

Biological and Habitat Assessment of Selected Clermont County Streams

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Submitted by:

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PROJECT SUMMARY

The Midwest Biodiversity Institute, Inc. (MBI) was tasked by the Clermont Co. Soil and Water Conservation District (SWCD) to perform a biological and habitat assessment of selected stream and river locations in Clermont Co. during the summer-fall index period of 2006. Fish, macroinvertebrate, and habitat data were collected at six locations, two each in the E. Fork Little Miami River, Stonelick Creek, and the East Fork of Avey's Run during August and early October 2006. All data collection and analysis methods used were in accordance with Ohio EPA standard protocols (Ohio EPA 1987, 1989a,b). The results were evaluated in accordance with the biological criteria codified in the Ohio water quality standards (WQS; Ohio Administrative Code 3745-1) and Ohio EPA reporting practices. The data were managed and analyzed by MBI using the Ohio ECOS data management programs. We also accessed relevant historical biological and habitat data that is available.

East Fork L. Miami River

Two sites were sampled for fish and macroinvertebrates immediately upstream and downstream from a low head dam located in Williamsburg. The downstream site was located at river mile (RM) 36.2 and consisted of free-flowing lotic habitat. The upstream site (RM 36.7) was partially impounded by the low head dam. The results indicated full attainment of the Exceptional Warmwater Habitat (WWH) aquatic life use designation biological criteria at the downstream site (RM 36.2; Table 1). The fish Index of Biotic Integrity (IBI) and Modified Index of Well-Being (MIwb) results were above the ecoregional biocriteria. The Invertebrate Community Index (ICI) score of 42 was within the non-significant departure for this index hence it was considered to be in attainment of the EWH biocriterion. The EWH status was partial attainment at the upstream site (RM 36.7) because the macroinvertebrate assemblage failed to meet the EWH biocriterion based on a qualitative assessment. Both the IBI and MIwb values were in non-significant departure from the EWH biocriteria (Table 1). QHEI scores showed the change in habitat quality

Table 1. Aquatic life use attainment status of six locations sampled in three Clermont Co. streams during August and October 2006.

| River Mile | IBI | MIwb | ICI | QHEI | Status | Comments |
|---|------------------|-------------------|------------------|------|---------|-----------------------|
| <i>East Fork Little Miami River</i> | | | | | | |
| <i>Interior Plateau Ecoregion – Exceptional Warmwater Habitat (EWH)</i> | | | | | | |
| 36.7 ^B | 46 ^{ns} | 9.5 ^{ns} | G* | 75 | PARTIAL | Partial impoundment |
| 36.2 ^W | 52 | 10.6 | 42 ^{ns} | 93.5 | FULL | Dst. low head dam |
| <i>Stonelick Creek</i> | | | | | | |
| <i>Interior Plateau Ecoregion – Warmwater Habitat (WWH)</i> | | | | | | |
| 10.7 ^W | 30* | 7.5* | G | 90 | PARTIAL | |
| 10.5 ^W | 32* | 7.4* | G | 90 | PARTIAL | |
| <i>East Branch Avey Run</i> | | | | | | |
| <i>Interior Plateau Ecoregion – Undesignated</i> | | | | | | |
| 0.4 | 27* | NA | ND | 80 | NA | Ust. restoration site |
| 0.1 | 25* | NA | ND | 65 | NA | Restoration reach |

^W - site sampled with wading method.
^B - site sampled with boat method.
 * - significant exceedence of numerical biocriterion.
 ND - not determined
 NA - not applicable

| Ecoregion Biocriteria: Interior Plateau (IP) | | | |
|---|-----|-----|-----|
| Index | WWH | EWH | MWH |
| IBI - Headwater | 40 | 50 | 24 |
| IBI - Wading | 40 | 50 | 24 |
| MIwb - Wading | 8.1 | 9.4 | 6.2 |
| IBI - Boat | 38 | 48 | 24 |
| MIwb - Boat | 8.7 | 9.6 | 5.8 |
| ICI - all sites | 34 | 46 | 22 |
| ICI - Narrative | G* | E | F |

* G = Good; E = Exceptional; F = Fair

from excellent downstream to good upstream, the latter being affected by the partially impounded habitat at RM 36.7. The partial impairment of the EWH use designation is attributable to the impounded habitat at this site. Historical results based on sampling by Ohio EPA indicate consistent attainment of the EWH biocriteria at the downstream site.

Stonelick Creek

Two sites were sampled for fish and macroinvertebrates immediately upstream (RM 10.7) and downstream (RM 10.5) from the confluence with Newtonsville Creek (RM 10.6). Both sites consisted of free-flowing lotic habitat. The results indicate partial attainment of the Warmwater Habitat (WWH) aquatic life use designation at both sites (Table 1). The fish Index of Biotic Integrity (IBI) and Modified Index of Well-Being (MIwb) results were significantly below the ecoregional biocriteria and indicative of fair quality. The macroinvertebrate assemblage met the WWH biocriterion based on a qualitative assessment of good. QHEI scores indicated excellent instream habitat at both sites. Historical data from the lower 10 miles of Stonelick Creek collected since 1982 seems to suggest a historical impact that emanates upstream from the 2006 sites.

East Branch Avey's Run

The East Branch of Avey's Run was sampled at two locations upstream and within a proposed habitat restoration project area located in the Cincinnati Nature Center. Fish and qualitative macroinvertebrate sampling were performed at RM 0.4 and RM 0.1. Fish were present in good numbers at both sites with 3 species collected at RM 0.4 and 2 species at RM 0.1. The fish IBI scores were well below the ecoregional biocriterion for WWH (Table 1), which may be an indication of the inapplicability of that use. Larval salamanders (presumably two-lined salamander) were collected in low numbers at both sites. The macroinvertebrate assemblage was also characteristic of primary headwater streams and included 10 taxa of which seven were class I and three class II (Ohio EPA 2002) at the upstream site (RM 0.4). The downstream site (RM 0.1) yielded 7 taxa that included three class III and three class II headwater taxa. These results suggest that Avey's Run is a candidate for eventual designation under the Primary Headwater Habitat methodology of Ohio EPA. The QHEI results indicated good habitat at the upstream site and marginal quality at the downstream site, which was modified by a channel relocation project. The habitat of the upstream site was characteristic of a primary headwater having shallow pools and intermittent flows. The downstream site exhibited an accumulation of modified attributes reflecting the previous relocation of the stream channel.

STUDY AREA

In order to show water quality improvements of selected projects undertaken by the Clermont SWCD and the East Fork Watershed Collaborative biological and habitat data was collected to provide pre and post project information. The biological and habitat data will be used to determine the effectiveness of the ongoing and proposed projects. MBI performed biological and habitat assessments at each project area as follows.

East Fork Little Miami River

A low head dam located in the village of Williamsburg was built in the early 20th century to provide drinking water. Williamsburg now receives their drinking water from Clermont Co. and no longer requires this source. The East Fork Watershed Collaborative and Clermont Co. are in discussions with the village of Williamsburg concerning the removal of the dam. A site-specific biological and habitat assessment is needed to determine the potential benefits and impacts to biological, habitat, and water quality. Sampling was conducted at two locations, one immediately downstream from the dam (RM 36.2) and one immediately upstream in the impoundment (RM 36.7; Figure 1).

Stonelick Creek

Newtonsville Creek receives discharges from a large number of home sewage treatment systems that release partially or improperly treated sewage in and around the Village of Newtonsville. Results from chemical and microbiological sampling conducted in Newtonsville Creek and its tributaries indicate high levels of fecal contaminants. Clermont Co. is interested to know if these contaminants are having any negative impacts on the biological communities in Stonelick Creek downstream from the confluence with Newtonsville Run. To this end a biological and habitat assessment was performed in Stonelick Creek immediately upstream (RM 10.7) and downstream (RM 10.5) from the confluence with Newtonsville Creek, which is approximately 0.9 miles downstream from the village of Newtonsville (Figure 2).

East Branch Avey's Run

The Clermont Soil and Water Conservation District and East Fork Watershed Collaborative are engaged in a restoration project to enhance 1700 feet of the East Branch of Avey's Run located along property owned by the Cincinnati Nature Center. The primary goals of the stream restoration project are: 1) to improve water quality in the Lower East Fork watershed by improving stream and riparian function of this headwater stream; and 2) to enhance stream and riparian habitat consistent with the educational mission of the Cincinnati Nature Center. Two sites were assessed for biological and habitat quality (RM 0.4 and 0.1; Figure 3). Siltation and nutrients are listed as leading causes of impairment to the East Branch and Salt Run in the Lower East Fork Watershed as documented in the Lower East Fork Watershed Action Plan. The project stream, a small headwater tributary to Salt Run, is currently experiencing bank erosion due to previous channelization, down cutting, and subsequent lateral migration. The sediment released from the erosion is likely causing downstream siltation, as well as increased nutrient loadings. In order to reduce these impacts and improve water quality, natural channel design techniques will be used to return the channel to a stable, self-maintaining form that can transport its flow and sediment discharge without eroding or aggrading.

METHODS

The biological and habitat assessment employed in this study followed the field and laboratory methods and protocols of Ohio EPA. This includes the assessment of two

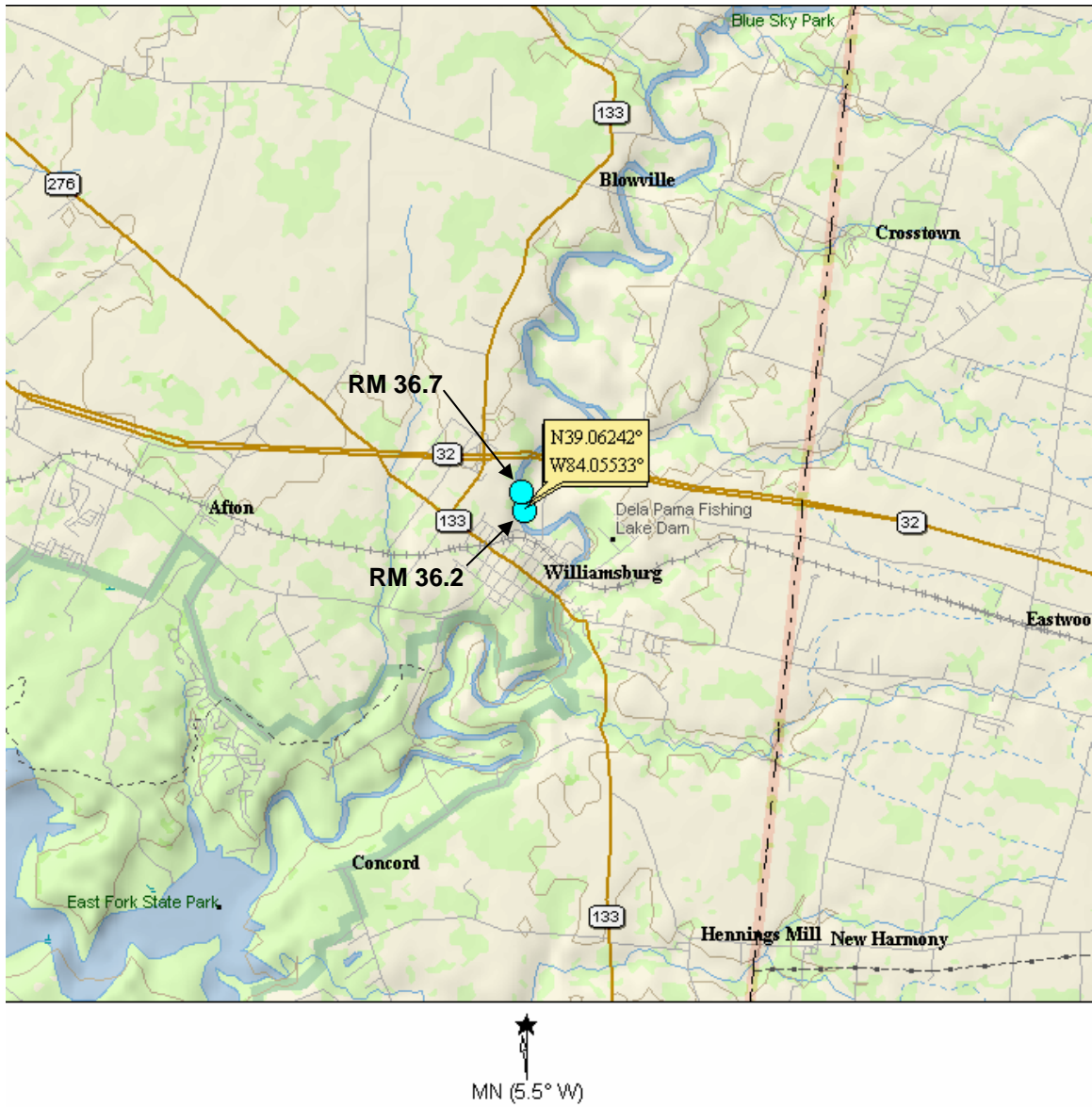


Figure 1. E. Fork L. Miami River study area map showing the village of Williamsburg and the location of the biological and habitat assessment sites upstream (RM 36.7) and downstream (RM 36.2) from the low head dam.

biological assemblages, fish and macroinvertebrates (Ohio EPA 1987, 1989a), the Primary Headwater Habitat methodology (Ohio EPA 2002 a,b,c), and the Qualitative Habitat Evaluation Index (QHEI; Ohio EPA 1989a, 2006; Rankin 1989, 1995).

Fish Assemblage Methods

Two methods for sampling the fish assemblage were used at each of the two E. Fork L. Miami River sampling sites. A wading electrofishing method was used at the downstream (RM 36.2) site and a boat mounted electrofishing method was used in the partially impounded upstream site (RM 36.7). The choice of method is dependent on site features such as depth and width and is made on a site-specific basis by the crew leader following

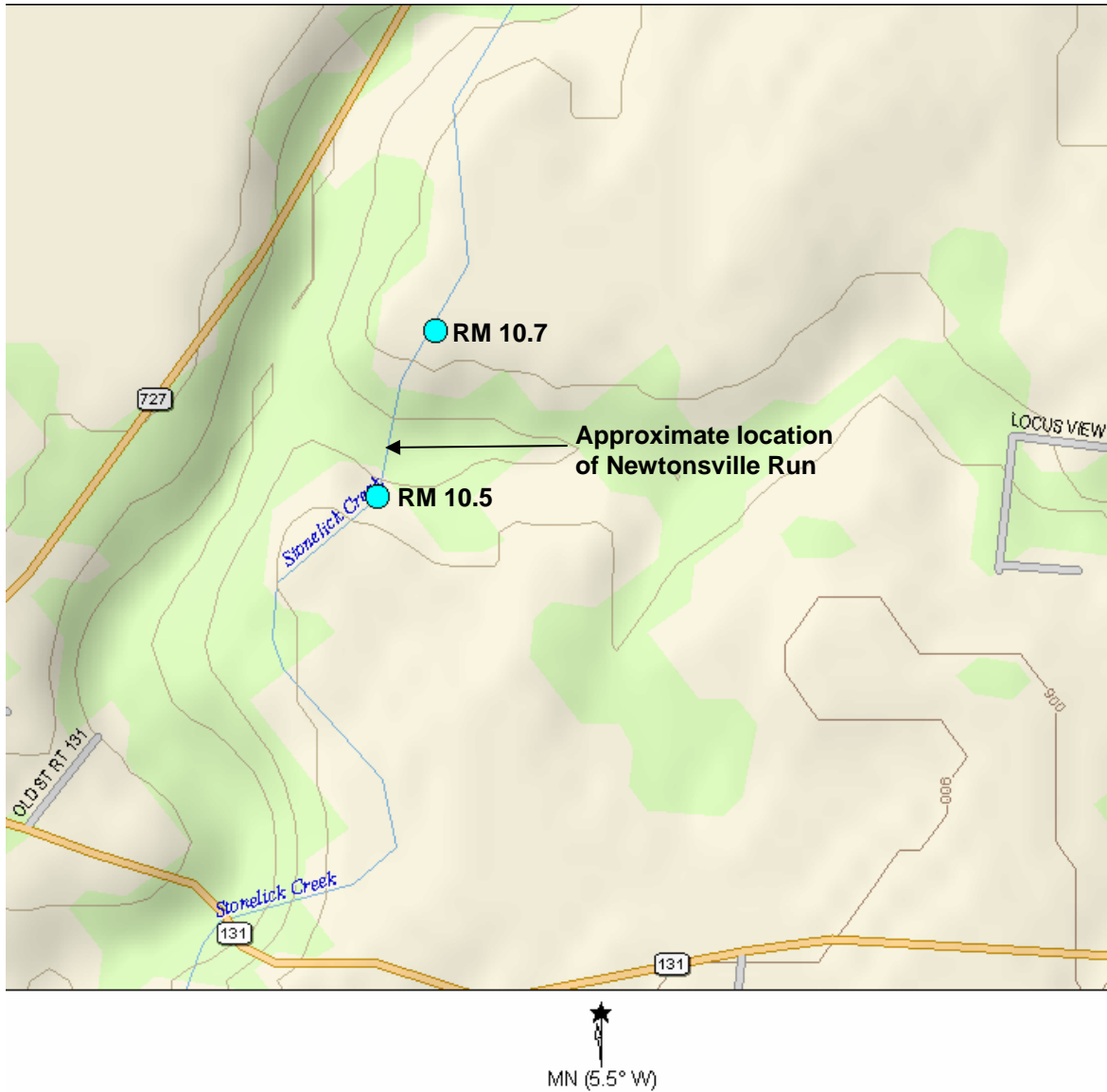


Figure 2. Study area map showing the location of the two biological and habitat assessment sites in Stonelick Creek upstream (RM 10.7) and downstream (RM 10.5) from Newtonsville Run (does not show on the map).

the guidance in Ohio EPA (1987, 1989a) and Yoder and Smith (1999). The biological indices that result from each method are independently calibrated and can be used interchangeably in the same river or stream provided they are not applied outside their calibration domain. The drainage area at the two study sites (234 mi.²) is within the domain for the calibration of the wading and boat methods.

Boat Methods

Boat methods are used in stream and river channels that are too deep and wide to be sampled effectively with wading equipment due to the limitations of the gear and its application. These range in size from small rivers (>150 mi.² drainage area) to the largest rivers (>1000-

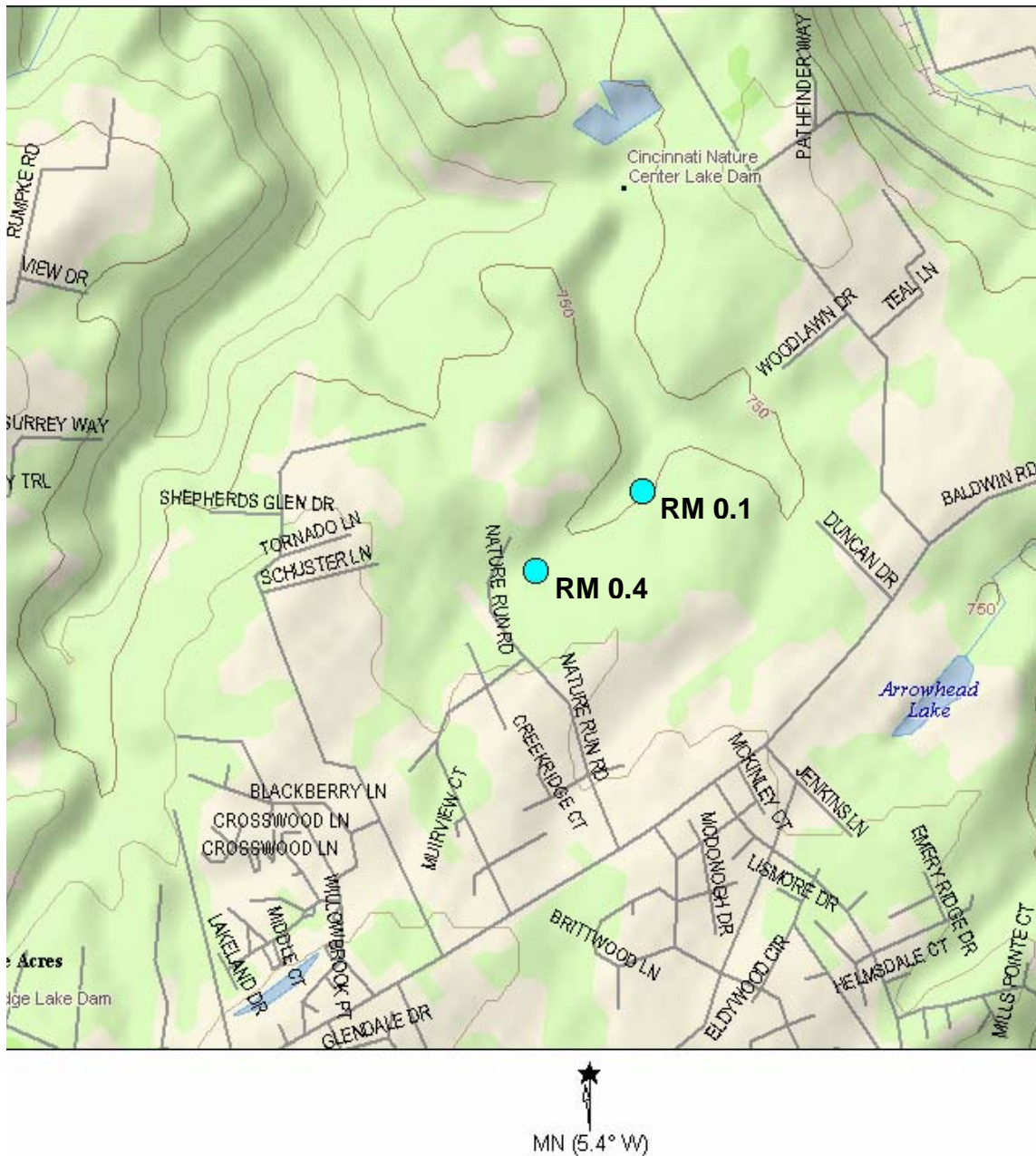


Figure 3. Study area map showing the location of the two biological and habitat assessment sites in the E. Branch Avey's Run adjacent to (RM 0.4) and downstream (RM 0.1) from the Cincinnati Nature Center (E. Branch Avey's Run does not show on the map).

6000 mi.² drainage area; Yoder and Smith 1999). Hence this method was applied at the partially impounded upstream site in the E. Fork L. Miami River (Figure 1). The boat mounted electrofishing apparatus is rigged on a 3.65 m wide beam (1.8 m) john boat and maneuvered with a 15 h.p. outboard motor. A Smith-Root 5.0 GPP electrofishing unit is used to generate pulsed D.C. current that is transmitted through the water by an arrangement of anodes and cathodes suspended in the water from the boat. Stainless steel cable anodes are hung from a retractable aluminum boom which extends approximately 2 m in front of the

boat. Four anodes are positioned on the front of the boom in a line perpendicular to the length of the boat. They consisted of single lengths of 3/16" stainless steel woven cable. Cathodes consisted of four 3/4" diameter flexible stainless steel conduit cut to lengths of 6-8' and suspended in a line perpendicular to the length of the boat directly from the bow. Wiring from the pulsator to the electrodes is encased in plastic conduit to protect against shorts and electrical shock. A positive pressure foot pedal switch is located on the bow platform and operated by a primary netter. Emergency cutoff switches are located within easy reach of the boat driver on the rear seat and on the 5.0 GPP controls.

Electrofishing unit settings are typically governed by relative conductivity. Ohio waters generally have relative conductivity values $>200-500 \mu\text{s}/\text{m}^2$ and thus necessitate using the low voltage range settings (maximum = 500 v) at 40-80% of the voltage range to produce 12-20 amperes. The settings used at a given site are based on trial and error using the voltage range that produces the highest amperage readings. A boat sampling crew consists of a netter and a driver each clad in chest waders and rubber gloves; the netter wears a personal flotation device. The netter's primary responsibility is to capture all fish sighted; the driver's responsibility is to maneuver the boat so as to provide the netter the best opportunity to capture stunned fish (the driver may assist in netting stunned fish that appear near the stern or behind the boat). Each 500 meter sampling zone is fished in a downstream direction by slowly and steadily maneuvering the electrofishing boat along the shoreline and in and around submerged objects by motoring or, if necessary, rowing or pushing. This usually requires frequent turning, backing, shifting (forward, reverse), changing speed, etc. in areas of moderate to extensive cover. It is absolutely essential to sample carefully, particularly at difficult sites where extensive woody debris or moderately fast to swift current requires skillful maneuvering. In zones with extensive woody debris and slow current it is necessary to maneuver the boat in and out of the "pockets" of habitat formed by the debris. Where water depth approaches 1.5-2.0 m it is frequently necessary to "wait" for fish to appear near the surface. In moderately fast or swift current it is necessary to conduct fast turns and maneuvers in order to put the netter in the best position to capture stunned fish. Site distance was determined with a GPS unit or with a laser range finder.

Wading Methods

Wading methods are used in streams that cannot be sampled with boat-mounted equipment due to the physical limitations of the stream channel. These range in size from the smallest headwater streams ($<1-20 \text{ mi.}^2$ drainage area) to sites of $400-500 \text{ mi.}^2$ drainage area that typically range from 5-40 m in width and 0.5-1.0 m in depth (Yoder and Smith 1999). Hence they were applied at the downstream site in the E. Fork L. Miami River and both sites in Stonelick Creek and Avey's Run (Figures 1-3).

The wading methods used in this study included a Wisconsin battery-powered backpack electrofishing unit and a T&J 1736 VDC generator-powered pulsed D.C. electrofishing unit. The latter was used either as a bank-set longline method or rigged on a 2.1 m pram with floatable rollers a 30 gallon plastic live well. The Wisconsin battery back pack unit utilizes 125 or 250 VDC produced from a 12 volt deep cycle gel battery. The pulsed DC current is

transmitted through a hand held net ring controlled by a single netter. A positive pressure switch mounted on the net pole must be manually depressed to complete the switch circuit and allow electrical current to flow through the electrodes. The cathode (- electrode) consists of a 2 meter long strand of 6 mm diameter stainless steel woven cable extending directly from the backpack unit. An assist netter is included in a two person (minimum) crew and all fish are placed in a floating live well or bucket for later processing. This method is used in small streams that are no more than two times the depth or five times the width of the primary net ring per Ohio EPA (1989).

The T&J electrofishing unit is used in larger wadeable streams and consists of a 1750 watt variable voltage generator and a pulsator that has the capacity to produce 150-300 volts pulsed D.C. The primary dip net ring serves as the anode (+ electrode). A positive pressure switch mounted on the net pole must be manually depressed to complete the switch circuit and allow electrical current to flow through the electrodes. The cathode (- electrode) consists of a 2 meter long strand of 6 mm diameter stainless steel woven cable attached to the bow of the pram. A three person crew clad in chest waders and rubber gloves performs the sampling proceeding in a general upstream direction for a distance of 150-200 meters. The primary netter operates the anode net ring while one crew member operates the pram and the third crew member assists in capturing stunned fish. The primary netter works the net ring beneath undercut banks, in and around root wads, woody debris, large boulders and other submerged structure using various techniques to enhance capturing fish. An effective technique for capturing fish under submerged objects is to thrust the anode ring within and/or under the structure with the current off, activating the current, and then quickly withdrawing the anode ring in one swift motion. This has the effect of drawing fish out from under such structure making their capture possible. In wider and deeper pools the anode ring is "cast" ahead of the netter with the current on. This is an effective technique for capturing larger fish and mid-water pool species. In riffle and run areas the primary netter "rakes" the anode ring from upstream to downstream, allowing it to drift with the current. At the same time the assist netter blocks off an area downstream of the anode ring with the assist net. This enhances the capture of riffle dwelling species. Sites are located to begin and end in a riffle or other channel restriction. Site distance was determined with a GPS unit or with a laser range finder.

Sample Processing

In common to the wading and boat methods, all captured fish are immediately placed in a live well or floating live net for processing. For the former, we employed a system where the live well water is continuously aerated and periodically exchanged with ambient water to minimize stress and mortality of captured fish. Fish are released immediately after they are identified to species, weighed (except headwater sites), and examined for external anomalies. The majority of captured fish are identified to species in the field; however, any uncertainty about the field identification of individual fish requires preservation of voucher specimens for later laboratory identification (Ohio EPA 1989a). Fish are preserved in a borax buffered 10% formalin solution and labeled by date, river or stream, river mile, and crew leader and noted on the field data sheet. Identification is made to the species level at a minimum and may be done to

the subspecific level in certain instances. All fish that are weighed, whether done individually, in the aggregate, or in a subsample, are examined for the presence of gross external anomalies. An external anomaly is defined as the presence of a visible skin, extremity (fin, barbel, operculum), or subcutaneous disorder, and is expressed as the weighted percentage of affected fish among all fish weighed. In order to standardize the procedure for counting and identifying anomalies criteria have been established for their identification and enumeration (Ohio EPA 1989b; Sanders et al. 1999). Vouchers are processed in the lab and identified using available keys such in Trautman (1981) and deposited in the Ohio State University Museum of Biodiversity, where the identifications are verified.

Macroinvertebrate Assessment

Macroinvertebrates were sampled using modified Hester-Dendy artificial substrate samplers and a qualitative dip net/hand pick method in accordance with Ohio EPA methods (Ohio EPA 1987, 1989a). The artificial substrates were exposed for a colonization period of six weeks between early August and late September 2006. A qualitative sample using triangular frame dip nets and hand picking was collected at the time of substrate retrieval in September. This consisted of sampling all available habitat types in the vicinity of the substrate set by two persons for a minimum of 30 minutes and thereafter until no new taxa are being observed based on gross examination.

Samples were initially preserved in a 10% solution of formaldehyde. Substrates were then transferred to the laboratory, disassembled, sieved (standard no. 30 and 40), and transferred to 70% ethyl alcohol. Processing includes an initial scan and pre-pick for large and rare taxa followed by subsampling procedures in accordance with Ohio EPA (1989a). Identifications are performed to the best taxonomic resolution possible for the commonly encountered orders and families, which is genus/species for most orders and families.

The qualitative dip net/hand pick method was used exclusively in the East Fork of Avey's Run as the stream channel was too small to accommodate artificial substrates and it is outside of the calibration domain of that method. It was also relied on at sites where the substrates were not retrieved because of their loss due to high flows and/or vandalism. Such was the case at the downstream E. Fork L. Miami R. site and both sites on Stonelick Creek.

Habitat Assessment

A qualitative evaluation of macrohabitat was made by the fish field crew leader after each location was sampled using the Qualitative Habitat Evaluation Index (QHEI; Rankin 1989, 1995; Ohio EPA 2006). The QHEI is a physical habitat index designed to provide an empirical, qualitative evaluation of the lotic macrohabitat characteristics that are important to fish assemblages. It consists of a visual estimate of the quality, composition, amount, and extent of substrate, cover, channel, riparian, flow, pool/run/riffle, and gradient variables. It has been shown to correspond predictably with key attributes of fish assemblage quality (Rankin 1989, 1995) and as such is an important tool in the diagnosis of habitat related fish assemblage impairments. The QHEI was originally developed as a

rapid assessment tool and in recognition of the constraints associated with the practicalities of conducting a large-scale monitoring program, i.e., the need for a rapid assessment tool that yields meaningful information and which takes advantage of the knowledge and insights of experienced field biologists who conduct the biological assessment. The QHEI incorporates the types and quality substrate, the types and amounts of instream cover, several characteristics of channel morphology, riparian zone extent and quality, bank stability and condition, and pool-run-riffle quality and characteristics. Slope or gradient is also factored into the QHEI score. We followed the guidance and scoring procedures outlined in Ohio EPA (1989a, 2006) and Rankin (1989, 1995).

Chemical/Physical Measurements

Chemical/physical measurements were recorded at the beginning of each fish assemblage sampling event and included dissolved oxygen (D.O.), temperature (°C), and conductivity ($\mu\text{S}/\text{cm}^2$). These were recorded with a YSI Model 76 meter that was calibrated and maintained in accordance with the manufacturer specifications.

Data Management

All biological, habitat, and water quality data were managed in accordance with sound QA/QC procedures and as specified by Ohio EPA (1987, 1989a). All data is keyed into the Ohio ECOS system using screens formatted similar to the field sheets. Data entry accuracy is checked by proofreading raw entries and correcting transcription errors prior to running the analytical routines. Standard data queries include species and taxa summaries by sampling site and data, and biological index and metric values by site and sampling date. Sampling sites are identified by the Ohio ECOS river code system, the Ohio EPA River Mile Index (RMI) system, and georeferenced using latitude/longitude determined at the beginning and end of each site.

RESULTS

Fish Assemblage

The fish assemblage was assessed twice at 6 sites, two each in the E. Fork L. Miami River, Stonelick Creek, and Avey's Run in August and early October 2006.

E. Fork L. Miami River

Sampling at two sites produced 43 species and 1 hybrid with an average of 567 individuals/km and an average biomass of 71 kg/km (Appendix A). Thirty (30) species were collected at the upstream site (RM 36.7) with an average of 444 individuals/km and an average biomass of 107.6 kg/km. Predominant species by numbers included golden redbreast (22.1%), green sunfish (18.7%), longear sunfish (12.6%), bluntnose minnow (5.0%), and smallmouth bass (4.3%) and by weight included common carp (41.0%), golden redbreast (15.0%), bigmouth buffalo (8.9%), silver redbreast (6.6%), flathead catfish (6.5%), and channel catfish (4.9%). This compared to 40 species at the downstream site (RM 36.2) with an average of 691 individuals/km and 34.5 kg/km. Predominant species by numbers included bluntnose minnow (12.4%), greenside darter (10.2%), central

stoneroller (8.4%), northern hog sucker (7.9%), green sunfish (7.8%), spotfin shiner (6.3%), and rainbow darter (5.5%) and by weight included common carp (22.3%), channel catfish (13.5%), northern hog sucker (13.0%), silver redhorse (11.0%), golden redhorse (10.8%), and smallmouth bass (7.4%).

The Modified Index of Well-Being (MIwb) scores were slightly higher downstream (average MIwb = 10.0) than upstream (average MIwb = 9.5), a reflection of the higher numbers, species richness, and evenness between species at RM 36.2. The IBI score (average IBI = 51) was slightly higher downstream compared to upstream (average IBI = 47), where there was a better representation of intolerant and sensitive species and a lesser predominance by highly tolerant species. Both indices met the EWH biocriteria, but were in non-significant departure at the upstream site.

Stonelick Creek

Sampling at two sites produced 17 species and 1 hybrid with an average of 727 individuals/km and an average biomass of 5.0 kg/km (Appendix A). All 17 species were collected at the upstream site (RM 10.7) with an average of 566 individuals/km and an average biomass of 4.3 kg/km. Predominant species by numbers included bluntnose minnow (28.8%), central stoneroller (18.2%), fantail darter (13.3%), johnny darter (8.2%), longear sunfish (4.2%), and green sunfish (4.1%) and by weight included central stoneroller (22.1%), creek chub (16.6%), green sunfish (13.2%), longear sunfish (10.9%), smallmouth bass (8.3%), and bluntnose minnow (6.9%). This compares to 16 species at the downstream site (RM 10.5) with an average of 889 individuals/km and 5.7 kg/km. Predominant species by numbers included central stoneroller (28.2%), bluntnose minnow (25.1%), fantail darter (12.2%), johnny darter (10.6%), creek chub (10.3%), and green sunfish (3.4%) and by weight included central stoneroller (39.1%), creek chub (17.5%), smallmouth bass (11.9%), green sunfish (9.1%), and longear sunfish (4.1%).

The Modified Index of Well-Being (MIwb) scores were only slightly higher upstream (average MIwb = 7.5) than downstream (average MIwb = 7.4) essentially being the same at both sites. IBI scores were slightly lower downstream (average IBI = 30) compared to upstream (average IBI = 32). All values represent significant departures from the WWH ecoregional biocriteria.

East Branch Avey's Run

Sampling at two sites produced 3 fish species with an average of 685 individuals/km and an average biomass of 2.7 kg/km (Appendix A). Three (3) species were collected at the upstream site (RM 0.4) with an average of 685 individuals/km and an average biomass of 2.6 kg/km. Creek chub (60.1%) and blacknose dace (39.6%) comprised the samples with two fantail darter individuals collected at the upstream site. Average IBI values were 27 and 25 at the upstream and downstream sites, respectively, and both failed to meet the WWH ecoregional biocriterion.

The fish assemblage is characteristic of class II primary headwater streams, i.e., they are obligate headwater species that prefer warm water. Creek chub is considered a pioneering species, i.e., one that can quickly reoccupy temporally variable aquatic habitats such as ephemeral streams. Blacknose dace and fantail darter are considered obligate headwater species, i.e., they require permanent water and flows year round.

A few salamander larvae (presumably two-lined salamander) were collected at both sites while sampling for fish by electrofishing. It is possible that the density of salamander larvae were underestimated by this collection technique. If verified, the presence of an obligate aquatic salamander is a class III primary headwater attribute.

Macroinvertebrate Assessment

The macroinvertebrate assemblage was assessed at 6 sites two each in the E. Fork L. Miami River, Stonelick Creek, and E. Branch Avey's Run in August and early October 2006. Artificial substrates were set at the four sites in the E. Fork L. Miami R. and Stonelick Creek, but only one was recovered. Hence the assemblage assessment was based on the qualitative sampling method at 3 sites plus the two sites in the East Branch Avey's Run.

E. Fork L. Miami River

The results of the macroinvertebrate sampling revealed 41 total taxa and 1532 organisms/ft² at the downstream site (RM 36.2); a total of 28 taxa were found in the qualitative sample (Appendix B). The ICI of 42 was a non-significant departure from the EWH ICI biocriterion at the downstream site. An artificial substrate sampler was not set at the upstream site (RM 36.7), hence the assessment is based on a qualitative sample in which a total of 31 taxa were found. A narrative rating of "good" was assigned to the qualitative sample at the upstream site and does not reflect attainment of the EWH. The qualitative EPT count was 8 compared to 13 at the downstream site.

Stonelick Creek

Artificial substrates were originally set at two sites upstream and downstream from Newtonsville Run. However, the downstream sampler was not found and the upstream set had been disturbed such that neither was processed. Qualitative sampling was then relied on and yielded 25 total taxa and 7 EPT taxa at the upstream site compared to 19 total taxa and 10 EPT taxa at the downstream site. The narrative rating assigned to each sample was "good" which reflects attainment of WWH expectations. There were essentially no appreciable differences in the assemblage found at both sites.

East Branch Avey's Run

Qualitative sampling produced 10 total and 0 EPT taxa at the upstream site (RM 0.4) and 7 total and 2 EPT taxa at the downstream site (RM 0.1). A narrative rating was not attempted due to the comparatively limited assemblages and the potential inapplicability of the WWH expectations to this small stream. The macroinvertebrate assemblage was characteristic of primary headwater streams and included 10 taxa of which seven were class

I and three class II (Ohio EPA 2002) at the upstream site (RM 0.4). The downstream site (RM 0.1) yielded 7 taxa that included three class III and three class II headwater taxa.

Habitat Assessment

Habitat was assessed at the six fish sampling sites using the QHEI following the procedures in Ohio EPA (1989b, 2006).

E. Fork L. Miami River

QHEI scores were higher at the downstream (RM 36.2) site compared to the partially impounded upstream (RM 36.7) site (Table 2). The number of modified attributes and ratio of modified:warmwater habitat attributes was lower at the downstream site and reflected excellent habitat quality. The upstream site exhibited an accumulation of modified attributes (5) that are consistent with impounded habitats. The QHEI score of 75 reflects very good quality and was attributable to a portion of this site retaining free-flowing characteristics. Restoring this site to entirely free-flowing would be expected to elevate the habitat quality to near that of the downstream site.

Stonelick Creek

Habitat was excellent at both sites with nearly identical habitat scores and assessments at both sites (Table 2). The QHEI scores of 90 were accompanied by only one modified attribute at each site.

East Branch Avey's Run

The habitat assessment at the upstream site (RM 0.4) reflected good quality stream habitat and a predominance of warmwater attributes. The assessment of the downstream site (RM 0.1) reflected a lower quality habitat with an accumulation of 4 high influence and 5 moderate influence modified attributes, a reflection of the lack of recovery from prior channel modifications (Table 2).

Chemical/Physical Data

Chemical/physical data was collected during each fish sampling event at the beginning of each site and included temperature (°C), dissolved oxygen (mg/l), and conductivity ($\mu\text{S}/\text{cm}^2$). With the exception of one D.O. value, all were well within values that are consistent with warmwater streams and rivers. The August D.O. (4.9 mg/l) measured at the upstream site in the E. Branch Avey's Run is marginal for aquatic life and is likely a reflection of the physical conditions common to intermittent streams. The temperatures at both sites reflected marginally cool conditions for August. The conductivity values in Stonelick Creek were similar at the upstream and downstream sites and did not reflect any apparent influence from discharges via Newtonsville Creek.

Historical Results

We analyzed historical data available in Ohio ECOS and as reported by Ohio EPA (Ohio EPA 1998) for the E. Fork L. Miami River and Stonelick Creek in an effort to put the 2006 results into perspective. Data for fish, macroinvertebrates, and habitat was available

Table 2. QHEI scores and metric values for sites sampled in East Fork L Miami watershed by MBI in 2006.

| River Mile | Gradient QHEI (ft/mile) | WWH Attributes | | | | | | | | | | MWH Attributes | | | | | | | | | | Total MLL MWH Attributes | (MWH+1)/(WWH+1) Ratio | (MWH+1)/(WWH+1) Ratio | | | | | | |
|---|-------------------------|-------------------------|------------------------|----------------------|---------------------------|-------------------------|------------------------|---------------------|---------------------------------|-------------------|--------------------------------|----------------------|----------------------------|----------------------|--------------|-----------------|----------------------------|--------------------------|--------------------|---------------------------|------------------------|--------------------------|-----------------------|-----------------------|--------------------------|-----------------------|---------------|----------------------|-----------------------------|-----------------|
| | | Key QHEI Components | | | | | | | | | | High Influence | | | | | Moderate Influence | | | | | | | | | | | | | |
| | | No Channel or Recovered | Bank/Gravel Substrates | Silt Free Substrates | Good/Excellent Substrates | Moderate/High Diversity | Extensive/Modest Cover | Fast Current/Eddies | Low/Normal Overall Embeddedness | Max Depth > 40 cm | Low/Normal Riffle Embeddedness | Total WWH Attributes | Channelized or No Recovery | Silt/Muck Substrates | No Sinuosity | Sparse/No Cover | Max Depth < 40 cm (WD, HW) | Total HLL MWH Attributes | Recovering Channel | Heavy/Moderate Silt Cover | Sand Substrates (Boat) | | | | Hardpan Substrate Origin | Fair/Poor Development | Low Sinuosity | Only 1-2 Cover Types | Intermittent and Poor Pools | No Fast Current |
| (11100) East Fork Little Miami River | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2006 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 36.2 | 93.5 | 6.13 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | 8 | | | | | 0 | | ■ | | | | | | | | 1 | 0.11 | 0.22 | | |
| 36.7 | 75.0 | 6.13 | | | | | | | ■ | ■ | 3 | | | | | 1 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | 5 | 0.50 | 1.75 |
| (11107) Stonelick Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2006 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10.5 | 90.0 | 18.80 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | 8 | | | | | 0 | | | | | | | | | ■ | 1 | 0.11 | 0.22 | | |
| 10.7 | 90.0 | 18.80 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | 8 | | | | | 0 | | | | | | | | | ■ | 1 | 0.11 | 0.22 | | |
| (11163) Avey's Run | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2006 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.1 | 58.0 | 65.00 | ■ | | | | | | ■ | ■ | 3 | ◆ | ◆ | ◆ | ◆ | 4 | ■ | | ■ | ■ | | | | | ■ | ■ | 5 | 1.25 | 2.50 | |
| 0.4 | 64.0 | 80.00 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | 6 | | | | ◆ | 1 | | | | | | | | | ■ | ■ | 2 | 0.29 | 0.57 | |

Table 3. Chemical/physical results based on sampling conducted at 6 locations in the E. Fork L. Miami River, Stonelick Creek, and East Branch Avey's Run.

| Location - Date | Temperature (°C) | Dissolved Oxygen (mg/l) | Conductivity (µS/cm ²) |
|-------------------------------|--|-------------------------|------------------------------------|
| <i>E. Fork L. Miami River</i> | | | |
| | Ust. low head dam (RM 36.7) | | |
| August sample | 27.1°C | 9.46 mg/l | 756 µS/cm ² |
| October sample | 18.2°C | 7.24 mg/l | 447 µS/cm ² |
| | Dst. low head dam (RM 36.2) | | |
| August sample | 29.3°C | 8.60 mg/l | 776 µS/cm ² |
| October sample | 18.5°C | 7.81 mg/l | 446 µS/cm ² |
| <i>Stonelick Creek</i> | | | |
| | Ust. Newtonsville Run (RM 10.7) | | |
| August sample | 27.0°C | 6.92 mg/l | 526 µS/cm ² |
| October sample | 15.9°C | 8.57 mg/l | 236 µS/cm ² |
| | Dst. Newtonsville Run (RM 10.5) | | |
| August sample | 27.6°C | 8.95 mg/l | 546 µS/cm ² |
| October sample | 15.4°C | 9.12 mg/l | 240 µS/cm ² |
| <i>East Branch Avey's Run</i> | | | |
| | Cincinnati Nature Center (RM 0.4) | | |
| August sample | 22.3°C | 4.90 mg/l | 353 µS/cm ² |
| October sample | 15.5°C | 6.13 mg/l | 606 µS/cm ² |
| | Dst. Cincinnati Nature Center (RM 0.1) | | |
| August sample | 22.4 C | 6.04 mg/l | 318 µS/cm ² |
| October sample | 15.9 C | 7.27 mg/l | 586 µS/cm ² |

from the downstream E. Fork site (RM 36.2) dating to 1982. Data for the fish assemblage and habitat was available in Stonelick Creek downstream from the 2006 sampling sites also dating to 1982. No historical data was available for the East Branch Avey's Run.

East Fork Little Miami River

Historical data was available from the mainstem downstream from the Williamsburg low head dam from 1982, 1998, and 2002. The sampling site location in each year was not exactly the same, but each was within a few tenths of river mile and is likely representative

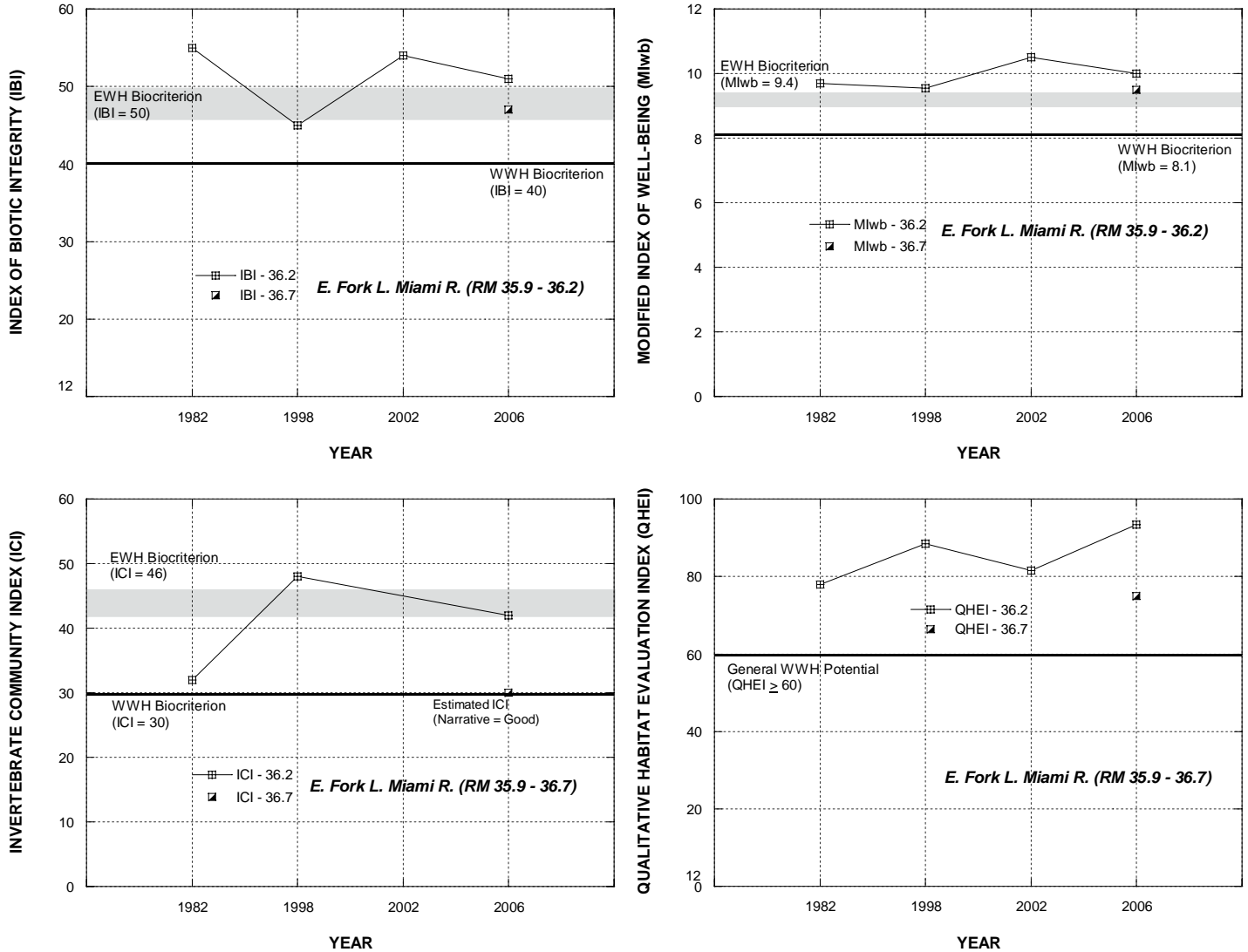


Figure 4. Historical values and trends for the IBI, MIwb, ICI, and QHEI in the E. Fork L. Miami River downstream from the low head dam in Williamsburg (RM 36.2). The 2006 results from the site located within a partially impounded site upstream from the dam (RM 36.7) are shown for comparison.

of the river reach below the dam. IBI values attained the EWH biocriterion in each year, with the 1998 value in non-significant departure (Figure 4). MIwb values were consistently above the EWH biocriterion. The ICI was well below the EWH biocriterion in 1982, but met this value in 1998 and 2002 (non-significant departure). The 2006 data verified the continued attainment of the EWH biocriteria for the IBI, MIwb, and ICI. The results obtained at the upstream site (RM 36.7) were consistently lower than the 2006 and most of the historical values, a reflection of the proportional habitat limitations imposed by the partially impounded conditions. The QHEI has been consistent between years perhaps showing a slight increase through 2006 at RM 36.2.

Stonelick Creek

Historical data from Stonelick Creek were largely available at multiple sites in the lower nine miles of the mainstem, thus these data were analyzed in both a spatial and temporal context (Figure 5). What is most apparent from this analysis is the consistent increase in the IBI and MIwb values from upstream to downstream. Based on the QHEI results Stonelick Creek clearly exhibits the potential to attain the WWH biocriteria hence supporting that current designation. The longitudinal pattern suggests that one or more impacts are occurring upstream from the 2006 sampling sites and recovery to marginal WWH conditions occurs between RM 4 and 5, some 4-5 miles downstream. The 2006 results do not demonstrate a direct link to possible impacts from Newtonsville via Newtonsville Creek. Ohio EPA (1998) assessed Stonelick Creek from above Stonelick Lake dam downstream to the mouth. They listed nutrient enrichment, siltation, habitat modification, unknown toxicity, low flows, low D.O., and organic enrichment as the associated causes of impairment. Some of these problems were attributed to impacts at the site immediately upstream from Stonelick Lake.

RECOMMENDATIONS

Based on the results of this study the following are recommended:

- 1) There is sufficient evidence to show the benefits of the removal of the low head dam in Williamsburg. This would not only improve the biological quality of the upstream site, but would also enhance the connectivity of the upper E. Fork L. Miami R. mainstem potentially improving the recovery potential of impacted stream segments in the upper watershed.
- 2) The cause of the impairment in Stonelick Creek upstream and downstream from Newtonsville Creek merits further investigation. The 2006 sites may be inadequate for detecting the true impacts from Newtonsville Creek, particularly those caused by oxygen demanding substances. If these are having an impact it would be most visible further downstream than the sampling site at RM 10.5. The longitudinal trend of the combined historical data for the MIwb hints at this type of effect. A survey design that reveals the “pollution profile” of Stonelick Creek would be more revealing.

We recommend that the assessment of the East Branch of Avey's Run be supplemented to include a salamander survey using the Ohio EPA primary headwater habitat methodology (Ohio EPA 2002a). It is possible that the fish sampling technique under-represented the abundance of salamanders, which are an important indicator of class III primary headwater habitat streams.

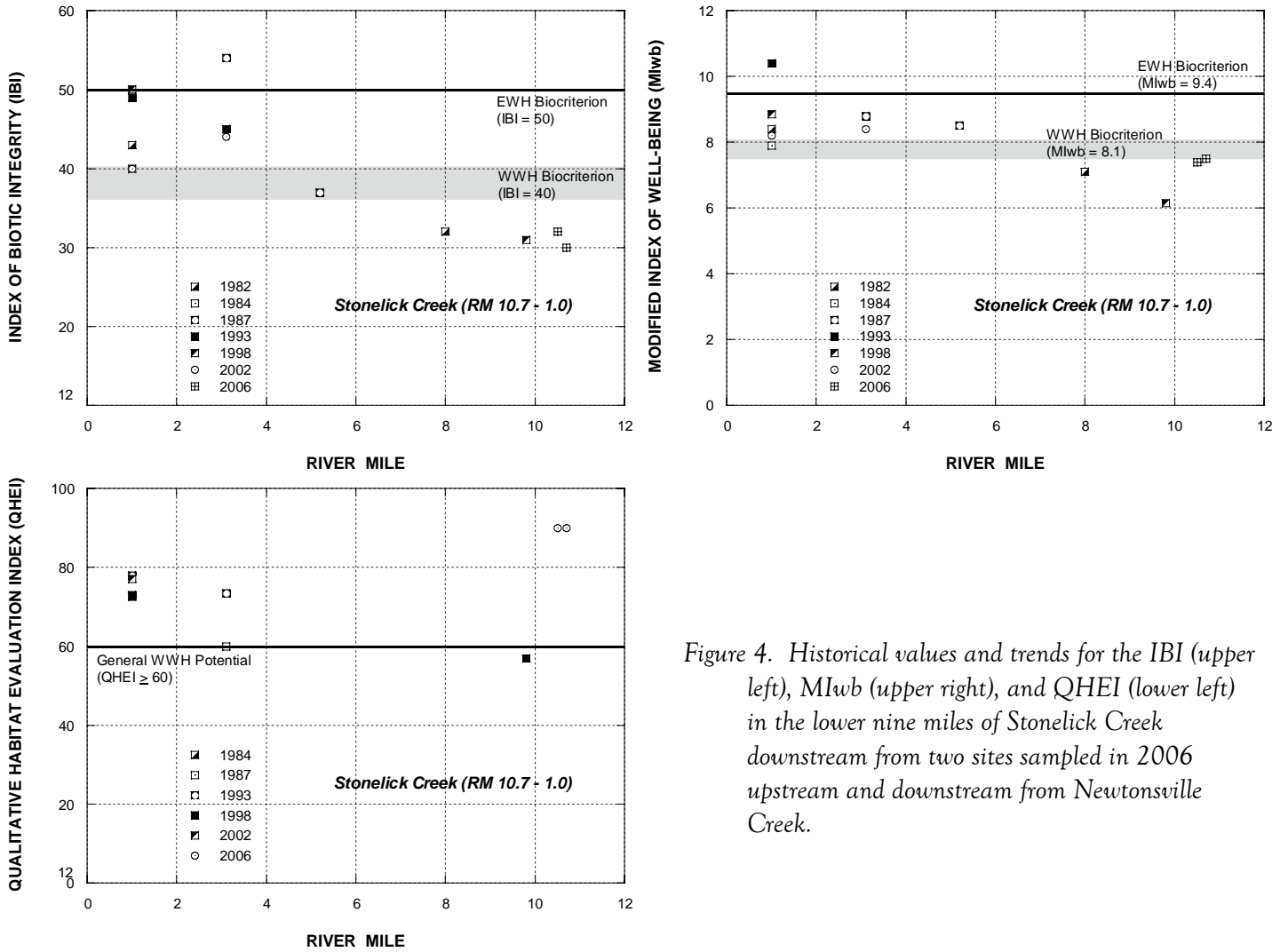


Figure 4. Historical values and trends for the IBI (upper left), MIwb (upper right), and QHEI (lower left) in the lower nine miles of Stonelick Creek downstream from two sites sampled in 2006 upstream and downstream from Newtonsville Creek.

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Appendix A: Fish Assemblage Results

Species Relative Abundance by Sampling Location

Index of Biotic Integrity Metric and Index Results and Modified Index of Well-Being
Results for Clermont Co. Sampling Locations

Appendix Table 1. Boat IBI scores and metrics at boat sites in the E. Fk. Little Miami study area sampled by MBI in 2006.

| River Mile | Type | Date | Drainage ^a area (sq mi) | Number of | | | | Percent of Individuals | | | | | | DELTA anomalies | Rel.No. minus tolerants /(1.0 km) | Modified | |
|--------------------------------|------|------------|---------------------------------------|------------------|--------------------|-------------------|-----------------------|------------------------|----------------------|--------------------|----------------|-------------------|-------------------|--------------------|--|----------|-----|
| | | | | Total species | Sunfish species | Sucker species | Intolerant species | Rnd-bodied suckers | Simple Lithophils | Tolerant fishes | Omni- vores | Top carnivores | Insect- ivores | | | IBI | lwb |
| East Fork Little Mia - (11100) | | | | | | | | | | | | | | | | | |
| Year: 2006 | | | | | | | | | | | | | | | | | |
| 36.70 | A | 08/08/2006 | 233 | 27(5) | 5(5) | 8(5) | 2(3) | 31(3) | 33(3) | 28(1) | 12(5) | 13(5) | 72(5) | 1.1(3) | 384(3) | 46 | 9.7 |
| 36.70 | A | 10/04/2006 | 233 | 26(5) | 4(5) | 8(5) | 2(3) | 27(3) | 35(3) | 26(3) | 9(5) | 6(3) | 81(5) | 0.0(5) | 262(3) | 48 | 9.3 |

♦ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

^a - Default value of 1000 sq mi used for these waters.

Appendix Table 2. Wading IBI scores and metrics at sites in the E. Fk. Little Miami study area sampled by MBI in 2006.

| River Mile | Type | Date | Drainage area (sq mi) | Number of | | | | | Percent of Individuals | | | | | Rel.No. minus tolerants /(0.3km) | IBI | Modified Iwb | |
|--------------------------------|------|------------|--------------------------|------------------|--------------------|-------------------|-----------------------|-------------------|------------------------|--------------------|----------------|-------------------|-------------------|---|--------|-----------------|-------------------|
| | | | | Total species | Sunfish species | Sucker species | Intolerant species | Darter species | Simple Lithophils | Tolerant fishes | Omni- vores | Top carnivores | Insect- ivores | | | | DELT anomalies |
| East Fork Little Mia - (11100) | | | | | | | | | | | | | | | | | |
| Year: 2006 | | | | | | | | | | | | | | | | | |
| 36.20 | E | 08/08/2006 | 234 | 33(5) | 5(5) | 5(5) | 4(3) | 7(5) | 40(5) | 24(3) | 19(3) | 3.8(3) | 67(5) | 0.5(3) | 710(3) | 48 | 10.4 |
| 36.20 | D | 10/04/2006 | 234 | 33(5) | 5(5) | 5(5) | 5(3) | 8(5) | 41(5) | 15(5) | 10(5) | 8.1(5) | 73(5) | 0.3(3) | 378(3) | 54 | 9.6 |
| Stonelick Creek - (11107) | | | | | | | | | | | | | | | | | |
| Year: 2006 | | | | | | | | | | | | | | | | | |
| 10.50 | E | 08/07/2006 | 36 | 15(3) | 2(3) | 1(1) | 0(1) | 4(3) | 5(1) | 49(1) | 30(3) | 0.9(1) | 27(3) | 0.0(5) | 542(3) | 28 | 7.4 |
| 10.50 | D | 10/10/2006 | 36 | 12(3) | 3(3) | 0(1) | 0(1) | 4(3) | 5(1) | 24(5) | 18(5) | 1.9(3) | 46(3) | 0.0(5) | 543(3) | 36 | 7.4 |
| 10.70 | E | 08/07/2006 | 34 | 15(3) | 3(3) | 1(1) | 0(1) | 3(3) | 7(1) | 51(1) | 32(3) | 1.3(3) | 30(3) | 0.2(3) | 350(3) | 28 | 7.6 |
| 10.70 | E | 10/10/2006 | 34 | 16(3) | 3(3) | 0(1) | 0(1) | 4(3) | 6(1) | 38(3) | 24(3) | 1.4(3) | 54(3) | 0.0(5) | 261(3) | 32 | 7.4 |

na - Qualitative data, Modified Iwb not applicable.

◆ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

Appendix Table 3. Headwater IBI scores and metrics at in the Avey's Run study area sampled by MBI in 2006.

| River Mile | Type | Date | Drainage area (sq mi) | Number of | | | | | | Percent of Individuals | | | | | Rel.No. minus tolerants /(0.3km) | IBI |
|------------------------------|------|------------|-----------------------|---------------|----------------|-------------------|-------------------|--------------------------|-------------------|------------------------|------------|-------------------|---------------|----------------|----------------------------------|-----|
| | | | | Total species | Minnow species | Headwater species | Sensitive species | Darter & Sculpin species | Simple Lithophils | Tolerant fishes | Omni-vores | Pioneering fishes | Insect-ivores | DELT anomalies | | |
| <i>Avey's Run - (11-163)</i> | | | | | | | | | | | | | | | | |
| Year: 2006 | | | | | | | | | | | | | | | | |
| 0.10 | F | 08/08/2006 | 0.1 | 2(1) | 2(3) | 1(1) | 0(1) | 0(1) | 1(3) | 100(1) | 0(5) | 57(1) | 0(1) | 0.0(5) | 0(1) | 24 |
| 0.10 | F | 10/10/2006 | 0.1 | 2(1) | 2(3) | 1(1) | 0(1) | 0(1) | 1(3) | 100(1) | 0(5) | 51(3) | 0(1) | 0.0(5) | 0(1) | 26 |
| 0.40 | F | 08/08/2006 | 0.2 | 3(1) | 2(3) | 2(3) | 0(1) | 1(3) | 1(3) | 100(1) | 0(5) | 64(1) | 0(1) | 0.0(5) | 4(1) | 28 |
| 0.40 | F | 10/10/2006 | 0.2 | 2(1) | 2(3) | 1(1) | 0(1) | 0(1) | 1(3) | 100(1) | 0(5) | 50(3) | 0(1) | 0.0(5) | 0(1) | 26 |

◆ - IBI is low end adjusted.

* - < 200 Total individuals in sample

** - < 50 Total individuals in sample

● - One or more species excluded from IBI calculation.

| | | |
|---------------------------|---|--------------------------------|
| River Code: 11-100 | Stream: East Fork Little Miami River | Sample Date: 08/08/2006 |
| River Mile: 36.70 | Location: UST Williamsburg Dam (impound) | Invalid Sample: |
| Time Fished: 2536 sec | Drainage: 233.0 sq mi | Depth: |
| Dist Fished: 0.50 km | Basin: Little Miami River | Flow: C |
| Site ID:: | Lat:: 39.062420 | Lat:: 84.055330 |
| | | Data Source: 01 |
| | | Sampler Type: A |

| Species Name / ODNR status | IBI Grp | Feed Guild | Target Spec. Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|----------------------------|---------|------------|------------------|-----------|-----------------|-------------|-----------------|-------------|----------------|
| Bigmouth Buffalo | C | I | | 3 | 6.00 | 1.12 | 13.88 | 9.37 | 2,313.33 |
| Quillback Carpsucker | C | O | | 4 | 8.00 | 1.50 | 3.78 | 2.55 | 472.50 |
| River Carpsucker | C | O | | 4 | 8.00 | 1.50 | 5.52 | 3.72 | 690.00 |
| Silver Redhorse | R | I | M | 4 | 8.00 | 1.50 | 8.24 | 5.56 | 1,030.50 |
| Black Redhorse | R | I | I | 2 | 4.00 | 0.75 | 0.90 | 0.61 | 225.00 |
| Golden Redhorse | R | I | M | 68 | 136.00 | 25.47 | 22.48 | 15.17 | 165.29 |
| Northern Hog Sucker | R | I | M | 5 | 10.00 | 1.87 | 0.72 | 0.49 | 72.40 |
| Smallmouth Redhorse | R | I | M | 3 | 6.00 | 1.12 | 0.12 | 0.08 | 20.00 |
| Common Carp | G | O | MG T | 9 | 18.00 | 3.37 | 60.19 | 40.61 | 3,343.89 |
| Emerald Shiner | N | I | | 3 | 6.00 | 1.12 | 0.01 | 0.01 | 2.00 |
| Silver Shiner | N | I | I | 1 | 2.00 | 0.37 | 0.02 | 0.01 | 8.00 |
| Steelcolor Shiner | N | I | P | 1 | 2.00 | 0.37 | 0.01 | 0.01 | 6.00 |
| Spottfin Shiner | N | I | MG | 12 | 24.00 | 4.49 | 0.07 | 0.05 | 2.83 |
| Bluntnose Minnow | N | O | MG T | 16 | 32.00 | 5.99 | 0.04 | 0.03 | 1.25 |
| Central Stoneroller | N | H | | 1 | 2.00 | 0.37 | 0.04 | 0.02 | 18.00 |
| Channel Catfish | F | | MG | 3 | 6.00 | 1.12 | 5.14 | 3.47 | 856.67 |
| Flathead Catfish | F | P | | 5 | 10.00 | 1.87 | 13.97 | 9.43 | 1,397.20 |
| Brook Silverside | | I | MG M | 1 | 2.00 | 0.37 | 0.01 | 0.01 | 4.00 |
| Rock Bass | S | C | MG | 1 | 2.00 | 0.37 | 0.06 | 0.04 | 30.00 |
| Smallmouth Bass | F | C | MG M | 14 | 28.00 | 5.24 | 5.40 | 3.64 | 192.86 |
| Spotted Bass | F | C | MG | 3 | 6.00 | 1.12 | 2.30 | 1.55 | 384.00 |
| Largemouth Bass | F | C | MG | 13 | 26.00 | 4.87 | 2.30 | 1.55 | 88.62 |
| Green Sunfish | S | I | MG T | 50 | 100.00 | 18.73 | 2.04 | 1.38 | 20.40 |
| Bluegill Sunfish | S | I | MG P | 1 | 2.00 | 0.37 | 0.02 | 0.01 | 10.00 |
| Orangespotted Sunfish | S | I | | 1 | 2.00 | 0.37 | 0.02 | 0.01 | 8.00 |
| Longear Sunfish | S | I | FD M | 35 | 70.00 | 13.11 | 0.86 | 0.58 | 12.29 |
| Hybrid X Sunfish | | | | 1 | 2.00 | 0.37 | 0.05 | 0.03 | 24.00 |
| Johnny Darter | D | I | | 2 | 4.00 | 0.75 | 0.00 | 0.00 | 0.50 |
| Greenside Darter | D | I | M | 1 | 2.00 | 0.37 | 0.00 | 0.00 | 2.00 |
| <i>Date Total</i> | | | | 267 | 534.00 | | 148.20 | | |
| <i>Number of Species</i> | | | | 28 | | | | | |
| <i>Number of Hybrids</i> | | | | 1 | | | | | |

| | | |
|---------------------------|---|--------------------------------|
| River Code: 11-100 | Stream: East Fork Little Miami River | Sample Date: 10/04/2006 |
| River Mile: 36.70 | Location: UST Williamsburg Dam (impound) | Invalid Sample: |
| Time Fished: 3037 sec | Drainage: 233.0 sq mi | Depth: |
| Dist Fished: 0.50 km | Basin: Little Miami River | Flow: C |
| Site ID:: | Lat:: 39.062420 | Lat:: 84.055330 |
| | | Data Source: 01 |
| | | Sampler Type: A |

| Species Name / ODNR status | IBI Grp | Feed Guild | Target Spec. Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|----------------------------|---------|------------|------------------|-----------|-----------------|-------------|-----------------|-------------|----------------|
| Bigmouth Buffalo | C | I | | 1 | 2.00 | 0.56 | 5.20 | 7.77 | 2,600.00 |
| Quillback Carpsucker | C | O | | 2 | 4.00 | 1.13 | 1.40 | 2.09 | 350.00 |
| River Carpsucker | C | O | | 1 | 2.00 | 0.56 | 1.28 | 1.91 | 640.00 |
| Silver Redhorse | R | I | M | 3 | 6.00 | 1.69 | 6.00 | 8.96 | 1,000.00 |
| Black Redhorse | R | I | I | 3 | 6.00 | 1.69 | 2.16 | 3.23 | 360.00 |
| Golden Redhorse | R | I | M | 30 | 60.00 | 16.95 | 9.68 | 14.46 | 161.33 |
| Northern Hog Sucker | R | I | M | 4 | 8.00 | 2.26 | 0.62 | 0.92 | 77.00 |
| Smallmouth Redhorse | R | I | M | 8 | 16.00 | 4.52 | 1.70 | 2.54 | 106.50 |
| Common Carp | G | O | MG T | 7 | 14.00 | 3.95 | 28.12 | 42.00 | 2,008.57 |
| Emerald Shiner | N | I | | 1 | 2.00 | 0.56 | 0.01 | 0.01 | 3.00 |
| Silver Shiner | N | I | I | 7 | 14.00 | 3.95 | 0.06 | 0.10 | 4.57 |
| Spotfin Shiner | N | I | MG | 4 | 8.00 | 2.26 | 0.03 | 0.05 | 4.00 |
| Bluntnose Minnow | N | O | MG T | 6 | 12.00 | 3.39 | 0.02 | 0.03 | 1.67 |
| Central Stoneroller | N | H | | 1 | 2.00 | 0.56 | 0.01 | 0.02 | 6.00 |
| Channel Catfish | F | | MG | 3 | 6.00 | 1.69 | 5.32 | 7.95 | 886.67 |
| Flathead Catfish | F | P | | 1 | 2.00 | 0.56 | 0.00 | 0.00 | 0.00 |
| Brook Silverside | | I | MG M | 9 | 18.00 | 5.08 | 0.04 | 0.06 | 2.22 |
| Smallmouth Bass | F | C | MG M | 5 | 10.00 | 2.82 | 1.02 | 1.53 | 102.40 |
| Spotted Bass | F | C | MG | 4 | 8.00 | 2.26 | 0.62 | 0.92 | 77.00 |
| Largemouth Bass | F | C | MG | 1 | 2.00 | 0.56 | 1.08 | 1.62 | 542.00 |
| Green Sunfish | S | I | MG T | 33 | 66.00 | 18.64 | 1.69 | 2.52 | 25.58 |
| Bluegill Sunfish | S | I | MG P | 10 | 20.00 | 5.65 | 0.04 | 0.06 | 1.90 |
| Orangespotted Sunfish | S | I | | 1 | 2.00 | 0.56 | 0.02 | 0.03 | 10.00 |
| Longear Sunfish | S | I | FD M | 21 | 42.00 | 11.86 | 0.64 | 0.96 | 15.33 |
| Redear Sunfish | E | I | | 2 | 4.00 | 1.13 | 0.08 | 0.12 | 20.00 |
| Hybrid X Sunfish | | | | 2 | 4.00 | 1.13 | 0.03 | 0.04 | 7.00 |
| Logperch | D | I | M | 2 | 4.00 | 1.13 | 0.03 | 0.05 | 8.00 |
| Johnny Darter | D | I | | 1 | 2.00 | 0.56 | 0.00 | 0.01 | 2.00 |
| Greenside Darter | D | I | M | 4 | 8.00 | 2.26 | 0.04 | 0.07 | 5.50 |
| <i>Date Total</i> | | | | 177 | 354.00 | | 66.96 | | |
| <i>Number of Species</i> | | | | 28 | | | | | |
| <i>Number of Hybrids</i> | | | | 1 | | | | | |

| | | |
|---------------------------|---|--------------------------------|
| River Code: 11-100 | Stream: East Fork Little Miami River | Sample Date: 08/08/2006 |
| River Mile: 36.20 | Location: DST Williamsburg Dam | Invalid Sample: |
| Time Fished: 3600 sec | Drainage: 234.0 sq mi | Depth: |
| Dist Fished: 0.20 km | Basin: Little Miami River | Flow: C |
| Site ID:: | Lat:: 39.061850 | Lat:: 84.055610 |
| | | Data Source: 01 |
| | | Sampler Type: E |

| Species Name / ODNR status | IBI Grp | Feed Guild | Target Spec. Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|----------------------------|---------|------------|------------------|-----------|-----------------|-------------|-----------------|-------------|----------------|
| Gizzard Shad | | O | MG | 18 | 27.00 | 2.88 | 2.37 | 5.75 | 87.78 |
| Quillback Carpsucker | C | O | | 2 | 3.00 | 0.32 | 0.75 | 1.83 | 251.00 |
| Silver Redhorse | R | I | M | 1 | 1.50 | 0.16 | 2.55 | 6.18 | 1,700.00 |
| Golden Redhorse | R | I | M | 22 | 33.00 | 3.51 | 4.57 | 11.08 | 138.45 |
| Northern Hog Sucker | R | I | M | 54 | 81.00 | 8.63 | 7.11 | 17.24 | 87.78 |
| Smallmouth Redhorse | R | I | M | 1 | 1.50 | 0.16 | 0.66 | 1.61 | 442.00 |
| Common Carp | G | O | MG T | 2 | 3.00 | 0.32 | 5.37 | 13.02 | 1,790.00 |
| Creek Chub | N | G | FS T | 1 | 1.50 | 0.16 | 0.05 | 0.12 | 32.00 |
| Suckermouth Minnow | N | I | | 3 | 4.50 | 0.48 | 0.02 | 0.04 | 3.33 |
| Emerald Shiner | N | I | | 16 | 24.00 | 2.56 | 0.06 | 0.14 | 2.38 |
| Silver Shiner | N | I | I | 1 | 1.50 | 0.16 | 0.01 | 0.01 | 4.00 |
| Spotfin Shiner | N | I | MG | 31 | 46.50 | 4.95 | 0.15 | 0.36 | 3.23 |
| Sand Shiner | N | I | FD M | 7 | 10.50 | 1.12 | 0.02 | 0.04 | 1.43 |
| Bluntnose Minnow | N | O | MG T | 96 | 144.00 | 15.34 | 0.20 | 0.48 | 1.38 |
| Central Stoneroller | N | H | | 58 | 87.00 | 9.27 | 0.63 | 1.53 | 7.24 |
| Channel Catfish | F | | MG | 6 | 9.00 | 0.96 | 7.73 | 18.75 | 859.00 |
| Yellow Bullhead | | I | MG T | 2 | 3.00 | 0.32 | 0.03 | 0.07 | 10.00 |
| Flathead Catfish | F | P | | 5 | 7.50 | 0.80 | 1.55 | 3.75 | 206.00 |
| Stonecat Madtom | | I | I | 12 | 18.00 | 1.92 | 0.06 | 0.14 | 3.17 |
| Brook Silverside | | I | MG M | 3 | 4.50 | 0.48 | 0.01 | 0.02 | 1.67 |
| Rock Bass | S | C | MG | 1 | 1.50 | 0.16 | 0.15 | 0.36 | 100.00 |
| Smallmouth Bass | F | C | MG M | 15 | 22.50 | 2.40 | 2.92 | 7.07 | 129.60 |
| Spotted Bass | F | C | MG | 3 | 4.50 | 0.48 | 0.69 | 1.67 | 152.67 |
| Green Sunfish | S | I | MG T | 52 | 78.00 | 8.31 | 1.33 | 3.23 | 17.08 |
| Bluegill Sunfish | S | I | MG P | 9 | 13.50 | 1.44 | 0.53 | 1.27 | 38.89 |
| Orangespotted Sunfish | S | I | | 6 | 9.00 | 0.96 | 0.08 | 0.18 | 8.33 |
| Longear Sunfish | S | I | FD M | 23 | 34.50 | 3.67 | 0.62 | 1.49 | 17.83 |
| Hybrid X Sunfish | | | | 2 | 3.00 | 0.32 | 0.06 | 0.15 | 20.00 |
| Slenderhead Darter | D | I | R | 2 | 3.00 | 0.32 | 0.01 | 0.03 | 4.00 |
| Logperch | D | I | M | 33 | 49.50 | 5.27 | 0.51 | 1.24 | 10.36 |
| Johnny Darter | D | I | | 2 | 3.00 | 0.32 | 0.00 | 0.01 | 1.00 |
| Greenside Darter | D | I | M | 67 | 100.50 | 10.70 | 0.27 | 0.65 | 2.69 |
| Banded Darter | D | I | I | 14 | 21.00 | 2.24 | 0.03 | 0.08 | 1.57 |
| Rainbow Darter | D | I | M | 36 | 54.00 | 5.75 | 0.13 | 0.32 | 2.44 |
| Fantail Darter | D | I | | 20 | 30.00 | 3.19 | 0.04 | 0.10 | 1.40 |
| <i>Date Total</i> | | | | 626 | 939.00 | | 41.24 | | |
| <i>Number of Species</i> | | | | 34 | | | | | |
| <i>Number of Hybrids</i> | | | | 1 | | | | | |

| | | |
|---------------------------|---|--------------------------------|
| River Code: 11-100 | Stream: East Fork Little Miami River | Sample Date: 10/04/2006 |
| River Mile: 36.20 | Location: DST Williamsburg Dam | Invalid Sample: |
| Time Fished: 3166 sec | Drainage: 234.0 sq mi | Depth: |
| Dist Fished: 0.20 km | Basin: Little Miami River | Flow: C |
| Site ID:: | Lat:: 39.061850 | Lat:: 84.055610 |
| | | Data Source: 01 |
| | | Sampler Type: D |

| Species Name / ODNR status | IBI Grp | Feed Guild | Target Spec. Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|----------------------------|---------|------------|------------------|-----------|-----------------|-------------|-----------------|-------------|----------------|
| Gizzard Shad | | O | MG | 7 | 10.50 | 2.37 | 0.69 | 2.47 | 65.43 |
| Silver Redhorse | R | I | M | 2 | 3.00 | 0.68 | 5.07 | 18.26 | 1,690.00 |
| Black Redhorse | R | I | I | 1 | 1.50 | 0.34 | 0.02 | 0.05 | 10.00 |
| Golden Redhorse | R | I | M | 15 | 22.50 | 5.08 | 2.85 | 10.27 | 126.67 |
| Shorthead Redhorse | R | I | M | 2 | 3.00 | 0.68 | 0.29 | 1.03 | 95.00 |
| Northern Hog Sucker | R | I | M | 19 | 28.50 | 6.44 | 1.84 | 6.63 | 64.63 |
| Common Carp | G | O | MG T | 4 | 6.00 | 1.36 | 10.04 | 36.15 | 1,673.00 |
| Suckermouth Minnow | N | I | | 1 | 1.50 | 0.34 | 0.00 | 0.01 | 2.00 |
| Silver Shiner | N | I | I | 4 | 6.00 | 1.36 | 0.05 | 0.16 | 7.50 |
| Steelcolor Shiner | N | I | P | 1 | 1.50 | 0.34 | 0.01 | 0.02 | 4.00 |
| Spotfin Shiner | N | I | MG | 27 | 40.50 | 9.15 | 0.09 | 0.32 | 2.22 |
| Sand Shiner | N | I | FD M | 6 | 9.00 | 2.03 | 0.02 | 0.06 | 2.00 |
| Bluntnose Minnow | N | O | MG T | 18 | 27.00 | 6.10 | 0.08 | 0.28 | 2.89 |
| Central Stoneroller | N | H | | 19 | 28.50 | 6.44 | 0.17 | 0.59 | 5.79 |
| Channel Catfish | F | | MG | 8 | 12.00 | 2.71 | 1.57 | 5.66 | 131.00 |
| Yellow Bullhead | | I | MG T | 1 | 1.50 | 0.34 | 0.01 | 0.04 | 8.00 |
| Stonecat Madtom | | I | I | 6 | 9.00 | 2.03 | 0.03 | 0.12 | 3.67 |
| White Bass | F | P | MG | 1 | 1.50 | 0.34 | 0.18 | 0.65 | 120.00 |
| Rock Bass | S | C | MG | 4 | 6.00 | 1.36 | 0.26 | 0.92 | 42.50 |
| Smallmouth Bass | F | C | MG M | 13 | 19.50 | 4.41 | 2.18 | 7.83 | 111.54 |
| Spotted Bass | F | C | MG | 4 | 6.00 | 1.36 | 0.62 | 2.22 | 102.50 |
| Largemouth Bass | F | C | MG | 2 | 3.00 | 0.68 | 0.46 | 1.66 | 154.00 |
| Green Sunfish | S | I | MG T | 20 | 30.00 | 6.78 | 0.44 | 1.57 | 14.50 |
| Bluegill Sunfish | S | I | MG P | 1 | 1.50 | 0.34 | 0.08 | 0.27 | 50.00 |
| Orangespotted Sunfish | S | I | | 1 | 1.50 | 0.34 | 0.03 | 0.11 | 20.00 |
| Longear Sunfish | S | I | FD M | 16 | 24.00 | 5.42 | 0.34 | 1.23 | 14.25 |
| Blackside Darter | D | I | | 1 | 1.50 | 0.34 | 0.00 | 0.01 | 2.00 |
| Slenderhead Darter | D | I | R | 1 | 1.50 | 0.34 | 0.01 | 0.02 | 4.00 |
| Logperch | D | I | M | 17 | 25.50 | 5.76 | 0.15 | 0.54 | 5.88 |
| Johnny Darter | D | I | | 3 | 4.50 | 1.02 | 0.01 | 0.02 | 1.00 |
| Greenside Darter | D | I | M | 27 | 40.50 | 9.15 | 0.11 | 0.40 | 2.74 |
| Banded Darter | D | I | I | 15 | 22.50 | 5.08 | 0.04 | 0.15 | 1.87 |
| Rainbow Darter | D | I | M | 15 | 22.50 | 5.08 | 0.05 | 0.17 | 2.13 |
| Fantail Darter | D | I | | 13 | 19.50 | 4.41 | 0.02 | 0.08 | 1.08 |
| <i>Date Total</i> | | | | 295 | 442.50 | | 27.76 | | |
| <i>Number of Species</i> | | | | 34 | | | | | |
| <i>Number of Hybrids</i> | | | | 0 | | | | | |

| | | |
|---------------------------|--------------------------------|--------------------------------|
| River Code: 11-107 | Stream: Stonelick Creek | Sample Date: 08/07/2006 |
| River Mile: 10.70 | Location: | Invalid Sample: |
| Time Fished: 2700 sec | Drainage: 34.4 sq mi | Depth: |
| Dist Fished: 0.20 km | Basin: Little Miami River | Flow: C |
| Site ID:: | Lat:: 39.186100 | Lat:: 84.106530 |
| | | Data Source: 01 |
| | | Sampler Type: E |

| Species Name / ODNR status | IBI Grp | Feed Guild | Target Spec. | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|----------------------------|---------|------------|--------------|-----|-----------|-----------------|-------------|-----------------|-------------|----------------|
| White Sucker | W | O | FD | T | 4 | 6.00 | 0.84 | 0.42 | 6.93 | 70.00 |
| Creek Chub | N | G | FS | T | 63 | 94.50 | 13.29 | 1.14 | 18.84 | 12.08 |
| Scarlet Shiner | N | I | | M | 16 | 24.00 | 3.38 | 0.07 | 1.19 | 3.00 |
| Striped Shiner | N | I | | | 10 | 15.00 | 2.11 | 0.14 | 2.23 | 9.00 |
| Bluntnose Minnow | N | O | MG | T | 149 | 223.50 | 31.43 | 0.39 | 6.38 | 1.73 |
| Central Stoneroller | N | H | | | 107 | 160.50 | 22.57 | 1.39 | 22.86 | 8.64 |
| Yellow Bullhead | | I | MG | T | 2 | 3.00 | 0.42 | 0.22 | 3.66 | 74.00 |
| Smallmouth Bass | F | C | MG | M | 5 | 7.50 | 1.05 | 0.45 | 7.42 | 60.00 |
| Largemouth Bass | F | C | MG | | 1 | 1.50 | 0.21 | 0.08 | 1.24 | 50.00 |
| Green Sunfish | S | I | MG | T | 23 | 34.50 | 4.85 | 0.83 | 13.61 | 23.91 |
| Bluegill Sunfish | S | I | MG | P | 2 | 3.00 | 0.42 | 0.06 | 0.99 | 20.00 |
| Longear Sunfish | S | I | FD | M | 24 | 36.00 | 5.06 | 0.72 | 11.88 | 20.00 |
| Hybrid X Sunfish | | | | | 2 | 3.00 | 0.42 | 0.11 | 1.73 | 35.00 |
| Johnny Darter | D | I | | | 19 | 28.50 | 4.01 | 0.02 | 0.28 | 0.58 |
| Rainbow Darter | D | I | | M | 5 | 7.50 | 1.05 | 0.02 | 0.25 | 2.00 |
| Fantail Darter | D | I | | | 42 | 63.00 | 8.86 | 0.03 | 0.54 | 0.52 |
| <i>Date Total</i> | | | | | 474 | 711.00 | | 6.06 | | |
| <i>Number of Species</i> | | | | | 15 | | | | | |
| <i>Number of Hybrids</i> | | | | | 1 | | | | | |

| | | |
|---------------------------|--------------------------------|--------------------------------|
| River Code: 11-107 | Stream: Stonelick Creek | Sample Date: 10/10/2006 |
| River Mile: 10.70 | Location: | Invalid Sample: |
| Time Fished: 2413 sec | Drainage: 34.4 sq mi | Depth: |
| Dist Fished: 0.20 km | Basin: Little Miami River | Flow: C |
| Site ID:: | Lat:: 39.186100 | Lat:: 84.106530 |
| | | Data Source: 01 |
| | | Sampler Type: E |

| Species Name / ODNR status | IBI Grp | Feed Guild | Target Spec. Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|----------------------------|---------|------------|------------------|-----------|-----------------|-------------|-----------------|-------------|----------------|
| Creek Chub | N | G | FS T | 27 | 40.50 | 9.64 | 0.27 | 11.00 | 6.67 |
| Scarlet Shiner | N | I | M | 10 | 15.00 | 3.57 | 0.04 | 1.71 | 2.80 |
| Striped Shiner | N | I | | 3 | 4.50 | 1.07 | 0.08 | 3.06 | 16.67 |
| Silverjaw Minnow | N | I | | 10 | 15.00 | 3.57 | 0.05 | 1.96 | 3.20 |
| Bluntnose Minnow | N | O | MG T | 68 | 102.00 | 24.29 | 0.20 | 8.31 | 2.00 |
| Central Stoneroller | N | H | | 30 | 45.00 | 10.71 | 0.49 | 20.05 | 10.93 |
| Yellow Bullhead | | I | MG T | 3 | 4.50 | 1.07 | 0.22 | 8.80 | 48.00 |
| Smallmouth Bass | F | C | MG M | 2 | 3.00 | 0.71 | 0.26 | 10.39 | 85.00 |
| Largemouth Bass | F | C | MG | 2 | 3.00 | 0.71 | 0.10 | 3.91 | 32.00 |
| Green Sunfish | S | I | MG T | 8 | 12.00 | 2.86 | 0.30 | 12.35 | 25.25 |
| Bluegill Sunfish | S | I | MG P | 3 | 4.50 | 1.07 | 0.01 | 0.37 | 2.00 |
| Longear Sunfish | S | I | FD M | 8 | 12.00 | 2.86 | 0.21 | 8.44 | 17.25 |
| Hybrid X Sunfish | | | | 1 | 1.50 | 0.36 | 0.08 | 3.42 | 56.00 |
| Johnny Darter | D | I | | 43 | 64.50 | 15.36 | 0.04 | 1.59 | 0.60 |
| Rainbow Darter | D | I | M | 3 | 4.50 | 1.07 | 0.02 | 0.61 | 3.33 |
| Orangethroat Darter | D | I | | 1 | 1.50 | 0.36 | 0.01 | 0.20 | 3.00 |
| Fantail Darter | D | I | | 58 | 87.00 | 20.71 | 0.10 | 3.87 | 1.09 |
| <i>Date Total</i> | | | | 280 | 420.00 | | 2.45 | | |
| <i>Number of Species</i> | | | | 16 | | | | | |
| <i>Number of Hybrids</i> | | | | 1 | | | | | |

| | | |
|---------------------------|--------------------------------|--------------------------------|
| River Code: 11-107 | Stream: Stonelick Creek | Sample Date: 08/07/2006 |
| River Mile: 10.50 | Location: | Invalid Sample: |
| Time Fished: 3600 sec | Drainage: 36.7 sq mi | Depth: |
| Dist Fished: 0.20 km | Basin: Little Miami River | Flow: C |
| Site ID:: | Lat:: 39.186100 | Lat:: 84.106530 |
| | | Data Source: 01 |
| | | Sampler Type: E |

| Species Name / ODNR status | IBI Grp | Feed Guild | Target Spec. Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|-------------------------------|------------|---------------|---------------------|--------------|--------------------|----------------|--------------------|----------------|-------------------|
| White Sucker | W | O | FD T | 1 | 1.50 | 0.14 | 0.01 | 0.10 | 4.00 |
| Creek Chub | N | G | FS T | 106 | 159.00 | 14.99 | 1.45 | 25.25 | 9.14 |
| Scarlet Shiner | N | I | M | 24 | 36.00 | 3.39 | 0.10 | 1.81 | 2.88 |
| Silverjaw Minnow | N | I | | 11 | 16.50 | 1.56 | 0.06 | 0.99 | 3.45 |
| Bluntnose Minnow | N | O | MG T | 211 | 316.50 | 29.84 | 0.68 | 11.72 | 2.13 |
| Central Stoneroller | N | H | | 189 | 283.50 | 26.73 | 1.86 | 32.25 | 6.55 |
| Yellow Bullhead | | I | MG T | 2 | 3.00 | 0.28 | 0.15 | 2.60 | 50.00 |
| Smallmouth Bass | F | C | MG M | 4 | 6.00 | 0.57 | 0.31 | 5.37 | 51.50 |
| Largemouth Bass | F | C | MG | 2 | 3.00 | 0.28 | 0.11 | 1.82 | 35.00 |
| Green Sunfish | S | I | MG T | 26 | 39.00 | 3.68 | 0.71 | 12.24 | 18.08 |
| Longear Sunfish | S | I | FD M | 1 | 1.50 | 0.14 | 0.05 | 0.78 | 30.00 |
| Hybrid X Sunfish | | | | 1 | 1.50 | 0.14 | 0.08 | 1.30 | 50.00 |
| Johnny Darter | D | I | | 45 | 67.50 | 6.36 | 0.06 | 1.04 | 0.89 |
| Rainbow Darter | D | I | M | 10 | 15.00 | 1.41 | 0.03 | 0.57 | 2.20 |
| Orangethroat Darter | D | I | | 1 | 1.50 | 0.14 | 0.00 | 0.05 | 2.00 |
| Fantail Darter | D | I | | 73 | 109.50 | 10.33 | 0.12 | 2.12 | 1.11 |
| <i>Date Total</i> | | | | 707 | 1,060.50 | | 5.76 | | |
| <i>Number of Species</i> | | | | 15 | | | | | |
| <i>Number of Hybrids</i> | | | | 1 | | | | | |

| | | |
|---------------------------|--------------------------------|--------------------------------|
| River Code: 11-107 | Stream: Stonelick Creek | Sample Date: 10/10/2006 |
| River Mile: 10.50 | Location: | Invalid Sample: |
| Time Fished: 3042 sec | Drainage: 36.7 sq mi | Depth: |
| Dist Fished: 0.20 km | Basin: Little Miami River | Flow: C |
| Site ID:: | Lat:: 39.186100 | Lat:: 84.106530 |
| | | Data Source: 01 |
| | | Sampler Type: D |

| Species Name / ODNR status | IBI Grp | Feed Guild | Target Spec. | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|----------------------------|--------------------------|------------|--------------|-----|-----------|-----------------|-------------|-----------------|-------------|----------------|
| Creek Chub | N | G | FS | T | 16 | 24.00 | 3.35 | 0.53 | 9.57 | 22.19 |
| Scarlet Shiner | N | I | | M | 11 | 16.50 | 2.30 | 0.01 | 0.25 | 0.82 |
| Bluntnose Minnow | N | O | MG | T | 86 | 129.00 | 17.99 | 0.32 | 5.66 | 2.44 |
| Central Stoneroller | N | H | | | 146 | 219.00 | 30.54 | 2.58 | 46.25 | 11.76 |
| Smallmouth Bass | F | C | MG | M | 9 | 13.50 | 1.88 | 1.04 | 18.74 | 77.33 |
| Green Sunfish | S | I | MG | T | 14 | 21.00 | 2.93 | 0.32 | 5.82 | 15.43 |
| Bluegill Sunfish | S | I | MG | P | 13 | 19.50 | 2.72 | 0.04 | 0.75 | 2.15 |
| Longear Sunfish | S | I | FD | M | 15 | 22.50 | 3.14 | 0.41 | 7.43 | 18.40 |
| Hybrid X Sunfish | | | | | 2 | 3.00 | 0.42 | 0.12 | 2.21 | 41.00 |
| Johnny Darter | D | I | | | 80 | 120.00 | 16.74 | 0.06 | 1.13 | 0.53 |
| Rainbow Darter | D | I | | M | 13 | 19.50 | 2.72 | 0.03 | 0.54 | 1.54 |
| Orangethroat Darter | D | I | | | 1 | 1.50 | 0.21 | 0.00 | 0.05 | 2.00 |
| Fantail Darter | D | I | | | 72 | 108.00 | 15.06 | 0.09 | 1.62 | 0.83 |
| | <i>Date Total</i> | | | | 478 | 717.00 | | 5.57 | | |
| | <i>Number of Species</i> | | | | 12 | | | | | |
| | <i>Number of Hybrids</i> | | | | 1 | | | | | |

| | | |
|---------------------------|---------------------------|--------------------------------|
| River Code: 11-163 | Stream: Avey's Run | Sample Date: 08/08/2006 |
| River Mile: 0.40 | Location: Dst Restoration | Invalid Sample: |
| Time Fished: 2400 sec | Drainage: 0.1 sq mi | Depth: |
| Dist Fished: 0.15 km | Basin: Little Miami River | Flow: C |
| Site ID:: | Lat:: 39.113250 | Lat:: 84.246310 |
| | | Data Source: 01 |
| | | Sampler Type: F |

| Species Name / ODNR status | IBI Grp | Feed Guild | Target Spec. Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|-------------------------------|--------------------------|---------------|---------------------|--------------|--------------------|----------------|--------------------|----------------|-------------------|
| Western Blacknose Dace | N | G | FS T | 171 | 342.00 | 35.19 | 0.80 | 19.50 | 2.34 |
| Creek Chub | N | G | FS T | 313 | 626.00 | 64.40 | 3.30 | 80.45 | 5.27 |
| Fantail Darter | D | I | | 2 | 4.00 | 0.41 | 0.00 | 0.05 | 0.50 |
| | <i>Date Total</i> | | | 486 | 972.00 | | 4.10 | | |
| | <i>Number of Species</i> | | | 3 | | | | | |
| | <i>Number of Hybrids</i> | | | 0 | | | | | |

| | | |
|---------------------------|---------------------------|--------------------------------|
| River Code: 11-163 | Stream: Avey's Run | Sample Date: 10/10/2006 |
| River Mile: 0.40 | Location: Dst Restoration | Invalid Sample: |
| Time Fished: 800 sec | Drainage: 0.1 sq mi | Depth: |
| Dist Fished: 0.15 km | Basin: Little Miami River | Flow: C |
| Site ID:: | Lat:: 39.113250 | Lat:: 84.246310 |
| | | Data Source: 01 |
| | | Sampler Type: F |

| Species Name / ODNR status | IBI Grp | Feed Guild | Target Spec. Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|-------------------------------|--------------------------|---------------|---------------------|--------------|--------------------|----------------|--------------------|----------------|-------------------|
| Western Blacknose Dace | N | G | FS T | 100 | 200.00 | 50.25 | 0.40 | 40.00 | 2.00 |
| Creek Chub | N | G | FS T | 99 | 198.00 | 49.75 | 0.60 | 60.00 | 3.03 |
| | <i>Date Total</i> | | | 199 | 398.00 | | 1.00 | | |
| | <i>Number of Species</i> | | | 2 | | | | | |
| | <i>Number of Hybrids</i> | | | 0 | | | | | |

| | | |
|---------------------------|---------------------------|--------------------------------|
| River Code: 11-163 | Stream: Avey's Run | Sample Date: 08/08/2006 |
| River Mile: 0.10 | Location: Dst Restoration | Invalid Sample: |
| Time Fished: 2700 sec | Drainage: 0.2 sq mi | Depth: |
| Dist Fished: 0.15 km | Basin: Little Miami River | Flow: C |
| Site ID:: | Lat:: 39.115470 | Lat:: 84.242640 |
| | | Data Source: 01 |
| | | Sampler Type: F |

| Species Name / ODNR status | IBI Grp | Feed Guild | Target Spec. Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|-------------------------------|--------------------------|---------------|---------------------|--------------|--------------------|----------------|--------------------|----------------|-------------------|
| Western Blacknose Dace | N | G | FS T | 211 | 422.00 | 43.42 | 1.18 | 26.22 | 2.80 |
| Creek Chub | N | G | FS T | 275 | 550.00 | 56.58 | 3.32 | 73.78 | 6.04 |
| | <i>Date Total</i> | | | 486 | 972.00 | | 4.50 | | |
| | <i>Number of Species</i> | | | 2 | | | | | |
| | <i>Number of Hybrids</i> | | | 0 | | | | | |

| | | |
|---------------------------|---------------------------|--------------------------------|
| River Code: 11-163 | Stream: Avey's Run | Sample Date: 10/10/2006 |
| River Mile: 0.10 | Location: Dst Restoration | Invalid Sample: |
| Time Fished: 734 sec | Drainage: 0.2 sq mi | Depth: |
| Dist Fished: 0.15 km | Basin: Little Miami River | Flow: C |
| Site ID:: | Lat:: 39.115470 | Lat:: 84.242640 |
| | | Data Source: 01 |
| | | Sampler Type: F |

| Species Name / ODNR status | IBI Grp | Feed Guild | Target Spec. Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|-------------------------------|--------------------------|---------------|---------------------|--------------|--------------------|----------------|--------------------|----------------|-------------------|
| Western Blacknose Dace | N | G | FS T | 98 | 196.00 | 49.00 | 0.40 | 35.71 | 2.04 |
| Creek Chub | N | G | FS T | 102 | 204.00 | 51.00 | 0.72 | 64.29 | 3.53 |
| | <i>Date Total</i> | | | 200 | 400.00 | | 1.12 | | |
| | <i>Number of Species</i> | | | 2 | | | | | |
| | <i>Number of Hybrids</i> | | | 0 | | | | | |

Appendix B: Macroinvertebrate Assemblage Results

Invertebrate Community Index Metric and Index Results
Taxa Relative Abundance by Sampling Location

Invertebrate Community Index Metric and Index Results for Clermont Co. Sampling
Locations

Appendix Table 5. ICI and metrics scores for macroinvertebrate stations sampled in the East Fork Little Miami study area during 2006..

| River Mile | Drainage Area (sq mi) | Number of | | | | Percent: | | | | | | ICI |
|---------------------------------------|-----------------------------|---------------|----------------|-------------------|------------------|----------|------------------|------------------|------------------|-----------------------|--------------|-----|
| | | Total Taxa | Mayfly Taxa | Caddisfly Taxa | Dipteran Taxa | Mayflies | Caddis- flies | Tany- tarsini | Other Dipt/NI | Tolerant Organisms | Qual. EPT | |
| East Fork Little Miami River (11-100) | | | | | | | | | | | | |
| Year: 2006 | | | | | | | | | | | | |
| 36.20 | 234.0 | 27(4) | 5(2) | 3(4) | 14(4) | 16.8(4) | 23.8(6) | 21.6(4) | 33.4(4) | 0.5(6) | 13(4) | 42 |

Appendix Table 6. Macroinvertebrate taxa collected in the East Fork Little River study area during 2006.

Site: East Fork Little Miami River DST Williamsburg Dam

Collection Date: 10/03/2006 River Code: 11-100 River: East Fork Little Miami River RM: 36.20

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|-----------|--|------|---------|---------------------------|---------------------------|----------------|---------|
| 03600 | Oligochaeta | T | 8 + | 99860 | Lampsilis radiata luteola | MI | + |
| 05900 | Lirceus sp | F | + | | | | |
| 08250 | Orconectes (Procericambarus) rusticus | F | + | No. Quantitative Taxa: 27 | | Total Taxa: 41 | |
| 11130 | Baetis intercalaris | F | 80 + | No. Qualitative Taxa: 28 | | ICI: 42 | |
| 11670 | Proclleon irrubrum | MI | + | Number of Organisms: 1532 | | Qual EPT: 13 | |
| 12200 | Isonychia sp | MI | 28 + | | | | |
| 13000 | Leucrocuta sp | I | + | | | | |
| 13400 | Stenacron sp | F | + | | | | |
| 13521 | Stenonema femoratum | F | 1 + | | | | |
| 13561 | Stenonema pulchellum | MI | 124 + | | | | |
| 17200 | Caenis sp | F | 24 + | | | | |
| 21300 | Hetaerina sp | F | + | | | | |
| 34700 | Agnetina capitata complex | I | 5 + | | | | |
| 48410 | Corydalis cornutus | MI | 14 + | | | | |
| 50315 | Chimarra obscura | MI | 112 + | | | | |
| 52200 | Cheumatopsyche sp | F | 233 + | | | | |
| 52430 | Ceratopsyche morosa group | MI | 20 | | | | |
| 52540 | Hydropsyche dicantha | MI | + | | | | |
| 58505 | Helicopsyche borealis | MI | + | | | | |
| 59970 | Petrophila sp | I | + | | | | |
| 68075 | Psephenus herricki | MI | + | | | | |
| 69400 | Stenelmis sp | F | 48 + | | | | |
| 71100 | Hexatoma sp | MI | + | | | | |
| 71900 | Tipula sp | F | + | | | | |
| 74100 | Simulium sp | F | 32 + | | | | |
| 77500 | Conchapelopia sp | F | 62 | | | | |
| 80370 | Corynoneura lobata | MI | 4 | | | | |
| 80700 | Eukiefferiella sp | | 69 + | | | | |
| 81231 | Nanocladius (N.) crassicornus or N. (N.) "rectinervis" | F | 7 | | | | |
| 81650 | Parametriocnemus sp | MI | 7 | | | | |
| 82121 | Thienemanniella lobapodema | MI | 4 | | | | |
| 82141 | Thienemanniella xena | F | 3 | | | | |
| 83300 | Glyptotendipes (G.) sp | M | 35 | | | | |
| 83840 | Microtendipes pedellus group | MI | 14 | | | | |
| 84450 | Polypedilum (Uresipedilum) flavum | F | 262 + | | | | |
| 85625 | Rheotanytarsus sp | MI | 310 | | | | |
| 85821 | Tanytarsus glabrescens group sp 7 | MI | 21 | | | | |
| 87540 | Hemerodromia sp | F | 4 | | | | |
| 93900 | Elimia sp | MI | + | | | | |
| 98600 | Sphaerium sp | F | 1 | | | | |

Appendix Table 6

Site: East Fork Little Miami River UST Williamsburg Dam (impound)

Collection Date: 10/03/2006 River Code: 11-100 River: East Fork Little Miami River RM: 36.70

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|-----------|---------------------------------------|------|---------|-----------|------|------|---------|
| 01801 | Turbellaria | F | + | | | | |
| 03600 | Oligochaeta | T | + | | | | |
| 08250 | Orconectes (Procericambarus) rusticus | F | + | | | | |
| 11130 | Baetis intercalaris | F | + | | | | |
| 12200 | Isonychia sp | MI | + | | | | |
| 13000 | Leucrocuta sp | I | + | | | | |
| 13400 | Stenacron sp | F | + | | | | |
| 13561 | Stenonema pulchellum | MI | + | | | | |
| 22001 | Coenagrionidae | M | + | | | | |
| 22300 | Argia sp | F | + | | | | |
| 34700 | Agnetina capitata complex | I | + | | | | |
| 48410 | Corydalis cornutus | MI | + | | | | |
| 50315 | Chimarra obscura | MI | + | | | | |
| 52200 | Cheumatopsyche sp | F | + | | | | |
| 59970 | Petrophila sp | I | + | | | | |
| 60900 | Peltodytes sp | M | + | | | | |
| 68075 | Psephenus herricki | MI | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 69400 | Stenelmis sp | F | + | | | | |
| 74100 | Simulium sp | F | + | | | | |
| 80700 | Eukiefferiella sp | | + | | | | |
| 84450 | Polypedilum (Uresipedilum) flavum | F | + | | | | |
| 93900 | Elimia sp | MI | + | | | | |
| 97601 | Corbicula fluminea | MI | + | | | | |
| 98600 | Sphaerium sp | F | + | | | | |
| 99100 | Pyganodon grandis | F | + | | | | |
| 99240 | Lasmigona complanata | MI | + | | | | |
| 99320 | Tritogonia verrucosa | I | + | | | | |
| 99440 | Fusconaia flava | MI | + | | | | |
| 99860 | Lampsilis radiata luteola | MI | + | | | | |
| 99880 | Lampsilis cardium | I | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 31
 No. Qualitative Taxa: 31 ICI: G
 Number of Organisms: 0 Qual EPT: 8

Appendix Table 6

Site: Stonelick Creek

Collection Date: 09/26/2006 River Code: 11-107 River: Stonelick Creek

RM: 10.50

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|-----------|---------------------------------------|------|---------|-----------|------|------|---------|
| 05900 | Lirceus sp | F | + | | | | |
| 08250 | Orconectes (Procericambarus) rusticus | F | + | | | | |
| 11120 | Baetis flavistriga | F | + | | | | |
| 11130 | Baetis intercalaris | F | + | | | | |
| 13400 | Stenacron sp | F | + | | | | |
| 13521 | Stenonema femoratum | F | + | | | | |
| 13550 | Stenonema mexicanum integrum | MI | + | | | | |
| 17200 | Caenis sp | F | + | | | | |
| 22001 | Coenagrionidae | M | + | | | | |
| 50315 | Chimarra obscura | MI | + | | | | |
| 51600 | Polycentropus sp | MI | + | | | | |
| 52200 | Cheumatopsyche sp | F | + | | | | |
| 58505 | Helicopsyche borealis | MI | + | | | | |
| 63300 | Hydroporus sp | F | + | | | | |
| 69400 | Stenelmis sp | F | + | | | | |
| 74100 | Simulium sp | F | + | | | | |
| 80700 | Eukiefferiella sp | | + | | | | |
| 84450 | Polypedilum (Uresipedilum) flavum | F | + | | | | |
| 93900 | Elimia sp | MI | + | | | | |

| | |
|--------------------------|----------------|
| No. Quantitative Taxa: 0 | Total Taxa: 19 |
| No. Qualitative Taxa: 19 | ICI: G |
| Number of Organisms: 0 | Qual EPT: 10 |

Appendix Table 6

Site: Stonelick Creek

Collection Date: 09/26/2006 River Code: 11-107 River: Stonelick Creek

RM: 10.70

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|-----------|---------------------------------------|------|---------|-----------|------|------|---------|
| 01801 | Turbellaria | F | + | | | | |
| 05900 | Lirceus sp | F | + | | | | |
| 06201 | Hyalella azteca | F | + | | | | |
| 08250 | Orconectes (Procericambarus) rusticus | F | + | | | | |
| 11120 | Baetis flavistriga | F | + | | | | |
| 11130 | Baetis intercalaris | F | + | | | | |
| 13400 | Stenacron sp | F | + | | | | |
| 13521 | Stenonema femoratum | F | + | | | | |
| 13550 | Stenonema mexicanum integrum | MI | + | | | | |
| 17200 | Caenis sp | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 22001 | Coenagrionidae | M | + | | | | |
| 23909 | Boyeria vinosa | F | + | | | | |
| 52200 | Cheumatopsyche sp | F | + | | | | |
| 63300 | Hydroporus sp | F | + | | | | |
| 68075 | Psephenus herricki | MI | + | | | | |
| 69400 | Stenelmis sp | F | + | | | | |
| 77500 | Conchapelopia sp | F | + | | | | |
| 80700 | Eukiefferiella sp | | + | | | | |
| 83840 | Microtendipes pedellus group | MI | + | | | | |
| 84450 | Polypedilum (Uresipedilum) flavum | F | + | | | | |
| 84470 | Polypedilum (P.) illinoense | T | + | | | | |
| 86236 | Tabanus reinwardtii | F | + | | | | |
| 93900 | Elimia sp | MI | + | | | | |
| 97601 | Corbicula fluminea | MI | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 25

No. Qualitative Taxa: 25 ICI: G

Number of Organisms: 0 Qual EPT: 7

Appendix Table 6

Site: Avey's Run Dst Restoration

Collection Date: 09/26/2006 River Code: 11-163 River: Avey's Run

RM: 0.10

| Taxa | | | | Taxa | | | |
|-------|---------------------|------|---------|------|------|------|---------|
| Code | Taxa | Tol. | Qt./Ql. | Code | Taxa | Tol. | Qt./Ql. |
| 05900 | Lirceus sp | F | + | | | | |
| 07800 | Cambarus sp | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 52315 | Diplectrona modesta | F | + | | | | |
| 57400 | Neophylax sp | I | + | | | | |
| 68075 | Psephenus herricki | MI | + | | | | |
| 81650 | Parametrioctenus sp | MI | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 7

No. Qualitative Taxa: 7 ICI: -

Number of Organisms: 0 Qual EPT: 2

Appendix Table 6

Site: Avey's Run Dst Restoration

Collection Date: 09/26/2006 River Code: 11-163 River: Avey's Run

RM: 0.40

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|-----------|---------------------|------|---------|-----------|------|------|---------|
| 01801 | Turbellaria | F | + | | | | |
| 03600 | Oligochaeta | T | + | | | | |
| 05900 | Lirceus sp | F | + | | | | |
| 06201 | Hyalella azteca | F | + | | | | |
| 07800 | Cambarus sp | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 71900 | Tipula sp | F | + | | | | |
| 82710 | Chironomus (C.) sp | T | + | | | | |
| 84750 | Stictochironomus sp | F | + | | | | |
| 87400 | Stratiomys sp | F | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 10

No. Qualitative Taxa: 10 ICI: -

Number of Organisms: 0 Qual EPT: 0