

# **NORTHEAST OHIO REGIONAL SEWER DISTRICT**

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## **2011 Euclid Creek Environmental Monitoring Biological, Water Quality and Habitat Survey Results**



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

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## Introduction

In 2011, the Northeast Ohio Regional Sewer District (NEORSD) conducted water chemistry sampling, habitat assessments, and fish and benthic macroinvertebrate community surveys upstream and downstream of NEORSD-owned combined sewer overflows (CSOs) that discharge into Euclid Creek. 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 *2011 Euclid Creek Environmental Monitoring* approved by Ohio EPA on June 14, 2011.

The downstream site at river mile (RM) 0.55 was sampled as required by NEORSD's 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 aquatic community was impacted by NEORSD CSO discharges or other environmental factors and to obtain additional baseline data in support of future capital improvement projects. Benthic macroinvertebrate and water chemistry sampling were conducted at both sites. Habitat assessments and fish community surveys were also included as supplemental data.

Euclid Creek drains the communities of South Euclid, Lyndhurst, Willoughby Hills, Richmond Heights, Highland Heights, Euclid and Cleveland before emptying into Lake Erie. 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.

| <b>Table 1. 2011 Euclid Creek Sampling Sites</b> |          |           |                                    |                |   |
|--|----------|-----------|------------------------------------|----------------|---|
| River Mile                                       | Latitude | Longitude | Description                        | Quadrangle     | Purpose   |
| 0.55   | 41.5833  | -81.5594  | Downstream of Lake Shore Boulevard | East Cleveland | Evaluate water chemistry, habitat, fish, & macroinvertebrates in support of Ohio EPA Permit No. 3PA00002*FD |
| 1.65   | -41.5738 | -81.5470  | Upstream of Saint Clair Avenue     | East Cleveland | Evaluate water chemistry, habitat, fish & macroinvertebrates upstream of NEORSD CSOs                        |

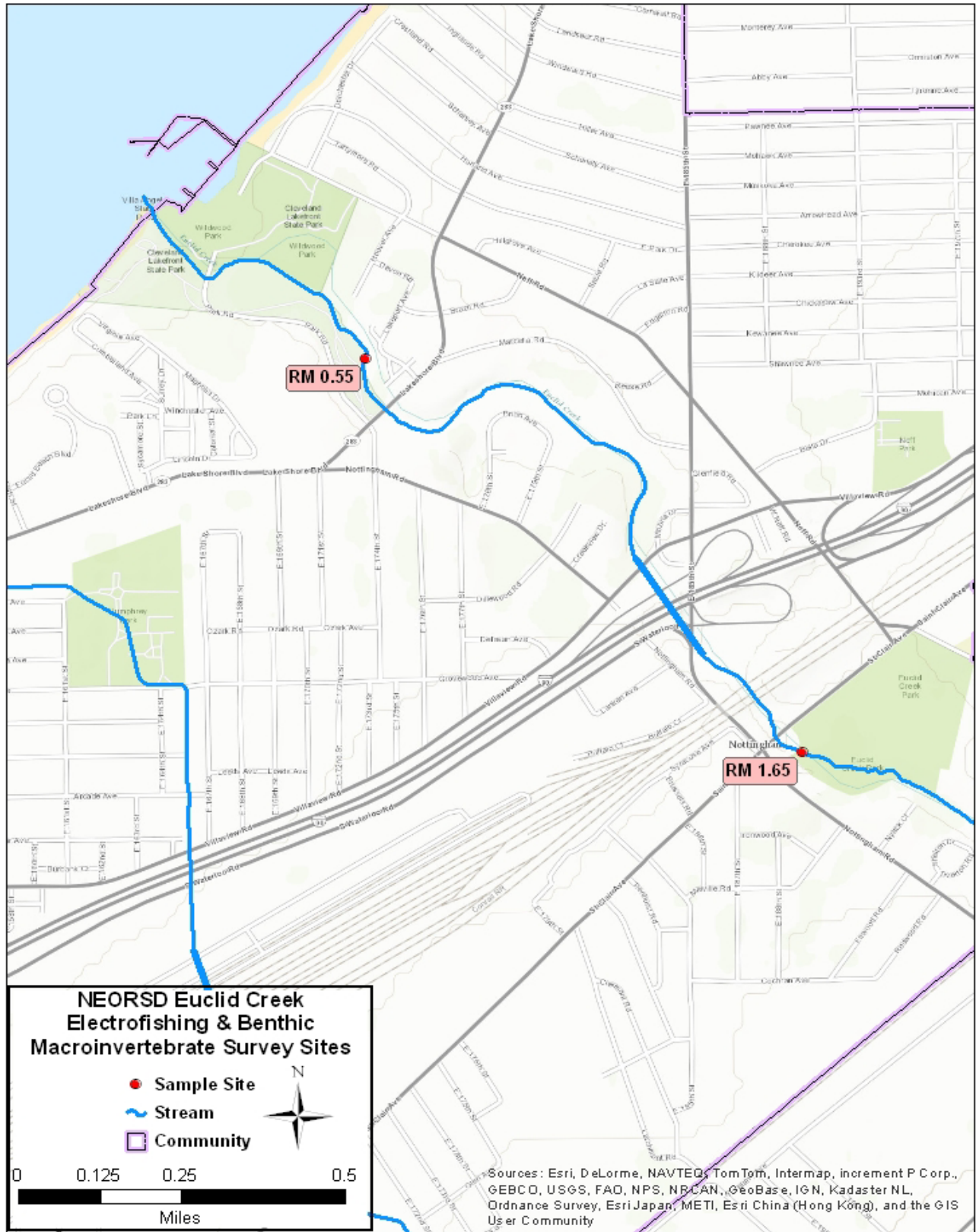


Figure 1. 2011 Sampling Locations on Euclid Creek

## Water Chemistry & Bacteriological Sampling

### Methods

A total of 22 water chemistry and bacteriological samples were collected at RMs 0.55 and 1.65 over six sampling events beginning June 28, 2011 and ending on August 3, 2011. The final sampling event (August 3<sup>rd</sup>) was only conducted at RM 0.55 to satisfy permit requirements. Samples collected during the July 20<sup>th</sup> and August 3<sup>rd</sup> sampling events were associated with wet weather events<sup>1</sup>. RM 0.55 was also sampled as part of the NEORSD *2011 Lake Erie Bacteriological Sampling of Edgewater, Euclid and Villa Angela Beaches* project study plan, and the results of that sampling are discussed in the report *2011 Lake Erie Bacteriological Sampling Results at Edgewater, Euclid, and Villa Angela Beaches*.

All techniques used during water sampling and chemical analyses followed the *Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices* (2009) to ensure consistency throughout the study. Water chemistry samples were collected in two 4-liter disposable polyethylene cubitainers with disposable polypropylene lids and two 473-milliliter (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. The bacteriological samples were collected in a sterile 250 mL disposable plastic bottle. Field analyses were conducted using a YSI 600XL sonde meter to measure dissolved oxygen, water temperature, conductivity and pH. All field notes and field measurements were recorded on a Surface Water Condition Sampling Field Data Form. All samples were stored on ice in a cooler in the locked vehicle until they were relinquished to NEORSD's Analytical Services with a Chain of Custody (COC). All COCs and Surface Water Condition Sampling Field Data Forms are available upon request from the Water Quality & Industrial Surveillance (WQIS) Division.

### Results and Discussion

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, 2010). 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. From that comparison, exceedances were noted for mercury and *Escherichia coli*.

Mercury analysis for all of the samples was done using EPA Method 245.1. Because the minimum detection limit (MDL) for this method is above the criteria, and all values were either below the MDL or estimated to be between the MDL and practical quantitation limit (PQL); it generally cannot be determined if the sampling sites were in

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<sup>1</sup> Wet weather sampling events: greater than 0.10 inches of rain but less than 0.25 inches, samples collected that day and the following day were considered wet weather samples; greater than 0.25 inches, the samples collected that day and the following two days were considered wet weather samples.

attainment of those criteria. It was found, though, that the Protection of Human Health Nondrinking Outside Mixing Zone Average (OMZA) and Protection of Wildlife OMZA criteria for mercury were still exceeded at both sites for multiple thirty-day periods. The use of the low-level EPA Method 1631E for analysis would have been expected to have resulted in exceedances at both sites of the Human Health Nondrinking and Protection of Wildlife criteria throughout the sampling period.

For the Class B primary contact recreation criteria, the seasonal geometric mean criterion of 161 colony-forming units per 100 milliliters (CFU/100 ml) was exceeded at both sites (see Table 2). Additionally, the single sample maximum criterion of 523 CFU/100 ml was also exceeded at both sites in more than ten percent of samples taken in each 30-day period with two or more samples.

| <b>Table 2. Euclid Creek <i>E. coli</i> Densities</b> |           |         |         |   |
|---|-----------|---------|---------|---|
| Sample Date   | Units     | RM 0.55 | RM 1.65 | Wet Weather Sampling Event <sup>2</sup> |
| 6/28/2011   | CFU/100mL | 660     | 540     | No                                      |
| 7/6/2011  | CFU/100mL | 744     | 290     | No                                      |
| 7/13/2011   | CFU/100mL | 630     | 300     | No                                      |
| 7/20/2011   | CFU/100mL | 1,580   | 1,240   | Yes                                     |
| 7/27/2011   | CFU/100mL | 240     | 165     | No                                      |
| 8/3/2011  | CFU/100mL | 3,650   | ---     | Yes                                     |
| Seasonal Geometric Mean                               | CFU/100mL | 868     | 395     | n/a                                     |
| --- no sample was taken                               |           |         |         |   |

There are several possible reasons why these sites are exceeding the Class B Primary Contact Recreation criteria. The NEORS D 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. Additionally, there are numerous documented improper connections in the cities of Cleveland and Euclid, which could have an impact on the *E. coli* densities seen during dry weather. Finally, bacteriological contamination from improper connections, failing septic systems or from urban runoff in other areas of the Euclid Creek watershed may be impacting the water quality at the sample sites.

Over the course of the sampling, two field blanks were collected for quality assurance and quality control purposes. There were instances in which the concentration

<sup>2</sup> Rainfall data taken from NEORS D Easterly WWTP (REA) and South Euclid (RSO) Rain Gauges from June 26, 2011 to August 3, 2011.

of ammonia and copper in the field blank was high enough that some of the results associated with those samples needed to be qualified or rejected. This occurred in both field blanks for ammonia and in one field blank for copper. Because there were no exceedances associated with these parameters, qualification or rejection of these results did not significantly change the overall water chemistry assessment of the creek. It is not clear at this time where the contamination in the field blanks came from. Further investigations in 2012 may help to determine potential sources and how to eliminate them.

Duplicate samples were also collected two times during the study in order to evaluate variability and error that could occur during sampling. 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

Generally, an RPD of 40% is allowable for field samples; those that are higher may indicate potential problems with sample collection and are not used for comparison to the water quality standards. There were two instances in which the RPD for a set of parameters was greater than 40%; once each for ammonia and turbidity. The sample for ammonia was collected as part of a wet weather event. The increased flow during this sampling event may have resulted in less homogenization of the creek than during dry weather due to runoff and therefore could have resulted in the differences observed between the two samples. The sample in which the RPD for turbidity was greater than acceptable was collected during a dry weather event. It is uncertain what caused the discrepancies between the samples in this instance.

## Habitat Assessment

### Methods

Aquatic habitat conditions were assessed at RMs 0.55 and 1.65 using the Qualitative Habitat Evaluation Index (QHEI). The QHEI, as described in the Ohio EPA document *Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (QHEI)* (2006), is an index used to assess the physical components of a stream that are important to fish communities. The index is comprised of six metrics: stream substrate, instream cover, channel morphology, riparian zone and bank erosion, pool/glide and riffle-run quality, and map gradient. Each metric is given a score, and the sum of all metric scores is the QHEI score for that site. A QHEI score  $\geq$

60 indicates that the stream has adequate habitat diversity and should be able to attain a WWH fish community as long as no other aquatic life use impairments exist (Rankin, 1989). The QHEI field sheets for each site are available upon request from the 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. These scores were consistent with the assessments performed in 2010 (Table 3). The higher score at RM 0.55 in 2009 was mostly due to better substrate and the presence of a functional riffle, which was lacking in 2010 and 2011.

| River Mile  | Year | QHEI         |                  |
|---|------|--------------|------------------|
|   |      | Score        | Narrative Rating |
| 0.55  | 2011 | 52.75        | <i>Fair</i>      |
|   | 2010 | 54.00        | <i>Fair</i>      |
|   | 2009 | <b>67.50</b> | <i>Good</i>      |
| 1.65  | 2011 | <b>74.25</b> | <i>Good</i>      |
|   | 2010 | <b>74.00</b> | <i>Good</i>      |
|   | 2009 | <b>75.00</b> | <i>Excellent</i> |
| <b>Bold indicates score met Ohio EPA's WWH target score</b> |      |              |                  |

#### 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 (>1m), boulders, and woody debris. This site exhibited moderate-to-heavy silt cover, slow current velocity and no functional riffle. There was also moderate bank erosion on river left and no erosion on river right. Over the last three years, the habitat score at RM 0.55 changed from a narrative rating of *Good* in 2009 to a rating of *Fair* in 2010 and 2011. Coincidentally, field crews noted that this site was at low flow in 2010 and high flow in 2011. Since this site is within a lacustrary zone, these scores may have been influenced by lake levels.

#### River Mile 1.65

This site had predominately cobble and gravel substrates with sparse-to-moderate instream cover consisting of undercut banks, shallows, rootmats, pools (>1m), boulders and woody debris. This site had two functional riffles each with areas deeper than 10cm and moderately stable riffle/run substrates. There was also heavy-to-no bank erosion on

river left and moderate erosion on river right. The habitat score at RM 1.65 has remained consistent with a narrative rating of *Excellent* to *Good* over the last three years.

## Electrofishing

### Methods

Electrofishing surveys were conducted two times at RMs 0.55 and 1.65. Both sampling sites are considered wading sites because they each have a tributary drainage area of greater than 20 square miles (mi<sup>2</sup>). Sampling was conducted using longline electrofishing techniques and consisted of shocking all habitat types within a sampling zone of 0.20 kilometers in length, while moving from downstream to upstream. The methods that were used followed Ohio EPA's protocols in the document *Biological Criteria for the Protection of Aquatic Life, Volumes II* (1987) and *III* (1987b). Fish collected during the surveys were identified to species level, counted, and examined for the presence of external anomalies including deformities, erosions, lesions, and tumors (DELTs). 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. A list of the species, numbers, pollution tolerances and incidence of DELT anomalies for fish collected during the electrofishing surveys at each site is available upon request from the WQIS Division.

The results from this sampling were evaluated using two Ohio EPA indices, the Index of Biotic Integrity (IBI) and the Modified Index of Well Being (MIwb). The IBI is made up of a total of 12 community metrics representing structural and functional attributes. The structural attributes are based upon fish numbers and diversity, while the functional attributes reflect environmental tolerances, feeding strategies, reproductive requirements, and incidence of disease. The 12 metrics for wading sites are listed below:

- |                                   |                                     |
|-----------------------------------|-------------------------------------|
| 1. Number of Native Species       | 7. Proportion of Omnivores          |
| 2. Number of Darter Species       | 8. Proportion of Insectivores       |
| 3. Number of Sunfish Species      | 9. Proportion of Top Carnivores     |
| 4. Number of Sucker Species       | 10. Number of Individuals           |
| 5. Number of Intolerant Species   | 11. Proportion of Simple Lithophils |
| 6. Proportion of Tolerant Species | 12. Proportion with DELT anomalies  |

These metrics are individually scored by comparing the data collected at the survey site with values recorded from reference sites located in a similar geographical region. Ohio has a total of five different geographical regions; the Greater Cleveland area is located within the Erie/Ontario Drift and Lake Plain (or EOLP). The summation of the 12 individual metrics equals the IBI score, which corresponds to a narrative rating based upon the geographical region. An IBI score  $\geq 38$  (*Good*) is in attainment of the



WWH biocriterion for wading sites in the EOLP ecoregion. An IBI score of 34 (*Marginally Good*) is also in attainment, as it is considered nonsignificant departure ( $\leq 4$  IBI units) from the criterion.

The second index utilized by the Ohio EPA is the Modified Index of Well-being (MIwb). The MIwb, Formula 2 below, incorporates four fish community measures: numbers of individuals, biomass, and the Shannon Diversity Index (Formula 3 below) based on numbers and weight of fish. The result of the mathematical calculation is the MIwb score, which also corresponds to a narrative rating based upon the geographical region.

$$\text{Formula 2: } MIwb = 0.5 \ln N + 0.5 \ln B + \bar{H}(\text{No.}) + \bar{H}(\text{Wt.})$$

$N$  = 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

$$\text{Formula 3: } \bar{H} = -\sum \left[ \left( \frac{n_i}{N} \right) \log_e \left( \frac{n_i}{N} \right) \right]$$

$n_i$  = Relative numbers or weight of species

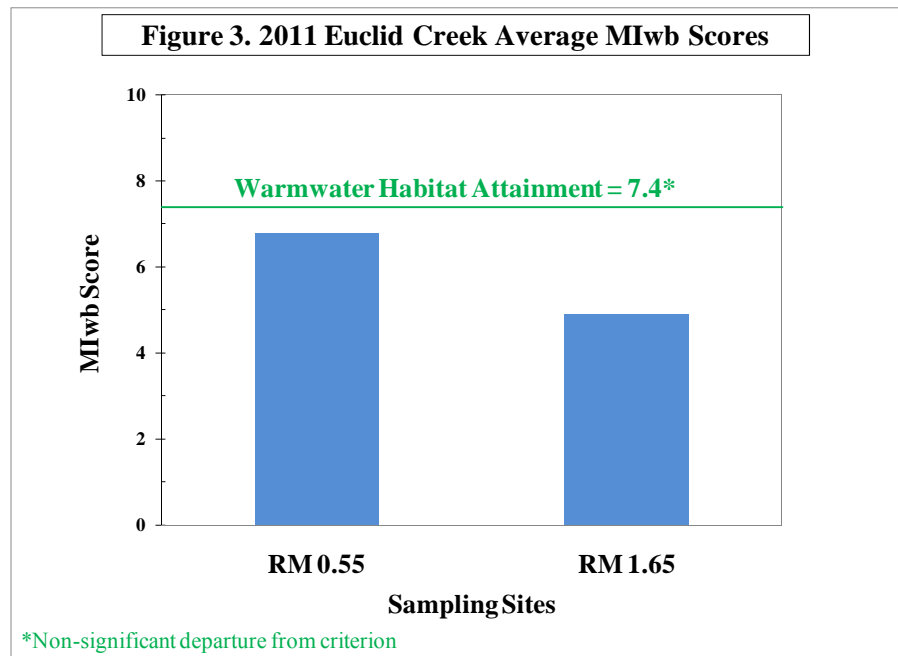
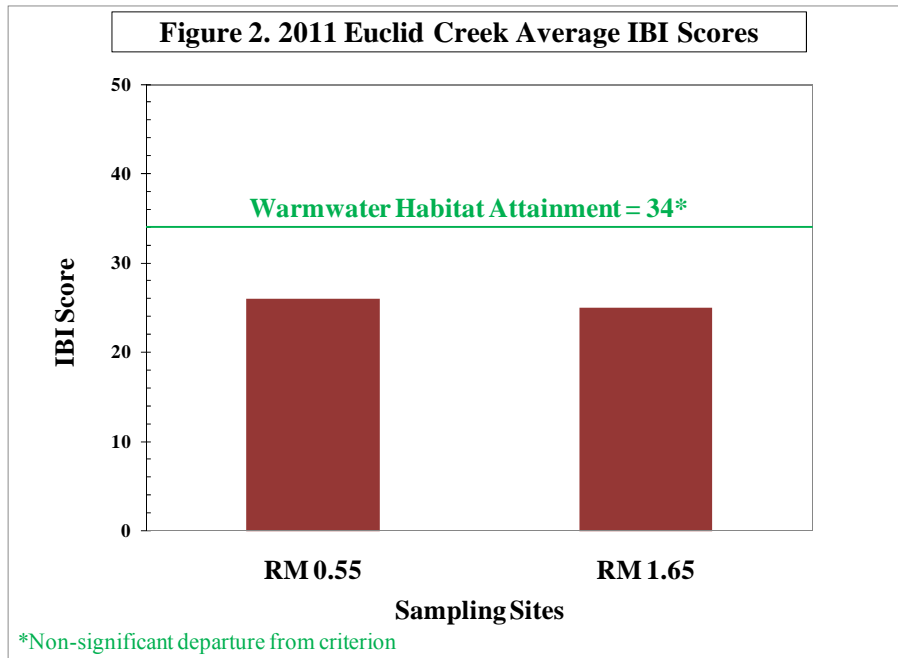
$N$  = Total number or weight of the sample

An MIwb score  $\geq 7.9$  (*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 ( $\leq 0.5$  MIwb units) from the criterion.

## Results and Discussion

The IBI and MIwb scores for both sites were in non-attainment of the WWH biocriteria (Table 4, Figures 2 & 3). Of the two sites, RM 0.55 had a slightly higher IBI and MIwb score than RM 1.65. Overall, these scores were consistent with the surveys conducted over the last few years (Table 5).

| River Mile | 1 <sup>st</sup> Pass |      | 2 <sup>nd</sup> Pass |      | Average |      |
|------------|----------------------|------|----------------------|------|---------|------|
|            | IBI                  | MIwb | IBI                  | MIwb | IBI     | MIwb |
| 0.55       | 24                   | 6.4  | 28                   | 7.1  | 26      | 6.8  |
| 1.65       | 26                   | 5.2  | 24                   | 4.5  | 25      | 4.9  |



| River Mile | Year | IBI   |                  | MIwb  |                  |
|------------|------|-------|------------------|-------|------------------|
|            |      | Score | Narrative Rating | Score | Narrative Rating |
| 0.55       | 2011 | 26    | <i>Poor</i>      | 6.8   | <i>Fair</i>      |
|            | 2010 | 26    | <i>Poor</i>      | 6.6   | <i>Fair</i>      |

| Table 5. 2009 - 2011 Euclid Creek Average IBI & MIwb Scores |      |       |                  |       |                  |
|---|------|-------|------------------|-------|------------------|
| River Mile  | Year | IBI   |                  | MIwb  |                  |
|   |      | Score | Narrative Rating | Score | Narrative Rating |
|   | 2009 | 28*   | <i>Fair</i>      | 6.9*  | <i>Fair</i>      |
| 1.65  | 2011 | 25    | <i>Poor</i>      | 4.9   | <i>Poor</i>      |
|   | 2010 | 25    | <i>Poor</i>      | 5.6   | <i>Poor</i>      |
|   | 2009 | 24*   | <i>Poor</i>      | 6.2*  | <i>Fair</i>      |
| *only one pass conducted                                    |      |       |                  |       |                  |

### River Mile 0.55

At RM 0.55, a total of 21 different fish species were collected during the two electrofishing passes. However, 71% 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 most likely migrated upstream and is not representative of a resident species found in the creek. The majority of the IBI metrics received a score of 1 or 3 during both passes, while only once did a metric (Number of Sunfish Species) receive the highest score of 5. Similar scoring was seen in 2009 and 2010, as a majority of the IBI metrics received a score of 1 or 3.

The limiting factors at this site may be habitat characteristics such as poor stream development, slow current velocity and no functional riffle. The lack of these factors may deter a healthy fish community from permanently inhabiting this site. Additionally, environmental stressors such as CSO discharges, improper connections, and urban runoff may be negatively impacting the fish community at this site.

### River Mile 1.65

At RM 1.65, a total of nine different species were collected during the two passes. Again, the majority of the species collected (55%) were highly pollution-tolerant species. The western blacknose dace was the most abundant species, comprising 46% of the total catch in the first pass and 41% of the total catch in the second pass. Three IBI metrics received the highest score of 5 for both passes: the Proportion of Omnivores, Proportion of Simple Lithophils, and Proportion with DELT anomalies; but all other metrics received the lowest score of 1. Similar IBI scoring was seen in the last few years, as the same three metrics received a score of 5 in almost every pass conducted since 2009. 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 74.25 (*Good*), the fish population was not indicative of a WWH community. This may be due to the dam located at East 185<sup>th</sup>

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 is minimal. Additionally, environmental stressors such as CSO discharges, failing septic systems, suspected improper sanitary connection to the storm sewer system and urban runoff may be negatively impacting the fish community at this site.

## Macroinvertebrate Sampling

### Methods

Macroinvertebrates were sampled quantitatively at RMs 0.55 and 1.65 for a six-week period using a modified Hester-Dendy artificial substrate sampler (HD). A qualitative assessment was also completed during retrieval of the HD, at which time all available habitats were actively sampled with a dip net. The sampling methods that were used followed Ohio EPA's protocols in the document *Biological Criteria for the Protection of Aquatic Life, Volume III* (1987b). When the HDs were retrieved, it was noted that both were covered in debris with moderate to heavy silt cover.

An Aquaflo Probe Model 6900 was used to measure stream velocity in feet per second (fps) during deployment and retrieval of the HD. Since stream flow over the HD is second only to water quality in determining the macroinvertebrate community represented during sampling, stream flow should be 0.3 fps or greater for comparability (DeShon, 1995). The flow met this requirement during deployment and retrieval of the HD at RM 1.65, but not at RM 0.55, as it was measured both times at 0.0 fps.

Quantitative and qualitative macroinvertebrate samples were shipped to Midwest Biodiversity Institute (Columbus, OH), for identification and enumeration. Specimens were identified to the lowest practical taxonomic level, as defined by Ohio EPA (1987b), when life stage and condition allowed. The taxa lists and enumerations are available upon request from the WQIS Division.

The overall aquatic macroinvertebrate community was evaluated using Ohio EPA's Invertebrate Community Index (ICI). The ICI consists of 10 community metrics based on drainage area, each with four different scoring categories. Metrics 1-9 are based upon the quantitative sample, while Metric 10 is based upon taxa richness of mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera), or EPT taxa, in the qualitative sample. The 10 metrics are listed below:

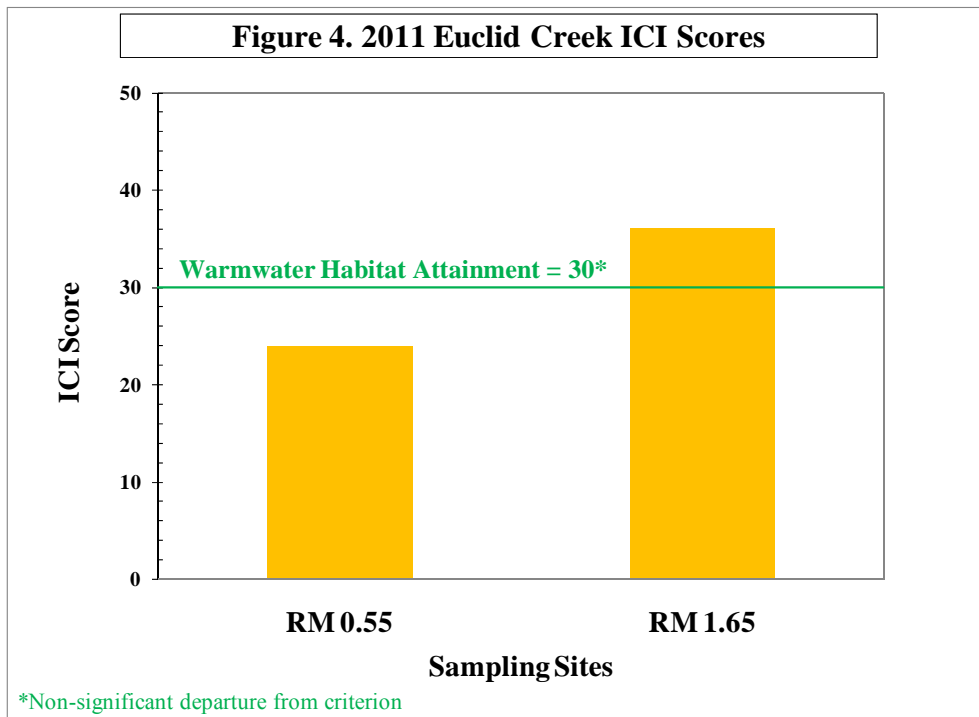
1. Total Number of Taxa
2. Total Number of Mayfly Taxa
3. Total Number of Caddisfly Taxa
4. Total Number of Dipteran Taxa
5. Percent Mayflies
6. Percent Caddisflies
7. Percent Tanytarsini Midges
8. Percent Other Dipterans & Non-Insects
9. Percent Tolerant Organisms
10. Total Number of Qualitative EPT Taxa

The total of the 10 individual metric categories determines the ICI score. The higher the ICI score, the less of a deviation from relatively unimpacted reference sites utilized by the Ohio EPA for each eco-region. An ICI score  $\geq 34$  (*Good*) is in attainment of the WWH biocriterion for wading sites in the EOLP ecoregion of Ohio. An ICI score of 30 (*Marginally Good*) is considered to be in nonsignificant departure ( $\leq 4$  ICI units) from the criterion.

### 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 6, Figure 4). These results were comparable with the sampling conducted over the last few years at those sites (Table 7).

| Table 6. 2011 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>      | 30                      | 24                     | 3                          |
| 1.65   | <b>36</b> | <i>Good</i>      | 35                      | 21                     | 6                          |
| <b>Bold indicates attainment of WWH biocriterion</b> |           |                  |                         |                        |                            |



| River Mile   | Year | ICI       |                  |
|--|------|-----------|------------------|
|  |      | Score     | Narrative Rating |
| 0.55   | 2011 | 24        | <i>Fair</i>      |
|  | 2010 | 18        | <i>Fair</i>      |
|  | 2009 | 24        | <i>Fair</i>      |
| 1.65   | 2011 | <b>36</b> | <i>Good</i>      |
|  | 2010 | <b>42</b> | <i>Very Good</i> |
|  | 2009 | <b>38</b> | <i>Good</i>      |
| <b>Bold indicates attainment of WWH biocriterion</b> |      |           |                  |

River Mile 0.55

At RM 0.55, a total of 30 different taxa were collected from the quantitative sample. During qualitative sampling, only three EPT Taxa were collected at this site. Only one ICI metric received the highest possible score of 6 (Number of Caddisfly Taxa), while four metrics received the lowest possible score of 0 (Number of Mayfly Taxa, Percent Mayflies, Percent Other Dipterans & Non-Insects, and Total Number of Qualitative EPT Taxa). Overall, the community composition of the HD sample revealed: 0% mayflies, 4% caddisflies, 20% tribe Tanytarsini midges, and 76% other organisms. Similar ICI scoring was seen in 2009 and 2010 at this site, with at least three metrics receiving the lowest possible score of 0.

As with the fish community, the limiting factors to the macroinvertebrate community may be habitat characteristics such as poor stream development, slow current velocity and no functional riffle. Additionally, environmental stressors such as CSO discharges, improper connections, and urban runoff may be negatively impacting the macroinvertebrate community at this site.

River Mile 1.65

At RM 1.65, a total of 35 different taxa were collected from the quantitative sample. It should be noted that at the time of collection, the HD was mostly buried. During qualitative sampling, a total of six EPT taxa were collected at this site. Three ICI metrics received the highest possible score of 6 (Number of Caddisfly Taxa, Number of Dipteran Taxa, and Percent Caddisflies), while only one metric received a score of 0 (Number of Mayfly Taxa). The overall community composition revealed: 19% mayflies, 26% caddisflies, 1% tribe Tanytarsini midges, and 54% other organisms.

Over the last three years, this site has been in attainment of WWH biocriterion and has shown consistent ICI results. 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 of 0. Additionally, the Number of Caddisfly Taxa and Percent Caddisflies have consistently scored a 6 during those years.

## 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 8). The limiting factors to the biological community at this site may be poor habitat characteristics such as slow current velocity, poor stream development and a 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 8). The limiting factor to the fish community may be the East 185<sup>th</sup> Street dam, which acts 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.

| <b>Table 8. 2011 Euclid Creek Survey Results</b>                                       |                                    |           |            |           |                       |                           |
|--|------------------------------------|-----------|------------|-----------|-----------------------|---------------------------|
| River Mile   | Aquatic Life Use Attainment Status | IBI Score | MIwb Score | ICI Score | QHEI Score            | Water Quality Exceedances |
| 0.55   | NON                                | 26        | 6.8        | 24        | 52.75 ( <i>Fair</i> ) | <i>E. coli</i>            |
| 1.65   | PARTIAL                            | 25        | 4.9        | 36        | 74.25 ( <i>Good</i> ) | <i>E. coli</i>            |
| WWH biocriteria attainment - IBI score of 38, MIwb score of 7.9, ICI score of 34       |                                    |           |            |           |                       |                           |
| Nonsignificant Departure $\leq 4$ IBI units, $\leq 0.5$ MIwb units, $\leq 4$ 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 April 2011 and the Euclid Creek Pump Station project is scheduled to begin in August 2013. 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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Analytical Services Division – Completed analysis for all water chemistry sampling

## References

- DeShon, J. E. (1995). Development and Application of the Invertebrate Community Index (ICI). In W. Davis and T. Simon (Ed.), *Biological assessment and criteria, tools for water resource planning and decision making* (pp. 217-243). Boca Raton, FL: Lewis Publishers.
- Ohio Environmental Protection Agency. (1987a). *Biological criteria for the protection of aquatic life: Volume II. Users manual for biological field assessment of Ohio surface waters*. Columbus, OH: Division of Water Quality Monitoring and Assessment. (Updated January 1988; September 1989; November 2006; August 2008).
- Ohio Environmental Protection Agency. (1987b). *Biological criteria for the protection of aquatic life: Volume III. Standardized biological field sampling and laboratory methods for assessing fish and macroinvertebrate communities*. Columbus, OH: Division of Water Quality Monitoring and Assessment,. (Updated September 1989; March 2001; November 2006; and August 2008.)
- Ohio Environmental Protection Agency. (2005). *Total Maximum Daily Loads for the Euclid Creek Watershed*. Columbus, OH: Ohio EPA, Division of Surface Water.
- Ohio Environmental Protection Agency. (2006). *Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (QHEI)* (Ohio EPA Technical Bulletin EAS/2006-06-1). Columbus, OH: Division of Surface Water; Division of Ecological Assessment Section.
- Ohio Environmental Protection Agency. (2009). *Manual of Ohio EPA Surveillance Methods and Quality Assurance Practice*. Columbus, OH: Division of Surface



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Water; Division of Environmental Services.

Ohio Environmental Protection Agency, Division of Surface Water. (2010, March 15).  
*State of Ohio Water Quality Standards, Chapter 3745-1*. Retrieved from  
<http://www.epa.state.oh.us/portals/35/rules/01-07.pdf>