

NORTHEAST OHIO REGIONAL SEWER DISTRICT

2012 Euclid Creek Environmental Monitoring Biological, Water Quality and Habitat Survey Results



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

Introduction

In 2012, the Northeast Ohio Regional Sewer District (NEORS D) conducted water chemistry sampling, habitat assessments, and fish and benthic macroinvertebrate community surveys on Euclid Creek. Euclid Creek is a natural stream which receives stormwater drainage from the communities of South Euclid, Lyndhurst, Willoughby Hills, Richmond Heights, Highland Heights, Euclid and Cleveland before emptying into Lake Erie. Sampling was conducted by NEORS D 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 NEORS D study plan *2012 Euclid Creek Environmental Monitoring* approved by Ohio EPA on May 15, 2012.

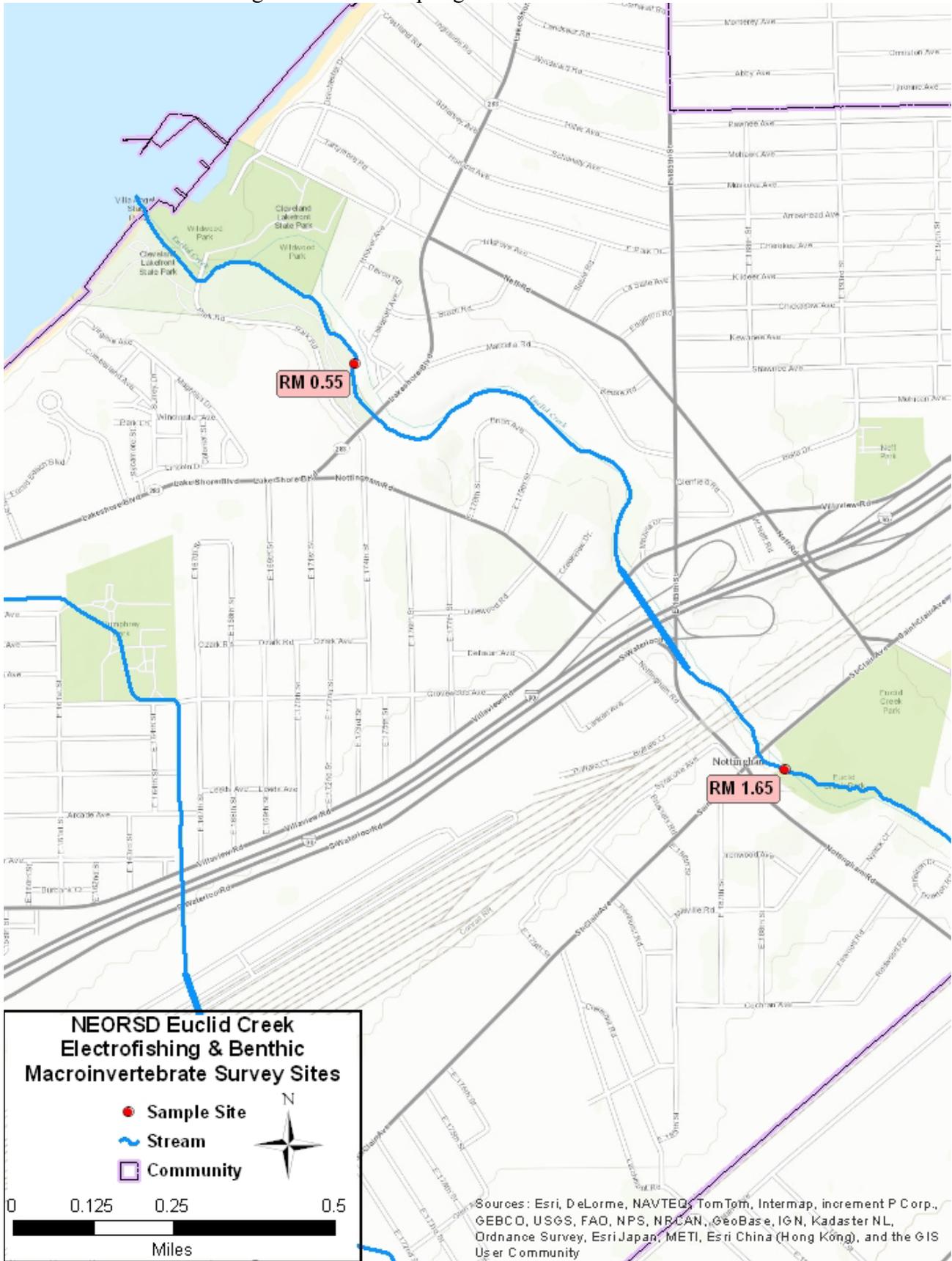
The downstream site at river mile (RM) 0.55 was sampled as required by NEORS D's Combined Sewer Overflow (CSO) permit, Ohio Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) Permit No. 3PA00002*FD. The upstream site at RM 1.65 was sampled to determine the extent to which the downstream macroinvertebrate community was impacted by NEORS D CSO discharges or other environmental factors; and to obtain additional baseline data in support of future capital improvement projects. Benthic macroinvertebrate, fish community, habitat assessment and water chemistry sampling was also conducted at both sites.

Table 1 lists the sampling sites with respect to river mile, latitude/longitude, description, and types of surveys conducted, and Figure 1 is a map of the sampling locations on the creek.

Table 1. 2012 Euclid Creek Sampling Sites

Water Body	Latitude	Longitude	River Mile	Location Information	USGS HUC 8 Number-Name	Purpose
Euclid Creek, Main Branch	41.5738	-81.5470	1.65	Upstream of Saint Clair Avenue	04110003-Ashtabula-Chagrin	Evaluate water chemistry, habitat, fish & macroinvertebrates upstream of NEORS D CSOs
Euclid Creek, Main Branch	41.5833	-81.5594	0.55	Downstream of Lake Shore Boulevard	04110003-Ashtabula-Chagrin	Evaluate water chemistry, habitat, fish, & macroinvertebrates in support of Ohio EPA Permit No. 3PA00002*FD

Figure 1. 2012 Sampling Locations on Euclid Creek



Water Chemistry & Bacteriological Sampling

Methods

Water chemistry and bacteriological sampling was conducted six times between June 19 and July 24 on Euclid Creek at RMs 0.55 and 1.65. The final sampling event (July 24) was only conducted at RM 0.55 to satisfy permit requirements. Techniques used for sampling and analyses followed the *Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices* (2012) and Ohio EPA's *Surface Water Field Sampling Manual for water chemistry, bacteria, and flows* (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).

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

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.

Results and Discussion

Over the course of the sampling, two field blanks were collected for QA/QC purposes. A total of 15 water quality parameters were either rejected, estimated or

downgraded due to potential field blank contamination. It is unclear how the field blanks became contaminated and may be due to inappropriate sample collection, handling, contaminated blank water and/or interference during analysis. Table 2 lists water quality parameters that were rejected, estimated or downgraded from Level 3 to Level 2 data based on Ohio EPA data validation protocol.

Table 2. Potential Field Blank Contamination

Cd	Al	Ti
Cr+6	Fe	Tl
Cu	NO ₃	Total-P
DR Phos	NH ₃	Turbidity
Hg	NO ₃ +NO ₂	Zn

A duplicate sample was collected on July 24 at RM 0.55 and on July 10 at RM 1.65 for QA/QC purposes. The duplicate sample collected at RM 0.55 revealed 11 parameters that were rejected due to RPDs that were greater than the acceptable RPD (Table 3). There are numerous reasons for why a large number of parameters were rejected, such as a lack of precision and consistency in sample collection and/or analytical procedures, environmental heterogeneity and/or improper handling of samples. The duplicate sample collected at RM 1.65 did not have any parameters that required qualification of the data.

Table 3. Unacceptable RPDs

Date	Site	Parameter	Acceptable RPD (%)	Actual RPD (%)	Qualifier
7/24/2012	RM 0.55	<i>E. coli</i>	15.1	29.7	Rejected
		Iron	17.0	26.0	Rejected
		Manganese	9.7	33.1	Rejected
		Sodium	9.3	13.4	Rejected
		Ammonia	35.5	90.6	Rejected
		Nitrate	19.6	182.6	Rejected
		NO ₃ +NO ₂	19.6	182.6	Rejected
		Total Phosphorus	28.4	36.7	Rejected
		Total Suspended Solids	35.3	46.1	Rejected
		Turbidity	32.6	70.2	Rejected
Vanadium	62.5	124.1	Rejected		

Paired parameters, which are parameters in which one is a subset of the other, for all samples collected were also evaluated and compared for QA/QC purposes. These comparisons revealed that all of the data for chromium and hexavalent chromium were either estimated or rejected. Because there were no exceedances associated with these

parameters, qualification of these results did not significantly change the overall water chemistry assessment of the creek.

Both sites on Euclid Creek are designated as Warmwater Habitat (WWH), Agricultural Water Supply, Industrial Water Supply, and Class B Primary Contact Recreation (Ohio EPA, 2009). The results of the water chemistry and bacteriological samples were compared to the applicable water quality standards to determine attainment status for those designated uses. Of that comparison, two exceedances were noted for mercury and *Escherichia coli*.

Mercury analysis for all of the sampling events was completed using EPA Method 245.1. Using this method, it was found that the Protection of Human Health Nondrinking Water Outside Mixing Zone Average (OMZA) and Protection of Wildlife OMZA criteria for mercury were exceeded at both sites for multiple thirty-day periods (Table 4). Mercury may be introduced into the creek through CSO discharges, atmospheric deposition and urban and stormwater runoff within the watershed.

Table 4. 2012 Euclid Creek Mercury Results

30-day Period	Result		Criterion					
	RM 0.55 30-day Average (µg/L)	RM 1.65 30-day Average (µg/L)	Human Health Criterion (µg/L)	RM 0.55 Exceedance (Y/N)	RM 1.65 Exceedance (Y/N)	Wildlife Criterion (µg/L)	RM 0.55 Exceedance (Y/N)	RM 1.65 Exceedance (Y/N)
6/19-7/19	0.007	0.005	0.0031	Y	Y	0.0013	Y	Y
6/26/-7/26	0.005	0.006	0.0031	Y	Y	0.0013	Y	Y
7/2-8/1	0.006	0.007	0.0031	Y	Y	0.0013	Y	Y
7/10-8/9	0.007	0.010	0.0031	Y	Y	0.0013	Y	Y
7/17-8/16	0.004	-	0.0031	Y	Y	0.0013	Y	Y
-Sample not taken								

The Class B Primary Contact Recreation criteria for Euclid Creek includes an *E. coli* criterion not to exceed a single sample maximum (SSM) of 523 colony-forming units per 100 milliliters (CFU/100mL) in more than ten percent of the samples taken during any thirty-day period, and a seasonal geometric mean (SGM) criterion of 161 CFU/100mL (Ohio EPA, 2009). The *E. coli* densities at both sites exceeded the SSM of 523 CFU/100mL in more than ten percent of the samples taken for multiple thirty-day periods. RM 0.55 exceeded the SSM criterion for all five of the thirty-day periods during which samples were collected, whereas, RM 1.65 exceeded the criterion three of four thirty-day periods. Additionally, both sites exceeded the SGM criterion of 161 CFU/100mL (Table 5).

Table 5. Euclid Creek *E. coli* Densities

Sample Date	Units	RM 0.55	RM 1.65	Wet Weather Sampling Event ¹
6/19/12	CFU/100mL	1284	1033	Yes
6/26/12	CFU/100mL	190	270	No
7/2/12	CFU/100mL	EC 6800	4000	Yes
7/10/12	CFU/100mL	548	188*	No
7/17/12	CFU/100mL	334	300	No
7/24/12	CFU/100mL	784*	---	No
Seasonal Geometric Mean	CFU/100mL	787	575	n/a
--- no sample was taken (not a permit-required site) *Average of sample and duplicate sample EC= Estimated count				

There are several possible reasons why these sites are exceeding the SSM and SGM criteria. The NEORSD owns three CSOs on Euclid Creek and there are additional CSOs in the city of Euclid, all of which may cause elevated *E. coli* densities in the creek during wet weather or as dry weather overflows. Additionally, there are numerous documented improper connections, and bacteriologically contaminated storm sewers in the cities of Cleveland and Euclid, which could have an impact on the *E. coli* densities seen during dry weather. Furthermore, the conditions of storm sewers in cities further upstream are unknown and may also have bacteriological contamination of the storm sewer system tributary to Euclid Creek. Known improper connections and storm sewer outfalls with bacteriological contamination in Cleveland and Euclid were investigated during 2012 by WQIS personnel and when applicable, were communicated to the appropriate community for remediation. Although the investigation was ongoing at the time of this report, the issue of storm sewer bacteriological contamination remains a concern for the health of Euclid Creek. Finally, bacteriological contamination from failing septic systems or from urban runoff in the Euclid Creek watershed may also be impacting the water quality at the sample sites.

Habitat Assessment

Methods

Instream habitat assessments were conducted once at each site on Euclid Creek in 2012 using the Qualitative Habitat Evaluation Index (QHEI). The QHEI was developed by the Ohio EPA to assess aquatic habitat conditions that may influence the presence or absence of fish species by evaluating the physical attributes of a stream. The index is

¹ Rainfall data taken from NEORSD Easterly WWTP (REA) Rain Gauge.

based on six metrics: stream substrate, instream cover, channel morphology, riparian zone and bank condition, pool and riffle quality, and stream gradient. The QHEI has a maximum score of 100, and a score of 60 or more suggests that sufficient habitat exists to support a fish community that meets the warmwater habitat criterion (Ohio EPA, 2003). A more detailed description of the QHEI can be found in Ohio EPA's *Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (QHEI)* (2006). QHEI field sheets for each site are available upon request from the NEORSD WQIS Division.

Results and Discussion

The QHEI score at RM 1.65 met Ohio EPA's target score of 60, but the score at RM 0.55 was below the target (Table 6). These scores were consistent with the assessments performed in 2011, when the scores were 74.25 and 52.75, respectively.

Table 6. 2012 Euclid Creek QHEI Results and Stream Flows

River Mile	Date	QHEI Score	Narrative	Stream Flow (ft ³ /s) [#]
0.55	6/15/12	54.5	<i>Fair</i>	3.7
1.65	9/11/12	76.0	<i>Excellent</i>	10

[#] Provisional flow data obtained from USGS 04208700 Euclid Creek flow gauge in Cleveland, Ohio

River Mile 0.55

This site was comprised of predominately sand and gravel substrates with moderate instream cover consisting of undercut banks, overhanging vegetation, shallows, rootmats, deep pools (>70cm), boulders, backwater, aquatic macrophytes and woody debris. This site exhibited moderate silt cover, slow stability and no functional riffle. There was also heavy bank erosion on river left and no erosion on river right. Over the last three years, the stream habitat narrative rating at RM 0.55 has been *Fair*.

River Mile 1.65

This site had predominately cobble and bedrock substrates with moderate instream cover consisting of undercut banks, overhanging vegetation, shallows, rootmats, pools (>70cm), boulders and woody debris. This site had riffles with areas deeper than 10cm and moderately stable-to-stable riffle/run substrates. There was also moderate bank erosion on river left and river right. This was the first year that this site scored *Excellent* since 2009; however, the scores have been within two points of each other within the last four years.

Electrofishing

Methods

Two quantitative electrofishing passes were conducted at each site in 2012. A list of the dates when the surveys were completed, along with flow as measured at the United

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States Geological Survey gage station 04208700 in Cleveland, is given in Table 7. Both sampling sites are considered wading sites because they each have a tributary drainage area of greater than 20 square miles (mi²). 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 0.20 kilometers for 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.

Table 7. 2012 Euclid Creek Electrofishing Surveys

Site	1 st Pass		2 nd Pass	
	Date	Stream Flow (ft ³ /s)	Date	Stream Flow (ft ³ /s)
RM 0.55	6/15/2012	3.7	7/23/2012	2.8
RM 1.65	6/18/2012	20	7/23/2012	2.8
# Provisional flow data obtained from USGS 04208700 Euclid Creek flow gauge in Cleveland, Ohio				

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). 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 12 metrics utilized for wading sites are listed in Table 8.

Table 8. IBI Metrics

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 3 below, incorporates four fish community measures: numbers of individuals, biomass, and the Shannon Diversity Index (H) (Formula 4 below) based on numbers and weight of fish. The MIwb is a result of a mathematical calculation based upon the formula.

Formula 3: $MIwb = 0.5 \ln N + 0.5 \ln B + \bar{H}(No.) + \bar{H}(Wt.)$

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

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

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

Formula 4:
$$\bar{H} = - \sum \left[\left(\frac{n_i}{N} \right) \log_e \left(\frac{n_i}{N} \right) \right]$$

n_i = Relative numbers or weight of species

N = Total number or weight of the sample

An MIwb score ≥ 7.9 (*Good*) is in attainment of the WWH biocriterion for wading sites in the EOLP ecoregion. An MIwb score of 7.4 (*Marginally Good*) is also in attainment, as it is considered nonsignificant departure (≤ 0.5 MIwb units) from the criterion.

Results and Discussion

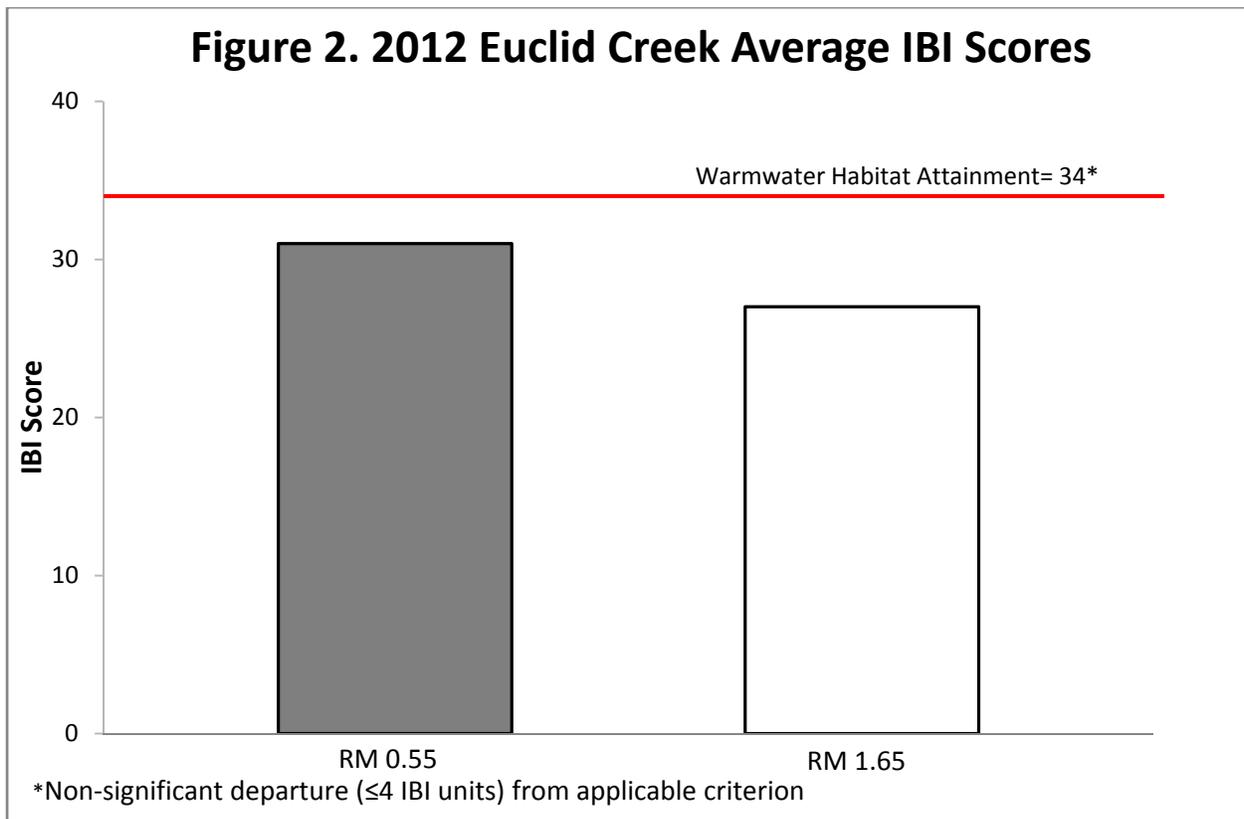
The IBI scores for both sites were in non-attainment of the WWH biocriterion (Table 9, Figures 2 & 3). The MIwb scores, with the exception of the first pass and

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average MIwb scores at RM 0.55, were also in non-attainment of the WWH biocriterion. Of the two sites, RM 0.55 had a slightly higher IBI and MIwb score than RM 1.65. Overall, the scores at RM 1.65 were similar to the scores from the surveys conducted over the last few years. The IBI score at RM 0.55 increased by 5 and the MIwb score increased by 0.8 units from 2011 to 2012, which may be indicative of an improving fish community (Table 10).

Table 9. 2012 Euclid Creek IBI & MIwb Results

River Mile	1 st Pass		2 nd Pass		Average	
	IBI	MIwb	IBI	MIwb	IBI	MIwb
0.55	30	8.1	32	7.1	31	7.6
1.65	26	5.6	28	6.7	27	6.2
Bold indicates attainment of WWH biocriterion [IBI ≥38; MIwb ≥7.9]						
<i>Italics indicates non-significant departure from WWH biocriterion [IBI ≥34; MIwb ≥7.4]</i>						



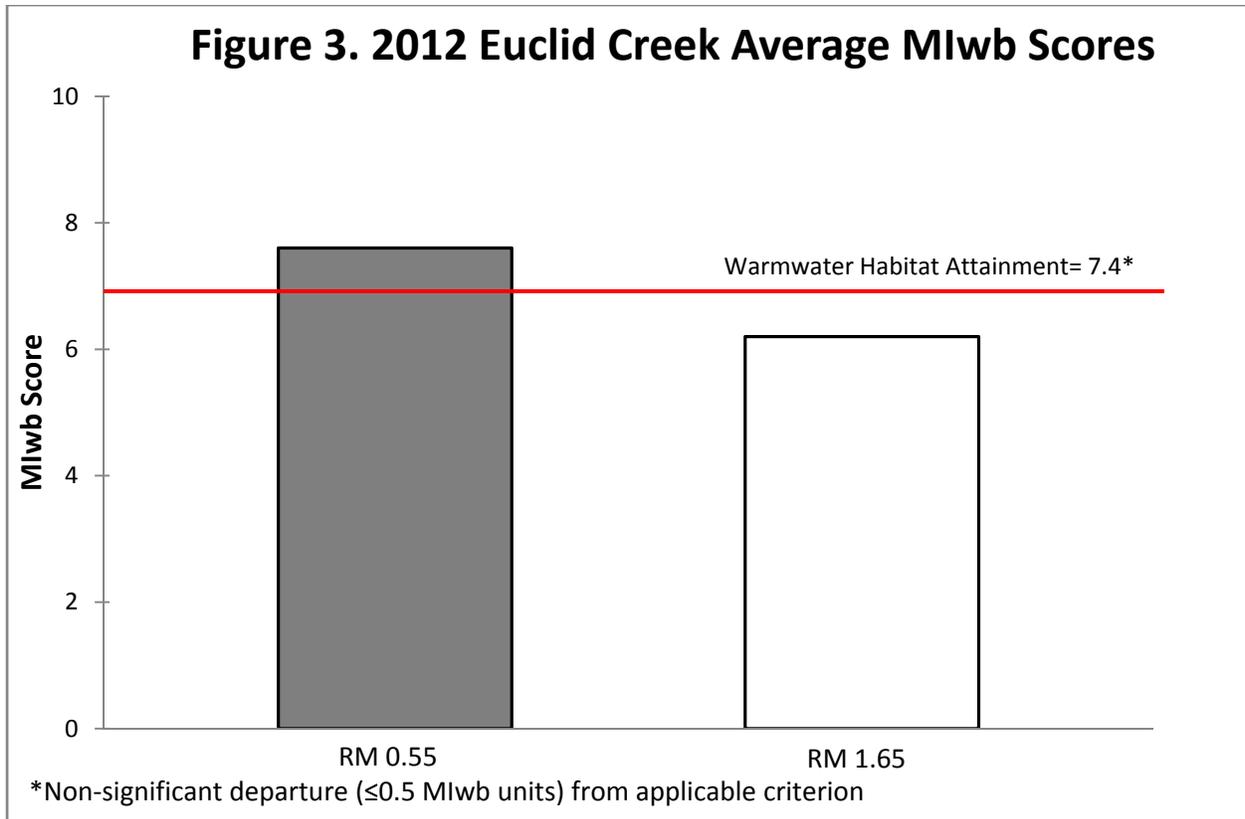


Table 10. 2010 - 2012 Euclid Creek Average IBI & MIwb Scores

River Mile	Year	IBI		MIwb	
		Score	Narrative Rating	Score	Narrative Rating
0.55	2012	31	<i>Fair</i>	7.6	<i>Marginally Good</i>
	2011	26	<i>Poor</i>	6.8	<i>Fair</i>
	2010	26	<i>Poor</i>	6.6	<i>Fair</i>
1.65	2012	27	<i>Poor</i>	6.2	<i>Fair</i>
	2011	25	<i>Poor</i>	4.9	<i>Poor</i>
	2010	25	<i>Poor</i>	5.6	<i>Poor</i>

Bold indicates attainment of WWH biocriterion

River Mile 0.55

At RM 0.55, a total of 25 different fish species were collected during the two electrofishing passes. However, 47.9% of the total catch consisted of highly pollution-tolerant species such as common white suckers (*Catostomus commersonii*), creek chubs (*Semotilus atromaculatus*), bluntnose minnows (*Pimephales notatus*) and western blacknose dace (*Rhinichthys obtusus*). The only notable species collected during both passes was the mimic shiner (*Notropis volucellus*), which has common intolerance to pollution; but given the close proximity of Lake Erie, this species has most likely migrated upstream and is not representative of a resident species found in the creek at this

site. The majority of the IBI metrics received a score of 3 or 1 during both passes. However, four different metrics (Number of Sunfish Species, Number of Individuals, Number of Native Species and Proportion of DELTs) among the two passes received the highest score (5). Similar scoring was seen in 2010 and 2011, as a majority of the IBI metrics received a score of three or one.

The limiting factors at this site may be habitat characteristics such as poor stream development, variable current velocity and no functional riffle. The lack of these factors may deter a healthy fish community from permanently inhabiting this site. Additionally, on the afternoon of July 6, a transformer failure at the Euclid Creek Pump Station caused approximately 141,000 gallons of wastewater to be discharged to Euclid Creek. The pump station is located less than 400 feet upstream of the sampling site at RM 0.55. Although the power failure was remediated by Cleveland Public Power in just over an hour, it is unknown if the discharge had a negative effect on the fish community at RM 0.55. Other environmental stressors such as CSO discharges, improper connections, and urban runoff may also be negatively impacting the fish community at this site.

River Mile 1.65

At RM 1.65, a total of seven different species were collected during the two passes. Again, more than half of the species collected were highly pollution-tolerant species. The western blacknose dace and the creek chub were the most abundant species, comprising nearly half of all species collected at each pass. However, in 2011, the proportion of highly-tolerant species collected in each pass was greater than the proportion in 2012. The three IBI metrics that received the highest score (5) during both passes were the Proportion of Omnivores, Proportion of Simple Lithophils, and Proportion with DELT anomalies. The Number of Individuals metric received a score of 5 for the first pass and a score of 3 for the second pass. All other metrics received a score of one. Similar IBI scoring was seen in the last few years. This occurrence in scoring may be indicative of a fish community that has not changed over the last few years.

Although this site had a QHEI score of 76 (*Excellent*), the poor fish community was not indicative of a healthy WWH community. This may be due to the dam located downstream at East 185th Street, south of Interstate 90, which acts as a migration barrier, prohibiting fish from moving farther upstream on Euclid Creek. If new species of fish cannot make it to the upstream site, then the potential for the IBI and MIwb scores to increase and meet attainment is minimal. Additionally, environmental stressors such as CSO discharges, failing septic systems and urban runoff may be negatively impacting the fish community at this site.

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. Sampling was conducted at both of the locations listed in Table 1. 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.

The macroinvertebrate 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 defined by the Ohio EPA (1987b). Lists of the species collected during the quantitative and qualitative sampling at each site are available upon request from the WQIS Division.

The overall aquatic macroinvertebrate community in the stream was evaluated using Ohio EPA's Invertebrate Community Index (ICI) (OEPA 1987a). 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.

Table 11. ICI Metrics

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 and Discussion

The ICI score for RM 1.65 was in attainment of the WWH biocriterion, while the score for RM 0.55 was not (Table 12, Figure 4). It should be noted that at RM 1.65, the HD was installed approximately 50 feet upstream of the normal sampling location due to

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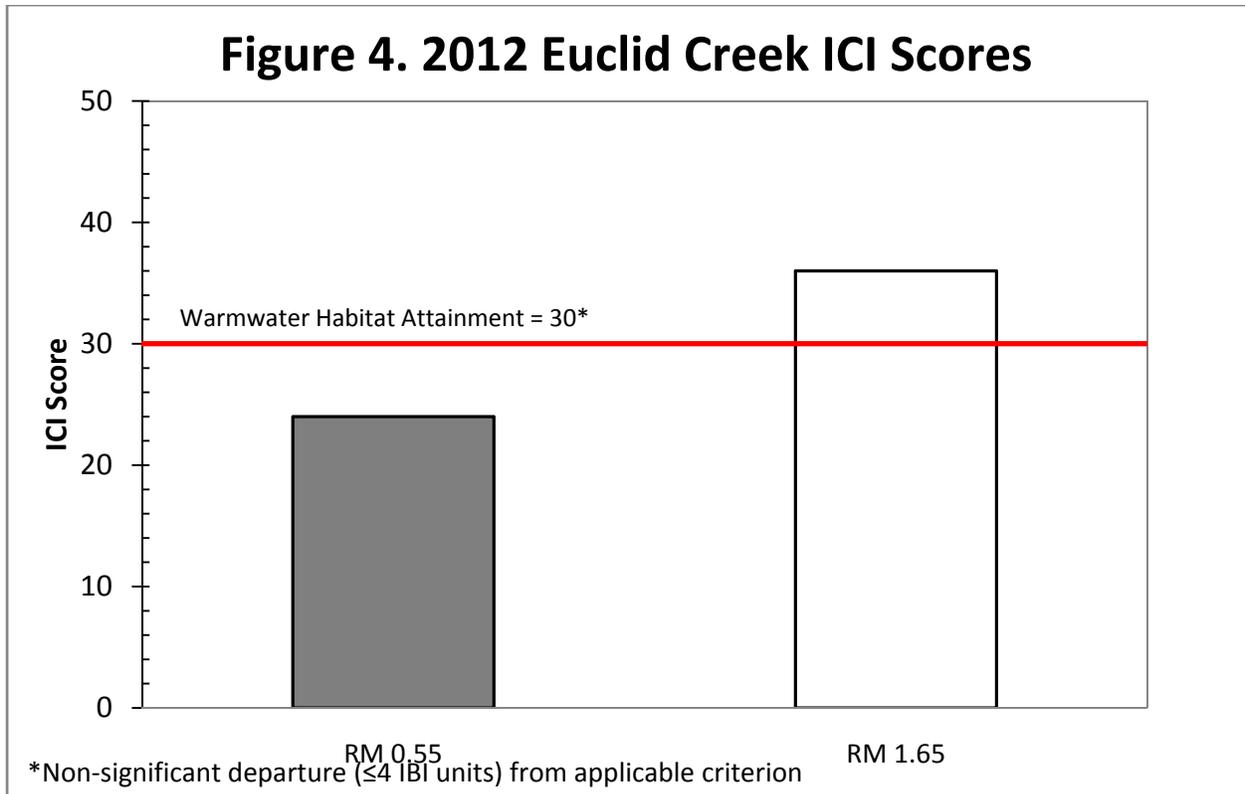
low flow conditions. These results were comparable with the sampling conducted over the last few years at those sites (Table 13).

Table 12. 2012 Euclid Creek ICI Results

River Mile	ICI Score	Narrative Rating	Total Quantitative Taxa	Total Qualitative Taxa	Total Qualitative EPT Taxa
0.55	24	<i>Fair</i>	27	21	2
1.65	36	<i>Good</i>	25	24	8
Bold indicates attainment of WWH biocriterion					

Table 13. 2010– 2012 Euclid Creek ICI Scores

River Mile	Year	ICI	
		Score	Narrative Rating
0.55	2012	24	<i>Fair</i>
	2011	24	<i>Fair</i>
	2010	18	<i>Fair</i>
1.65	2012	36	<i>Good</i>
	2011	36	<i>Good</i>
	2010	42	<i>Very Good</i>
Bold indicates attainment of WWH biocriterion			



River Mile 0.55

At RM 0.55, a total of 27 different taxa were collected from the quantitative sample. During qualitative sampling, only two EPT taxa were collected at this site. Two ICI metrics, Number of Dipteran Taxa and Percent Tribe Tanytarsini, received the highest possible score (6). There were multiple occasions during HD deployment that the HD blocks were partially out of the water. Additionally, when the HD was retrieved, it was found on its side. However, since the 2012 ICI scores were similar to years past, this may not have had a negative effect on the ICI score.

Overall, the community composition of the HD sample revealed: 0.5% mayflies, 0.4% caddisflies, 50% tribe Tanytarsini midges, and 49% other organisms (other dipterans and non-insects). Similar ICI scoring was seen in 2011 at this site, with at least three metrics receiving the lowest possible score (0). In 2012, there was a nearly 30% increase in the percent of Tribe Tanytarsini midges compared to 2011. Due to the intermediate pollution tolerance of Tribe Tanytarsini midges, their numbers tend to decline under moderate pollution. Therefore, the increase in Tribe Tanytarsini midges in 2012 may be due to better water quality at the site.

As with the fish community, the limiting factors to the macroinvertebrate community may be habitat characteristics such as poor stream development, variable current velocity and no functional riffle. Additionally, the July 6 transformer failure at

the Euclid Creek Pump Station may also have had a negative effect on the macroinvertebrate community at RM 0.55. Other contributing factors such as CSO discharges, improper connections, and urban runoff may be negatively impacting the macroinvertebrate community at this site as well.

River Mile 1.65

At RM 1.65, a total of 25 different taxa were collected from the quantitative sample. During qualitative sampling, a total of eight EPT taxa were collected at this site. Three ICI metrics, Number of Caddisfly Taxa, Percent Tribe Tanytarsini and Percent Tolerant Organisms, received the highest possible score (6), while only one metric received a score of 0 (Number of Mayfly Taxa). The overall community composition revealed: 0.05% mayflies, 0.47% caddisflies, 63% tribe Tanytarsini midges, and 36% other organisms.

Over the last three years, this site has been in attainment of WWH biocriterion. In 2009, 2010 and 2011, at least three ICI metrics received the highest possible score of 6, while only one metric (Mayfly Taxa) received the lowest possible score (0). However, similar to RM 0.55, the community composition in 2012 has changed from years past, although this change did not have an effect on the ICI score or attainment status. This was the first year since 2009 that the Percent Caddisflies metric went from the highest score of 6 to a metric score of 2. The community composition shifted from a caddisfly (26%) and other diptera and non-insect (54%) community in 2011 to a predominately Tribe Tanytarsini (63%) community in 2012. As previously mentioned, Tribe Tanytarsini are intermediately tolerant to pollution, therefore, a higher percentage may indicate satisfactory water quality at this site.

Conclusions

The results of NEORSD's water chemistry sampling, habitat assessments, and fish and benthic macroinvertebrate community surveys at RMs 0.55 and 1.65 indicate that both sites may be impacted by a variety of aquatic habitat limitations and environmental stressors. RM 0.55, which is downstream of NEORSD-owned CSOs, was in non-attainment of the WWH biocriteria for fish and macroinvertebrates (Table 14). The limiting factors to the biological community at this site may be poor habitat characteristics such as slow current velocity, poor stream development and the lack of a functional riffle. RM 1.65, which is upstream of NEORSD-owned CSOs, was in attainment of the WWH biocriterion for macroinvertebrates, but not for fish (Table 14). The limiting factor to the fish community may be the East 185th Street dam, which acts as a migration barrier preventing upstream fish passage. The biological communities at both sites may also be negatively impacted by sources of pollution associated with bacteriological contamination from CSO discharges, improper connections, failing septic systems, and urban runoff. The issue of storm sewer bacteriological contamination within the Euclid Creek watershed was thoroughly investigated during 2012 by WQIS

personnel and when applicable, was communicated to the appropriate community for eventual remediation. Although the investigation is still ongoing, the issue of bacteriological contamination remains a concern for the health of Euclid Creek.

Table 14. 2012 Euclid Creek Survey Results

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
0.55	PARTIAL	31 (Fair)	7.6 (Marginally Good)	24 (Fair)	54.5 (Fair)	<i>E. coli</i> , Mercury
1.65	PARTIAL	27 (Poor)	6.2 (Fair)	36 (Good)	76 (Excellent)	<i>E. coli</i> , Mercury
WWH biocriterion attainment: IBI score of 38; MIwb score of 7.9; ICI score of 34						
Nonsignificant departure: ≤4 IBI units; ≤0.5 MIwb units; ≤4 ICI units						

Future monitoring of RMs 0.55 and 1.65 on Euclid Creek will be vital as current and future NEORSD capital improvement projects are anticipated to control the number of CSO discharges to Euclid Creek. The Tunnel Dewatering Pump Station and Euclid Creek Tunnel projects began in December 2010 and the Euclid Creek Pump Station project began in October 2013 with an anticipated 2015 completion for these projects. Further sampling post-construction will help determine the effectiveness of the projects and any improvements on the water quality, habitat and biological communities in Euclid Creek.

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