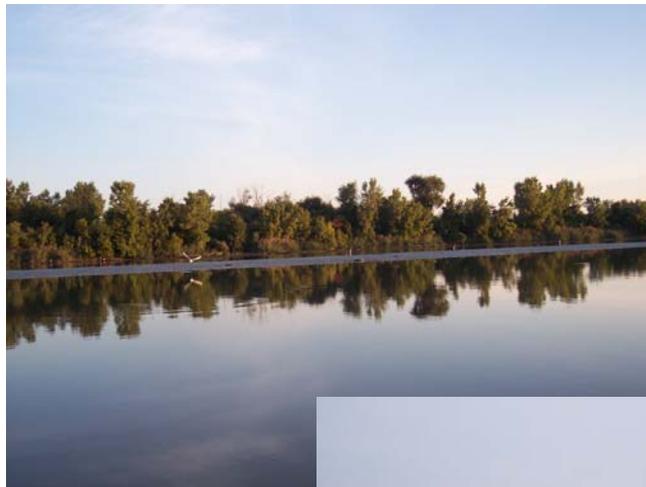


Division of Surface Water

Biological and Water Quality Study of the Ottawa River

Lower Nine Miles

Lucas County



December 31, 2007

Ted Strickland, Governor
Chris Korleski, Director

Biological and Water Quality Study of the Ottawa River

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2007

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prepared for
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SUMMARY

Based on the performance of the biological communities, the entire 6.1 miles of the Ottawa River study area was in non-attainment of the Warmwater Habitat aquatic life use (Table 1). The non-attainment was caused by poor/fair fish and macroinvertebrate community results. The urbanized condition of the Ottawa River within the study segment (e.g., combined sewer overflows, urban runoff), poor river habitat (e.g., reduced or absent current, homogeneous fine substrates, reduced instream cover), and elevated sediment contaminants contributed to the impaired biological communities. Although degraded biological conditions are still present in the Ottawa River, improvements have continued to occur over the last 20 years. Particularly for macroinvertebrate communities, the amount of organic enrichment appears to have decreased from 2002 when macroinvertebrate densities from the quantitative samples were approximately a factor of ten higher than in 2007.

Sediment samples collected from the Ottawa River had total PCB and PAH compounds at levels which exceeded the *Probable Effect Concentration* (PEC), indicating a level above which harmful biological effects are likely to be observed. Elevated PCBs and PAH compounds were also documented at the upstream/background site at River Mile 8.6. Of the metal parameters tested, lead was measured at a high level adjacent to the Old Jeep Plant/ North Cove Landfill area.

Ohio EPA has established various levels of concern and recommended consumption levels for fish contaminants in the Ohio Fish Consumption Advisory Program. Total PCBs have a '*do not eat*' level at or above 2.0 mg/kg. Based on the 2007 fish fillet (common carp) results, 8 of 10 samples were above the '*do not eat*' level – the other two samples were at a consumption level of no more than 6 meals per year. Whole body fish (pumpkinseed sunfish) samples from the Ottawa River were also elevated at all ten sampling locations, with the highest levels downstream from River Mile 6.2. The Ottawa River in the lower 16 miles has a '*do not wade or swim*' advisory and a '*do not eat*' advisory for all fish and snapping turtles.

FOREWORD

What is a Biological and Water Quality Survey?

A biological and water quality survey, or “biosurvey,” is an interdisciplinary monitoring effort coordinated on a waterbody specific or watershed scale. This effort may involve a relatively simple setting focusing on one or two small streams, one or two principal stressors, and a handful of sampling sites or a much more complex effort including entire drainage basins, multiple and overlapping stressors, and tens of sites. Each year Ohio EPA conducts biosurveys in 4-5 watersheds study areas with an aggregate total of 250-300 sampling sites.

The Ohio EPA employs biological, chemical, and physical monitoring and assessment techniques in biosurveys in order to meet three major objectives: 1) determine the extent to which use designations assigned in the Ohio Water Quality Standards (WQS) are either attained or not attained; 2) determine if use designations assigned to a given water body are appropriate and attainable; and 3) determine if any changes in key ambient biological, chemical, or physical indicators have taken place over time, particularly before and after the implementation of point source pollution controls or best management practices. The data gathered by a biosurvey is processed, evaluated, and synthesized in a biological and water quality report. Each biological and water quality study contains a summary of major findings and recommendations for revisions to WQS, future monitoring needs, or other actions which may be needed to resolve existing impairment of designated uses. While the principal focus of a biosurvey is on the status of aquatic life uses, the status of other uses such as recreation and water supply, as well as human health concerns, are also addressed.

The findings and conclusions of a biological and water quality study may factor into regulatory actions taken by Ohio EPA (e.g., NPDES permits, Director’s Orders, the Ohio Water Quality Standards [OAC 3745-1], Water Quality Permit Support Documents [WQPSDs]), and are eventually incorporated into State Water Quality Management Plans, the Ohio Nonpoint Source Assessment, and the biennial Integrated Water Quality Monitoring and Assessment Report (305[b] and 303[d]).

Hierarchy of Indicators

A carefully conceived ambient monitoring approach, using cost-effective indicators consisting of ecological, chemical, and toxicological measures, can ensure that all relevant pollution sources are judged objectively on the basis of environmental results. Ohio EPA relies on a tiered approach in attempting to link the results of administrative activities with true environmental measures. This integrated approach includes a hierarchical continuum from administrative to true environmental indicators (Figure 1). The six “levels” of indicators include: 1) actions taken by regulatory agencies (permitting, enforcement, grants); 2) responses by the regulated community (treatment works, pollution prevention); 3) changes in discharged quantities (pollutant loadings); 4) changes in ambient conditions (water quality, habitat); 5) changes in uptake and/or assimilation (tissue contamination, biomarkers, wasteload allocation); and, 6) changes in health, ecology, or other effects (ecological condition, pathogens). In this process the results of administrative activities (levels 1 and 2) can be linked to efforts to improve water quality (levels 3, 4, and 5) which should translate into the environmental “results” (level 6). Thus, the aggregate effect of billions of dollars spent on water pollution control since the early 1970s can now be determined with quantifiable measures of environmental condition. Superimposed on this hierarchy is the concept of stressor, exposure, and response indicators. *Stressor* indicators generally include activities which have the potential to degrade the aquatic environment such as pollutant discharges (permitted and unpermitted), land use effects, and habitat modifications. *Exposure* indicators are those which measure the effects of stressors and can include whole effluent toxicity tests, tissue residues, and biomarkers, each of which provides evidence of biological exposure to a stressor or bioaccumulative agent. *Response* indicators are generally composite measures of the cumulative effects of stress and exposure and include the more direct measures of community and population response that are represented here by the biological indices which comprise Ohio’s biological criteria. Other response indicators could include target assemblages, i.e., rare, threatened, endangered, special status, and

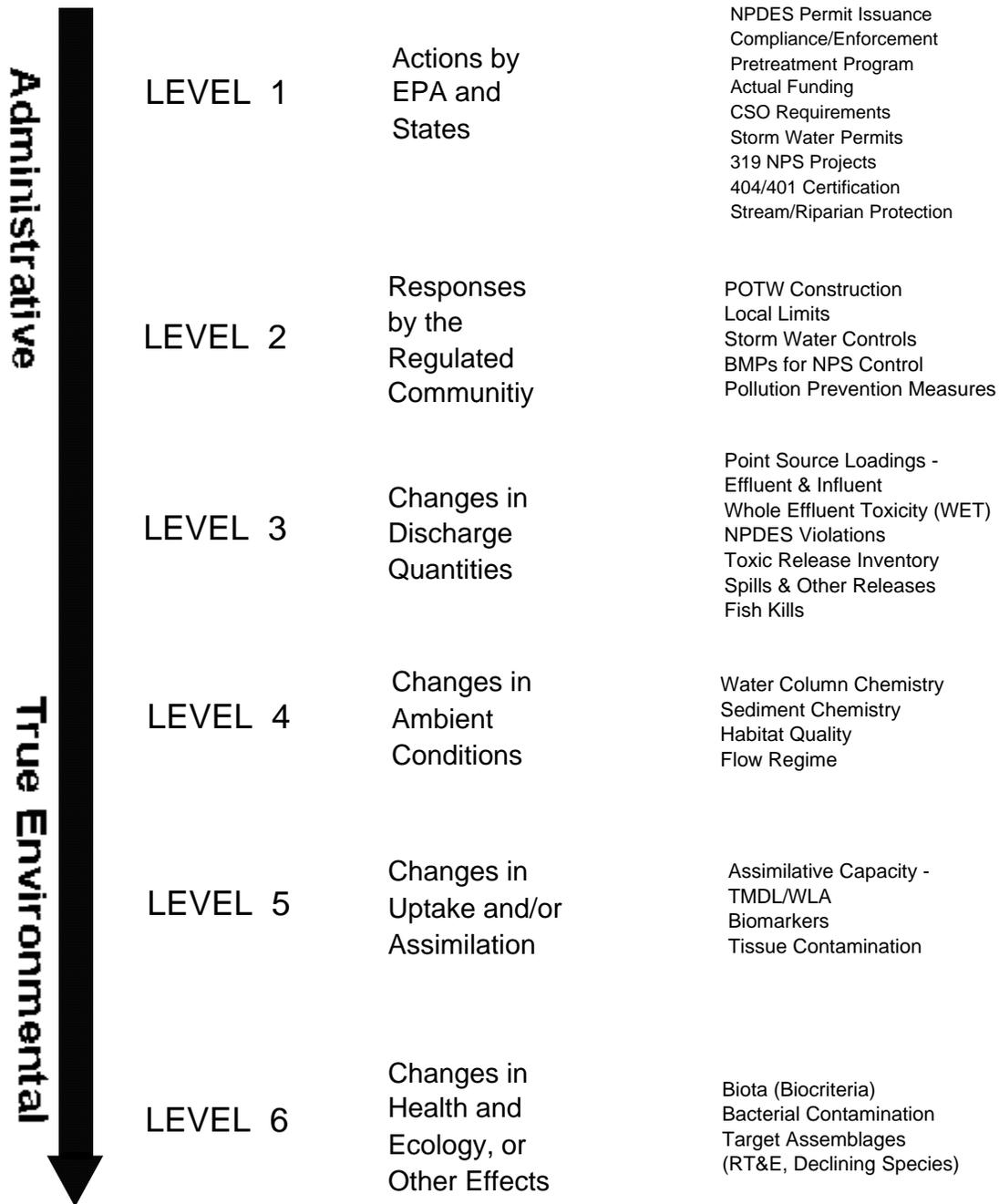


Figure 1. Hierarchy of administrative and environmental indicators which can be used for water quality management activities such as monitoring and assessment, reporting, and the evaluation of overall program effectiveness. This is patterned after a model developed by the U.S. EPA.

declining species or bacterial levels which serve as surrogates for the recreation uses. These indicators represent the essential technical elements for watershed-based management approaches. The key, however, is to use the different indicators *within* the roles which are most appropriate for each.

Describing the causes and sources associated with observed impairments revealed by the biological criteria and linking this with pollution sources involves an interpretation of multiple lines of evidence including water chemistry data, sediment data, habitat data, effluent data, biomonitoring results, land use data, and biological response signatures within the biological data itself. Thus the assignment of principal causes and sources of impairment represents the association of impairments (defined by response indicators) with stressor and exposure indicators. The principal reporting venue for this process on a watershed or subbasin scale is a biological and water quality report. These reports then provide the foundation for aggregated assessments such as the Integrated Water Quality Monitoring and Assessment Report (305[b] and 303[d]), the Ohio Nonpoint Source Assessment, and other technical bulletins.

Ohio Water Quality Standards: Designated Aquatic Life Use

The Ohio Water Quality Standards (WQS; Ohio Administrative Code 3745-1) consist of designated uses and chemical, physical, and biological criteria designed to represent measurable properties of the environment that are consistent with the goals specified by each use designation. Use designations consist of two broad groups, aquatic life and non-aquatic life uses. In applications of the Ohio WQS to the management of water resource issues in Ohio's rivers and streams, the aquatic life use criteria frequently result in the most stringent protection and restoration requirements, hence their emphasis in biological and water quality reports. Also, an emphasis on protecting for aquatic life generally results in water quality suitable for all uses. The five different aquatic life uses currently defined in the Ohio WQS are described as follows:

1) *Warmwater Habitat (WWH)* - this use designation defines the "typical" warmwater assemblage of aquatic organisms for Ohio rivers and streams; *this use represents the principal restoration target for the majority of water resource management efforts in Ohio.*

2) *Exceptional Warmwater Habitat (EWH)* - this use designation is reserved for waters which support "unusual and exceptional" assemblages of aquatic organisms which are characterized by a high diversity of species, particularly those which are highly intolerant and/or rare, threatened, endangered, or special status (*i.e.*, declining species); *this designation represents a protection goal for water resource management efforts dealing with Ohio's best water resources.*

3) *Coldwater Habitat (CWH)* - this use is intended for waters which support assemblages of cold water organisms and/or those which are stocked with salmonids with the intent of providing a put-and-take fishery on a year round basis which is further sanctioned by the Ohio DNR, Division of Wildlife; this use should not be confused with the Seasonal Salmonid Habitat (SSH) use which applies to the Lake Erie tributaries which support periodic "runs" of salmonids during the spring, summer, and/or fall.

4) *Modified Warmwater Habitat (MWH)* - this use applies to streams and rivers which have been subjected to extensive, maintained, and essentially permanent hydromodifications such that the biocriteria for the WWH use are not attainable *and where the activities have been sanctioned by state or federal law*; the representative aquatic assemblages are generally composed of species which are tolerant to low dissolved oxygen, silt, nutrient enrichment, and poor quality habitat.

5) *Limited Resource Water (LRW)* - this use applies to small streams (usually <3 mi² drainage area) and other water courses which have been irretrievably altered to the extent that no appreciable assemblage of aquatic life can be supported; such waterways generally include small streams in extensively urbanized areas, those which lie in watersheds with extensive drainage modifications, those which completely lack water on a recurring annual basis (*i.e.*, true ephemeral streams), or other irretrievably altered waterways.

Chemical, physical, and/or biological criteria are generally assigned to each use designation in accordance with the broad goals defined by each. As such the system of use designations employed in the Ohio WQS constitutes a “tiered” approach in that varying and graduated levels of protection are provided by each. This hierarchy is especially apparent for parameters such as dissolved oxygen, ammonia-nitrogen, temperature, and the biological criteria. For other parameters such as heavy metals, the technology to construct an equally graduated set of criteria has been lacking, thus the same water quality criteria may apply to two or three different use designations.

Ohio Water Quality Standards: Non-Aquatic Life Uses

In addition to assessing the appropriateness and status of aquatic life uses, each biological and water quality survey also addresses non-aquatic life uses such as recreation, water supply, and human health concerns as appropriate. The recreation uses most applicable to rivers and streams are the Primary Contact Recreation (PCR) and Secondary Contact Recreation (SCR) uses. The criterion for designating the PCR use can be having a water depth of at least one meter over an area of at least 100 square feet or, lacking this, where frequent human contact is a reasonable expectation. If a water body does not meet either criterion, the SCR use applies. The attainment status of PCR and SCR is determined using bacterial indicators (*e.g.*, fecal coliform, *E. coli*) and the criteria for each are specified in the Ohio WQS.

Attainment of recreation uses are evaluated based on monitored bacteria levels. The Ohio Water Quality Standards state that all waters should be free from any public health nuisance associated with raw or poorly treated sewage (Administrative Code 3745-1-04, Part F). Additional criteria (Administrative Code 3745-1-07) apply to waters that are designated as suitable for full body contact such as swimming (PCR- primary contact recreation) or for partial body contact such as wading (SCR- secondary contact recreation). These standards were developed to protect human health, because even though fecal coliform bacteria are relatively harmless in most cases, their presence indicates that the water has been contaminated with fecal matter.

Water supply uses include Public Water Supply (PWS), Agricultural Water Supply (AWS), and Industrial Water Supply (IWS). Public Water Supplies are simply defined as segments within 500 yards of a potable water supply or food processing industry intake. The AWS and IWS use designations generally apply to all waters unless it can be clearly shown that they are not applicable. An example of this would be an urban area where livestock watering or pasturing does not take place, thus the AWS use would not apply. Chemical criteria are specified in the Ohio WQS for each use and attainment status is based primarily on chemical-specific indicators. Human health concerns are additionally addressed with fish tissue data, but any consumption advisories are issued by the Ohio Department of Health.

ACKNOWLEDGEMENTS

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INTRODUCTION

The Ottawa River study area included the mainstem from I-475 (upstream from the old Jeep plant) to near I-75 (downstream from the Hoffman Road Landfill). This segment of the Ottawa River runs from River Mile 8.6 to River Mile 3.5. This study incorporates data collected from another 2007 study of the Ottawa River adjacent to the Dura Avenue Landfill. Numerous other samplings of the lower Ottawa River have been completed by the Ohio EPA prior to 2007 (*i.e.*, 2002, 2001, 2000, 1999, 1996, 1992, 1990, and 1986).

Specific objectives of the evaluation were to:

- establish the present biological condition in the Ottawa River in the vicinity of the Old Jeep Plant, North Cove Landfill, the Lagrange reach, Dura Avenue Landfill, Stickney depositional area, and far field influences by evaluating fish and macroinvertebrate communities,
- determine the attainment status of the Warmwater Habitat aquatic life use designation for the Ottawa River within the study area,
- evaluate surficial sediment chemical quality at co-located biological stations in the Ottawa River and,
- assess fish tissue contaminant levels for fillet and whole body samples from the Ottawa River.

The Ottawa River watershed is in the Huron-Erie Lake Plain (HELP) ecoregion. The aquatic life use in the Ottawa River currently is Warmwater Habitat (WWH). The Ottawa River in the lower nine miles exhibits lacustrine conditions. A lacustrine is defined as a transition zone in a river that flows into a large freshwater lake and is continuously affected by the water levels in the lake. At lacustrine sampling locations, the fish and macroinvertebrate communities were assessed using interim lacustrine biocriteria developed by the Ohio EPA.

Table 1. Aquatic life use attainment status for stations sampled in the Ottawa River, 2007. The Lacustuary Index of Biotic Integrity (LIBI), Modified Index of Well-being (MIwb), and Lacustuary Invertebrate Community Index (LICI) scores are based on the performance of the biological community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biological community. Attainment status is based on applicable fish and macroinvertebrate benchmarks for the Interim Criterion for Lake Erie Lacustuaries.

River Mile Sample Site	Attainment Status	LIBI	MIwb	LICI	QHEI	Comments
Ottawa River						
8.6	NON	32.5*	7.4*	<u>20</u> ^b	49.5	Upstream/ background
8.0	NON	<u>27</u> *	<u>6.0</u> *	<u>22</u> *	47.5	Adjacent old Jeep Plant/North Cove Landfill
6.8	NON	<u>27.5</u> *	<u>5.9</u> *	<u>18</u> *	47.0	Upstream Lagrange reach
6.2	NON	<u>27.5</u> *	<u>6.2</u> *	<u>20</u> *	46.5	At Lagrange reach
5.8	NON	32*	<u>6.1</u> *	<u>18</u> *	43.5	Upstream Dura Ave. Landfill
5.5	NON	<u>25</u> *	<u>6.0</u> *	<u>22</u> *	41.5	Adjacent Dura Ave. Landfill IRM Wall
5.3	NON	32*	6.9*	<u>18</u> *	45.0	Adjacent lower Dura Ave. Landfill
5.0	NON	<u>27</u> *	<u>6.6</u> *	<u>16</u> *	38.0	Downstream Dura Ave. Landfill
4.6	NON	<u>21.5</u> *	<u>6.3</u> *	<u>22</u> *	36.0	Stickney depositional area
3.5	NON	<u>20.5</u> *	6.8*	<u>14</u> *	40.0	Downstream Holland Road Landfill

Interim Lacustuary Biocriteria – Ottawa River	
INDEX	Score
LIBI	42
MIwb	8.6
LICI	42

* Significant departure from ecoregion biocriterion; poor and very poor results are underlined.

^b This site was evaluated using the inland river and stream ICI rather than LICI methodology based on flow conditions at the sampling location.

Table 2. Sampling locations in the Ottawa River study area, 2007. Type of sampling included fish community (F), macroinvertebrate community (M), and sediment (S, and fish tissue (T).

Stream/ River Mile	Type of Sampling	Latitude	Longitude	Landmark
Ottawa River				
8.6	F,M,S,T	41° 40' 35.4"	83° 34' 27.1"	Upstream SR 120, near I-475; upstream/ background
8.0	F,M,S,T	41° 40' 54.5"	83° 34' 03.3"	Downstream SR 120; adjacent old Jeep Plant/North Cove Landfill
6.8	F,M,S,T	41° 41' 16.1"	83° 33' 01.1"	Dst. Detroit Ave./Ust. Lagrange St.; upstream Lagrange reach
6.2	F,M,S,T	41° 41' 24.7"	83° 32' 21.7"	Dst. Lagrange St./Ust. RR bridge; Lagrange reach
5.8	F,M,S,T	41° 41' 38.6"	83° 32' 06.1"	Near RR bridge; upstream Dura Landfill
5.5	F,M,S,T	41° 41' 47.6"	83° 31' 53.2"	Adjacent Dura Landfill IRM barrier wall
5.3	F,M,S,T	41° 41' 55.3"	83° 31' 47.2"	Adj. lower Dura Landfill; upstream landfill overflow channel
5.0	F,M,S,T	41° 42' 11.1"	83° 31' 41.7"	Downstream Dura Landfill; Stickney Ave.
4.6	F,M,S,T	41° 42' 08.4"	83° 31' 11.4"	Downstream Stickney Ave.; Stickney depositional area
3.5	F,M,S,T	41° 42' 40.2"	83° 31' 10.9"	Upstream I-75; Downstream Holland Road Landfill

Ottawa River Site Map

Figure 1. Sampling locations in the Ottawa River, 2007.



METHODS

All chemical, physical, and biological field, EPA laboratory, data processing, and data analysis methods and procedures adhere to those specified in the Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices (Ohio Environmental Protection Agency 2006d), Biological Criteria for the Protection of Aquatic Life, Volumes II - III (Ohio Environmental Protection Agency 1987b, 1989a, 1989b, 2006a, 2006b), Biological Criteria for the Protection of Aquatic Life, Volumes IV: Fish and Macroinvertebrate Indices for Ohio's Lake Erie Nearshore Waters, Harbors, and Lacustuaries (Ohio EPA 1997, Draft), The Qualitative Habitat Evaluation Index (QHEI); Rationale, Methods, and Application (Rankin 1989), Methods for Assessing Habitat in Flowing Waters: Using the Qualitative Habitat Evaluation Index (Ohio EPA 2006c), and Ohio EPA Sediment Sampling Guide and Methodologies (Ohio EPA 2001), and Ohio EPA Fish Tissue Collection Manual (Ohio EPA 2005).

Use Attainment

Attainment/non-attainment of aquatic life uses for the Ottawa River was determined using interim lacustuary biological criteria. Numerical biological criteria are based on multimetric biological indices including the Index of Biotic Integrity (IBI) and modified Index of Well-Being (MIwb), indices measuring the response of the fish community, and the Invertebrate Community Index (ICI), which indicates the response of the macroinvertebrate community.

Performance expectations for the basic aquatic life uses (Warmwater Habitat [WWH], Exceptional Warmwater Habitat [EWH], and Modified Warmwater Habitat [MWH] were developed using the regional reference site approach (Hughes et al. 1986; Omernik 1987). This fits the practical definition of biological integrity as the biological performance of the natural habitats within a region (Karr and Dudley 1981). Attainment of an aquatic life use is FULL if all three indices (or those available) meet the applicable criteria, PARTIAL if at least one of the indices did not attain and performance did not fall below the fair category, and NON if all indices either fail to attain or any index indicates poor or very poor performance. Biological results for the Ottawa River were compared to interim lacustuary biocriteria. Lacustuary biocriteria were developed to assess those segments of rivers and streams located in the boundary area between Lake Erie and free-flowing rivers.

Stream Habitat Evaluation

Physical habitat is evaluated using the Qualitative Habitat Evaluation Index (QHEI) developed by the Ohio EPA for streams and rivers in Ohio (Rankin 1989, 1995; Ohio EPA 2006c). Various attributes of the available habitat are scored based on their overall importance to the establishment of viable, diverse aquatic faunas. Evaluations of type and quality of substrate, amount of instream cover, channel morphology, extent of riparian canopy, pool and riffle development and quality, and stream gradient are among the metrics used to evaluate the characteristics of a stream segment, not just the characteristics of a single sampling site. As such, individual sites may have much poorer physical habitat due to a localized disturbance yet still support aquatic communities closely resembling those sampled at adjacent sites with better habitat, provided water quality conditions are similar. QHEI scores from hundreds of segments around the state have indicated that values higher than 60 were generally conducive to the establishment of warmwater faunas while those which scored in excess of 75 often typify habitat conditions which have the ability to support exceptional faunas.

Sediment Assessment

Fine grain sediment samples were collected multi-incrementally in the upper four inches of bottom material at each location using decontaminated stainless steel scoops. At each location, between 16 and 30 scoops of fine grained material over a 300 - 400 meter section of river were collected. Sediment incremental samples were homogenized in stainless steel pans, transferred into glass jars with teflon lined lids, placed on ice (to maintain 4°C) in a cooler, and shipped to a contract lab. Sediment data are reported on a dry weight basis. Decontamination of sediment sampling equipment followed the procedures outlined in the Ohio EPA sediment sampling guidance manual (Ohio EPA 2001). Sediment evaluations were conducted using guidelines established in MacDonald *et al.* (2000), along with a comparison of results to Ohio Sediment Reference Values (Ohio EPA 2003a). Semivolatile organic compounds were reanalyzed in January, 2008 due to high dilutions in the initial testing. The reanalyzed results were used in the sediment evaluation.

Macroinvertebrate Community Assessment

Macroinvertebrates were collected from artificial substrates and from the natural habitats at all Ottawa River sites. The artificial substrate collection provided quantitative data and consisted of a composite sample of five modified Hester-Dendy multiple-plate samplers colonized for six weeks. At the time of the artificial substrate collection, a qualitative multihabitat composite sample was also collected. This sampling effort consisted of an inventory of all observed macroinvertebrate taxa from the natural habitats at each site with no attempt to quantify populations other than notations on the predominance of specific taxa or taxa groups within major macrohabitat types (e.g., riffle, run, pool, and margin). Detailed discussion of macroinvertebrate field and laboratory procedures is contained in Biological Criteria for the Protection of Aquatic Life: Volume III, Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities (Ohio EPA 1989a, 2006b). The upper end of RM 8.6 exhibited one-directional flow, which was where the macroinvertebrate artificial substrate samplers were deployed. This area of the Ottawa River is at the upper edge of the lacustuary zone, and is influenced by lake level and seiche effects. The fish zone encompassed this area along with the more lacustuary like lower end of RM 8.6. Due to flow conditions at the macroinvertebrate sampler, the inland stream and river ICI was used instead of the lacustuary ICI to evaluate the macroinvertebrate data.

Fish Community Assessment

Fish were sampled twice at each Ottawa River site using pulsed DC boat electrofishing methods. Fish were processed in the field, and included identifying each individual to species, counting, weighing (Ottawa River only), and recording any external abnormalities. Discussion of the fish community assessment methodology used in this report is contained in Biological Criteria for the Protection of Aquatic Life: Volume III, Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities (Ohio EPA 1989a, 2006b).

Fish Tissue

Fish tissue samples were collected from each of the 10 biological sampling locations on the Ottawa River. Both whole body (pumpkinseed sunfish) and fillet (common carp) samples were processed at each site. Fish samples were filleted in the field using decontaminated stainless steel fillet knives. Whole body and fillet samples were wrapped in aluminum foil, put in a sealed plastic bag, and placed on dry ice. Sampling and decontamination protocols followed those listed in the Ohio EPA Fish Tissue Collection Manual (2005); however, it is not necessary to clean aluminum foil which was used directly from the roll. Fish tissue samples were shipped to a contract laboratory.

Field Instrument Calibration

Laser rangefinders, used to measure sampling distance, were calibrated once at the Groveport Field Facility prior to summer field sampling activities. Fish weighing scales were checked against certified weights once per month during the field season.

Causal Associations

Using the results, conclusions, and recommendations of this report requires an understanding of the methodology used to determine the use attainment status and assigning probable causes and sources of impairment. The identification of impairment in rivers and streams is straightforward - the numerical biological criteria are used to judge aquatic life use attainment and impairment (partial and non-attainment). The rationale for using the biological criteria, within a weight of evidence framework, has been extensively discussed elsewhere (Karr *et al.* 1986; Karr 1991; Ohio EPA 1987a,b; Yoder 1989; Miner and Borton 1991; Yoder 1991; Yoder 1995). Describing the causes and sources associated with observed impairments relies on an interpretation of multiple lines of evidence including water chemistry data, sediment data, habitat data, effluent data, land use data, and biological results (Yoder and Rankin 1995). Thus the assignment of principal causes and sources of impairment in this report represent the association of impairments (based on response indicators) with stressor and exposure indicators. The reliability of the identification of probable causes and sources is increased where many such prior associations have been identified, or have been experimentally or statistically linked together. The ultimate measure of success in water resource management is the restoration of lost or damaged ecosystem attributes including aquatic community structure and function. While there have been criticisms of misapplying the metaphor of ecosystem "health" compared to human patient "health" (Suter 1993), in this document we are referring to the process for evaluating biological integrity and causes or sources associated with observed impairments, not whether human health and ecosystem health are analogous concepts.

RESULTS

Sediment Quality

Sediment samples were collected at ten locations in the Ottawa River by the Ohio EPA on September 17 and 18, 2007. Sampling locations were co-located at biological sampling sites. Samples were analyzed for total analyte list inorganics (metals), PCBs, semivolatile organic compounds, and organochlorinated pesticides. Specific chemical parameters tested and results are listed in Appendix Table 1 and 2. Sediment data were evaluated using guidelines established in *Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems* (MacDonald *et.al.* 2000), and *Ohio Specific Sediment Reference Values (SRVs)* for metals (Ohio EPA 2003a). The consensus-based sediment guidelines define two levels of ecotoxic effects. A *Threshold Effect Concentration (TEC)* is a level of sediment chemical quality below which harmful effects are unlikely to be observed. A *Probable Effect Concentration (PEC)* indicates a level above which harmful effects are likely to be observed.

All ten sampling locations in the Ottawa River exhibited some degree of sediment chemical contamination. Seven of the 10 sediment samples collected from the Ottawa River exceeded the PEC for total PCBs; the remaining three sites exceeded the TEC. PAH compounds were reported at elevated levels at all Ottawa River locations. Eight of the ten sediment samples documented two or more PAH compounds above PEC levels. Organochlorinated pesticides were only tested at four of the sediment sites. At these four sites, the metabolites of DDT - DDD and DDE - were measured above PEC guidelines. Lead levels were above PEC guidelines at three of the 10 Ottawa River sites. The highest lead concentration occurred at RM 8.0, adjacent to the old Jeep plant and North Cove Landfill. Overall, sediment conditions in the Ottawa River suggest contamination levels likely to cause harmful effects to river biology.

Table 3. Chemical parameters measured above screening levels in sediment samples collected by Ohio EPA from the Ottawa River, September, 2007. Contamination levels were determined for parameters using consensus-based sediment quality guidelines (MacDonald *et.al.* 2000). Sediment reference values are listed in the Ohio EPA Ecological Risk Assessment Guidance (2003a). Shaded numbers indicate values above the following: Threshold Effect Concentration -TEC (yellow), Probable Effect Concentration - PEC (red) and Sediment Reference Value (orange). Sampling locations are indicated by river mile (RM).

Parameter	RM 8.6	RM 8.0	RM 6.8	RM 6.2	RM 5.8	RM 5.5	RM 5.3	RM 5.0	RM 4.6	RM 3.5
Total PCBs	2990	227.1	182.5	450.7	1500	2300	1920	2500	3853	1050.1
Total PAHs	13,820	4,380	21,550	1,860	31,500	40,180	35,600	22,600	4,580	<1700
Anthracene	<1110	<1570	<1250	<1550	<1300	1600	<1200	<640	<1500	<1700
Benz(a)anthracene	1210	<1570	1730	<1550	2200	3100	2600	1700	<1500	<1700
Benzo(a)pyrene	1350	<1570	1900	<1550	2600	2800	3000	2000	<1500	<1700
Chrysene	1530	<1570	2210	<1550	3300	3400	3600	2400	<1500	<1700
Dibenz(a,h)anthracene	<1110	<1570	<1250	<1550	<1300	840	<1200	<640	<1500	<1700
Fluoranthene	3220	2440	4290	1860	5300	6000	6100	3700	2580	<1700
Fluorene	<1110	<1570	<1250	<1550	<1300	830	<1200	<640	<1500	<1700
Naphthalene	<1110	<1570	<1250	<1550	<1300	680	<1200	<640	<1500	<1700
Phenanthrene	1460	<1570	1760	<1550	2200	5300	3100	1600	<1500	<1700
Pyrene	2440	1940	3260	<1550	4900	5900	5800	3700	2000	<1700
4,4'-DDD	NA	NA	NA	NA	63	36	45	39	NA	NA
4,4'-DDE	NA	NA	NA	NA	33	18	40	32	NA	NA
4,4'-DDT	NA	NA	NA	NA	<17	17	10	13	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	<17	12	11	15	NA	NA
Mercury	0.030	0.825	0.0799	0.142	NA	NA	NA	NA	0.168	0.197
Cadmium	0.357	1.52	3.72	0.946	NA	NA	NA	NA	1.28	1.87
Copper	14.1	68.3	68.3	40.5	NA	NA	NA	NA	44.3	53.5
Lead	31.4	603	110	71.6	94.5	132	112	150	105	97.6
Zinc	60.4	249	196	149	NA	NA	NA	NA	184	191.5

< - Not detected at or above the method detection limit (MDL value reported with the less than symbol).

Fish Community

Within the Ottawa River project area, a total of 4,244 fish representing 38 species were collected between August and September, 2007. Relative numbers and species collected per location are presented in Appendix Table 3 and IBI metrics are presented in Appendix Table 4.

Fish communities were sampled in the Ottawa River at 10 locations; sampling location descriptions are noted in Table 2. The fish communities from all 10 sampling locations exhibited biological degradation. The lacustrine IBI (LIBI: 20.5-32.5) and MIwb (5.9-7.4) scores were in the poor to fair range and all 10 sites were not achieving the applicable biocriteria. Collectively, fish communities within the Ottawa River study area have improved from 1990 to 2007, as noted in Table 5.

Table 5. Average LIBI and MIwb scores, and percent DELT anomalies for the Ottawa River for 2007, 2002/2000, and 1996-1990.

	2007	2002	1996
LIBI	27.2	21.6	18.0
MIwb	6.4	6.4	5.5
DELT Anomalies	7.1%	7.4%	16.4%

The physical condition of fish was monitored at each sampling site by recording the incidence of DELT (deformities, fin erosions, lesions/ulcers, and tumors) anomalies. Biosurvey results collected by Ohio EPA show a high frequency of DELT anomalies to be an accurate indication of pollution stress usually caused by multiple sublethal stresses as the result of degraded water quality (i.e., often a combination of toxic impacts combined with marginal D.O. concentrations). Within Ohio, there are ample

correlations between sites with chemically contaminated sediments (e.g., metals, PAHs), high percent occurrence of DELT anomalies (>10-20%), and low Index of Biotic Integrity and Modified Index of Well-Being scores (Yoder 1991). Elevated levels of DELT anomalies were recorded during 2007, with results ranging between 2.3% and 14.7%. Average DELT anomalies recorded in the Ottawa River fish communities have shown an improvement since the 1990s (Table 5).

Table 6. Fish community summaries based on pulsed D.C. electrofishing sampling conducted by Ohio EPA in the Ottawa from August - September, 2007. Relative numbers and weight are per 1.0 km for Ottawa River sites.

Stream River Mile	Sampling Method	Species (Mean)	Species (Total)	Relative Number	Relative Wt. (kg)	QHEI	MIwb	LIBI	Narrative Evaluation
Ottawa River									
8.6	Boat	17.5	22	479	62.3	49.5	7.4*	32.5*	Fair
8.0	Boat	14.5	18	213	77.5	47.5	<u>6.0*</u>	<u>27*</u>	Poor
6.8	Boat	16.0	21	350	85.9	47.0	<u>5.9*</u>	<u>27.5*</u>	Poor
6.2	Boat	15.0	18	436	93.2	46.5	<u>6.2*</u>	<u>27.5*</u>	Poor
5.8	Boat	15.5	18	451	40.0	43.5	<u>6.1*</u>	32*	Poor/Fair
5.5	Boat	13.0	16	331	93.0	41.5	<u>6.0*</u>	<u>25*</u>	Poor
5.3	Boat	15.0	19	512	39.2	45.0	6.9*	32*	Fair
5.0	Boat	15.5	20	637	137.0	38.0	<u>6.6*</u>	<u>27*</u>	Poor
4.6	Boat	14.5	20	311	93.5	36.0	<u>6.3*</u>	<u>21.5*</u>	Poor
3.5	Boat	14.5	21	547	160.6	40.0	6.8*	<u>20.5*</u>	Fair/Poor

Interim Lacustrine Biocriteria – Ottawa River	
INDEX	Score
LIBI	42
MIwb	8.6

* Significant departure from ecoregion biocriterion; poor and very poor results are underlined.

Macroinvertebrate Community

The macroinvertebrate communities at ten Ottawa River sites were sampled in 2007 using qualitative (multi-habitat composite) and quantitative (artificial substrate) sampling protocols. Results are summarized in Table 7. The LICI metrics and the raw data are attached as Appendix Tables 5 and 6.

The macroinvertebrate communities from all of the Ottawa River sampling locations within the lacustrary (RMs 8.0-3.5) were evaluated as poor, indicative of non-attainment of the Warmwater Habitat use designation. The macroinvertebrate community LICI scores ranged from 14 to 22. The RM 8.6 sampling location was evaluated as fair (ICI =20) using inland stream and river ICI metrics for the Huron-Erie Lake Plain ecoregion. This sampling location was within a glide that had consistent one directional flow which made the lacustrary metrics inappropriate for evaluation of this site. The macroinvertebrate communities from all sampling locations were indicative of degraded river conditions. For sampling locations from RMs 5.8-3.5, the percentage of macroinvertebrates that were tolerant of organic enrichment and/or toxic conditions varied from 92% to 96%. For the upstream sampling locations, the percentage of macroinvertebrates tolerant of organic enrichment and/or toxic conditions varied from 37% at the RM 8.6 site to 89% at the RM 6.2 site. The percentage of tolerant macroinvertebrates increased as sampling location moved downstream in the lacustrary. Combined sewer overflows, poor instream habitat, and elevated contaminant levels in the sediments all contributed to the poor condition of the macroinvertebrate community.

The macroinvertebrate community has improved slightly from 2002 results, when LICI scores ranged from 6 to 12 and RMs 5.8, 5.5, and 5.3, were evaluated as very poor. In 2002, the composition of the macroinvertebrate community was similar to the 2007 results, with 96% to 99% of the macroinvertebrates tolerant of organic enrichment and/or toxic conditions. The amount of organic enrichment appears to have decreased from 2002 when macroinvertebrate densities collected from the quantitative artificial substrate samplers were approximately a factor of ten higher than in 2007.

Table 7. Summary of macroinvertebrate data collected from artificial substrates (quantitative sampling) and natural substrates (qualitative sampling) in the Ottawa River.

Stream/ River Mile	Density Number/ft ²	Total Taxa	Quantitative Taxa	Qualitative Taxa	Qualitative EPT ^a	LICI	Evaluation
Ottawa River 2007							
8.6	445	39	32	27	4	20 ^{*b}	Fair
8.0	454	26	20	14	0	<u>22*</u>	Poor
6.8	726	25	20	10	0	<u>18*</u>	Poor
6.2	448	26	22	7	0	<u>20*</u>	Poor
5.8	267	30	23	17	0	<u>18*</u>	Poor
5.5	52	25	24	5	0	<u>22*</u>	Poor
5.3	239	28	27	5	0	<u>18*</u>	Poor
5.0	237	36	29	14	0	<u>16*</u>	Poor
4.6	268	29	24	10	0	<u>22*</u>	Poor
3.5	540	24	15	15	0	<u>14*</u>	Poor
Ottawa River 2002							
5.8	2495	15	9	8	0	<u>6*</u>	Very Poor
5.5	2563	13	12	5	0	<u>8*</u>	Very Poor
5.3	3070	7	7	3	0	<u>6*</u>	Very Poor
5.0	1698	24	17	11	0	<u>12*</u>	Poor
Ottawa River 2001							
6.1	1183	33	22	23	0	<u>10*</u>	Very Poor
6.0	451	29	23	10	0	<u>14*</u>	Poor
5.8	387	23	15	9	0	<u>10*</u>	Very Poor
Ottawa River 2000							
7.9	213	20	18	4	0	<u>14*</u>	Poor
7.3	212	26	20	13	0	<u>16*</u>	Poor
6.1	593	21	18	9	0	<u>14*</u>	Poor
5.2	640	29	18	20	0	<u>16*</u>	Poor
3.5	814	29	14	27	2	<u>14*</u>	Poor
1.7	2875	25	11	25	2	<u>8*</u>	Very Poor
Ottawa River 1999							
6.1	1527	23	14	16	0	<u>10*</u>	Very Poor
6.0	1265	23	15	15	0	<u>12*</u>	Poor
5.9	1518	17	14	11	0	<u>10*</u>	Very Poor
5.8	1101	21	12	14	0	<u>10*</u>	Very Poor
Ottawa River 1996							
5.7	1730	23	11	15	0	<u>6*</u>	Very Poor
5.5	2275	21	12	14	0	<u>8*</u>	Very Poor
5.3	5910	21	14	14	0	<u>6*</u>	Very Poor
Ottawa River 1992							
9.0	393	40	30	21	3	<u>16*</u> ^b	Poor
6.4	472	25	19	9	0	<u>12*</u>	Poor
4.9	391	17	14	5	0	<u>10*</u>	Very Poor
Ottawa River 1986							
9.0	272	29	23	19	0	<u>6*</u> ^b	Very Poor
7.4	365	28	22	12	0	<u>14*</u>	Poor
6.9	551	29	21	16	0	<u>12*</u>	Poor
4.9	388	20	16	10	0	<u>16*</u>	Poor
1.6	616	23	14	18	1	<u>12*</u>	Poor

Interim Lacustrine and WWH Biocriteria Ottawa River	
INDEX	Score
LICI	42
ICI	34

^a EPT=total Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) taxa richness, a measure of pollution sensitive organisms.

^b This site was evaluated using inland stream and river ICI rather than LICI methodology based on flow conditions at the sampling location.

* Significant departure from ecoregion biocriterion; poor and very poor results are underlined.

Fish Tissue

Fish tissue samples were collected from 10 locations on the Ottawa River during September, 2007. Twenty samples were analyzed for PCBs and percent lipids, and eight samples were additionally tested for organochlorinated pesticides. Summarized results are presented in Table 8; complete analytical results are detailed in Appendix Tables 7 and 8. Fish tissue sample information is presented in Appendix Table 9.

The concentration of total PCB Aroclors in common carp fillet samples from the Ottawa River study area ranged between 1.60 mg/kg and 5.50 mg/kg. Ohio EPA has established various levels of concern and recommended consumption levels for fish contaminants in the Ohio Fish Consumption Advisory Program. Total PCBs have a 'do not eat' level at or above 2.0 mg/kg. Eight of ten common carp fillet samples were above the 'do not eat' level. No obvious longitudinal trends were noted in PCB concentrations of fillet samples. Although numerous pesticides were detected at measurable levels in common carp filets, all values were below unrestricted consumption levels. The Ottawa River currently has a 'do not eat' advisory due to PCBs (for all species) from I-475 to the mouth.

Table 8. Summary of tissue contaminants detected in fillet and whole body fish collected from the Ottawa River, 2007. PCB values above the Ohio 'Do Not Eat' level are highlighted in red. NA= not analyzed.

	RM 8.6	RM 8.0	RM 6.8	RM 6.2	RM 5.8	RM 5.5	RM 5.3	RM 5.0	RM 4.6	RM 3.5
Parameter	Common Carp (fillet)									
PCB-1248	3.60	1.90	1.70	1.10	2.50	3.90	2.10	3.00	1.10	2.40
PCB-1254	1.60	<1.00	0.92	0.57	1.20	1.60	1.10	1.30	0.50	1.00
PCB-1260	<1.00	<1.00	0.61	0.40	0.52	<1.00	<0.50	<1.00	<0.20	<0.50
Total PCBs (calculated)	5.20	1.90	3.23	2.07	4.22	5.50	3.20	4.30	1.60	3.40
1% Lipid Normalized PCBs	0.94	0.50	0.92	0.83	1.05	0.71	1.14	1.48	0.84	0.85
delta-BHC	NA	NA	NA	NA	61	<25	<15	<25	NA	NA
4,4'-DDD	NA	NA	NA	NA	93	110	64	92	NA	NA
4,4'-DDE	NA	NA	NA	NA	140	150	100	130	NA	NA
4,4'-DDT	NA	NA	NA	NA	48	55	42	48	NA	NA
Percent Lipids	5.5	3.8	3.5	2.5	4.0	7.7	2.8	2.9	1.9	4.0
	Pumpkinseed Sunfish (whole body)									
PCB-1242	<0.28	<0.45	<0.35	<0.49	<1.20	1.60	1.60	<1.30	<1.20	<0.83
PCB-1248	0.48	0.63	0.65	0.87	1.20	<1.20	<1.20	1.50	1.40	1.30
PCB-1254	0.29	0.36	0.36	0.47	0.66	0.68	0.58	0.69	0.67	0.60
Total PCBs (calculated)	0.77	0.99	1.01	1.34	1.86	2.28	2.18	2.19	2.07	1.90
1% Lipid Normalized PCBs	0.33	0.35	0.50	0.79	0.98	1.14	1.09	1.15	1.22	0.59
4,4'-DDD	NA	NA	NA	NA	38	54	42	43	NA	NA
4,4'-DDE	NA	NA	NA	NA	82	66	57	67	NA	NA
4,4'-DDT	NA	NA	NA	NA	10	28	20	7.9	NA	NA
Dieldrin	NA	NA	NA	NA	13	21	20	15	NA	NA
Endrin	NA	NA	NA	NA	<5.0	<5.0	<5.0	5.4	NA	NA
Endrin aldehyde	NA	NA	NA	NA	5.0	<5.0	<5.0	<5.0	NA	NA
Heptachlor	NA	NA	NA	NA	5.2	6.8	5.6	5.9	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	7.7	7.6	6.2	6.5	NA	NA
Percent Lipids	2.3	2.8	2.0	1.7	1.9	2.0	2.0	1.9	1.7	3.2

Whole body PCB concentrations were measured in pumpkinseed sunfish (composite samples) from all ten Ottawa River biological monitoring stations. Total PCBs ranged between 0.77 and 2.28 mg/kg, with the lowest concentrations at the two furthest upstream stations.

The ability of an organism to bioaccumulate lipophilic organic chemicals is assumed to be proportional to its lipid content (Ohio EPA 1994). Since PCBs are lipophilic and lipid content varies between fish species and between individuals, lipid normalization helps to characterize relative site contamination by PCBs. The PCB data in Table 8 are normalized to 1% lipid content. Normalized PCB values for common carp were comparable between sampling locations. Pumpkinseed sunfish values were lowest at the two most upstream sampling locations.

NOTICE TO USERS

Ohio EPA incorporated biological criteria into the Ohio Water Quality Standards (WQS; Ohio Administrative Code 3745-1) regulations in February 1990 (effective May 1990). These criteria consist of numeric values for the Index of Biotic Integrity (IBI) and Modified Index of Well-Being (MIwb), both of which are based on fish assemblage data, and the Invertebrate Community Index (ICI), which is based on macroinvertebrate assemblage data. Criteria for each index are specified for each of Ohio's five ecoregions (as described by Omernik 1987), and are further organized by organism group, index, site type, and aquatic life use designation. These criteria, along with the existing chemical and whole effluent toxicity evaluation methods and criteria, figure prominently in the monitoring and assessment of Ohio's surface water resources.

The following documents support the use of biological criteria by outlining the rationale for using biological information, the methods by which the biocriteria were derived and calculated, the field methods by which sampling must be conducted, and the process for evaluating results:

Ohio Environmental Protection Agency. 1987a. Biological criteria for the protection of aquatic life: Volume I. The role of biological data in water quality assessment. Div. Water Qual. Monit. & Assess., Surface Water Section, Columbus, Ohio.

Ohio Environmental Protection Agency. 1987b. Biological criteria for the protection of aquatic life: Volume II. Users manual for biological field assessment of Ohio surface waters. Div. Water Qual. Monit. & Assess., Surface Water Section, Columbus, Ohio.

Ohio Environmental Protection Agency. 1989b. Addendum to Biological criteria for the protection of aquatic life: Volume II. Users manual for biological field assessment of Ohio surface waters. Div. Water Qual. Plan. & Assess., Ecol. Assess. Sect., Columbus, Ohio.

Ohio Environmental Protection Agency. 1989c. Biological criteria for the protection of aquatic life: Volume III. Standardized biological field sampling and laboratory methods for assessing fish and macroinvertebrate communities. Div. Water Quality Plan. & Assess., Ecol. Assess. Sect., Columbus, Ohio.

Ohio Environmental Protection Agency. 1990. The use of biological criteria in the Ohio EPA surface water monitoring and assessment program. Div. Water Qual. Plan. & Assess., Ecol. Assess. Sect., Columbus, Ohio.

Ohio Environmental Protection Agency. 2006a. 2006 updates to Biological Criteria for the Protection of Aquatic Life: Volume II and Volume II Addendum. Users manual for biological field assessment of Ohio surface waters. Div. of Surface Water, Ecol. Assess. Sect., Columbus, Ohio.

Ohio Environmental Protection Agency. 2006b. 2006 updates to Biological Criteria for the Protection of Aquatic Life: Volume III. Standardized biological field sampling and laboratory methods for assessing fish and macroinvertebrate communities. Div. of Surface Water, Ecol. Assess. Sect., Columbus, Ohio.

Ohio Environmental Protection Agency. 2006c. Methods for assessing habitat in flowing waters: Using the Qualitative Habitat Evaluation Index (QHEI). Ohio EPA Tech. Bull. EAS/2006-06-1. Div. of Surface Water, Ecol. Assess. Sect., Columbus, Ohio.

Rankin, E.T. 1989. The qualitative habitat evaluation index (QHEI): rationale, methods, and application. Div. Water Qual. Plan. & Assess., Ecol. Assess. Sect., Columbus, Ohio.

In addition to the preceding guidance documents, the following publications by the Ohio EPA should also be consulted as they present supplemental information and analyses used by the Ohio EPA to implement the biological criteria.

- DeShon, J.D. 1995. Development and application of the invertebrate community index (ICI), pp. 217-243. in W.S. Davis and T. Simon (eds.). *Biological Assessment and Criteria: Tools for Risk-based Planning and Decision Making*. Lewis Publishers, Boca Raton, FL.
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These documents and this report may be obtained by writing to:

Ohio EPA, Division of Surface Water
Ecological Assessment Section
4675 Homer Ohio Lane
Groveport, Ohio 43125
(614) 836-8786

or

www.epa.state.oh.us/dsw/formspubs.html

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Appendix Table 1. Results of Ohio EPA sediment sampling conducted in the Ottawa River, September, 2007.

Stream	Ottawa River						
River Mile	8.6	8.0	6.8	6.2	4.6	3.5	3.5
Date Sampled	9/17/2007	9/17/2007	9/17/2007	9/17/2007	9/18/2007	9/18/2007	9/18/2007
Time Sampled	2:25 PM	4:00 PM	5:05 PM	6:10 PM	8:15 AM	9:30 AM	9:30 AM
TAL Metals (mg/kg)							Duplicate
Mercury	0.030J	0.825	0.0799J	0.142J	0.168J	0.182J	0.213J
Aluminum	2,550	5,090	3,270	6,300	5,580	7,990	7,950
Silver	0.741J	1.12J	2.83	1.21J	1.23J	1.57J	1.52J
Arsenic	3.33	5.9	4.04	4.15	4.98	6.38	5.88
Barium	28.1	188	148	69.0	85.2	96.1	91.3
Beryllium	0.131J	0.375J	0.178J	0.338J	0.293J	0.415J	0.400J
Calcium	17,500	38,300	22,800	20,100	27,600	37,400	37,100
Cadmium	0.357J	1.52	3.72	0.946	1.28	1.97	1.77
Cobalt	2.54	4.63	3.53	4.78	4.82	6.46	6.25
Chromium	11.9	36.1	29.0	21.4	28.6	43.4	41.9
Copper	14.1	68.3	68.3	40.5	44.3	55.9	51.1
Iron	5,820	12,200	8,130	12,000	10,700	15,000	14,500
Potassium	428	779	511	1000	935	1280	1310
Magnesium	5,290	8,360	7,740	8,270	10,400	10,500	10,000
Manganese	135	224	154	171	209	277	264
Sodium	147	399	142	178	174	205	203
Nickel	6.93	18.6	11.1	17.0	16.9	27.0	25.6
Lead	31.4	603	110	71.6	105	101	94.2
Vanadium	6.71	13.2	8.41	15.0	13.1	17.1	16.9
Zinc	60.4	249	196	149	184	198	185
Antimony	<0.0694	<0.0980	<0.0767	<0.0913	<0.0885	<0.106	<0.104
Selenium	<0.479	1.97	2.95	0.827J	1.93	<0.765	1.08J
Thallium	0.126	0.208	0.193	0.225	0.287	0.346	0.341
Semi-volatile Organic Analytes (ug/kg)							
Phenol	<1110	<1570	<1250	<1550	<1500	<1720	<1680
bis-(2-Chloroethyl) ether	<1110	<1570	<1250	<1550	<1500	<1720	<1680
2-Chlorophenol	<1110	<1570	<1250	<1550	<1500	<1720	<1680
1,3-Dichlorobenzene	<1110	<1570	<1250	<1550	<1500	<1720	<1680
1,4-Dichlorobenzene	<1110	<1570	<1250	<1550	<1500	<1720	<1680
Benzyl alcohol	<1110	<1570	<1250	<1550	<1500	<1720	<1680
1,2-Dichlorobenzene	<1110	<1570	<1250	<1550	<1500	<1720	<1680
2-Methylphenol	<1110	<1570	<1250	<1550	<1500	<1720	<1680
3-,4-Methylphenol	<1110	<1570	<1250	<1550	<1500	<1720	<1680
bis(2-Chloroisopropyl) ether	<1110	<1570	<1250	<1550	<1500	<1720	<1680
N-Nitroso-di-n-propylamine	<1110	<1570	<1250	<1550	<1500	<1720	<1680
Hexachloroethane	<1110	<1570	<1250	<1550	<1500	<1720	<1680
Nitrobenzene	<1110	<1570	<1250	<1550	<1500	<1720	<1680
Isophorone	<1110	<1570	<1250	<1550	<1500	<1720	<1680
2-Nitrophenol	<1110	<1570	<1250	<1550	<1500	<1720	<1680
2,4-Dimethylphenol	<1110	<1570	<1250	<1550	<1500	<1720	<1680
Benzoic acid	<4450	<6270	<4990	<6210	<5990	<6880	<6730
bis(2-Chloroethoxy)methane	<1110	<1570	<1250	<1550	<1500	<1720	<1680
2,4-Dichlorophenol	<1110	<1570	<1250	<1550	<1500	<1720	<1680
1,2,4-Trichlorobenzene	<1110	<1570	<1250	<1550	<1500	<1720	<1680
Naphthalene	<1110	<1570	<1250	<1550	<1500	<1720	<1680
4-Chloroaniline	<1110	<1570	<1250	<1550	<1500	<1720	<1680

Appendix Table 1. Continued.

Stream	Ottawa River						
River Mile	8.6	8.0	6.8	6.2	4.6	3.5	3.5
Date Sampled	9/17/2007	9/17/2007	9/17/2007	9/17/2007	9/18/2007	9/18/2007	9/18/2007
Time Sampled	2:25 PM	4:00 PM	5:05 PM	6:10 PM	8:15 AM	9:30 AM	9:30 AM
Semi-volatile Organic Analytes (ug/kg)							Duplicate
Hexachlorobutadiene	<1110	<1570	<1250	<1550	<1500	<1720	<1680
4-Chloro-3-methylphenol	<1110	<1570	<1250	<1550	<1500	<1720	<1680
2-Methylnaphthalene	<1110	<1570	<1250	<1550	<1500	<1720	<1680
Hexachlorocyclopentadiene	<1110	<1570	<1250	<1550	<1500	<1720	<1680
2,4,6-Trichlorophenol	<1110	<1570	<1250	<1550	<1500	<1720	<1680
2,4,5-Trichlorophenol	<1110	<1570	<1250	<1550	<1500	<1720	<1680
2-Chloronaphthalene	<1110	<1570	<1250	<1550	<1500	<1720	<1680
2-Nitroaniline	<4450	<6270	<4990	<6210	<5990	<6880	<6730
Dimethylphthalate	<1110	<1570	<1250	<1550	<1500	<1720	<1680
Acenaphthylene	<1110	<1570	<1250	<1550	<1500	<1720	<1680
2,6-Dinitrotoluene	<1110	<1570	<1250	<1550	<1500	<1720	<1680
3-Nitroaniline	<4450	<6270	<4990	<6210	<5990	<6880	<6730
Acenaphthene	<1110	<1570	<1250	<1550	<1500	<1720	<1680
2,4-Dinitrophenol	<4450	<6270	<4990	<6210	<5990	<6880	<6730
4-Nitrophenol	<4450	<6270	<4990	<6210	<5990	<6880	<6730
Dibenzofuran	<1110	<1570	<1250	<1550	<1500	<1720	<1680
2,4-Dinitrotoluene	<1110	<1570	<1250	<1550	<1500	<1720	<1680
Diethylphthalate	<1110	<1570	<1250	<1550	<1500	<1720	<1680
4-Chlorophenyl-phenyl ether	<1110	<1570	<1250	<1550	<1500	<1720	<1680
Fluorene	<1110	<1570	<1250	<1550	<1500	<1720	<1680
4-Nitroaniline	<4450	<6270	<4990	<6210	<5990	<6880	<6730
4,6-Dinitro-2-methylphenol	<4450	<6270	<4990	<6210	<5990	<6880	<6730
N-Nitrosodiphenylamine	<1110	<1570	<1250	<1550	<1500	<1720	<1680
4-Bromophenyl-phenylether	<1110	<1570	<1250	<1550	<1500	<1720	<1680
Hexachlorobenzene	<1110	<1570	<1250	<1550	<1500	<1720	<1680
Pentachlorophenol	<4450	<6270	<4990	<6210	<5990	<6880	<6730
Phenanthrene	1460J	<1570	1760J	<1550	<1500	<1720	<1680
Anthracene	<1110	<1570	<1250	<1550	<1500	<1720	<1680
Di-N-butylphthalate	<1110	<1570	<1250	<1550	<1500	<1720	<1680
Fluoranthene	3,220	2440J	4,290	1860J	2580J	<1720	<1680
Pyrene	2440	1940J	3260	<1550	2000J	<1720	<1680
Butylbenzylphthalate	<1110	<1570	<1250	<1550	<1500	<1720	<1680
3,3'-Dichlorobenzidine	<2230	<3140	<2490	<3100	<2990	<3440	<3370
Benzo(a)anthracene	1210J	<1570	1730J	<1550	<1500	<1720	<1680
Chrysene	1530J	<1570	2210J	<1550	<1500	<1720	<1680
bis(2-Ethylhexyl) phthalate	<1110	<1570	<1250	<1550	1520J	<1720	<1680
Di-n-octylphthalate	<1110	<1570	<1250	<1550	<1500	<1720	<1680
Benzo(b)fluoranthene	1240J	<1570	1790J	<1550	<1500	<1720	<1680
Benzo(k)fluoranthene	1370J	<1570	1920J	<1550	<1500	<1720	<1680
Benzo(a)pyrene	1350J	<1570	1900J	<1550	<1500	<1720	<1680
Indeno(1,2,3-cd)pyrene	<1110	<1570	1290J	<1550	<1500	<1720	<1680
Dibenzo(a,h)anthracene	<1110	<1570	<1250	<1550	<1500	<1720	<1680
Benzo(g,h,i)perylene	<1110	<1570	1400J	<1550	<1500	<1720	<1680

Appendix Table 1. Continued.

Stream	Ottawa River						
River Mile	8.6	8.0	6.8	6.2	4.6	3.5	3.5
Date Sampled	9/17/2007	9/17/2007	9/17/2007	9/17/2007	9/18/2007	9/18/2007	9/18/2007
Time Sampled	2:25 PM	4:00 PM	5:05 PM	6:10 PM	8:15 AM	9:30 AM	9:30 AM
PCBs (ug/kg)							Duplicate
Aroclor 1016	<114	<17.1	<14.0	<16.1	<163	<18.2	<18.8
Aroclor 1221	<114	<17.1	<14.0	<16.1	<163	<18.2	<18.8
Aroclor 1232	<114	<17.1	<14.0	<16.1	<163	<18.2	<18.8
Aroclor 1242	2990	189	155	369	3620	963	965
Aroclor 1248	<114	<17.1	<14.0	<16.1	<163	<18.2	<18.8
Aroclor 1254	<114	<17.1	<14.0	<16.1	<163	<18.2	<18.8
Aroclor 1260	<114	38.1	27.5J	81.7	233	85.0	87.2
Other							
Percent Solids	71.9	50.5	63.4	52.5	54.8	47.0	48.0

J - The analyte was positively identified, but the quantitation was below the reporting limit (RL).

< - Not detected at or above the method detection limit (MDL value reported with the less than symbol).

Appendix Table 2. Sediment sampling results for semivolatile organic compounds, pesticides, and PCBs from the Ottawa River (RMs 5.0 - 5.8), September, 2007.

Stream	Ottawa River	Ottawa River	Ottawa River	Ottawa River
River Mile	5.8	5.5	5.3	5.0
Date Sampled	9/18/2006	9/18/2006	9/18/2006	9/18/2006
Time Sampled	2:30 PM	12:55 PM	11:45 AM	10:45 AM
Semivolatile Organic Compounds (ug/kg)				
Acenaphthene	<1300	<640	<1200	<640
Acenaphthylene	<1300	<640	<1200	<640
Anthracene	<1300	1600	<1200	<640
Benz[a]anthracene	2200	3100	2600	1700
Benzo[b]fluoranthene	3900	3100	4000	2100
Benzo[k]fluoranthene	2900	2200	2700	2200
Benzo[g,h,i]perylene	2200	1900	2400	1700
Benzo[a]pyrene	2600	2800	3000	2000
bis(2-Chloroethoxy)methane	<1300	<640	<1200	<640
bis(2-Chloroethyl)ether	<1300	<640	<1200	<640
bis(2-Chloroisopropyl)ether	<1300	<640	<1200	<640
bis(2-Ethylhexyl)phthalate	3300	2500	3900	3500
4-Bromophenyl-phenyl ether	<1300	<640	<1200	<640
Butyl benzyl phthalate	<1300	<640	<1200	<640
4-Chloroaniline	<1300	<640	<1200	<640
4-Chloro-3-methylphenol	<1300	<640	<1200	<640
2-Chloronaphthalene	<1300	<640	<1200	<640
2-Chlorophenol	<1300	<640	<1200	<640
4-Chlorophenyl-phenylether	<1300	<640	<1200	<640
Chrysene	3300	3400	3600	2400
Dibenz[a,h]anthracene	<1300	840	<1200	<640
Dibenzofuran	<1300	730	<1200	<640
Di-n-butylphthalate	<1300	<640	<1200	<640
1,2-Dichlorobenzene	<1300	<640	<1200	<640
1,3-Dichlorobenzene	<1300	<640	<1200	<640
1,4-Dichlorobenzene	<1300	<640	<1200	<640
3,3'-Dichlorobenzidine	<6400	<3100	<5900	<3100
2,4-Dichlorophenol	<1300	<640	<1200	<640
Diethylphthalate	<1300	<640	<1200	<640
2,4-Dimethylphenol	<1300	<640	<1200	<640
Dimethyl phthalate	<1300	<640	<1200	<640
4,6-Dinitro-2-methylphenol	<6400	<3100	<5900	<3100
2,4-Dinitrophenol	<6400	<3100	<5900	<3100
2,4-Dinitrotoluene	<1300	<640	<1200	<640
2,6-Dinitrotoluene	<1300	<640	<1200	<640
Di-n-octyl phthalate	<1300	<640	<1200	800
Fluoranthene	5300	6000	6100	3700
Fluorene	<1300	830	<1200	<640
Hexachlorobenzene	<1300	<640	<1200	<640
Hexachlorobutadiene	<1300	<640	<1200	<640
Hexachlorocyclopentadiene	<6400	<3100	<5900	<3100
Hexachloroethane	<1300	<640	<1200	<640

Appendix Table 2. Continued.

Stream	Ottawa River	Ottawa River	Ottawa River	Ottawa River
River Mile	5.8	5.5	5.3	5.0
Date Sampled	9/18/2006	9/18/2006	9/18/2006	9/18/2006
Time Sampled	2:30 PM	12:55 PM	11:45 AM	10:45 AM
Semivolatile Organic Compounds (ug/kg)				
Indeno[1,2,3-cd]pyrene	2000	1800	2300	1500
Isophorone	<1300	<640	<1200	<640
2-Methylnaphthalene	<1300	1600	<1200	<640
2-Methylphenol	<1300	<640	<1200	<640
4-Methylphenol	<1300	<640	<1200	<640
Naphthalene	<1300	680	<1200	<640
2-Nitroaniline	<6400	<3100	<5900	<3100
3-Nitroaniline	<6400	<3100	<5900	<3100
4-Nitroaniline	<6400	<3100	<5900	<3100
Nitrobenzene	<1300	<640	<1200	<640
2-Nitrophenol	<1300	<640	<1200	<640
4-Nitrophenol	<6400	<3100	<5900	<3100
N-Nitrosodiphenylamine	<1300	<640	<1200	<640
N-Nitroso-di-n-propylamine	<1300	<640	<1200	<640
Pentachlorophenol	<6400	<3100	<5900	<3100
Phenanthrene	2200	5300	3100	1600
Phenol	<1300	<640	<1200	<640
Pyrene	4900	5900	5800	3700
1,2,4-Trichlorobenzene	<1300	<640	<1200	<640
2,4,5-Trichlorophenol	<1300	<640	<1200	<640
2,4,6-Trichlorophenol	<1300	<640	<1200	<640
Pesticides (ug/kg)				
Aldrin	<17	<8.3	<7.9	<8.2
alpha-BHC	<17	<8.3	<7.9	<8.2
beta-BHC	17 COL	<8.3	14 COL	<8.2
delta-BHC	<17	<8.3	<7.9	94
gamma-BHC (Lindane)	<17	<8.3	<7.9	<8.2
Chlordane (Technical)	<170	<130 G	<130 G	<120 G
4,4'-DDD	63 COL	36 COL	45 COL	39 COL
4,4'-DDE	33	18 COL	40	32
4,4'-DDT	<17	17	10 COL	13
Dieldrin	<17	<8.3	<7.9	<8.2
Endrin	<17	<8.3	<7.9	<8.2
Endrin aldehyde	<17	<8.3	<7.9	<8.2
Endosulfan I	<17	<8.3	<7.9	<8.2
Endosulfan II	<17	<8.3	<7.9	<8.2
Endosulfan sulfate	<17	<8.3	<7.9	<8.2
Heptachlor	<17	11 COL	<7.9	13 COL
Heptachlor epoxide	<17	12 COL	11 COL	15 COL
Methoxychlor	<33	<16	<15	<16
Toxaphene	<670	<330	<310	<330

Appendix Table 2. Continued.

Stream	Ottawa River	Ottawa River	Ottawa River	Ottawa River
River Mile	5.8	5.5	5.3	5.0
Date Sampled	9/18/2006	9/18/2006	9/18/2006	9/18/2006
Time Sampled	2:30 PM	12:55 PM	11:45 AM	10:45 AM
PCBs (ug/kg)				
Aroclor 1016	<1200 G	<1700 G	<1200 G	<1900 G
Aroclor 1221	<780 G	<1500 G	<850 G	<1400 G
Aroclor 1232	<1600 G	<2400 G	<1600 G	<2500 G
Aroclor 1242	1500	2300	1600	2500
Aroclor 1248	<900 G	<980 G	<800 G	<1200 G
Aroclor 1254	<330	<640	320	<640
Aroclor 1260	<330	<640	<310	<640
Metals (mg/kg)				
Arsenic	5.9	5	5.7	4.8
Lead	94.5	132	112	150
Other				
Percent Moisture	45	38	46	38

< - Not detected at or above the reporting limit (RL value reported with the less than symbol).

G - Elevated reporting limit due to matrix interference.

COL - More than 40% RPD between primary and confirmation column results. The lower of the two results is

AP - Altered pattern.

Appendix Table 3. Ohio EPA fish results from the Ottawa River, 2007.

Species List

River Code: 04-300	Stream: Ottawa River	Sample Date: 2007
River Mile: 8.60	Location: upst. Jeep plant	Date Range: 08/08/2007
Time Fished: 3409 sec	Drainage: 155.0 sq mi	Thru: 09/20/2007
Dist Fished: 1.00 km	Basin: Ottawa River	Sampler Type: A
	No of Passes: 2	

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M	2	2.00	0.42	0.05	0.08	25.00
Northern Pike	F	P	M	1	1.00	0.21	0.74	1.19	740.00
White Sucker	W	O	S T	25	25.00	5.22	3.37	5.42	134.92
Spotted Sucker	R	I	S	1	1.00	0.21	0.59	0.95	592.00
Common Carp	G	O	M T	25	25.00	5.22	43.70	70.15	1,747.94
Goldfish	G	O	M T	9	9.00	1.88	1.92	3.09	213.67
Creek Chub	N	G	N T	3	3.00	0.63	0.01	0.02	4.00
Emerald Shiner	N	I	M	168	168.00	35.07	0.56	0.90	3.33
Spottail Shiner	N	I	M P	4	4.00	0.84	0.02	0.02	3.75
Spotfin Shiner	N	I	M	8	8.00	1.67	0.03	0.04	3.13
Sand Shiner	N	I	M M	10	10.00	2.09	0.02	0.02	1.50
Bluntnose Minnow	N	O	C T	60	60.00	12.53	0.18	0.29	3.03
Central Stoneroller	N	H	N	14	14.00	2.92	0.06	0.09	3.93
Common Carp X Goldfish	G	O	T	1	1.00	0.21	1.95	3.13	1,950.00
Smallmouth Bass	F	C	C M	23	23.00	4.80	1.41	2.26	61.30
Largemouth Bass	F	C	C	15	15.00	3.13	0.78	1.24	51.67
Green Sunfish	S	I	C T	3	3.00	0.63	0.07	0.11	23.50
Bluegill Sunfish	S	I	C P	27	27.00	5.64	0.85	1.36	31.30
Pumpkinseed Sunfish	S	I	C P	27	27.00	5.64	1.06	1.70	39.33
Green Sf X Pumpkinseed				6	6.00	1.25	0.65	1.05	109.00
Yellow Perch			M	13	13.00	2.71	0.68	1.09	52.08
Logperch	D	I	S M	6	6.00	1.25	0.03	0.04	4.67
Freshwater Drum			M P	3	3.00	0.63	3.52	5.66	1,174.33
Round Goby				25	25.00	5.22	0.05	0.09	2.16
<i>Mile Total</i>				479	479.00		62.29		
<i>Number of Species</i>				22					
<i>Number of Hybrids</i>				2					

River Code: 04-300	Stream: Ottawa River	Sample Date: 2007
River Mile: 8.00	Location: adj. Jeep plant	Date Range: 08/08/2007
Time Fished: 4163 sec	Drainage: 155.0 sq mi	Thru: 09/20/2007
Dist Fished: 1.00 km	Basin: Ottawa River	No of Passes: 2
		Sampler Type: A

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M	6	6.00	2.82	0.16	0.20	26.17
Golden Redhorse	R	I	S M	1	1.00	0.47	0.36	0.47	362.00
White Sucker	W	O	S T	3	3.00	1.41	0.53	0.68	176.00
Spotted Sucker	R	I	S	3	3.00	1.41	0.94	1.21	312.00
Common Carp	G	O	M T	30	30.00	14.08	67.58	87.20	2,252.50
Goldfish	G	O	M T	9	9.00	4.23	2.68	3.46	297.73
Golden Shiner	N	I	M T	1	1.00	0.47	0.05	0.07	52.00
Emerald Shiner	N	I	M	66	66.00	30.99	0.22	0.28	3.26
Spotfin Shiner	N	I	M	3	3.00	1.41	0.02	0.02	5.33
Fathead Minnow	N	O	C T	6	6.00	2.82	0.01	0.02	2.00
Bluntnose Minnow	N	O	C T	3	3.00	1.41	0.00	0.00	1.00
Largemouth Bass	F	C	C	9	9.00	4.23	1.54	1.99	171.22
Green Sunfish	S	I	C T	14	14.00	6.57	0.40	0.52	28.79
Bluegill Sunfish	S	I	C P	14	14.00	6.57	0.37	0.47	26.18
Pumpkinseed Sunfish	S	I	C P	29	29.00	13.62	0.93	1.19	31.92
Green Sf X Pumpkinseed				5	5.00	2.35	0.53	0.69	106.60
Yellow Perch			M	9	9.00	4.23	0.79	1.02	87.78
Freshwater Drum			M P	1	1.00	0.47	0.40	0.51	395.00
Round Goby				1	1.00	0.47	0.00	0.00	1.00
<i>Mile Total</i>				213	213.00		77.49		
<i>Number of Species</i>				18					
<i>Number of Hybrids</i>				1					

Species List

River Code: 04-300	Stream: Ottawa River	Sample Date: 2007
River Mile: 6.80	Location: dst. Detroit Ave.	Date Range: 08/08/2007
Time Fished: 3758 sec	Drainage: 159.0 sq mi	Thru: 09/20/2007
Dist Fished: 1.00 km	Basin: Ottawa River	No of Passes: 2
		Sampler Type: A

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Northern Pike	F	P	M	1	1.00	0.29	0.63	0.73	625.00
White Sucker	W	O	S T	4	4.00	1.14	0.15	0.18	38.00
Spotted Sucker	R	I	S	1	1.00	0.29	0.27	0.31	270.00
Common Carp	G	O	M T	46	46.00	13.14	72.75	84.71	1,581.60
Goldfish	G	O	M T	19	19.00	5.43	5.75	6.69	302.53
Golden Shiner	N	I	M T	3	3.00	0.86	0.01	0.02	4.67
Emerald Shiner	N	I	M	114	114.00	32.57	0.23	0.26	1.99
Striped Shiner	N	I	S	2	2.00	0.57	0.01	0.01	6.00
Spottail Shiner	N	I	M P	1	1.00	0.29	0.00	0.00	3.00
Spotfin Shiner	N	I	M	3	3.00	0.86	0.02	0.02	5.00
Fathead Minnow	N	O	C T	2	2.00	0.57	0.01	0.01	2.50
Bluntnose Minnow	N	O	C T	5	5.00	1.43	0.02	0.02	3.00
Common Carp X Goldfish	G	O	T	1	1.00	0.29	1.20	1.40	1,200.00
Yellow Bullhead		I	C T	1	1.00	0.29	0.11	0.13	110.00
Brown Bullhead		I	C T	1	1.00	0.29	0.10	0.12	100.00
White Perch	E		M	5	5.00	1.43	0.07	0.08	13.00
Largemouth Bass	F	C	C	8	8.00	2.29	0.38	0.44	47.00
Green Sunfish	S	I	C T	5	5.00	1.43	0.11	0.13	22.40
Bluegill Sunfish	S	I	C P	23	23.00	6.57	0.56	0.66	24.52
Pumpkinseed Sunfish	S	I	C P	95	95.00	27.14	2.42	2.82	25.52
Green Sf X Bluegill Sf				2	2.00	0.57	0.07	0.09	37.00
Yellow Perch			M	7	7.00	2.00	0.26	0.30	36.43
Freshwater Drum			M P	1	1.00	0.29	0.77	0.90	770.00
	<i>Mile Total</i>			350	350.00		85.89		
	<i>Number of Species</i>			21					
	<i>Number of Hybrids</i>			2					

Species List

River Code: 04-300	Stream: Ottawa River	Sample Date: 2007
River Mile: 6.20	Location: dst. Langrange St.	Date Range: 08/08/2007
Time Fished: 4133 sec	Drainage: 160.0 sq mi	Thru: 09/20/2007
Dist Fished: 1.00 km	Basin: Ottawa River	No of Passes: 2
		Sampler Type: A

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M	1	1.00	0.23	0.03	0.03	32.00
Common Carp	G	O	M T	43	43.00	9.86	79.68	85.48	1,853.06
Goldfish	G	O	M T	25	25.00	5.73	5.19	5.56	207.47
Golden Shiner	N	I	M T	16	16.00	3.67	0.10	0.11	6.51
Emerald Shiner	N	I	M	60	60.00	13.76	0.14	0.14	2.25
Spottail Shiner	N	I	M P	5	5.00	1.15	0.03	0.03	5.40
Spotfin Shiner	N	I	M	8	8.00	1.83	0.03	0.04	4.13
Fathead Minnow	N	O	C T	11	11.00	2.52	0.02	0.02	1.55
Bluntnose Minnow	N	O	C T	31	31.00	7.11	0.07	0.07	2.13
Common Carp X Goldfish	G	O	T	2	2.00	0.46	1.68	1.80	837.50
Yellow Bullhead		I	C T	1	1.00	0.23	0.11	0.11	105.00
White Perch	E		M	4	4.00	0.92	0.05	0.05	11.25
White Crappie	S	I	C	1	1.00	0.23	0.01	0.01	8.00
Largemouth Bass	F	C	C	16	16.00	3.67	0.79	0.85	49.56
Green Sunfish	S	I	C T	27	27.00	6.19	0.50	0.53	18.37
Bluegill Sunfish	S	I	C P	34	34.00	7.80	0.71	0.76	20.95
Pumpkinseed Sunfish	S	I	C P	140	140.00	32.11	3.14	3.37	22.43
Bluegill X Pumpkinseed				3	3.00	0.69	0.13	0.14	42.67
Green Sf X Bluegill Sf				1	1.00	0.23	0.04	0.04	38.00
Yellow Perch			M	6	6.00	1.38	0.16	0.17	26.17
Freshwater Drum			M P	1	1.00	0.23	0.64	0.68	635.00
<i>Mile Total</i>				436	436.00		93.21		
<i>Number of Species</i>				18					
<i>Number of Hybrids</i>				3					

Species List

River Code: 04-300	Stream: Ottawa River	Sample Date: 2007
River Mile: 5.80	Location: upst. Dura Landfill	Date Range: 08/10/2007
Time Fished: 3888 sec	Drainage: 160.0 sq mi	Thru: 09/19/2007
Dist Fished: 1.00 km	Basin: Ottawa River	No of Passes: 2
		Sampler Type: A

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M	2	2.00	0.44	0.20	0.51	101.50
White Sucker	W	O	S T	3	3.00	0.67	0.04	0.09	11.67
Common Carp	G	O	M T	21	21.00	4.66	33.23	83.04	1,582.14
Goldfish	G	O	M T	6	6.00	1.33	1.11	2.77	184.83
Golden Shiner	N	I	M T	18	18.00	3.99	0.18	0.45	10.06
Creek Chub	N	G	N T	3	3.00	0.67	0.02	0.04	5.00
Emerald Shiner	N	I	M	72	72.00	15.96	0.19	0.47	2.61
Spottail Shiner	N	I	M P	15	15.00	3.33	0.04	0.09	2.33
Fathead Minnow	N	O	C T	9	9.00	2.00	0.02	0.05	2.44
Bluntnose Minnow	N	O	C T	64	64.00	14.19	0.16	0.40	2.50
Central Stoneroller	N	H	N	1	1.00	0.22	0.00	0.00	2.00
Brown Bullhead		I	C T	1	1.00	0.22	0.07	0.17	67.00
White Perch	E		M	9	9.00	2.00	0.07	0.18	8.11
Largemouth Bass	F	C	C	5	5.00	1.11	0.26	0.66	52.80
Green Sunfish	S	I	C T	2	2.00	0.44	0.05	0.11	22.50
Bluegill Sunfish	S	I	C P	10	10.00	2.22	0.20	0.50	19.86
Pumpkinseed Sunfish	S	I	C P	204	204.00	45.23	3.98	9.96	19.53
Bluegill X Pumpkinseed				2	2.00	0.44	0.10	0.25	50.00
Green Sf X Bluegill Sf				1	1.00	0.22	0.08	0.19	75.00
Yellow Perch			M	3	3.00	0.67	0.03	0.07	10.00
<i>Mile Total</i>				451	451.00		40.01		
<i>Number of Species</i>				18					
<i>Number of Hybrids</i>				2					

Species List

River Code: 04-300	Stream: Ottawa River	Sample Date: 2007
River Mile: 5.50	Location:	Date Range: 08/09/2007
Time Fished: 2747 sec	Drainage: 166.0 sq mi	Thru: 09/19/2007
Dist Fished: 0.80 km	Basin: Ottawa River	No of Passes: 2
		Sampler Type: A

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M	2	2.50	0.75	0.05	0.05	20.00
Common Carp	G	O	M T	44	55.00	16.60	77.30	83.09	1,405.54
Goldfish	G	O	M T	13	16.25	4.91	4.38	4.70	269.23
Golden Shiner	N	I	M T	4	5.00	1.51	0.04	0.04	8.00
Emerald Shiner	N	I	M	8	10.00	3.02	0.05	0.06	5.13
Spotfin Shiner	N	I	M	1	1.25	0.38	0.00	0.00	2.00
Fathead Minnow	N	O	C T	1	1.25	0.38	0.00	0.00	2.00
Bluntnose Minnow	N	O	C T	14	17.50	5.28	0.08	0.08	4.29
Yellow Bullhead		I	C T	2	2.50	0.75	0.47	0.51	189.00
Brown Bullhead		I	C T	3	3.75	1.13	0.25	0.27	66.33
White Perch	E		M	1	1.25	0.38	0.04	0.04	29.00
Largemouth Bass	F	C	C	10	12.50	3.77	1.44	1.55	115.00
Green Sunfish	S	I	C T	12	15.00	4.53	0.54	0.58	35.86
Bluegill Sunfish	S	I	C P	32	40.00	12.08	1.00	1.07	24.96
Pumpkinseed Sunfish	S	I	C P	109	136.25	41.13	6.21	6.67	45.57
Green Sf X Bluegill Sf				8	10.00	3.02	1.20	1.29	119.63
Logperch	D	I	S M	1	1.25	0.38	0.00	0.00	3.00
<i>Mile Total</i>				265	331.25		93.04		
<i>Number of Species</i>				16					
<i>Number of Hybrids</i>				1					

Species List

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River Code: 04-300	Stream: Ottawa River	Sample Date: 2007
River Mile: 5.30	Location: adj. Dura Landfill	Date Range: 08/09/2007
Time Fished: 3979 sec	Drainage: 166.0 sq mi	Thru: 09/19/2007
Dist Fished: 0.90 km	Basin: Ottawa River	Sampler Type: A
	No of Passes: 2	

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M	1	1.11	0.22	0.02	0.06	20.00
Bigmouth Buffalo	C	I	M	1	1.11	0.22	1.94	4.96	1,750.00
White Sucker	W	O	S T	2	2.22	0.43	0.20	0.51	91.00
Common Carp	G	O	M T	17	18.89	3.69	26.72	68.12	1,414.71
Goldfish	G	O	M T	11	12.22	2.39	2.81	7.17	230.18
Golden Shiner	N	I	M T	48	53.33	10.41	0.29	0.75	5.52
Creek Chub	N	G	N T	1	1.11	0.22	0.00	0.01	4.00
Emerald Shiner	N	I	M	37	41.11	8.03	0.10	0.27	2.53
Spottail Shiner	N	I	M P	3	3.33	0.65	0.01	0.03	4.00
Fathead Minnow	N	O	C T	25	27.78	5.42	0.07	0.17	2.41
Bluntnose Minnow	N	O	C T	52	57.78	11.28	0.11	0.27	1.86
Yellow Bullhead		I	C T	1	1.11	0.22	0.07	0.17	59.00
Brown Bullhead		I	C T	2	2.22	0.43	0.21	0.54	95.00
Largemouth Bass	F	C	C	11	12.22	2.39	0.53	1.35	43.18
Green Sunfish	S	I	C T	33	36.67	7.16	0.90	2.31	24.67
Bluegill Sunfish	S	I	C P	18	20.00	3.90	0.59	1.51	29.69
Pumpkinseed Sunfish	S	I	C P	191	212.22	41.43	4.31	10.99	20.31
Green Sf X Bluegill Sf				5	5.56	1.08	0.30	0.76	54.00
Yellow Perch			M	1	1.11	0.22	0.01	0.03	10.00
Logperch	D	I	S M	1	1.11	0.22	0.01	0.01	5.00
<i>Mile Total</i>				461	512.22		39.23		
<i>Number of Species</i>				19					
<i>Number of Hybrids</i>				1					

River Code: 04-300	Stream: Ottawa River	Sample Date: 2007
River Mile: 5.00	Location: Stickney Ave.	Date Range: 08/09/2007
Time Fished: 3947 sec	Drainage: 166.0 sq mi	Thru: 09/19/2007
Dist Fished: 1.00 km	Basin: Ottawa River	Sampler Type: A
	No of Passes: 2	

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M	2	2.00	0.31	0.05	0.04	25.50
Shorthead Redhorse	R	I	S M	1	1.00	0.16	0.01	0.01	10.00
White Sucker	W	O	S T	4	4.00	0.63	0.04	0.03	9.75
Common Carp	G	O	M T	84	84.00	13.19	118.94	86.81	1,416.00
Goldfish	G	O	M T	20	20.00	3.14	3.82	2.78	190.74
Golden Shiner	N	I	M T	71	71.00	11.15	0.46	0.34	6.52
Emerald Shiner	N	I	M	67	67.00	10.52	0.15	0.11	2.25
Spottail Shiner	N	I	M P	1	1.00	0.16	0.01	0.00	6.00
Fathead Minnow	N	O	C T	3	3.00	0.47	0.00	0.00	1.33
Bluntnose Minnow	N	O	C T	52	52.00	8.16	0.09	0.06	1.69
Yellow Bullhead		I	C T	1	1.00	0.16	0.18	0.13	178.00
Brown Bullhead		I	C T	4	4.00	0.63	0.40	0.29	99.75
White Perch	E		M	1	1.00	0.16	0.01	0.01	12.00
White Crappie	S	I	C	1	1.00	0.16	0.09	0.06	89.00
Largemouth Bass	F	C	C	14	14.00	2.20	1.21	0.88	86.57
Green Sunfish	S	I	C T	15	15.00	2.35	0.28	0.20	18.65
Bluegill Sunfish	S	I	C P	34	34.00	5.34	0.76	0.55	22.32
Pumpkinseed Sunfish	S	I	C P	255	255.00	40.03	8.98	6.56	35.23
Green Sf X Bluegill Sf				3	3.00	0.47	0.30	0.22	100.67
Green Sf X Pumpkinseed				1	1.00	0.16	0.12	0.09	120.00
Yellow Perch			M	2	2.00	0.31	0.32	0.24	161.00
Freshwater Drum			M P	1	1.00	0.16	0.79	0.58	792.00
<i>Mile Total</i>				637	637.00		137.02		
<i>Number of Species</i>				20					
<i>Number of Hybrids</i>				2					

Species List

River Code: 04-300	Stream: Ottawa River	Sample Date: 2007
River Mile: 4.60	Location: dst. Stickney Ave.	Date Range: 08/09/2007
Time Fished: 3911 sec	Drainage: 167.0 sq mi	Thru: 09/19/2007
Dist Fished: 1.00 km	Basin: Ottawa River	Sampler Type: A
	No of Passes: 2	

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild	Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Gizzard Shad		O	M		1	1.00	0.32	0.02	0.02	20.00
White Sucker	W	O	S	T	1	1.00	0.32	0.01	0.01	10.00
Common Carp	G	O	M	T	50	50.00	16.08	75.68	80.96	1,513.52
Goldfish	G	O	M	T	56	56.00	18.01	9.78	10.46	174.57
Golden Shiner	N	I	M	T	6	6.00	1.93	0.08	0.08	13.00
Emerald Shiner	N	I	M		17	17.00	5.47	0.05	0.05	2.94
Spottail Shiner	N	I	M	P	2	2.00	0.64	0.01	0.01	4.00
Fathead Minnow	N	O	C	T	1	1.00	0.32	0.00	0.00	2.00
Bluntnose Minnow	N	O	C	T	5	5.00	1.61	0.01	0.01	2.00
Yellow Bullhead		I	C	T	1	1.00	0.32	0.07	0.07	70.00
Black Bullhead		I	C	P	1	1.00	0.32	0.09	0.10	89.00
White Perch	E		M		10	10.00	3.22	0.10	0.11	10.30
White Crappie	S	I	C		1	1.00	0.32	0.11	0.12	110.00
Largemouth Bass	F	C	C		14	14.00	4.50	1.94	2.08	138.57
Green Sunfish	S	I	C	T	9	9.00	2.89	0.44	0.47	48.44
Bluegill Sunfish	S	I	C	P	33	33.00	10.61	0.94	1.01	28.48
Pumpkinseed Sunfish	S	I	C	P	92	92.00	29.58	2.59	2.77	28.11
Bluegill X Pumpkinseed					2	2.00	0.64	0.11	0.12	54.00
Green Sf X Pumpkinseed					4	4.00	1.29	0.25	0.26	61.50
Yellow Perch			M		3	3.00	0.96	0.11	0.12	36.67
Logperch	D	I	S	M	1	1.00	0.32	0.01	0.01	6.00
Freshwater Drum			M	P	1	1.00	0.32	1.10	1.18	1,100.00
<i>Mile Total</i>					311	311.00		93.47		
<i>Number of Species</i>					20					
<i>Number of Hybrids</i>					2					

Species List

River Code: 04-300	Stream: Ottawa River	Sample Date: 2007
River Mile: 3.50	Location: Swartz Rd.	Date Range: 08/09/2007
Time Fished: 2906 sec	Drainage: 168.0 sq mi	Thru: 09/19/2007
Dist Fished: 1.00 km	Basin: Ottawa River	Sampler Type: A
	No of Passes: 2	

Species Name / ODNR status	IBI Grp	Feed Guild	Breed Guild Tol	# of Fish	Relative Number	% by Number	Relative Weight	% by Weight	Ave(gm) Weight
Longnose Gar		P	M	1	1.00	0.18	0.13	0.08	128.00
Gizzard Shad		O	M	2	2.00	0.37	0.04	0.03	21.00
Northern Pike	F	P	M	1	1.00	0.18	0.86	0.54	860.00
Golden Redhorse	R	I	S M	1	1.00	0.18	0.01	0.01	10.00
White Sucker	W	O	S T	1	1.00	0.18	0.05	0.03	45.00
Common Carp	G	O	M T	58	58.00	10.60	117.49	73.13	2,025.65
Goldfish	G	O	M T	180	180.00	32.91	25.74	16.02	143.01
Emerald Shiner	N	I	M	12	12.00	2.19	0.04	0.02	3.00
Spottail Shiner	N	I	M P	1	1.00	0.18	0.00	0.00	4.00
Brown Bullhead		I	C T	1	1.00	0.18	0.21	0.13	212.00
Brook Silverside		I	M M	1	1.00	0.18	0.00	0.00	2.00
White Bass	F	P	M	23	23.00	4.20	0.34	0.21	14.61
White Perch	E		M	12	12.00	2.19	0.09	0.06	7.67
Rock Bass	S	C	C	1	1.00	0.18	0.18	0.11	175.00
Largemouth Bass	F	C	C	32	32.00	5.85	5.42	3.37	169.41
Green Sunfish	S	I	C T	7	7.00	1.28	0.28	0.17	40.14
Bluegill Sunfish	S	I	C P	86	86.00	15.72	2.78	1.73	32.29
Orangespotted Sunfish	S	I	C	1	1.00	0.18	0.02	0.01	17.00
Pumpkinseed Sunfish	S	I	C P	119	119.00	21.76	4.73	2.94	39.71
Green Sf X Pumpkinseed				4	4.00	0.73	0.27	0.17	66.75
Yellow Perch			M	1	1.00	0.18	0.01	0.01	10.00
Freshwater Drum			M P	2	2.00	0.37	1.98	1.23	987.50
<i>Mile Total</i>				547	547.00		160.65		
<i>Number of Species</i>				21					
<i>Number of Hybrids</i>				1					

Appendix Table 4. Index of Biotic Integrity (IBI) and Modified Index of Well-being (MIwb) metrics and scores for sites sampled in the Ottawa River, 2007.

River Mile	Type	Date	Drainage area (sq mi)	Number of					Percent of Individuals						Rel.No. minus tolerants / (1.0 km)	Modified IBI lwb	
				Total species	Centrarch. species	Sensitive species	Benthic species	Cyprinid species	Exotics	Tolerant fishes	Omnivores	Top carnivores	Phytophils	DELT anomalies			
Ottawa River - (04-300)																	
Year: 2007																	
8.60	A	08/08/2007	155	14(3)	5(3)	1(1)	6(3)	5(5)	11(3)	36(1)	33(3)	6(1)	16.3(3)	2.0(3)	392(1)	30	7.4
8.60	A	09/20/2007	155	16(5)	4(3)	3(3)	5(3)	6(5)	13(3)	20(3)	20(3)	10(3)	8.8(1)	5.8(0)	562(3)	35	7.4
8.00	A	08/08/2007	157	13(3)	5(3)	1(1)	4(3)	4(3)	21(1)	35(1)	28(3)	5(1)	20.9(5)	9.1(0)	268(1)	25	6.4
8.00	A	09/20/2007	157	11(3)	5(3)	0(0)	4(3)	3(3)	15(3)	26(1)	18(3)	3(1)	29.1(5)	2.7(3)	146(1) *	29	5.6
6.80	A	08/08/2007	159	12(3)	5(3)	0(0)	3(1)	5(5)	27(1)	32(1)	29(3)	2(1)	15.9(3)	9.1(0)	366(1)	22	5.4
6.80	A	09/20/2007	159	15(3)	4(3)	0(0)	4(3)	5(5)	13(3)	17(3)	14(5)	4(1)	51.5(5)	3.1(1)	334(1)	33	6.4
6.20	A	08/08/2007	160	13(3)	5(3)	0(0)	2(1)	6(5)	25(1)	54(0)	39(1)	1(1)	26.5(5)	5.8(0)	422(1)	21	6.2
6.20	A	09/20/2007	160	13(3)	7(5)	0(0)	1(1)	6(5)	8(5)	19(3)	13(5)	6(1)	54.2(5)	6.1(0)	448(1)	34	6.3
5.80	A	08/10/2007	160	12(3)	5(3)	0(0)	3(1)	5(5)	10(3)	19(3)	14(5)	1(1)	50.2(5)	2.1(3)	486(3)	35	6.2
5.80	A	09/19/2007	160	14(3)	5(3)	0(0)	3(1)	7(5)	6(5)	40(1)	34(3)	1(1)	51.9(5)	3.9(1)	412(1)	29	6.0
5.50	A	08/09/2007	166	11(3)	5(3)	1(1)	4(3)	4(3)	37(1)	59(0)	46(1)	3(1)	23.1(5)	13.3(0)	293(1)	22	5.4
5.50	A	09/19/2007	166	10(3)	5(3)	0(0)	2(1)	4(3)	10(3)	16(3)	12(5)	5(1)	64.9(5)	6.9(0)	365(1)	28	6.6
5.30	A	08/09/2007	166	11(3)	5(3)	1(1)	3(1)	4(3)	8(5)	33(1)	20(3)	1(1)	48.5(5)	2.5(3)	440(1)	30	6.9
5.30	A	09/19/2007	166	15(3)	5(3)	0(0)	4(3)	6(5)	5(5)	48(0)	26(3)	3(1)	58.9(5)	2.0(3)	582(3)	34	6.9
5.00	A	08/09/2007	166	11(3)	5(3)	0(0)	2(1)	4(3)	23(1)	45(1)	32(3)	2(1)	42.4(5)	9.8(0)	524(3)	24	6.4
5.00	A	09/19/2007	166	15(3)	6(3)	1(1)	5(3)	4(3)	12(3)	37(1)	21(3)	3(1)	61.6(5)	4.6(1)	746(3)	30	6.9
4.60	A	08/09/2007	167	11(3)	5(3)	1(1)	3(1)	4(3)	41(0)	45(0)	37(3)	6(1)	33.6(5)	16.3(0)	310(1)	21	6.2
4.60	A	09/19/2007	167	12(3)	5(3)	0(0)	3(1)	4(3)	34(1)	38(1)	36(3)	3(1)	40.4(5)	6.8(0)	310(1)	22	6.3
3.80	A	08/09/2007	168	5(1)	3(1)	0(0)	1(1)	1(1)	78(0)	64(0)	64(1)	3(1)	14.9(3)	18.6(0)	188(1) *	10	4.1
3.50	A	08/09/2007	168	9(3)	6(3)	0(0)	1(1)	1(1)	70(0)	63(0)	63(1)	4(1)	16.0(3)	18.6(0)	388(1)	14	6.1
3.50	A	09/19/2007	168	14(3)	6(3)	2(1)	4(3)	2(1)	33(1)	35(1)	33(3)	14(3)	34.8(5)	10.9(0)	702(3)	27	7.4

♦ - IBI is low end adjusted.

Appendix Table 5. Ohio EPA macroinvertebrate results from the Ottawa River, 2007.

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Ottawa River

Collection Date: 09/17/2007 River Code: 04-300 RM: 8.60

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	<i>Hydra sp</i>	1			
01801	<i>Turbellaria</i>	+			
03600	<i>Oligochaeta</i>	57			+
05800	<i>Caecidotea sp</i>	8			+
11120	<i>Baetis flavistriga</i>	3			
11130	<i>Baetis intercalaris</i>	4			+
13400	<i>Stenacron sp</i>	19			
13521	<i>Stenonema femoratum</i>				+
21200	<i>Calopteryx sp</i>	1			
22300	<i>Argia sp</i>	7			+
52200	<i>Cheumatopsyche sp</i>	191			+
52530	<i>Hydropsyche depravata group</i>	3			+
74100	<i>Simulium sp</i>				+
77120	<i>Ablabesmyia mallochi</i>	41			+
77500	<i>Conchapelopia sp</i>	20			+
77800	<i>Helopelopia sp</i>	61			
80370	<i>Corynoneura lobata</i>	144			
80410	<i>Cricotopus (C.) sp</i>	41			
80420	<i>Cricotopus (C.) bicinctus</i>	102			+
81825	<i>Rheocricotopus (Psilocricotopus) robacki</i>	164			+
82141	<i>Thienemanniella xena</i>	112			
82820	<i>Cryptochironomus sp</i>				+
83040	<i>Dicrotendipes neomodestus</i>	20			+
83300	<i>Glyptotendipes (G.) sp</i>	20			
83840	<i>Microtendipes pedellus group</i>	20			
84210	<i>Paratendipes albimanus or P. duplicatus</i>	20			+
84450	<i>Polypedilum (Uresipedilum) flavum</i>	123			+
84460	<i>Polypedilum (P.) fallax group</i>	184			
84470	<i>Polypedilum (P.) illinoense</i>	409			+
84540	<i>Polypedilum (Tripodura) scalaenum group</i>	82			+
84750	<i>Stictochironomus sp</i>				+
84800	<i>Tribelos jucundum</i>				+
85500	<i>Paratanytarsus sp</i>	164			+
85625	<i>Rheotanytarsus sp</i>	20			+
85821	<i>Tanytarsus glabrescens group sp 7</i>	123			+
87540	<i>Hemerodromia sp</i>	2			
93900	<i>Elimia sp</i>	15			+
96900	<i>Ferrissia sp</i>	45			+
97601	<i>Corbicula fluminea</i>				+

No. Quantitative Taxa: 32 Total Taxa: 39
 No. Qualitative Taxa: 27 ICI: **20**
 Number of Organisms: 2226 Qual EPT: 4

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Ottawa River
adj. Jeep plant

Collection Date: 09/17/2007 River Code: 04-300 RM: 8.00

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
00401	<i>Spongillidae</i>	+			
01320	<i>Hydra sp</i>	42			
01801	<i>Turbellaria</i>	2			
03600	<i>Oligochaeta</i>	850 +			
05800	<i>Caecidotea sp</i>	11 +			
13400	<i>Stenacron sp</i>	8			
21200	<i>Calopteryx sp</i>	+			
22300	<i>Argia sp</i>	4 +			
24107	<i>Nasiaeschna pentacantha</i>	+			
49101	<i>Sisyridae</i>	+			
77120	<i>Ablabesmyia mallochii</i>	+			
82700	<i>Chironomus sp</i>	28			
83040	<i>Dicrotendipes neomodestus</i>	264			
83050	<i>Dicrotendipes lucifer</i>	222			
83051	<i>Dicrotendipes simpsoni</i>	42			
83300	<i>Glyptotendipes (G.) sp</i>	14 +			
84210	<i>Paratendipes albimanus or P. duplicatus</i>	14			
84315	<i>Phaenopsectra flavipes</i>	+			
84460	<i>Polypedilum (P.) fallax group</i>	56 +			
84470	<i>Polypedilum (P.) illinoense</i>	56 +			
84540	<i>Polypedilum (Tripodura) scalaenum group</i>	42			
84800	<i>Tribelos jucundum</i>	125 +			
85500	<i>Paratanytarsus sp</i>	236			
85821	<i>Tanytarsus glabrescens group sp 7</i>	167			
96120	<i>Menetus (Micromenetus) dilatatus</i>	47			
96900	<i>Ferrissia sp</i>	43 +			

No. Quantitative Taxa: 20 Total Taxa: 26
 No. Qualitative Taxa: 14 LICI: 22
 Number of Organisms: 2273 Qual EPT: 0

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Ottawa River
dst. Detroit Ave.

Collection Date: 09/17/2007 River Code: 04-300 RM: 6.80

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	<i>Hydra sp</i>	329			
03600	<i>Oligochaeta</i>	1674 +			
04664	<i>Helobdella stagnalis</i>	+			
05800	<i>Caecidotea sp</i>	+			
22300	<i>Argia sp</i>	9			
45400	<i>Trichocorixa sp</i>	+			
60900	<i>Peltodytes sp</i>	+			
77500	<i>Conchapelopia sp</i>	26			
78655	<i>Procladius (Holotanypus) sp</i>	40 +			
80370	<i>Corynoneura lobata</i>	8			
82730	<i>Chironomus (C.) decorus group</i>	13 +			
83040	<i>Dicrotendipes neomodestus</i>	92			
83050	<i>Dicrotendipes lucifer</i>	593			
83051	<i>Dicrotendipes simpsoni</i>	237			
83300	<i>Glyptotendipes (G.) sp</i>	145			
84315	<i>Phaenopsectra flavipes</i>	+			
84450	<i>Polypedilum (Uresipedilum) flavum</i>	13			
84460	<i>Polypedilum (P.) fallax group</i>	13 +			
84470	<i>Polypedilum (P.) illinoense</i>	13			
84540	<i>Polypedilum (Tripodura) scalaenum group</i>	26			
85500	<i>Paratanytarsus sp</i>	66			
85821	<i>Tanytarsus glabrescens group sp 7</i>	105			
96120	<i>Menetus (Micromenetus) dilatatus</i>	106			
96900	<i>Ferrissia sp</i>	112 +			
98001	<i>Sphaeriidae</i>	8			

No. Quantitative Taxa: 20 Total Taxa: 25
 No. Qualitative Taxa: 10 LICI: **18**
 Number of Organisms: 3628 Qual EPT: 0

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Ottawa River
dst. Langrange St.

Collection Date: 09/17/2007 River Code: 04-300 RM: 6.20

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01320	<i>Hydra sp</i>	26			
01801	<i>Turbellaria</i>	4 +			
03600	<i>Oligochaeta</i>	1216 +			
04664	<i>Helobdella stagnalis</i>	+			
05800	<i>Caecidotea sp</i>	+			
22300	<i>Argia sp</i>	10			
44501	<i>Corixidae</i>	+			
77120	<i>Ablabesmyia mallochi</i>	7			
78655	<i>Procladius (Holotanypus) sp</i>	+			
80370	<i>Corynoneura lobata</i>	12			
83040	<i>Dicrotendipes neomodestus</i>	41			
83050	<i>Dicrotendipes lucifer</i>	212			
83051	<i>Dicrotendipes simpsoni</i>	137			
83300	<i>Glyptotendipes (G.) sp</i>	41 +			
83600	<i>Kiefferulus (K.) dux</i>	14			
84000	<i>Parachironomus sp</i>	7			
84460	<i>Polypedilum (P.) fallax group</i>	21			
84470	<i>Polypedilum (P.) illinoense</i>	14			
84540	<i>Polypedilum (Tripodura) scalaenum group</i>	7			
84750	<i>Stictochironomus sp</i>	7			
84800	<i>Tribelos jucundum</i>	14			
85500	<i>Paratanytarsus sp</i>	62			
85821	<i>Tanytarsus glabrescens group sp 7</i>	41			
95100	<i>Physella sp</i>	57			
96120	<i>Menetus (Micromenetus) dilatatus</i>	250			
96900	<i>Ferrissia sp</i>	38			

No. Quantitative Taxa: 22 Total Taxa: 26
 No. Qualitative Taxa: 7 LICI: **20**
 Number of Organisms: 2238 Qual EPT: 0

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Ottawa River
upst. Dura Landfill

Collection Date: 09/18/2007 River Code: 04-300 RM: 5.80

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	11			
03600	<i>Oligochaeta</i>	1021 +			
04664	<i>Helobdella stagnalis</i>	+			
04901	<i>Erpobdellidae</i>	+			
05800	<i>Caecidotea sp</i>	+			
13400	<i>Stenacron sp</i>	1			
22001	<i>Coenagrionidae</i>	1 +			
22300	<i>Argia sp</i>	1 +			
42700	<i>Belostoma sp</i>	+			
44501	<i>Corixidae</i>	+			
60900	<i>Peltodytes sp</i>	+			
78655	<i>Procladius (Holotanypus) sp</i>	1 +			
80420	<i>Cricotopus (C.) bicinctus</i>	1			
80490	<i>Cricotopus (Isocladius) intersectus group</i>	3			
80510	<i>Cricotopus (Isocladius) sylvestris group</i>	1			
82730	<i>Chironomus (C.) decorus group</i>	14 +			
82820	<i>Cryptochironomus sp</i>	+			
83002	<i>Dicrotendipes modestus</i>	5			
83040	<i>Dicrotendipes neomodestus</i>	8 +			
83050	<i>Dicrotendipes lucifer</i>	5			
83051	<i>Dicrotendipes simpsoni</i>	19			
83300	<i>Glyptotendipes (G.) sp</i>	23 +			
84000	<i>Parachironomus sp</i>	1			
84460	<i>Polypedilum (P.) fallax group</i>	22 +			
84470	<i>Polypedilum (P.) illinoense</i>	62 +			
84540	<i>Polypedilum (Tripodura) scalaenum group</i>	1			
85500	<i>Paratanytarsus sp</i>	6			
85821	<i>Tanytarsus glabrescens group sp 7</i>	12			
96120	<i>Menetus (Micromenetus) dilatatus</i>	108			
96900	<i>Ferrissia sp</i>	10 +			

No. Quantitative Taxa: 23 Total Taxa: 30
 No. Qualitative Taxa: 17 LICI: **18**
 Number of Organisms: 1337 Qual EPT: 0

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Ottawa River

Collection Date: 09/18/2007 River Code: 04-300 RM: 5.50

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
03221	<i>Pectinatella magnifica</i>	1			
03360	<i>Plumatella sp</i>	1 +			
03600	<i>Oligochaeta</i>	133			
06700	<i>Crangonyx sp</i>	+			
22300	<i>Argia sp</i>	1 +			
65800	<i>Berosus sp</i>	1			
78120	<i>Labrundinia maculata</i>	1			
80350	<i>Corynoneura sp</i>	1			
80410	<i>Cricotopus (C.) sp</i>	1			
80420	<i>Cricotopus (C.) bicinctus</i>	3			
80510	<i>Cricotopus (Isocladius) sylvestris group</i>	2			
81200	<i>Nanocladius sp</i>	1			
83050	<i>Dicrotendipes lucifer</i>	1			
83051	<i>Dicrotendipes simpsoni</i>	2			
83300	<i>Glyptotendipes (G.) sp</i>	8			
84450	<i>Polypedilum (Uresipedilum) flavum</i>	2			
84460	<i>Polypedilum (P.) fallax group</i>	1 +			
84470	<i>Polypedilum (P.) illinoense</i>	61			
84540	<i>Polypedilum (Tripodura) scalaenum group</i>	1			
85500	<i>Paratanytarsus sp</i>	3			
85821	<i>Tanytarsus glabrescens group sp 7</i>	5			
95100	<i>Physella sp</i>	1			
96120	<i>Menetus (Micromenetus) dilatatus</i>	8			
96900	<i>Ferrissia sp</i>	21 +			
98001	<i>Sphaeriidae</i>	2			

No. Quantitative Taxa: 24	Total Taxa: 25
No. Qualitative Taxa: 5	LICI: 22
Number of Organisms: 262	Qual EPT: 0

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Ottawa River
adj. Dura Landfill

Collection Date: 09/18/2007 River Code: 04-300 RM: 5.30

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	22 +			
03360	<i>Plumatella sp</i>	1			
03600	<i>Oligochaeta</i>	1072			
06700	<i>Crangonyx sp</i>	1			
13400	<i>Stenacron sp</i>	1			
21200	<i>Calopteryx sp</i>	+			
22001	<i>Coenagrionidae</i>	2			
22300	<i>Argia sp</i>	8 +			
77120	<i>Ablabesmyia mallochi</i>	3			
80350	<i>Corynoneura sp</i>	1			
80410	<i>Cricotopus (C.) sp</i>	2			
81231	<i>Nanocladius (N.) crassicornus or N. (N.) "rectinervis"</i>	2			
83002	<i>Dicrotendipes modestus</i>	3			
83040	<i>Dicrotendipes neomodestus</i>	1			
83050	<i>Dicrotendipes lucifer</i>	6			
83051	<i>Dicrotendipes simpsoni</i>	1			
83300	<i>Glyptotendipes (G.) sp</i>	30 +			
84200	<i>Paratendipes sp</i>	1			
84430	<i>Polypedilum (P.) albicorne</i>	3			
84450	<i>Polypedilum (Uresipedilum) flavum</i>	1			
84460	<i>Polypedilum (P.) fallax group</i>	2			
84470	<i>Polypedilum (P.) illinoense</i>	12			
84540	<i>Polypedilum (Tripodura) scalaenum group</i>	2			
84800	<i>Tribelos jucundum</i>	2			
85500	<i>Paratanytarsus sp</i>	7			
85821	<i>Tanytarsus glabrescens group sp 7</i>	3			
96120	<i>Menetus (Micromenetus) dilatatus</i>	7			
96900	<i>Ferrissia sp</i>	1 +			

No. Quantitative Taxa: 27

Total Taxa: 28

No. Qualitative Taxa: 5

LICI: 18

Number of Organisms: 1197

Qual EPT: 0

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Ottawa River
Stickney Ave.

Collection Date: 09/18/2007 River Code: 04-300 RM: 5.00

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
00653	<i>Eunapius fragilis</i>	+			
01320	<i>Hydra sp</i>	1			
01801	<i>Turbellaria</i>	37			
03451	<i>Urnatella gracilis</i>	2			
03600	<i>Oligochaeta</i>	982 +			
04664	<i>Helobdella stagnalis</i>	+			
04666	<i>Helobdella triserialis</i>	+			
05800	<i>Caecidotea sp</i>	+			
06700	<i>Crangonyx sp</i>	1			
08250	<i>Orconectes (Procericambarus) rusticus</i>	+			
08601	<i>Hydrachnidia</i>	2			
22001	<i>Coenagrionidae</i>	1 +			
22300	<i>Argia sp</i>	4 +			
45400	<i>Trichocorixa sp</i>	+			
60900	<i>Peltodytes sp</i>	+			
77500	<i>Conchapelopia sp</i>	2			
80410	<i>Cricotopus (C.) sp</i>	1			
80510	<i>Cricotopus (Isocladius) sylvestris group</i>	1			
82730	<i>Chironomus (C.) decorus group</i>	1			
83002	<i>Dicrotendipes modestus</i>	3			
83040	<i>Dicrotendipes neomodestus</i>	6			
83300	<i>Glyptotendipes (G.) sp</i>	13 +			
84000	<i>Parachironomus sp</i>	6			
84415	<i>Polypedilum (P.) sp</i>	1			
84450	<i>Polypedilum (Uresipedilum) flavum</i>	3			
84460	<i>Polypedilum (P.) fallax group</i>	3			
84470	<i>Polypedilum (P.) illinoense</i>	32 +			
84540	<i>Polypedilum (Tripodura) scalaenum group</i>	4			
84790	<i>Tribelos fuscicorne</i>	2 +			
84800	<i>Tribelos jucundum</i>	1			
85500	<i>Paratanytarsus sp</i>	4			
85821	<i>Tanytarsus glabrescens group sp 7</i>	8			
95100	<i>Physella sp</i>	3			
96120	<i>Menetus (Micromenetus) dilatatus</i>	32			
96900	<i>Ferrissia sp</i>	30 +			
98001	<i>Sphaeriidae</i>	1			

No. Quantitative Taxa: 29

Total Taxa: 36

No. Qualitative Taxa: 14

LICI: 16

Number of Organisms: 1187

Qual EPT: 0

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Ottawa River

Collection Date: 09/18/2007 River Code: 04-300 RM: 4.60

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01801	<i>Turbellaria</i>	1			
03360	<i>Plumatella sp</i>	+			
03600	<i>Oligochaeta</i>	812 +			
04666	<i>Helobdella triserialis</i>	+			
05800	<i>Caecidotea sp</i>	+			
06810	<i>Gammarus fasciatus</i>	2			
21200	<i>Calopteryx sp</i>	+			
22300	<i>Argia sp</i>	6 +			
45400	<i>Trichocorixa sp</i>	+			
51206	<i>Cyrmellus fraternus</i>	1			
77500	<i>Conchapelopia sp</i>	5			
80420	<i>Cricotopus (C.) bicinctus</i>	11			
82730	<i>Chironomus (C.) decorus group</i>	5			
83002	<i>Dicrotendipes modestus</i>	21			
83040	<i>Dicrotendipes neomodestus</i>	21			
83050	<i>Dicrotendipes lucifer</i>	11			
83051	<i>Dicrotendipes simpsoni</i>	26			
83300	<i>Glyptotendipes (G.) sp</i>	290 +			
84000	<i>Parachironomus sp</i>	11			
84450	<i>Polypedilum (Uresipedilum) flavum</i>	5			
84460	<i>Polypedilum (P.) fallax group</i>	26			
84470	<i>Polypedilum (P.) illinoense</i>	53 +			
84540	<i>Polypedilum (Tripodura) scalaenum group</i>	5			
84800	<i>Tribelos jucundum</i>	5			
85500	<i>Paratanytarsus sp</i>	11			
85821	<i>Tanytarsus glabrescens group sp 7</i>	5			
96120	<i>Menetus (Micromenetus) dilatatus</i>	4			
96900	<i>Ferrissia sp</i>	1 +			
98001	<i>Sphaeriidae</i>	2			

No. Quantitative Taxa: 24 Total Taxa: 29
 No. Qualitative Taxa: 10 LICI: 22
 Number of Organisms: 1340 Qual EPT: 0

**Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection**

Site: Ottawa River
adj. Hoffman Rd. Landfill

Collection Date: 09/18/2007 River Code: 04-300 RM: 3.50

Taxa Code	Taxa	Quant/Qual	Taxa Code	Taxa	Quant/Qual
01200	<i>Cordylophora lacustris</i>	1			
01320	<i>Hydra sp</i>	1			
01801	<i>Turbellaria</i>	2			
03360	<i>Plumatella sp</i>	+			
03600	<i>Oligochaeta</i>	781 +			
04664	<i>Helobdella stagnalis</i>	+			
05800	<i>Caecidotea sp</i>	+			
06700	<i>Crangonyx sp</i>	1			
22001	<i>Coenagrionidae</i>	+			
22300	<i>Argia sp</i>	+			
45400	<i>Trichocorixa sp</i>	+			
51206	<i>Cyrnellus fraternus</i>	20			
81200	<i>Nanocladius sp</i>	40			
82730	<i>Chironomus (C.) decorus group</i>	40			
83040	<i>Dicrotendipes neomodestus</i>	40 +			
83050	<i>Dicrotendipes lucifer</i>	160			
83051	<i>Dicrotendipes simpsoni</i>	360 +			
83300	<i>Glyptotendipes (G.) sp</i>	1180 +			
83700	<i>Microchironomus sp</i>	+			
84315	<i>Phaenopsectra flavipes</i>	+			
84460	<i>Polypedilum (P.) fallax group</i>	+			
84470	<i>Polypedilum (P.) illinoense</i>	40 +			
92615	<i>Cipangopaludina japonica</i>	1			
95100	<i>Physella sp</i>	35 +			

No. Quantitative Taxa: 15

Total Taxa: 24

No. Qualitative Taxa: 15

LICI: **14**

Number of Organisms: 2702

Qual EPT: 0

Appendix Table 6. Invertebrate Community Index (LICI) metrics and scores for sites sampled in the Ottawa River, 2007.

River Mile	Percent Lacustrary	Number of			Percent:					Diptera/ft ²	Qual. EPT	Eco-region	LICI
		Total Taxa	Sensitive Taxa	Dipteran Taxa	Mayflies & Caddisflies	Gatherers ^a	Sensitive Organisms	Other Diptera ^b	Predom Taxon				
Ottawa River (04-300)													
Year: 2007													
8.00	88.9	20(2)	2(0)	12(2)	0.4(2)	93.5(0)	7.7(4)	81.7(2)	37.4(6)	253(4)	0(0)	1	22
6.80	75.6	20(2)	2(0)	14(4)	0.0(0)	82.6(2)	3.1(2)	95.0(0)	46.1(4)	278(4)	0(0)	1	18
6.20	68.9	22(2)	2(0)	15(4)	0.0(0)	82.7(2)	2.4(2)	95.0(0)	54.3(4)	127(6)	0(0)	1	20
5.80	64.4	23(2)	2(0)	16(4)	0.1(2)	90.6(0)	1.0(2)	98.4(0)	76.4(2)	36.8(6)	0(0)	1	18
5.50	61.1	24(4)	1(0)	15(4)	0.0(0)	83.6(2)	1.9(2)	96.2(0)	50.8(4)	18.6(6)	0(0)	1	22
5.30	58.9	27(4)	2(0)	18(4)	0.1(2)	98.0(0)	0.3(2)	98.2(0)	89.6(0)	16.4(6)	0(0)	1	18
5.00	55.6	29(4)	2(0)	17(4)	0.0(0)	93.3(0)	0.8(2)	98.6(0)	82.7(0)	18.2(6)	0(0)	1	16
4.60	48.9	24(4)	1(0)	16(4)	0.1(2)	97.8(0)	0.4(2)	98.3(0)	60.6(4)	102(6)	0(0)	1	22
3.50	42.2	15(2)	0(0)	7(2)	0.7(2)	97.9(0)	0.0(0)	99.3(0)	43.7(4)	372(4)	0(0)	1	14

^a Percent of total gatherers as individuals excluding zebra mussels (*Dreissena polymorpha*).

^b Percent of dipterans as individuals excluding the midge tribe Tanytarsini.

River Mile	Drainage Area (sq mi)	Number of				Percent:					Qual. EPT	Eco-region	ICI
		Total Taxa	Mayfly Taxa	Caddisfly Taxa	Dipteran Taxa	Mayflies	Caddisflies	Tany-tarsini	Other Dipt/NI	Tolerant Organisms			
Ottawa River (04-300)													
Year: 2007													
8.60	155.0	32(4)	3(2)	2(2)	20(6)	1.2(2)	8.7(2)	13.8(2)	76.0(0)	35.8(0)	4(0)	1	20

Appendix Table 7. Fish tissue analytical results of common carp fillet samples from the Ottawa River, 2007. Values are reported on a wet weight basis.

River Mile	8.6	8.0	6.8	6.2	5.8	5.5	5.3	5.0	4.6	3.5
Fish Species	common carp									
Sample Type	SFFC									
Date Sampled	9/20/2007	9/20/2007	9/20/2007	9/20/2007	9/19/2007	9/19/2007	9/19/2007	9/19/2007	9/19/2007	9/19/2007
Percent Lipids	5.5	3.8	3.5	2.5	4.0	7.7	2.8	2.9	1.9	4.0
PCBs (ug/kg)										
PCB-1016	<2800 G	<1100 G	<1000 G	<510 G	<1100 G	<3000 G	<1300 G	<2100 G	<860 G	<1200 G
PCB-1221	<1400 G	<1000	<500	<200	<500	<1500 G	<630 G	<1100 G	<420 G	<500
PCB-1232	<4200 G	<1600 G	<1500 G	<790 G	<1700 G	<4400 G	<1900 G	<3100 G	<1200 G	<1800 G
PCB-1242	<2900 G	<1000 G	<920 G	<490 G	<1300 G	<3600 G	<1600 G	<2600 G	<820 G	<1100 G
PCB-1248	3600 AP	1900 AP	1700 AP	1100 AP	2500 AP	3900 AP	2100 AP	3000 AP	1100 AP	2400 AP
PCB-1254	1600 AP	<1000	920 AP	570 AP	1200 AP	1600 AP	1100 AP	1300 AP	500 AP	1000 AP
PCB-1260	<1000	<1000	610 AP	400 AP	520 AP	<1000	<500	<1000	<200	<500
Pesticides (ug/kg)										
Aldrin	NA	NA	NA	NA	<25	<25	<15	<25	NA	NA
alpha-BHC	NA	NA	NA	NA	<25	<25	<15	<25	NA	NA
beta-BHC	NA	NA	NA	NA	<25	<25	<15	<25	NA	NA
delta-BHC	NA	NA	NA	NA	61	<25	<15	<25	NA	NA
gamma-BHC (Lindane)	NA	NA	NA	NA	<25	<25	<15	<25	NA	NA
Chlordane (technical)	NA	NA	NA	NA	<270	<430 G	<320 G	<310 G	NA	NA
4,4'-DDD	NA	NA	NA	NA	93	110	64	92	NA	NA
4,4'-DDE	NA	NA	NA	NA	140	150	100	130	NA	NA
4,4'-DDT	NA	NA	NA	NA	48	55	42	48	NA	NA
Dieldrin	NA	NA	NA	NA	<25	<25	<15	<25	NA	NA
Endrin	NA	NA	NA	NA	<25	<25	<15	<25	NA	NA
Endosulfan I	NA	NA	NA	NA	<25	<25	<15	<25	NA	NA
Endosulfan II	NA	NA	NA	NA	<25	<25	<15	<25	NA	NA
Endosulfan Sulfate	NA	NA	NA	NA	<25	<25	<15	<25	NA	NA
Endrin aldehyde	NA	NA	NA	NA	<25	<25	<15	<25	NA	NA
Heptachlor	NA	NA	NA	NA	<25	<25	<15	<25	NA	NA
Heptachlor Epoxide	NA	NA	NA	NA	<25	<25	<15	<25	NA	NA
Methoxychlor	NA	NA	NA	NA	<50	<50	<30	<50	NA	NA
Toxaphene	NA	NA	NA	NA	<1000	<1000	<600	<1000	NA	NA

G - Elevated reporting limit due to matrix interference.

AP - Altered pattern.

COL - More than 40% RPD between primary and confirmation column results. The lower of the two results is reported.

Appendix Table 8. Fish tissue analytical results of pumpkinseed sunfish whole body samples from the Ottawa River, 2007. Values are reported on a wet weight basis.

River Mile	8.6	8.0	6.8	6.2	5.8	5.5	5.3	5.0	4.6	3.5
Fish Species	pumpkinseed sunfish									
Sample Type	WBC									
Date Sampled	9/20/2007	9/20/2007	9/20/2007	9/20/2007	9/19/2007	9/19/2007	9/19/2007	9/19/2007	9/19/2007	9/19/2007
Percent Lipids	2.3	2.8	2.0	1.7	1.9	2.0	2.0	1.9	1.7	3.2
PCBs (ug/kg)										
PCB-1016	<300 G	<450 G	<410 G	<530 G	<880 G	<1100 G	<1100 G	<1200 G	<1200 G	<930 G
PCB-1221	<200	<250	<250	<250	<500	<630 G	<620 G	<650 G	<630 G	<500
PCB-1232	<440 G	<700 G	<570 G	<800 G	<1400 G	<1800 G	<1800 G	<2000 G	<1900 G	<1300 G
PCB-1242	<280 G	<450 G	<350 G	<490 G	<1200 G	1600 AP	1600 AP	<1300 G	<1200 G	<830 G
PCB-1248	480 AP	630 AP	650 AP	870 AP	1200 AP	<1200 G	<1200 G	1500 AP	1400 AP	1300 AP
PCB-1254	290 AP	360 AP	360 AP	470 AP	660 AP	680 AP	580 AP	690 AP	670 AP	600 AP
PCB-1260	<200	<250	<250	<250	<500	<500	<500	<500	<500	<500
Pesticides (ug/kg)										
Aldrin	NA	NA	NA	NA	<5.0	<5.0	<5.0	<5.0	NA	NA
alpha-BHC	NA	NA	NA	NA	<5.0	<5.0	<5.0	<5.0	NA	NA
beta-BHC	NA	NA	NA	NA	<5.0	<5.0	<5.0	<5.0	NA	NA
delta-BHC	NA	NA	NA	NA	<5.0	<5.0	<5.0	<5.0	NA	NA
gamma-BHC (Lindane)	NA	NA	NA	NA	<5.0	<5.0	<5.0	<5.0	NA	NA
Chlordane (technical)	NA	NA	NA	NA	<170 G	<190 G	<160 G	<160 G	NA	NA
4,4'-DDD	NA	NA	NA	NA	38	54	42	43	NA	NA
4,4'-DDE	NA	NA	NA	NA	82	66	57	67	NA	NA
4,4'-DDT	NA	NA	NA	NA	10 COL	28	20	7.9 COL	NA	NA
Dieldrin	NA	NA	NA	NA	13	21	20	15	NA	NA
Endrin	NA	NA	NA	NA	<5.0	<5.0	<5.0	5.4 COL	NA	NA
Endosulfan I	NA	NA	NA	NA	<5.0	<5.0	<5.0	<5.0	NA	NA
Endosulfan II	NA	NA	NA	NA	<5.0	<5.0	<5.0	<5.0	NA	NA
Endosulfan Sulfate	NA	NA	NA	NA	<5.0	<5.0	<5.0	<5.0	NA	NA
Endrin aldehyde	NA	NA	NA	NA	5	<5.0	<5.0	<5.0	NA	NA
Heptachlor	NA	NA	NA	NA	5.2 COL	6.8 COL	5.6 COL	5.9 COL	NA	NA
Heptachlor Epoxide	NA	NA	NA	NA	7.7 COL	7.6 COL	6.2 COL	6.5 COL	NA	NA
Methoxychlor	NA	NA	NA	NA	<10	<10	<10	<10	NA	NA
Toxaphene	NA	NA	NA	NA	<230 G	<360 G	<320 G	<210 G	NA	NA

G - Elevated reporting limit due to matrix interference.

AP - Altered pattern.

COL - More than 40% RPD between primary and confirmation column results. The lower of the two results is reported.

Appendix Table 9. Fish tissue sample information for the Ottawa River, 2007. SFFC = skin off fillet composite, WBC = whole body composite

Station/River Mile	Fish Species	Sample #	Sample Type	Individual Fish Measurements Total Length (mm)/ Weight (grams)
8.6	Common carp	ORFT8.6CC	SFFC	570/2600, 565/2500, 608/3200, 545/2500, 520/1950
8.0	Common carp	ORFT8.0CC	SFFC	485/1800, 485/1550, 444/2050, 495/2075, 498/1900
6.8	Common carp	ORFT6.8CC	SFFC	476/1950, 534/1975, 498/1950, 480/1600, 502/1900
6.2	Common carp	ORFT6.5CC	SFFC	470/1750, 455/1600, 492/1725, 525/1900, 475/1500
5.8	Common carp	ORFT5.8CC	SFFC	461/1400, 499/1725, 514/2000, 452/1200, 440/1200
5.5	Common carp	ORFT5.5CC	SFFC	512/1700, 445/1450, 455/1500, 491/1600, 464/1300
5.3	Common carp	ORFT5.3CC	SFFC	505/1800, 482/1425, 493/1600, 480/1500
5.0	Common carp	ORFT5.0CC	SFFC	453/1500, 451/1375, 462/1375, 467/1500, 462/1700
4.6	Common carp	ORFT4.6CC	SFFC	465/1475, 472/1550, 471/1650, 480/1875, 498/2050
3.5	Common carp	ORFT3.5CC	SFFC	514/1900, 535/2200, 523/2275
8.6	Pumpkinseed sunfish	ORFT8.6PS	WBC	145/50, 125/38, 120/36, 140/53, 125/36, 110/28, 175/96
8.0	Pumpkinseed sunfish	ORFT8.0PS	WBC	115/35, 151/65, 137/52, 118/33, 114/30, 111/25
6.8	Pumpkinseed sunfish	ORFT6.8PS	WBC	134/30, 120/34, 107/22, 132/54, 120/32, 157/84
6.2	Pumpkinseed sunfish	ORFT6.5PS	WBC	120/24, 112/28, 109/22, 120/29, 121/37, 141/54, 161/35, 108/28, 112/33
5.8	Pumpkinseed sunfish	ORFT5.8PS	WBC	119/38, 132/56, 115/34, 123/43, 117/36, 129/45, 130/41, 127/42
5.5	Pumpkinseed sunfish	ORFT5.5PS	WBC	120/39, 141/58, 118/32, 109/28, 145/70, 133/55, 134/58
5.3	Pumpkinseed sunfish	ORFT5.3PS	WBC	115/28, 118/36, 125/40, 152/75, 137/44, 114/32, 110/27
5.0	Pumpkinseed sunfish	ORFT5.0PS	WBC	105/20, 151/75, 111/25, 102/19, 112/28, 126/39, 104/15, 109/29
4.6	Pumpkinseed sunfish	ORFT4.6PS	WBC	119/31, 120/38, 125/40, 109/27, 117/35, 115/28, 107/25, 110/26
3.5	Pumpkinseed sunfish	ORFT3.5PS	WBC	132/45, 157/88, 132/45, 130/43, 142/51, 135/43, 139/53