

# **NORTHEAST OHIO REGIONAL SEWER DISTRICT**

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## **2012 Blodgett Creek & Rocky River Biological, Habitat, Water Chemistry Assessment Study**



**Prepared by  
Water Quality and Industrial Surveillance Division**

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## **Introduction**

The Strongsville “A” Wastewater Treatment (WWTP), which discharged treated effluent into Blodgett Creek, was decommissioned on July 18, 1994. Wastewater flow previously tributary to the Strongsville “A” WWTP was diverted to the west leg of the Southwest Interceptor and conveyed to the Northeast Ohio Regional Sewer District’s Southerly Wastewater Treatment Center. Water chemistry, habitat and biological assessments were completed before and after the decommissioning of the wastewater treatment plant in 1994, 1996 and 2000.

In 2012, water chemistry, fish, macroinvertebrate and habitat assessments were reevaluated on Blodgett Creek and the West Branch of Rocky River to determine attainment status of the two surface waters. The habitat, fish and macroinvertebrate results were evaluated using the Ohio Environmental Protection Agency’s (EPA) Qualitative Habitat Evaluation Index (QHEI), Index of Biotic Integrity (IBI), Modified Index of Well Being (MIwb) and Invertebrate Community Index (ICI). An examination of the individual metrics that comprise these indices was used to evaluate the impact from point and non-point sources of pollution on the downstream macroinvertebrate and fish communities. Water chemistry data was compared to the Ohio Water Quality Standards to determine attainment of applicable uses (Ohio EPA, 2009b). Results were also compared to available historic data to show temporal and spatial trends.

Blodgett Creek at RMs 1.70 and 1.30 and Rocky River upstream and downstream of Blodgett Creek at RMs 4.65 and 4.40 are designated as warmwater habitat (WWH), agricultural water supply, industrial water supply, and either Class A (Rocky River) or Class B (Blodgett Creek) primary contact recreation waters. The Lake Erie Drainage Basin (LEDB) and Tier I criteria and Tier II values for aquatic life, wildlife, and human health nondrinking water criteria developed pursuant to OAC 3745-1 and 3745-2 also apply.

The biological integrity of Blodgett Creek was assessed at RM 1.70 (upstream of the former Strongsville “A” WWTP) and RM 1.30 (downstream of the former Strongsville “A” WWTP). Blodgett Creek was evaluated at these sites using Ohio EPA’s Qualitative Habitat Evaluation Index (QHEI), Index of Biotic Integrity (IBI) and Invertebrate Community Index (ICI). Rocky River was assessed for the same biological index scores and also included the Modified Index of well being (MIwb).

Sampling was conducted by NEORSD Level 3 Qualified Data Collectors certified by Ohio EPA in Fish Community and Benthic Macroinvertebrate Biology, Chemical Water Quality and Stream Habitat Assessments as explained in the NEORSD study plan approved by Ohio EPA on May 15, 2012.

Figure 1 is a map of the sampling locations on Blodgett Creek and Rocky River. Table 1 indicates the sampling locations and includes river mile (RM) where applicable, latitude/longitude, description, and the types of surveys conducted.

**Table 1.**

Water Body	Latitude	Longitude	River Mile	Location Information	USGS HUC 8 Number - Name	Purpose
Blodgett Creek	41.3489	-81.8728	1.70	Blodgett Creek upstream of decommissioned Strongsville "A" WWTP	04110001 Rocky	Evaluate water chemistry, habitat, fish, & macroinvertebrates upstream of former Strongsville "A" WWTP
Blodgett Creek	41.3495	-81.8785	1.30	Blodgett Creek downstream of decommissioned Strongsville "A" WWTP	04110001 Rocky	Evaluate water chemistry, habitat, fish, & macroinvertebrates downstream of former Strongsville "A" WWTP
Rocky River	41.3573	-81.8960	4.65	Rocky River West branch upstream of Blodgett Creek	04110001 Rocky	Evaluate water chemistry, habitat, fish & macroinvertebrates
Rocky River	41.3597	-81.8947	4.40	Rocky River West branch downstream of Blodgett Creek	04110001 Rocky	Evaluate water chemistry, habitat, fish, & macroinvertebrates

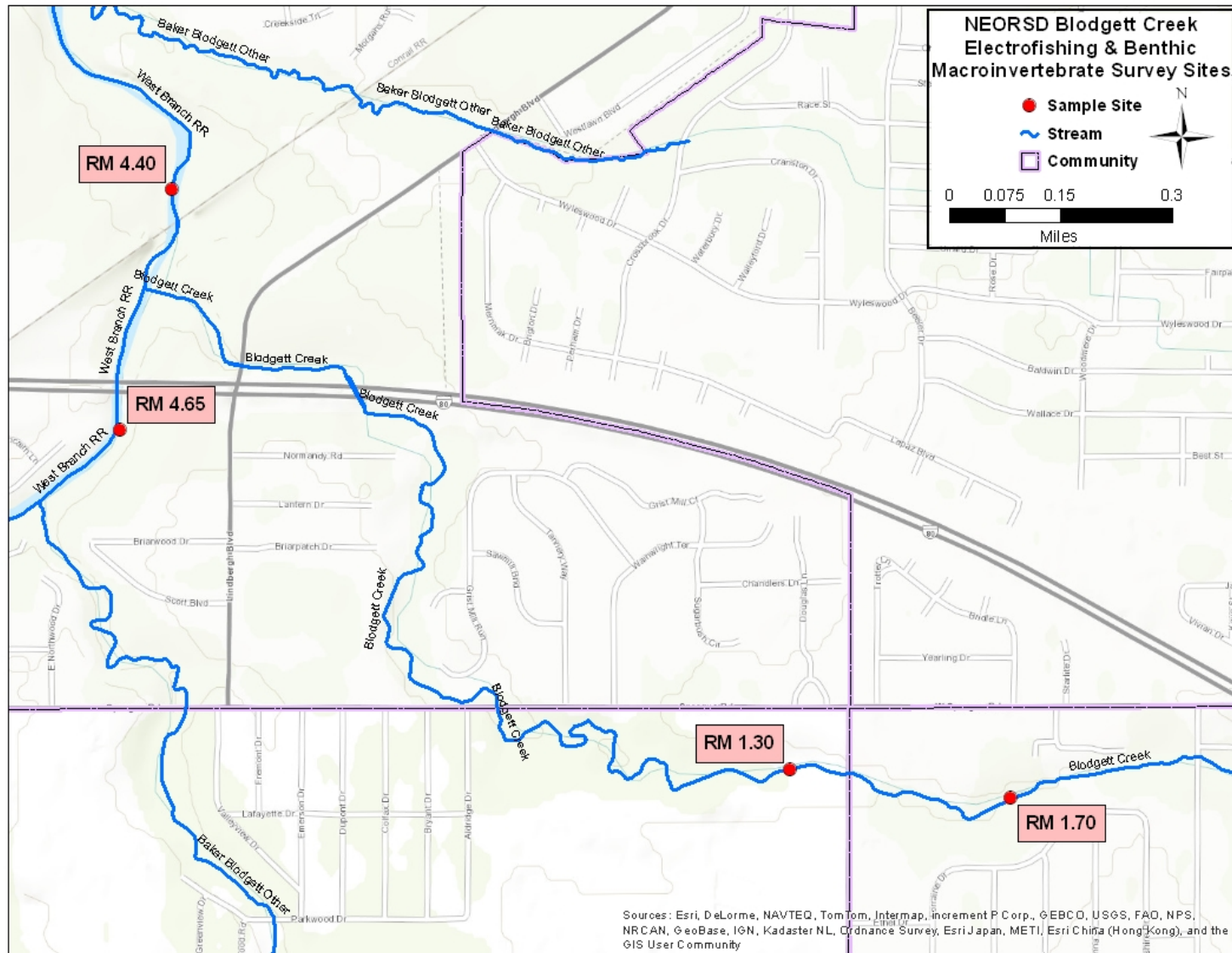


Figure 1. Sampling Locations

## Water Chemistry and Bacteriological Sampling

Water chemistry and bacteriological sampling was conducted five times between July 31, 2012 and August 29<sup>th</sup>, 2012, on Blodgett Creek at RMs 1.70 and 1.30 and Rocky River at RMs 4.65 and 4.40. Techniques used for sampling and analyses followed the *Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices* (2012) and *Surface Water Field Sampling Manual* (2013). Chemical water quality samples from each site were collected with two 4-liter disposable polyethylene cubitainers with disposable polypropylene lids and two 473-mL plastic bottles. One of the plastic bottles was field preserved with trace nitric acid and the other was field preserved with trace sulfuric acid. All water quality samples were collected as grab samples. Bacteriological samples were collected in sterilized plastic bottles. At the time of sampling, measurements for dissolved oxygen, pH, temperature, and conductivity were collected using a YSI 600XL sonde. Duplicate samples and field blanks were collected at randomly selected sites, at a frequency not less than 10% of the total samples collected. Relative percent difference (RPD) was used to determine the degree of discrepancy between the primary and duplicate sample (Formula 1).

$$\text{Formula 1: } \text{RPD} = \left( \frac{|X-Y|}{((X+Y)/2)} \right) * 100$$

X= is the concentration of the parameter in the primary sample

Y= is the concentration of the parameter in the duplicate sample

The acceptable percent RPD is based on the ratio of the sample concentration and detection limit (Formula 2) (Ohio EPA, 2013).

$$\text{Formula 2: } \text{Acceptable \% RPD} = [(0.9465X^{-0.344}) * 100] + 5$$

X = sample/detection limit ratio

Those RPDs that are higher than acceptable may indicate potential problems with sample collection and, as a result, the data was not used for comparison to the water quality standards.

Mercury analysis for all of the sampling events was done using EPA Method 245.1. Because the detection limit for this method is above the criteria for the Human Health Nondrinking and Protection of Wildlife Outside Mixing Zone Averages (OMZA), it generally cannot be determined if Blodgett Creek was in attainment of those criteria. Instead, this type of mercury sampling was used as a screening tool to determine whether contamination was present above those levels typically found in the river.

## Results and Discussion

During the study, there were two field blanks and two duplicate samples collected for QA/QC purposes. A total of six chemical parameters were either rejected, estimated or downgraded due to field blank contamination. These parameters included dissolved reactive phosphorus, ammonia, nitrites, total phosphorus, zinc and nitrites plus nitrates. Discrepancies may be attributed to improper sample handling or inconsistent sample collection. A total of three chemical parameters were downgraded from Level 3 to Level 2 data. The parameters included ammonia, dissolved reactive phosphorus, and total phosphorus.

Sample duplicates were collected on Blodgett Creek on July 31 and August 7, 2012, at RMs 1.30 and 1.70, respectively. The duplicate sample collected at RM 1.70 showed four parameters that were rejected due to RPDs that were greater than the acceptable RPD. These included dissolved reactive phosphorous, cadmium, turbidity and total suspended solids. The duplicate sample collected at RM 1.30 showed ammonia and *E. coli* being rejected due to a RPD being greater than the acceptable RPD (Table2).

**Table 2. Unacceptable RPDs**

Date	Site	Parameter	Acceptable RPD (%)	Actual RPD (%)	Qualifier
8/7/2012	Blodgett Creek RM 1.70	Cadmium	87.3	90.9	Rejected
		Dissolved reactive phosphorus	79.6	105.9	Rejected
		Total suspended solids	34.5	77.9	Rejected
		Turbidity	35.3	78.2	Rejected
7/31/2012	Blodgett Creek RM 1.30	Ammonia	39.7	82.8	Rejected
		<i>E. coli</i>	14.1	17.0	Rejected

Paired parameters for all samples collected were also evaluated and compared for QA/QC. Paired parameters for samples collected on Blodgett Creek and Rocky River showed all the data for chromium and hexavalent chromium were either estimated or rejected because of differences in sampling and analysis methods, or interference during analysis.

The Ohio water quality criteria for the protection of recreational uses apply outside the mixing zone to all water bodies assigned a recreational use designation (Ohio Administrative Code 3745-1-07). Blodgett Creek at RMs 1.70 and 1.30 were in non-

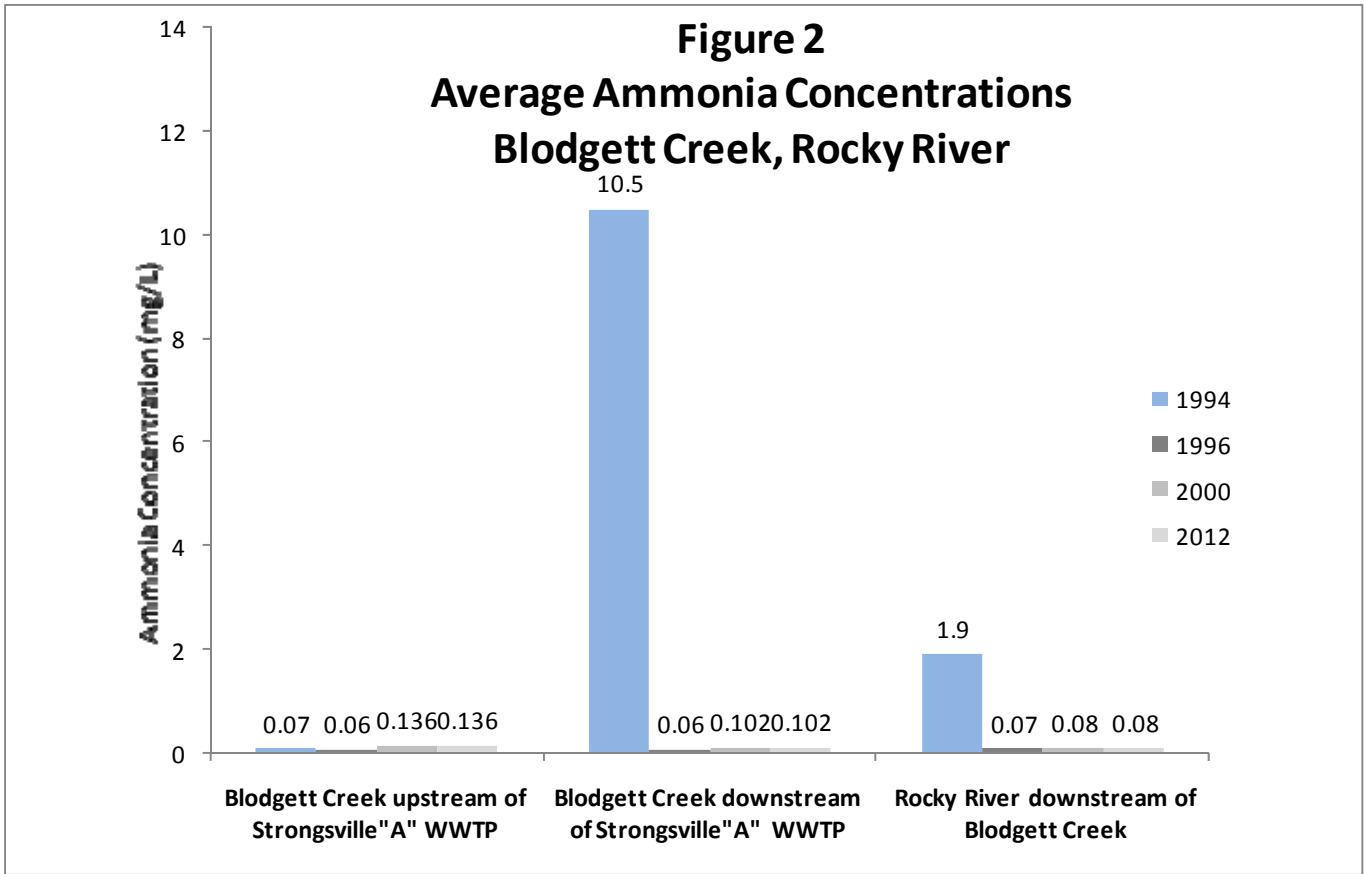
attainment of the *E. coli* criteria for Class B primary contact recreation by exceeding the single sample maximum of 523 colony-forming units per 100mL (CFU/100mL) in more than 10% of the samples taken in all 30-day periods. The recreation seasonal geomean criterion of 161 CFU/100mL was also exceeded at these sites. Rocky River at RMs 4.65 and 4.40 were in non-attainment of both the 298 CFU/100mL *E. coli* single sample maximum criterion and the 126 CFU/100mL seasonal geomean criterion for Class A primary contact recreation. Table 3 lists the *E. coli* sample results for each site.

Table 3. Blodgett Creek & Rocky River <i>E. coli</i> Densities					
Sample Date	Blodgett Creek RM 1.70	Blodgett Creek RM 1.30	Rocky River RM 4.65	Rocky River RM 4.40	Precipitation within 3 days of Sampling *Rain Gauge ROL
	<i>E. coli</i> (colony-forming units per 100mL)				(Total Inches)
7/31/2012	733	983	110	165	0.41
8/07/2012	382	1600	61	250	0.23
8/14/2012	20600	513	1000	767	0.56
8/21/2012	9000	15400	260	1133	0.14
8/29/2010	12000	2633	360	365	1.09

\*Rain Gauge at Olmsted Fall (ROL)

The elevated levels of *E. coli* during wet/and or dry weather conditions from any of the above sampling periods may be attributed to sources of sanitary contamination. This may include malfunctioning septic tank sewage discharges directly to Blodgett Creek or Rocky River, or from septic tank discharges to storm sewers, swales or ditches which flow to Blodgett Creek or Rocky River. There may also be faulty septic tanks in the vicinity of Blodgett Creek in Strongsville on Marks Road, Priem Road or Prospect Road (see 2012 Cuyahoga County Board of Health Active Septic Systems list).

Prior to the decommissioning of the Strongsville “A” WWTP in 1994, ammonia was elevated on Blodgett Creek downstream of the treatment plant effluent. Average ammonia concentrations were 10.5 mg/L in 1994 compared to 0.10 mg/L obtained in 2012 (Fig 2). Concentrations in 2012 were similar to those in 1996 and 2000, indicating that the decreases in ammonia occurred shortly after the WWTP was decommissioned.





## Habitat Assessment

### Methods

The Qualitative Habitat Evaluation Index (QHEI) score was determined for sites on Blodgett Creek at RM 1.30 and RM 1.70 and Rocky River at RM 4.40 and RM 4.65. The QHEI, developed by Ohio EPA, is used to assess the aquatic habitat conditions at each sample location by providing an evaluation of the physical components of a stream. The index is based on six metrics: stream substrate, instream cover, stream channel morphology, riparian and bank condition, pool and riffle quality and stream gradient. These metrics describe the physical attributes of a stream and may be important in explaining why fish species are present or absent. A more detailed description of the QHEI can be found in Ohio EPA's (2006), *Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (QHEI)*. The Ohio Environmental Protection agency has set a QHEI target goal of 60 for WWH with a score of  $\geq 60$  indicating adequate habitat diversity to support a warmwater habitat fish community. The QHEI field sheets for these sites are available upon request.

### Results and Discussion

On September 20, 2012, a QHEI score of 57 was measured on Blodgett Creek at RM 1.70. Sand was the predominant substrate type within the assessment area. The stream had sparse instream cover consisting of shallows, rootmats, boulders, woody debris and aquatic macrophytes. A low-scoring functional riffle with large gravel substrate was identified in 2012. Slow to moderate current velocities were present on the creek.

On July 17, 2012, Blodgett Creek at RM 1.30 received a QHEI score of 63. As with the upstream site, sand was the predominant substrate type. Moderate instream cover consisting of undercut banks, overhanging vegetation, deep pools, rootwads, boulders and woody debris were present. This relatively straight, poorly developed channel scored low in the channel morphology metric. Deep pools and no functional riffle were present at RM 1.30.

On September 21, 2012, a QHEI score of 68 was measured on Rocky River at RM 4.65. The best type of substrate present was bedrock. The stream had sparse instream cover consisting of very small amounts of undercut banks, overhanging vegetation, shallows, rootmats, boulders, woody debris and aquatic macrophytes. Current velocities in the pools or riffles were from very fast to slow.

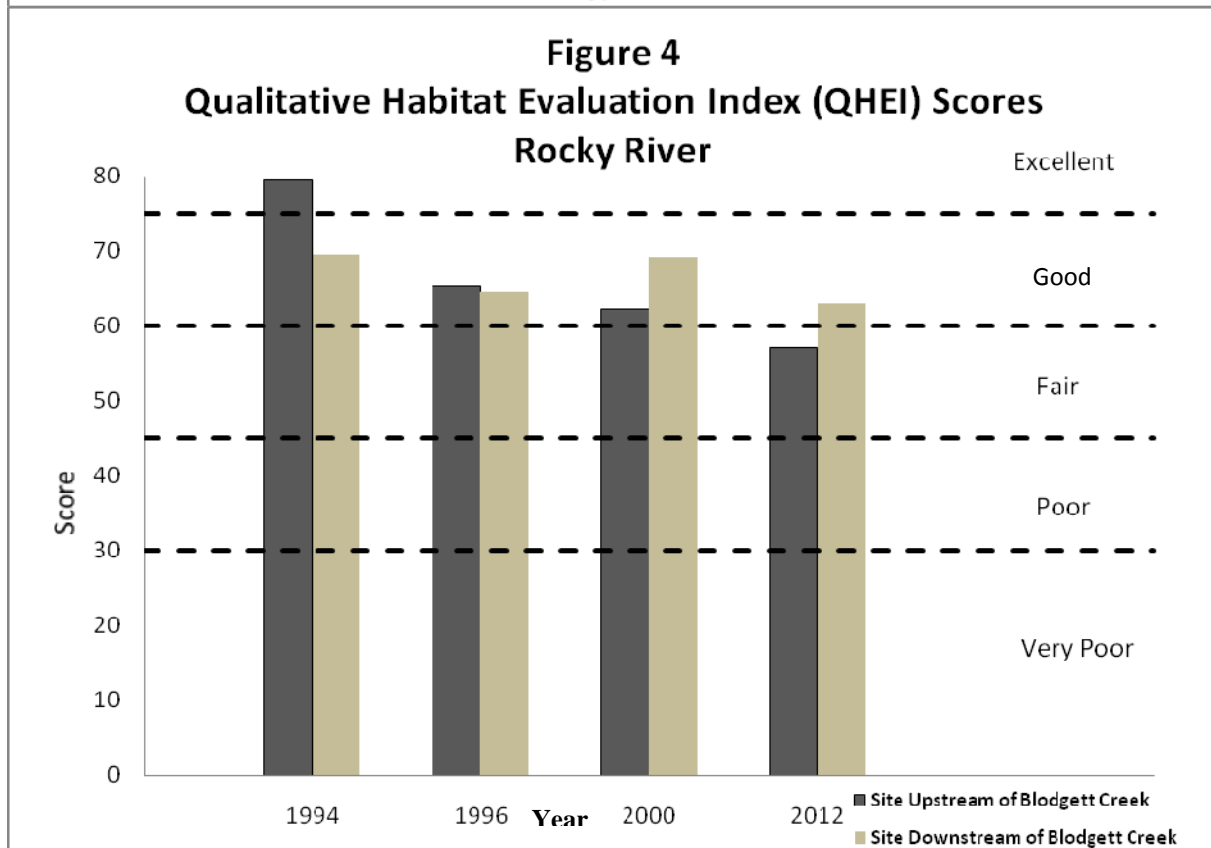
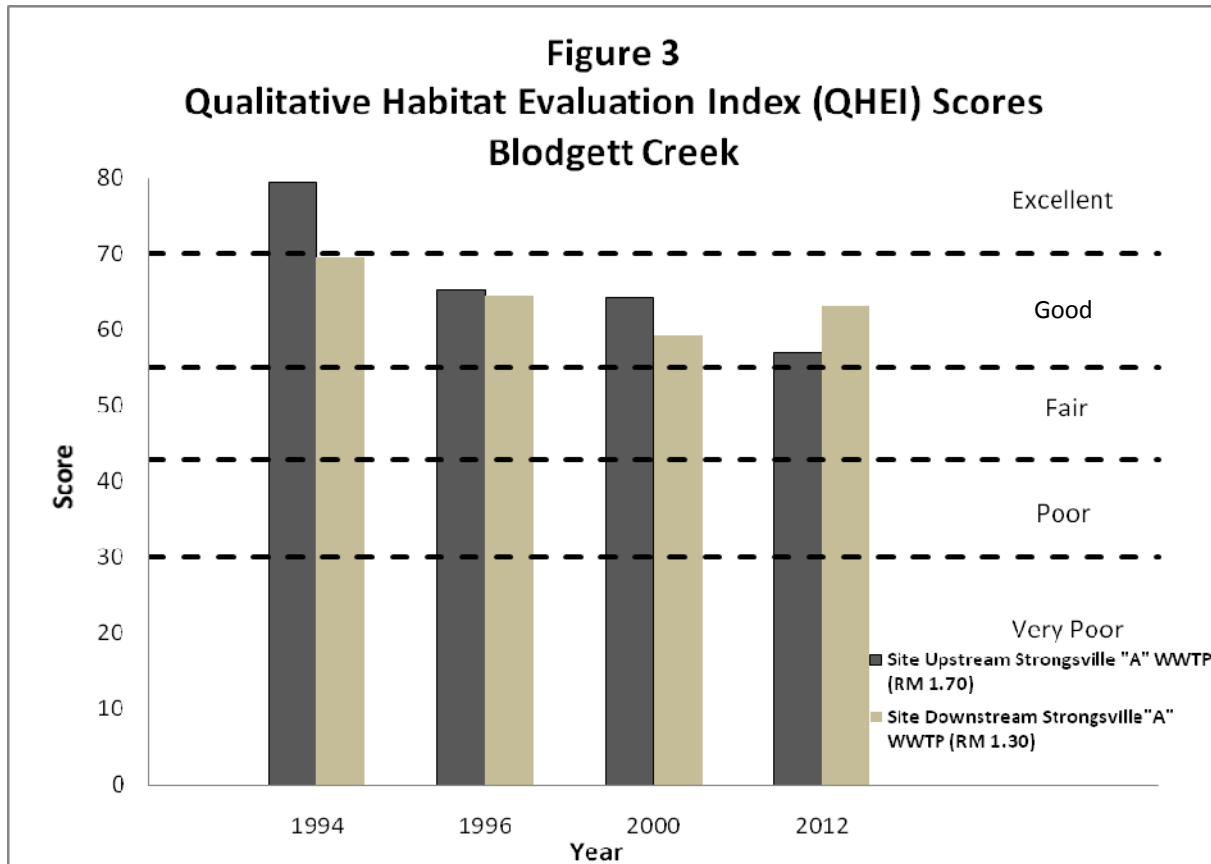
On September 20, 2012, a QHEI of 86.5 was measured on Rocky River at RM 4.40. Six various substrate types were evident in the river; however, boulder and bedrock predominated as the best substrate types within the measured zone. Moderate instream cover was present and consisted of undercut banks, overhanging vegetation, shallows,

rootmats, deep pools, rootwads, boulders, and woody debris. Excellent riffle/run development existed with a stable cobble and boulder riffle/run substrate within the stream bed.

Tables 4 and 5 lists the QHEI results from each site in 1994, 1996, 2000 and 2012. Figures 2 and 3 shows how these results compare to the QHEI target score of 60, at or above which a site should be able to support a warmwater habitat fish community. A significant decrease in the QHEI score was evident from 1994 to 2012 at RM 1.70. This was due to the absence of boulders as the predominant substrate type, sparse instream cover present, and fair to poor channel development within the stream. All these factors decreased the scoring of the QHEI in 2012.

Table 4. Blodgett Creek Qualitative Habitat Evaluation Index Scores					
Site	Location	1994	1996	2000	2012
RM 1.70	Upstream of former Strongsville "A" WWTP	79.50 <i>(Excellent)</i>	65.25 <i>(Good)</i>	64.25 <i>(Good)</i>	57.00 <i>(Fair)</i>
RM 1.30	Downstream of former Strongsville "A" WWTP	69.50 <i>(Good)</i>	64.50 <i>(Good)</i>	59.25 <i>(Good)</i>	63.00 <i>(Good)</i>

Table 5. Rocky River Qualitative Habitat Evaluation Index Scores					
Site	Location	1994	1996	2000	2012
RM 4.65	Upstream of Blodgett Creek	71.50 <i>(Good)</i>	-	62.25 <i>(Good)</i>	68.00 <i>(Good)</i>
RM 4.40	Downstream of Blodgett Creek	82.00 <i>(Excellent)</i>	-	64.50 <i>(Excellent)</i>	86.50 <i>(Excellent)</i>



## Electrofishing

### Methods

One quantitative electrofishing pass was conducted at each site in 2012. A list of the dates when the surveys were completed, along with flow as measured at the United States Geological Survey gage station in USGS Rocky River gauge near Berea, is given in Table 6. Sampling was conducted using longline electrofishing techniques and consisted of shocking all habitat types within a sampling zone while moving from downstream to upstream. The sampling zone was 0.15 kilometers (Headwater), for Blodgett Creek and 0.20 kilometers (Wading) for Rocky River at each site. The methods that were used followed Ohio EPA protocol methods as detailed in *Biological Criteria for the Protection of Aquatic Life, Volumes II* (1987a) and *III* (1987b). Fish collected during the surveys were identified, weighed and examined for the presence of anomalies, including DELTs (deformities, eroded fins, lesions, and tumors). All fish were then released to the waters from which they were collected, except for vouchers and those that could not be easily identified in the field.

Date	River Miles (RMs)	Daily Mean Flow (CFS*)
8/30/12	Blodgett Creek RM's 1.70 & 1.30	50
8 /27/12	Rocky River 4.40	154
8/31/12	Rocky River 4.65	35

\*Provisional data

The electrofishing results for each pass were compiled and utilized to evaluate fish community health through the application of two Ohio EPA indices, the Index of Biotic Integrity (IBI) and the Modified Index of Well-Being (MIwb). Sites on Rocky River at River Miles 4.65 and 4.40 utilized both index scores, but only the IBI was evaluated on Blodgett Creek. The IBI incorporates 12 community metrics representing structural and functional attributes. The structural attributes are based upon fish community aspects such as fish numbers and diversity. Functional attributes are based upon fish community aspects such as feeding strategies, environmental tolerances, and disease symptoms. These metrics are individually scored by comparing the data collected at the survey site with values expected at reference sites located in a similar geographical region. The maximum possible IBI score is 60 and the minimum possible score is 12. The summation of the 12 individual metrics scores provides a single-value IBI score, which

corresponds to a narrative rating of *Exceptional*, *Good*, *Marginally Good*, *Fair*, *Poor* or *Very Poor*. The IBI metrics used for headwater and wading sites are shown in Table 7 and 8 respectively.

<b>Table 7. IBI Metrics (Headwater)</b>
Total Number of Native Species
Number of Darters & Sculpins
Number of Headwater Species
Number of Minnow Species
Number of Sensitive Species
Percent Tolerant Species
Percent Pioneering Species
Percent Omnivores
Percent Insectivores
Number of Simple Lithophils
Percent DELT Anomalies
Number of Fish

<b>Table 8. IBI Metrics (Wading)</b>
Total Number of Native Species
Number of Darter species
Number of Sunfish Species
Number of Sucker Species
Number of Intolerant Species
Percent Tolerant Species
Percent Omnivores
Percent Insectivores
Percent Top Carnivores
Percent Simple Lithophils
Percent DELT Anomalies
Number of Fish

The second fish index utilized by Ohio EPA is the Modified Index of Well-being (MIwb). The MIwb, Formula 1 below, incorporates four fish community measures: numbers of individuals, biomass, and the Shannon Diversity Index (H) (Formula 2

below) based on numbers and weight of fish. The MIwb is a result of a mathematical calculation based upon the formula:

$$\text{Formula 1:} \quad MIwb = 0.5 \ln N + 0.5 \ln B + \bar{H}(\text{No.}) + \bar{H}(\text{Wt.})$$

$N$  = Relative numbers of all species excluding species designated as highly tolerant, hybrids, or exotics

$B$  = Relative weights of all species excluding species designated as highly tolerant, hybrids, or exotics

$\bar{H}(\text{No.})$  = Shannon Diversity Index based on numbers

$\bar{H}(\text{Wt.})$  = Shannon Diversity Index based on weight

$$\text{Formula 2:} \quad \bar{H} = - \sum \left[ \left( \frac{n_i}{N} \right) \log_e \left( \frac{n_i}{N} \right) \right]$$

$n_i$  = Relative numbers or weight of species

$N$  = Total number or weight of the sample

A Modified Index of Well Being (MIwb) was not calculated on Blodgett Creek because these sites had a drainage area less than twenty square miles; however, a MIwb was calculated at the Rocky River sites.

A list of the species, numbers, pollution tolerances and incidence of DELT anomalies for fish collected during the fish assessments is available upon request.

## Results

The biological integrity of Blodgett Creek was assessed at RM 1.70 (upstream of the former Strongsville “A” WWTP) and RM 1.30 (downstream of the former Strongsville “A” WWTP). Blodgett Creek was evaluated at these sites using Ohio EPA’s IBI Index evaluation. Rocky River sites at RMs 4.65 and 4.40 were evaluated using both the IBI and MIwb Index values.

In 1994, IBI scores of 22 (*Poor*), 26 (*Poor*), and 24 (*Poor*) were obtained at RM 1.70 on Blodgett Creek (Table 8). The most abundant fish collected was the creek chub, which comprised 96 % of the total fish collected at this site. In 1996, similar results were obtained at this site with IBI scores of 20 (*Poor*) and 28 (*Fair*), and the creek chub was still the most abundant fish collected, comprising 59% of the total fish collected. 2000 fish data results showed the fish community being ‘*Poor*’ with 56 % of the fish collected comprising creek chubs.

The 2012 results showed an IBI score of 24 (*Poor*) with the creek chub still dominating the stream, comprising 50% of the total catch. The remaining fish were blacknose dace, central stoneroller minnows, bluntnose minnow and common white suckers.

In 1994, no fish were collected at RM 1.30 on Blodgett Creek and an IBI score of twelve was obtained. Two years later, fish collection results showed an improvement in the fish community showing 954 fish collected on two electrofishing passes. IBI scores of 22 (*Poor*) and 24 (*Poor*) were obtained. Creek chubs, blacknose dace, bluntnose minnows and common white suckers were the species of fish collected. The increase in scores was most likely due to the decrease in ammonia concentrations in the creek. 2000 fish data showed “*Poor*” results and the creek chub still dominating and comprising 67 % of the total fish collected.

The 2012 results showed an IBI score of 24 (*Poor*). Common white suckers, goldfish, blacknose dace, creek chubs, bluntnose minnows, stoneroller minnows and green sunfish were the species collected. Tables 9 and 10 show the fish index scores throughout the sampling years. Figure 5 illustrates the IBI scores on Blodgett Creek before and after decommissioning of the Strongsville “A” WWTP.

In 1994 and 1996, average IBI scores of 34 and 42 (*Marginally Good/Good*) were obtained on Rocky River at RM 4.65, respectively. Average MIwb scores of 7.6 (*Marginally Good*) and 7.2 (*Marginally Good*) were obtained at this site in 1994 and 1996, respectively. In 1994, sand shiners dominated the catch and comprised 29.4% of the total fish collected. In 1996, the greenside darter was the most abundant fish collected, comprising 23% of the total catch. 2000 fish data showed “*Good*” results with average IBI and MIwb scores of 39 and 7.9, respectively. The pollution intolerant sand shiner dominated, comprising 21 % of the total fish collected.

In 2012, at RM 4.65, IBI and MIwb scores of 38 (*Good*) and 8.8 (*Good*) were obtained respectively. A total of nineteen species were collected at this site, the dominant fish being the sand shiner, comprising 49% of the total fish collected. The remaining catch was comprised of common white suckers, northern hog suckers, creek chubs, striped shiners, spotfin shiners, silverjaw minnows, bluntnose minnows, stoneroller minnows, northern rockbass, largemouth and smallmouth bass, bluegill and green sunfish, greenside, rainbow and johnny darters. The two pollution-intolerant species collected were the rosyface shiner and stonecat madtom. The highest metric scores (5) were obtained for the relative abundance of native fish collected (1,932), a high proportion of insectivores present (66%), and a high proportion of carnivores present (6.3%). The low proportion of fish with DELT anomalies (0.6%) also resulted in increased IBI scores.

In 1994 and 1996, average IBI scores of 34 (*Fair*) and 43 (*Good*) were obtained on Rocky River at RM 4.40. Average MIwb scores of 7.4 and 7.7 (*Marginally Good*) were obtained at this site in 1994 and 1996, respectively. In 1994, the common white sucker dominated the fish population and comprised 25% of the total catch. In 1996, the greenside darter was the most abundant fish collected, accounting for 23% of the catch. 2000 fish data showed ‘‘*Good*’’ results with average IBI and MIwb scores of 39 and 7.7, respectively. The pollution intolerant greenside darter dominated, comprising 26% of the total fish collected.

In 2012, at RM 4.40, results showed IBI and MIwb scores of 50 (*Exceptional*) and 9.0 (*Very Good*), respectively. Two hundred eighteen greenside darters were collected and accounted for 29% of total fish collected at RM 4.40. Other fish collected were golden redhorse, northern hog suckers, white suckers, creek chubs, striped shiners, sand shiners, bluntnose and stoneroller minnows, yellow bullheads, northern rockbass, smallmouth and largemouth bass, greenside, rainbow, and johnny darters, and four sunfish species entailing warmouth, green, bluegill and pumpkinseed. The pollution intolerant species rosyface shiner and stonecat madtom were also collected at this site. The highest metric scores (5) were obtained for the relative abundance of native fish collected (920) and a high proportion of insectivores present (56.6%), high proportion of carnivores (15.2%) and high proportion of lithophils (41.5%). The high number of sunfish species (5) and very few fish with DELTS (0.1%) also scored a (5), which resulted in the increased IBI scores. Figure 6 illustrates the IBI scores on Rocky River, upstream and downstream of Blodgett Creek, before and after decommissioning of the Strongsville ‘‘A’’ WWTP. The IBI score downstream of Blodgett Creek increased from 1994 to 1996 and again in 2012. This may be due to improvement in water quality from the decommissioning of the treatment plant.

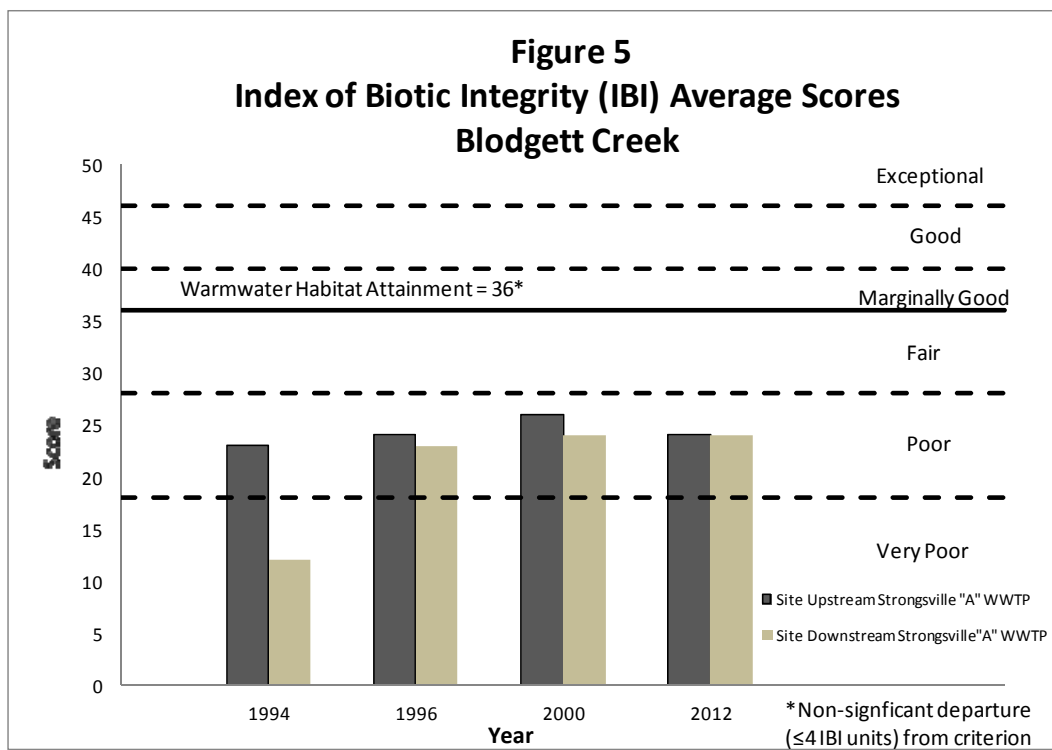
Site	Location	1994	1996	2000	2012*
RM 1.70	Upstream of former Strongsville ‘‘A’’WWTP	24 ( <i>Poor</i> )	24 ( <i>Poor</i> )	24 ( <i>Poor</i> )	24 ( <i>Poor</i> )
RM 1.30	Downstream of former Strongsville ‘‘A’’WWTP	12 ( <i>Very Poor</i> )	23 ( <i>Poor</i> )	24 ( <i>Poor</i> )	24 ( <i>Poor</i> )

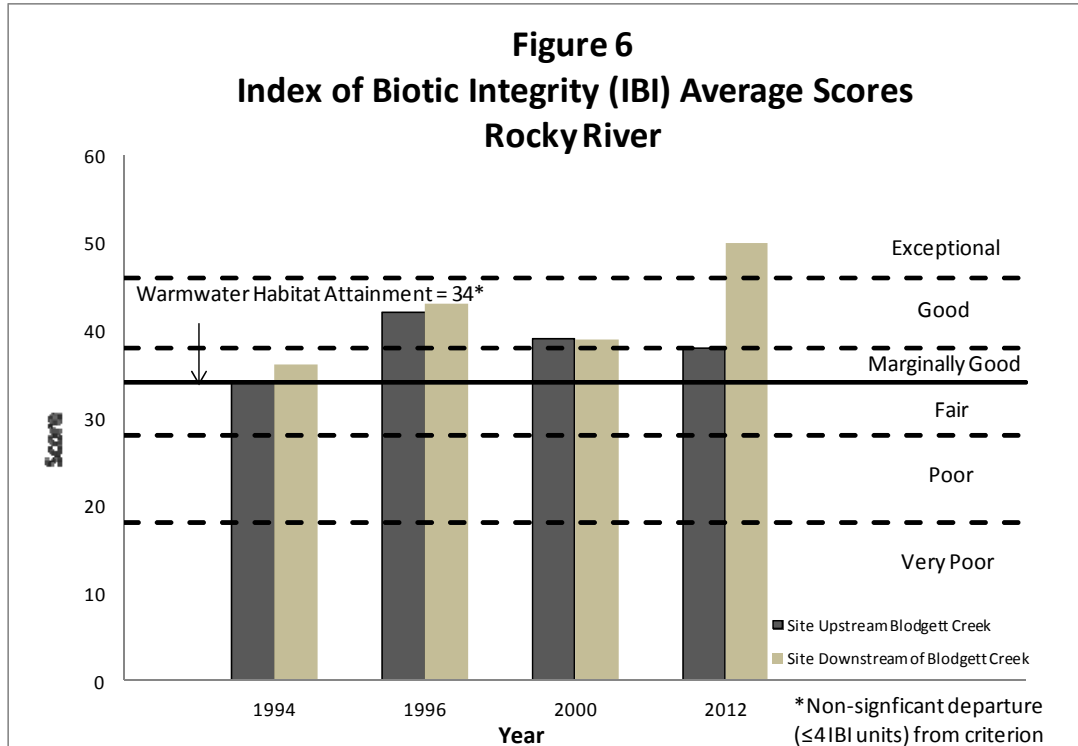
\**One electrofishing pass*



Table 10. Rocky River Index of Biotic Integrity Average Scores					
Site	Location	1994	1996	2000	2012
RM 4.65	Upstream of Blodgett Creek.	34 <i>(Marginally Good)</i>	42 <i>(Good)</i>	39 <i>(Good)</i>	38* <i>(Good)</i>
RM 4.40	Downstream of Blodgett Creek	36* <i>(Good)</i>	43 <i>(Good)</i>	39 <i>(Good)</i>	50* <i>(Exceptional)</i>

\*One electrofishing pass





## Macroinvertebrate Sampling

### Methods

Macroinvertebrates were sampled quantitatively using modified Hester-Dendy (HD) samplers in conjunction with a qualitative assessment of Ephemeroptera (mayfly), Plecoptera (stonefly) and Trichoptera (caddisfly), also referred to as EPT taxa, inhabiting available habitats at the time of HD retrieval. Quantitative sampling was conducted at RM(s) 1.70, 1.30, 4.65 and 4.40. Methods for sampling followed the Ohio EPA's Biological Criteria for the Protection of Aquatic Life, Volume III (1987b). The recommended period for HDs to be installed is six weeks.

Macroinvertebrate quantitative and qualitative samples were sent to Midwest Biodiversity Institute (MBI) of Columbus, Ohio for identification and enumeration. Specimens were identified to the lowest practical taxonomic level as recommended in Ohio EPA's *Biological Criteria for the Protection of Aquatic Life, Volume III* (1987, updated September 30, 1989; November 8, 2006; and August 26, 2008). The overall aquatic macroinvertebrate community in the stream was evaluated using Ohio EPA's Invertebrate Community Index (ICI) (OEPA 1987a, Ohio EPA undated), when an HD was retrieved. The ICI consists of ten community metrics (Table 11), each with four

scoring categories. Metrics 1-9 are based on the quantitative sample, while Metric 10 is based on the qualitative EPT taxa. The total of the individual metric scores result in the overall score. This scoring evaluates the community against Ohio EPA’s reference sites for each specific eco-region. The taxa lists and enumerations are available upon request from NEORSD’s WQIS Division.

<b>Table 11. ICI Metrics</b>
Total number of taxa
Number of mayfly taxa
Number of caddisfly taxa
Number of dipteran taxa
Percent mayflies
Percent caddisflies
Percent Tanytarsini midges
Percent other diptera and non-insects
Percent tolerant organisms (as defined)
Number of qualitative EPT taxa

**Results**

HDs were installed and retrieved from RMs 1.70 and 1.30 on Blodgett Creek in 2012. The ICI scores for each site are listed in Table 12. Table 13 also depicts Rocky River ICI scores upstream and downstream of Blodgett Creek.

Table 12. Blodgett Creek Invertebrate Community Index Scores		
Site	Location	2012 Score
RM 1.70	Upstream of former Strongsville “A” WWTP	36 ( <i>Good</i> )
RM 1.30	Downstream of former Strongsville “A” WWTP	42 ( <i>Very Good</i> )

Table 13. Rocky River Invertebrate Community Index Scores		
Site	Location	2012 Score
RM 4.65	Upstream of Blodgett Creek	44 ( <i>Very Good</i> )
RM 4.40	Downstream of Blodgett Creek	38 ( <i>Good</i> )

In 2012, an HD was set, removed and processed, and an ICI score of 36 (*Good*) was calculated on Blodgett Creek at RM 1.70. This score was in attainment of the Warmwater Habitat criteria of 34. The higher individual ICI metric score of 6 was obtained for the macroinvertebrate metrics of percent caddisfly composition (8.6%), percent tanytarsini midge composition (18.2%), and percent tolerant organisms (8.3%). The more typical characteristically good communities associated with a metric score of 4 was seen in the number of total taxa (26), and number of caddisfly taxa (2) at this site. The Hester-Dendy showed 26 different taxa collected at this site with the midge *Dicrotendipes neomodestus* being the most abundant (27%). This taxa group is listed as facultative pollution tolerant. The EPT taxa in the qualitative sampling showed a good density and diversity of Baetidae species being the predominant species collected in the riffles, and a low density of Heptagenia species collected in the runs.

In 2012, data was collected on Blodgett Creek at RM 1.30 and an ICI score of 42 (*Very Good*) was obtained. This score was in attainment of the Warmwater Habitat criterion of 34. The higher individual ICI metric score of 6 was obtained for the macroinvertebrate metrics of percent caddisfly composition (13.7%), percent tanytarsini midge composition (44.9%), and percent tolerant organisms (3.5%). The number of caddisfly taxa (3) also scored a 6. The more typical characteristically good communities associated with a metric score of 4 was seen in the number of total taxa (31), number of dipteran taxa (16) and percent other dipterans and non-insects (34.6). The Hester-Dendy showed 31 different taxa collected at this site with the midge *Tanytarsus glabrescens group sp 7* being the most abundant (33.6%). This taxa group is listed as facultative pollution tolerant. The EPT taxa in the qualitative sampling showed a good density and diversity of Hydropsychidae and Baetidae species being the predominant species collected in the riffles and runs, and a low diversity and density of Caenidae species collected in the pools.

Hester-Dendys were not installed on Blodgett Creek prior to 2012 and no ICI scores were calculated.

In 2012, Rocky River macroinvertebrates were evaluated based on the metrics that make up the ICI. An ICI score of 44 was obtained on Rocky River upstream of

Blodgett Creek at RM 4.65. This score was rated *Very Good* and was in attainment of the Warmwater Habitat criteria of 34. High ICI metric scores (6) were obtained for the following macroinvertebrate metrics: number of total taxa (40), the number of caddisfly taxa (5), and percent tolerant organisms (0.8%). The remaining metrics scored a 4, except the percent other dipteran and non-insect composition, which scored a 2. The Hester-Dendy showed 40 different taxa collected at this site with the moderately intolerant snail *Elimia sp.* being the most abundant (35.2%). A good diversity of moderately intolerant organisms consisting of mayflies, caddisflies, water pennies, snails and bivalves were collected qualitatively and quantitatively at this site.

An ICI score of 38 was obtained on Rocky River downstream of Blodgett Creek at RM 4.40. This score was rated *Good* and was in attainment of the Warmwater Habitat criteria of 34. One high ICI metric score (6) was obtained for the macroinvertebrate metric of percent tolerant organisms (1.0%). The remaining metrics scored a 4, except Percent Caddisflies, Tanytarsini midges and number of Dipteran Taxa, which scored a 2. The Hester-Dendy showed 34 different taxa collected at this site with flatworms and midges being the most abundant species collected (50.8%).

## Conclusions

Bacteriological sampling showed poor results on Blodgett Creek at RM 1.70 and RM 1.30 and results were in non-attainment of the *E. coli* criteria for Class B primary contact recreation standards. Rocky River at RMs 4.65 and 4.40 were also in non-attainment of the Class A primary contact recreation *E. coli* criteria. Elevated bacterial contamination during wet and dry weather may have resulted from faulty residential septic tank discharges to storm sewers or septic tank discharges to swales or ditches, which are then tributary to Blodgett Creek or Rocky River. Elevated levels of *E. coli* may indicate the presence of other pollutants that may be harmful to the fish and macroinvertebrates.

2012 Blodgett Creek and Rocky River chemical parameter results met Warmwater Habitat criteria attainment including ammonia concentrations. Prior to decommissioning the Strongsville "A" WWTP in 1994, elevated levels of ammonia were evident on Blodgett Creek, directly impacting the creek and resulting in no fish being collected downstream of the effluent. In 1996, ammonia concentrations had decreased and sampling results in 2000 and 2012 have shown ammonia concentrations remaining low. The decreased levels of ammonia after the decommissioning of the treatment plant appeared to influence the increase in numbers of fish. Hester-Dendys were not installed on Blodgett Creek prior to 2012 and no ICI scores were calculated, however, 2012 Blodgett Creek ICI scores of 36 (*Good*) and 42 (*Very Good*) were calculated at RM's 1.70 and 1.30 respectively. These scores were in attainment of the Warmwater Habitat criteria of 34 and the low ammonia

concentrations due to decommissioning of the treatment plant may have also attributed to the good macroinvertebrate scores on the creek.

In conclusion, overall Rocky River average IBI and MIwb scores have remained relatively the same in 1996 and 2000 (*Fair/Good*) and improved in 2012 (*Good/Exceptional*). The average IBI scores on Blodgett Creek upstream of the former Strongsville “A” WWTP were virtually unchanged from 1994 to 2012 attaining a “*Poor*” narrative rating. Downstream of the former WWTP, however, IBI scores improved from “*Very Poor*” in 1994 to “*Poor*” in 1996, 2000 and 2012. Fish index scores remain “*Poor*” and are in non-attainment of the WWH biocriteria; however, since the macroinvertebrate community scores are in attainment, a recovery of the fish community to attainment status may follow. The Blodgett Creek sites evaluated in the study were in partial attainment of Ohio EPA’s criterion for macroinvertebrate communities and failed to meet the criteria for fish communities. The Rocky River sites evaluated met both fish and macroinvertebrate community index scores (Table 14).

Table 14. 2012 Blodgett Creek/Rocky River Survey Results						
Stream & River Mile	Aquatic Life Use Attainment Status	IBI Score (Narrative Rating)	MIwb Score (Narrative Rating)	ICI Score (Narrative Rating)	QHEI Score (Narrative Rating)	Water Quality Exceedances
Blodgett Creek 1.70	PARTIAL	24 <i>Poor</i>	N/A	36 <i>Good*</i>	57 <i>Fair</i>	<i>E. coli</i>
Blodgett Creek 1.30	PARTIAL	24 <i>Poor</i>	N/A	42 <i>Very Good</i>	63 <i>Good</i>	<i>E. coli</i>
Rocky River 4.65	Full	38 <i>Good</i>	8.8 <i>Good</i>	44 <i>Very Good</i>	68 <i>Good</i>	<i>E. coli</i>
Rocky River 4.40	Full	50 <i>Exceptional</i>	9.0 <i>Very Good</i>	38 <i>Good</i>	86.5 <i>Excellent</i>	<i>E. coli</i>
WWH biocriterion attainment: IBI score of 36 (Blodgett Cr.) 34 (Rocky River); ICI score of 34 Non-significant departure: ≤4 IBI units; ≤0.5 MIwb *Narrative rating based on best professional judgment and habitat evaluation N/A: Not Applicable						

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