NORTHEAST OHIO REGIONAL SEWER DISTRICT

2010 Rocky River Macroinvertebrate Survey Results

Prepared by
Water Quality and Industrial Surveillance Division

Introduction

During 2010, the Northeast Ohio Regional Sewer District (NEORSD) conducted benthic macroinvertebrate community surveys on the Rocky River. The Rocky River has two stems, East and West, which meet in the city of North Olmsted. The river then flows north and continues through the cities of North Olmsted, Brook Park, Fairview Park, Cleveland, Rocky River and Lakewood before emptying into Lake Erie.

The purpose of this study was to evaluate the impact of NEORSD-owned Combined Sewer Overflow (CSO) 068 on the macroinvertebrate community. Historically, numerous improper connections and repeated blockages have allowed sanitary sewage to enter the main branch of the Rocky River through the storm water outlet (SWO) of CSO 068, which is located in Cleveland. The CSO averages approximately 47 overflows per year. Two sites on the main stem of the Rocky River were chosen to assess the macroinvertebrate community: one upstream of the CSO and one downstream of the CSO. The upstream macroinvertebrate data was compared to the data collected at the downstream location to determine the impact, if any, from CSO 068 on the main stem.

This study helped to determine the effects that CSO 068 and other environmental factors may have on the downstream site. The data from this study may also be used in the future to monitor improvement of the Rocky River over time. The Rocky River is designated State Resource Water, Warmwater Habitat (WWH), Seasonal Salmonid Habitat, Agricultural Water Supply, Industrial Water Supply and Class A Primary Contact Recreation, according to the Ohio EPA (2009).

Sampling was conducted by NEORSD Level 3 Qualified Data Collectors certified by Ohio EPA in Benthic Macroinvertebrate Biology. A map of the sampling locations is shown in Figure 1. Table 1 indicates the sampling locations with respect to river mile (RM), latitude/longitude, description and surveys conducted.

Table 1. Rocky River Sampling Sites

Site Location	River Mile	Latitude	Longitude	Description	Purpose
Rocky River (main stem)	2.80	41.46803883	81.82753367	Upstream of CSO 068	Evaluate macroinvertebrates upstream of CSO 068.
Rocky River (main stem)	2.45	41.47047200	81.82355433	Downstream of CSO 068	Evaluate macroinvertebrates downstream of CSO 068.

Figure 1. Rocky River Sampling Locations

Macroinvertebrate Sampling

Methods

Macroinvertebrates were sampled quantitatively at each site for one six-week period in 2010 using a modified Hester-Dendy artificial substrate sampler (HD) in conjunction with a qualitative assessment performed during retrieval. The modified HD is a type of passive sampling that has been utilized by the Ohio EPA since 1973 (DeShon, 1995).

The Invertebrate Community Index (ICI) was used as the principal measure of overall macroinvertebrate community condition. Developed by the Ohio EPA, the ICI is a modification of the Index of Biotic Integrity for fish (OEPA, 1987a). The ICI consists of ten individually scored structural and functional community metrics:

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 and non-insects
9. Percent tolerant organisms
10. Total number of qualitative EPT taxa

Metrics 1-9 are based on the quantitative sample, while Metric 10 is based on the number of Ephemeroptera (Mayflies), Plecoptera (Stoneflies) and Trichoptera (Caddisflies) in the qualitative sample. Metric 10 is also referred to as the EPT taxa metric.

Scoring criteria for all ten metrics is dependent upon drainage area. The scoring of an individual sample is based on the relevant attributes of that sample compared to equivalent data from 232 reference sites throughout Ohio. Metric scores have four different scoring categories (0, 2, 4, 6), ranging from six points for values comparable to exceptional community structure to zero points for values that deviate strongly from the expected range of values based on scoring criteria established by Ohio EPA (1989). The sum of the individual metric scores results in the ICI score for a particular location.

Macroinvertebrate samples were sent to AMT (Ravenna, 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). AMT calculated the ICI scores either by hand utilizing graphs from DeShon (1995), or formulas received from the Ohio EPA in June 2008. Refer to Attachment A for the taxa lists and enumerations.

Results and Discussion

HDs were installed at RMs 2.45 and 2.80 on August 18, 2010 and retrieved on September 27, 2010. RM 2.45 obtained an ICI score of 36 (*Good*) and was in attainment of the WWH ICI criterion of 34. This site, located downstream of CSO 068, had a slightly higher ICI score than RM 2.80, by 2 ICI units (Table 2). The HD sample consisted of six EPT taxa; two mayfly taxa and four caddisfly taxa. Eighty-one percent of the sample was composed of these EPT taxa which are sensitive to water pollution. Although there was only one taxa of Tribe Tanytarsini midges collected (*Rheotanytarsus* sp.), it comprised 8% of the HD sample (Figure 2). Considering all organisms collected on the HD, over 70% of the sample consisted of pollution intolerant and moderately intolerant organisms (Table 3). These results may indicate that there are few water quality issues affecting the macroinvertebrate community at this site.

Table 2. Macroinvertebrate HD Results						
River Mile	ICI Score	Density (Organisms per square foot)	Total Number of Taxa	Number of EPT Taxa	% Other	% Tolerant
2.80	34	485	25	10	10.8	4.2
2.45	36	1187	26	6	26.2	6

Table 3. HD Percent Tolerance Categories						
Site	Tolerance Categories					
River Mile	Intolerant	Moderately Intolerant	Facultative	Moderately Tolerant	Tolerant	Very Tolerant
2.80	0.54%	52.2%	42.5%	0%	4%	0%
2.45	0.40%	70.7%	27.5%	0.71%	0.07%	0.57%

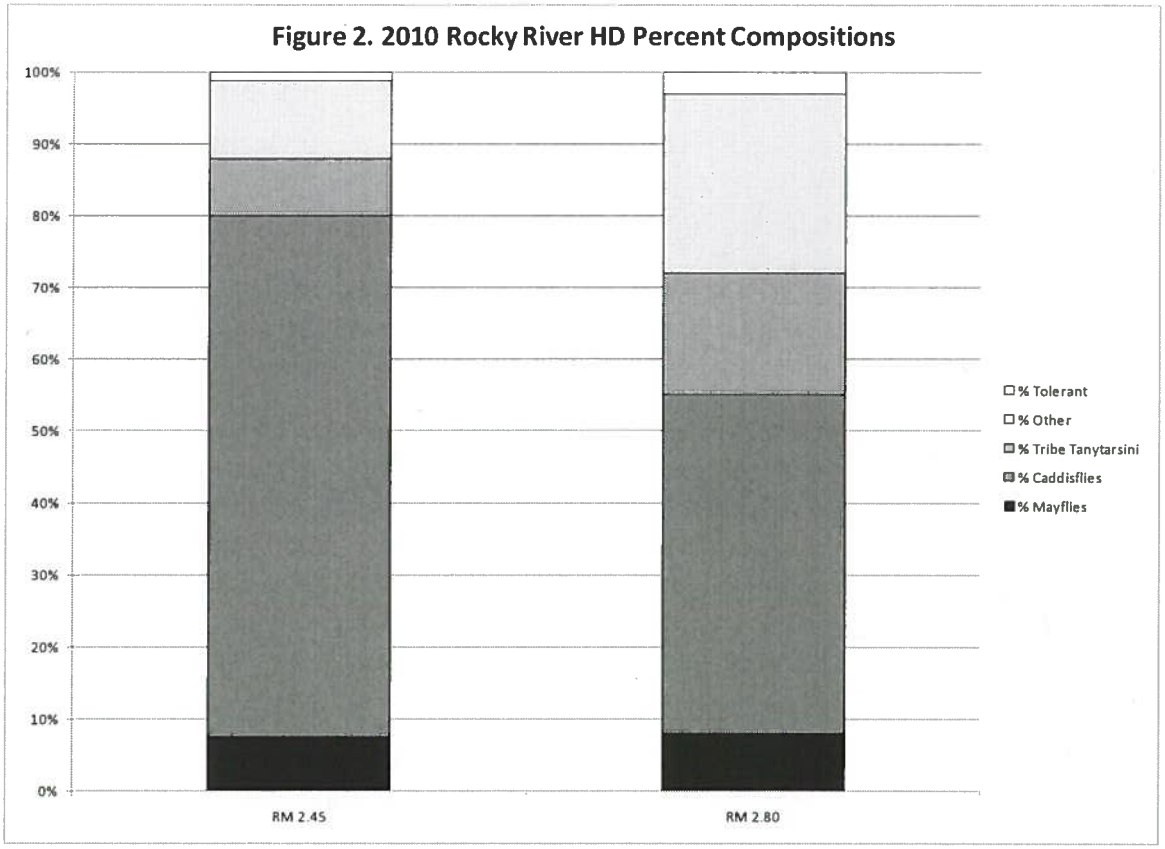
The qualitative sample at RM 2.45 consisted of 36 total taxa, eight of which were EPT taxa (Table 4). Of the 36 taxa, the majority were considered facultative taxa, meaning that they prefer good water quality, but can survive in polluted conditions (Table 5). Only one intolerant species was collected in the qualitative sample, *Petrophila* sp., which was not collected on the HD.

Table 4. Qualitative Samples		
River Mile	Total Number of Taxa	Number of EPT Taxa
2.80	37	10
2.45	36	8

Table 5. Qualitative Sample Tolerance Categories						
Site	Number of Taxa per Tolerance Category					
River Mile	Intolerant	Moderately Intolerant	Facultative	Moderately Tolerant	Tolerant	Very Tolerant
2.80	1	10	18	2	4	0
2.45	1	10	17	2	2	0

The location of the HD at RM 2.45 consisted of a closed canopy with fair riffle quality, moderate riffle development, slight bank erosion and poor margin habitat. Located within a residential/park area, flow at the site was greater than 1 foot per second (fps) during HD deployment and retrieval. The minimum flow recommended by the Ohio EPA for good colonization is 0.3 fps. According to the Ohio EPA, the "amount of current tends to have the most profound effect on the types and numbers of organisms collected" (OEPA, 1987a). This may have been one factor that contributed to the macroinvertebrates being in attainment of the WWH ICI criterion. Another contributing factor may be good water quality at the site, since water quality has the most important

affect on the health of the macroinvertebrate community, according to the Ohio EPA; however, this cannot be confirmed without the collecting and analyzing of water chemistry samples.



RM 2.80 was also in attainment of the WWH ICI criterion with an ICI score of 34 (*Good*) (Table 2). There were six mayfly taxa and four caddisfly taxa collected, making up 57% of the HD sample. Additionally, Tribe Tanytarsini midges comprised 16.5% of the sample, which are a pollution sensitive group (Figure 2). Over 50% of the sample consisted of pollution intolerant and moderately intolerant organisms with no very tolerant organisms collected (Table 3). Similar to RM 2.45, it appears that there may not be many water quality issues affecting the macroinvertebrate community at this site.

The qualitative sample at RM 2.80 was similar to the qualitative sample obtained at RM 2.45. There were a total of 37 total taxa, ten of which were EPT taxa (Table 4). The majority of the taxa collected were considered facultative taxa (Table 5). Similar to RM 2.45, *Petrophila* sp., an intolerant taxa, was collected in the qualitative sample, however there was one specimen that was also observed on the HD.

The location and surrounding habitat of the HD at this site was similar to RM 2.45. Like RM 2.45, this site had substantial flow, reaching 2.3 fps at HD retrieval. The

canopy was mainly open and the site was located within a residential/park area. Margin habitat was poor; however, riffle quality was good.

Conclusions

RMs 2.45 and 2.80 were both in attainment of the WWH ICI criterion in 2010. According to the macroinvertebrate data collected, it appears that CSO 068 is not having a significant negative impact on the macroinvertebrate community at RM 2.45. Both the upstream and downstream locations had nearly the same ICI scores with a similar diversity of macroinvertebrates.

Additional sampling for water chemistry, fish and habitat should be performed in the future to get a better understanding of the water quality on the Rocky River at these sites. This data can then be used to monitor the long-term health of the river. Furthermore, the elimination of improper connections in the drainage area and close monitoring and relief of any sewer blockages that may occur may help to further improve and maintain the health of the Rocky River.

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References

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Attachment A

2010 Rocky River RM 2.45
ICI Metrics and Scores

Site	RM 2.45
Date	9/27/2010
Drainage Area	290
Total # Organisms	*5936*
# of Taxa	26
Taxa Score	*4*
# of Mayfly	2
Mayfly Score	*0*
# of Caddisfly	4
Caddisfly Score	*4*
# of Diptera	13
Diptera Score	*4*
% Mayfly	7.55
% Mayfly Score	*2*
% Caddisfly	73.3
% Caddisfly Score	*6*
% Tanytarsini	8.09
% Tanytarsini Score	*2*
% Other	10.8
% Other Score	*6*
% Tolerant	1.23
% Tolerant Score	*6*
QUAL EPT	8
EPT Score	*2*
ICI Score	36

Total # of Quant. Sp.= 26
Total # of Qual. Sp.= 36
Total # of Sp.= 50
Total # of Organisms= 5936

2010 Rocky River RM 2.45
Quantitative total numbers and presence/absence of qualitative organisms

Taxa Code	Taxa	Total #	Qual
401	Spongillidae	-	+
1320	Hydra sp.	4	-
1801	Turbellaria	116	+
2600	Nematomorpha	-	+
3360	Plumatella	-	+
3600	Oligochaeta	4	+
4964	Mooreobdella microstoma	-	+
5800	Caecidotea sp.	-	+
6700	Crangonyx sp.	-	+
7701	Cambaridae	-	+
8601	Hydrachnidia	20	-
11120	Baetis flavistriga	6	-
11130	Baetis intercalaris	442	+
13400	Stenacron sp.	-	+
13521	Stenonema fermoratum	-	+
17200	Caenis sp.	-	+
21200	Calopteryx sp.	-	+
21300	Hetaerina sp.	1	+
22300	Argia sp.	-	+
22600	Enallagma sp.	-	+
23909	Boyeria vinosa	-	+
26700	Macromia sp.	-	+
52200	Cheumatopsyche sp.	765	+
52430	Ceratopsyche morosa grp.	2148	+
52450	Ceratopsyche sparna	1410	+
52540	Hydropsyche dicantha	26	+
59970	Petrophila sp.	-	+
68601	Ancyronyx variegata	-	+
68901	Macronychus glabratus	16	+
69400	Stenelmis sp.	-	+
74100	Simulium sp.	6	+
78450	Nilotanypus fimbriatus	8	-
80310	Cardiocladius obscurus	85	+
80370	Corynoneura lobata	26	-
80420	Cricotopus (C.) bicinctus	34	-
80430	Cricotopus tremulus grp.	8	-
80510	Cricotopus sylvestris grp.	34	-
80740	Eukiefferiella claripennis grp.	8	-
82101	Thienemanniella tauricapita	8	-
82141	Thienemanniella xena	119	-
82220	Tvetenia discoloripes grp.	16	-
83040	Dicrotendipes neomodestus	-	+
84450	Polypedilum flavum	145	+
85625	Rheotanytarsus sp.	480	-
85814	Tanytarsus glabrescens grp.	-	+
85840	Tanytarsus sepp	-	+
93900	Elimia sp.	-	+
96900	Ferrissia sp.	1	-

2010 Rocky River RM 2.45
Quantitative total numbers and presence/absence of qualitative organisms

97601	Corbicula fluminea	-	+
98600	Sphaerium sp.	-	+

2010 Rocky River RM 2.80
ICI Metrics and Scores

Site	RM 2.80
Date	9/27/2010
Drainage Area	290
Total # Organisms	*2424*
# of Taxa	25
Taxa Score	*4*
# of Mayfly	6
Mayfly Score	*4*
# of Caddisfly	4
Caddisfly Score	*4*
# of Diptera	9
Diptera Score	*2*
% Mayfly	8.46
% Mayfly Score	*2*
% Caddisfly	48.6
% Caddisfly Score	*6*
% Tanytarsini	16.5
% Tanytarsini Score	*2*
% Other	26.2
% Other Score	*4*
% Tolerant	4.17
% Tolerant Score	*4*
QUAL EPT	10
EPT Score	*2*
ICI Score	34

Total # of Quant. Sp.= 25
Total # of Qual. Sp.= 37
Total # of Sp.= 45
Total # of Organisms= 2424

2010 Rocky River RM 2.80
Quantitative total numbers and presence/absence of qualitative organisms

Taxa Code	Taxa	Total #	Qual
401	Spongillidae	-	+
1801	Turbellaria	2	+
3360	Plumatella	-	+
3600	Oligochaeta	101	+
4935	Erpobdella punctata punctata	2	+
4964	Mooreobdella microstoma	-	+
5800	Caecidotea sp.	-	+
8601	Hydrachnidia	-	+
11120	Baetis flavistriga	2	+
11130	Baetis intercalaris	194	+
13400	Stenacron sp.	1	+
13521	Stenonema fermoratum	6	-
16700	Tricorythodes sp.	1	-
17200	Caenis sp.	1	+
21200	Calopteryx sp.	-	+
22300	Argia sp.	-	+
22600	Enallagma sp.	-	+
23909	Boyeria vinosa	-	+
42700	Belostoma sp.	-	+
44501	Corixidae	-	+
50300	Chimarra sp.	-	+
52200	Cheumatopsyche sp.	432	+
52430	Ceratopsyche morosa grp.	468	+
52450	Ceratopsyche sparna	257	+
52540	Hydropsyche dicantha	20	+
53800	Hydroptila sp.	-	+
59970	Petrophila sp.	1	+
68601	Ancyronyx variegata	-	+
69400	Stenelmis sp.	5	+
80310	Cardiocladius obscurus	118	+
80370	Corynoneura lobata	12	-
80420	Cricotopus (C.) bicinctus	-	+
81231	Nanocladius crassicornus or "rectinervis"	12	-
82141	Thienemanniella xena	129	-
82220	Tvetenia discoloripes grp.	12	-
82700	Chironomus sp.	-	+
84450	Polypedilum flavum	106	+
84520	Polypedilum halterale grp.	82	+
85625	Rheotanytarsus sp.	330	-
85814	Tanytarsus glabrescens grp.	71	-
85840	Tanytarsus sepp	-	+
93900	Elimia sp.	-	+
96900	Ferrissia sp.	-	+
97601	Corbicula fluminea	59	+
98600	Sphaerium sp.	-	+