C	C			23

CHAGRIN RIVER - EAST BRANCH																						
RM	DATE1	WP	MF	ST	DO	CD	RI	OS	DA	DR	CR	BL	CF	SC	CL	SW	BF	AW	MI	PS	LE	CIV
6.70	5/26/2015		A	A	A	A					A											14
6.70	5/27/2015		A	A	A	A					A	A										16
6.70	7/13/2015	A	A	A	A	B					A											17

CHAGRIN RIVER - EAST BRANCH																					
RM	DATE1	WP	MF	ST	DO	CD	RI	OS	DA	DR	CR	BL	CF	SC	CL	SW	BF	AW	MI	PS	LE	CIV
6.70	10/12/2015		A	A	B	B					A											14
6.70	10/13/2015		A	A	B	B																12
11.50	5/6/2015		B	A		A	A				A		A	A								18
11.50	5/12/2015		A	A		A					A	A	A						A			16
11.50	5/18/2015		A	A		A	A				A							A				15
11.50	5/26/2015		B			A	B				A	A	A				A		A			16
11.50	5/28/2015	A	B		A	A	A					A	A					A	A			21
11.50	6/1/2015		A			A	A				A	A					A	A	A			16
11.60	5/12/2015		A	A		A					A		A					A				14
11.60	5/18/2015	A	B		A	A	A											A				16
11.60	5/26/2015		B	A		B	B						A					A	A			16
11.60	5/27/2015		B	A		A	A					A			A			A	A			18
11.60	5/28/2015		B			A	A				A	A						A				14
11.60	9/8/2015		B	A		B	B		A		A		B						A			19
11.70	5/6/2015		B	A		A	A				A											14
11.70	5/12/2015		B	A		A	A				A							A	A			16
11.70	5/18/2015		B	B	A		A	A	A		A						A	A				21
11.70	5/20/2015		B	A		B	A				A	A	A					A				19
11.70	5/27/2015		A	A	A	A	A			A	A		A				A	A	A			24
11.80	5/14/2015		A	A	A	A					A		A									16
11.80	5/19/2015		A	B		A	A				A	A						B				17
11.80	5/26/2015	A	B	A		A	B					A	A					A				20
11.80	5/27/2015	A	A		A	A	B			A	A								A	A		21
11.80	5/28/2015		B		A	A	A					A	A						A			17
11.90	5/6/2015		B	A		B			A		A							A				14
11.90	5/18/2015	A	A	A		B	A			A	B		A					A				22
11.90	5/27/2015		B	A		A	A					A	A						A			17
11.90	5/29/2015	A	B	A		A	A					A	A					A	A			21
11.90	6/1/2015		B	A		A					A							A	A			13