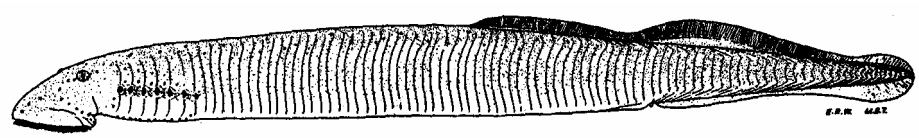
# FISH AND MACROINVERTEBRATE STUDY OF LEADING CREEK



*MBI Technical Report MB/2005-1*

# Fish and Macroinvertebrate Study of Leading Creek

2004 Field Year

Athens, Gallia, and Meigs Counties, Ohio

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MBI Technical Report MB/2005-3

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Division of Mineral Resources Management
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Cover photos: Top – mayfly larvae, Middle – longear sunfish; Bottom – silver lamprey

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**Forward**

This report generally follows the format used in Ohio EPA Technical Support Documents ("TSDs") and the purpose of an Ohio EPA TSD and this report are generally similar. Those familiar with a TSD should be able to use this report without much difficulty. There are some differences, however, in that a focus of this report is identifying waters affected by acid mine drainage (AMD) and other mine related stressors. This cannot be completely accomplished without an assessment of other stressors to aid in the process of discriminating among the various causes of impairment. We are also interested in generating useful endpoints for other watershed restoration efforts. In the Western Allegheny Plateau (WAP) ecoregion this typically includes understanding the effects of fine sediments on aquatic life and attainment of aquatic life uses. To accomplish this we will use data from this report and reference data from the WAP ecoregion to generate sediment endpoints for TMDL efforts.

The major objectives of a biosurvey are typically to: 1) determine the extent to which use aquatic life use designations are either attained or impaired; 2) determine the appropriate and attainable aquatic life use designation; and 3) determine the stressors responsible for any impairments or threats. The following discussion on the hierarchy of indicators is taken from Ohio EPA:

> Hierarchy of Indicators
>
> A carefully conceived ambient monitoring approach, using cost-effective indicators comprised 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 is outlined in Figure 1 and includes a hierarchical continuum from administrative to true environmental indicators. 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 un-permitted), 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 declining species or bacterial levels which serve as surrogates for the recreational 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 Ohio Water Resource Inventory (305[b] report), 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) Cold-water 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 mi. 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.

6) Limited Resource Water - Acid Mine Drainage (LRW-AMD) -this use applies to streams and rivers which have been subjected to severe acid mine drainage pollution from abandoned mine lands or gob piles, and where there is no near term prospect for reclamation; the representative aquatic assemblages are generally composed of species which are tolerant to low pH, silt, metals, and poor quality habitat. Ohio EPA has recently modified its use of this designation given the ongoing AMD and watershed restoration

projects that are occurring compared to a decade ago. For most streams where there is some planned restoration effort and limitations are not physical (e.g., MWH or small drainageway LRW) a WWH goal will be retained for these waters. We are following these recommendations for this study.

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.

## *Introduction*

The Leading Creek watershed has a long history of underground and surface mining. A byproduct of this historic activity has been acid mine drainage, sedimentation, and metal loadings in streams and tributaries in the vicinity of these mines. The upper watershed, upstream of Mud Fork is essentially free of mining impacts, but agricultural activities and waste-water are potential sources of impairment. Acid mine drainage (AMD) remediation efforts thus far have already shown substantial improvements in aquatic life from abatement of certain impacts in the certain Ohio watersheds (e.g., Ohio EPA 1997) including Leading Creek. This is reflected in Ohio EPA's decision to forgo the Limited Resource Water (LRW) designation[1] in watersheds where restoration efforts are planned or ongoing. This report focuses on identifying mining impaired waterways in Leading Creek downstream of and including Mud Fork and identifying the status of upstream areas from other potential impacts. This report focuses primarily on data collected in 2004 although we reference extensive data back into the 1980s and especially during and after the 1993 Southern Ohio Coal Co discharge and fish kill related to the pumping of water from the flooded Meigs # 31 Mine (Simon et al. 2002). Some of this data are used here and other data are referenced.

This central focus of this report is to identify the aquatic life use attainment status of streams in this watershed, and if impaired, to identify the likely responsible stressors. There has been extensive data collected related to the Meigs #31 Mine discharge (see Cherry et al. 1999), however, very little biological data existed in many of the tributaries to Leading Creek or in the upper watershed. This is especially true of the most severely AMD impacted portion of the watershed in the Thomas Fork sub-watershed. The broad effort in 2004, supplemented by the historical data serves as a baseline to measure the success abatement actions in the area.

Specific objectives of this study were to:

1) evaluate the physical habitat and the biological integrity of streams in the Leading Creek watershed,
2) assess impacts from mining activities, nonpoint sources of pollution, and habitat alterations,
3) determine attainment status of aquatic life and recommend changes where appropriate, and
4) establish a baseline of biological data for assessing AMD impacts.

*Benefits of Stream and River Restoration*

Stream restoration efforts occur frequently, but often without clear links back to services that streams and rivers provide to society. More explicit examination of the benefits of clean water and the restoration of aquatic life would help bolster support of watershed

[1] The Limited Resource Water aquatic life designation was assigned to waters where restoration was either considered irretrievable or where restoration efforts were not feasible within a short-term (~20 yr) time frame.

restoration efforts. Many of the services that healthy streams provide to society are not always obvious, but can be immense (Daily et al. 1997). As summarized by Daily et al. (1997):

> "Human societies derive many essential goods from natural ecosystems, including seafood, game animals, fodder, fuelwood, timber, and pharmaceutical products. These goods represent important and familiar parts of the economy. What has been less appreciated until recently is that natural ecosystems also perform fundamental life-support services without which human civilizations would cease to thrive. These include the purification of air and water, detoxification and decomposition of wastes, regulation of climate, regeneration of soil fertility, and production and maintenance of biodiversity, from which key ingredients of our agricultural, pharmaceutical, and industrial enterprises are derived. This array of services is generated by a complex interplay of natural cycles powered by solar energy and operating across a wide range of space and time scales. The process of waste disposal, for example, involves the life cycles of bacteria as well as the planet-wide cycles of major chemical elements such as carbon and nitrogen. Such processes are worth many trillions of dollars annually. Yet because most of these benefits are not traded in economic markets, they carry no price tags that could alert society to changes in their supply or deterioration of underlying ecological systems that generate them. Because threats to these systems are increasing, there is a critical need for identification and monitoring of ecosystem services both locally and globally, and for the incorporation of their value into decision-making processes."

In southeast Ohio, the more obvious economics benefits of clean waters and functioning watersheds are sufficient by themselves to drive watershed restoration efforts. Southeast Ohio has recently become a recreation destination for other areas of Ohio. For streams, a predominant use of these resources is for fishing. In a study in Oklahoma about 27% of those with fishing licenses fished in streams and rivers (Fisher et al. 2002). For the subregion of eastern Oklahoma, stream fishing generated about $24 million of activity for 1993. Nationally, Americans spend about $24 billion dollars a year on fishing. Improvements in fishability, which as we will show later is correlated with biological integrity, should result in repeat visits to southeast Ohio for fishing and related recreation (e.g., canoeing).

## Background

Leading Creek is a 3rd order stream with a drainage area of 150 square miles that begins in Athens County, drains a small part of Gallia County, but primarily flows southeast through Meigs County where it enters the Ohio River. More detailed information on its geology, landuse, etc., can be found in Bauers (2005) and Cherry et al. (1999). A station at RM 10.3 on the stream was an Ohio EPA biocriteria reference site and Leading Creek was a State Resource Water for the Western Allegheny Plateau ecoregion. In addition, it harbors populations of intolerant species such as the silver lamprey (*Ichthyomyzon unicuspis)*,

and in the recent past river redhorse (*Moxostoma carinatum*), an Ohio DNR species of special concern.

Meigs Mine Spill

Leading Creek downstream of Parker Run was devoid of most aquatic life after the discharge of contaminated (metals, acid) water pumped from the flooded Meigs #31 Mine during summer of 1993 (Simon et al 2002). The collapse and pumping of the Meigs #31 Mine during July 1993 was considered one of the largest environmental disturbances to ever occur in southeastern Ohio (Simon et al. 2002). The mine pumped over 1.1 billion gallons of low pH water, dissolved metals, and mine associated contaminants into Parker Run, a tributary of Leading Creek, and into Strongs Run, Robinson Run, and Sugar Run, all tributaries of Raccoon Creek, to drain the largest long wall coal mine in the United States. Pumping continued for three months between July and September 1993 and at one point turned the Ohio River orange from the iron flocculent that moved through Leading Creek. A number of stations were selected in these affected streams in the Raccoon Creek and Leading Creek watersheds to monitor changes in the system based on fish and macroinvertebrate assemblage indicators (Ohio EPA 1994, Simon et al. 2002). Patterns in these indicators ("ecological endpoints") were used to determine when the streams eventually recovered to their previous conditions (pre-discharge conditions) or Warmwater Habitat (WWH) designated use goals where pre-discharge data was unavailable (Ohio EPA 1994). Ohio EPA (1998, Jeff DeShon, personal communication) considers the streams to have recovered from the influence of the spill, but has recognized that other mine-related and nonpoint sources were still limiting full attainment of aquatic life uses.

Ohio EPA (1994) constructed ecological endpoints to gauge recovery from the discharge based on Ohio biocriteria, pre-discharge conditions, and the recovery of key sensitive taxa and species to the stream system. Prior to 1993 the Leading Creek watershed had a mix of waters severely impaired by AMD (e.g., Thomas Fork) along with other streams having impacts from non-AMD stressors especially fine sediments (e.g., sand bedload) and some local impacts from agriculture (livestock related bank erosion, riparian loss, and channelization). Penalties related to the spill funded a number of research projects that have provided data and research on conditions and stressors in the Leading Creek watershed. Some of these are summarized below and referenced in the discussions of impaired areas of the watershed.

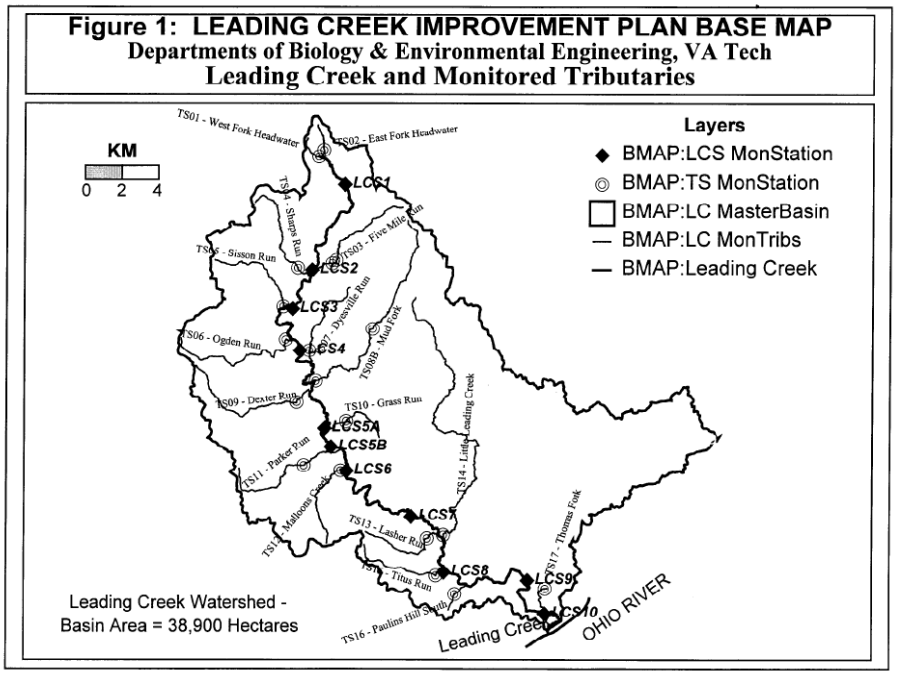
Other Studies

Currie (1999) examined the ecosystem stressors as a part of the development of the "Enhancement Plan" for the Leading Creek Watershed and these were incorporated in the Leading Creek Improvement Plan (Cherry et al. 1999) created as a guide for restoration actions in the watershed. Currie summarized the collection of ecotoxicological parameters including water and sediment quality, algal colonization upon artificial substrates, benthic macroinvertebrate data, acute water column toxicity, sediment chronic toxicity and in situ clam (*Corbicula fluminea)* toxicity. She also summarized the valuation of habitat impairments including QHEI habitat assessments, in-stream riparian surveys and land use

analysis. Currie identified agriculture and AMD as the two prevalent sources of stressors in the Leading Creek watershed, as Ohio EPA and Ohio DNR had done in earlier work in the watershed. Both of these were identified as important sources of the predominantly sediment-influenced habitat degradation that exists across the watershed. Currie generated an Ecotoxicological Rating (ETR) for 27 stations in Leading Creek by impact type as follows:

> "Development of the enhancement plan began with ten mainstem stations and 17 tributary stations based on prioritization of impact parameters using an Ecotoxicological Rating (ETR) developed specifically for the Leading Creek watershed. The ETR included biological, toxicological, chemical and physical data to integrate a complete description of the impacts affecting the Leading Creek watershed. The 23 parameters in the ETR for the mainstem stations were; sediment depth, acidic pH, quantitative Invertebrate Community Index (ICI) scores, conductivity, clam in situ survival and growth, Daphnia magna and Chironomus tentans sediment toxicity, stormwater acute toxicity, qualitative invertebrate richness and Ephemeroptera, Plecoptera and Trichoptera (EPT) abundance, percent AML area, concentrations of sodium, copper, zinc, iron, manganese, chloride, nitrate/nitrite, ammonia, TSS, plus Qualitative Habitat Evaluation Index (QHEI) and United States Environmental Protection Agency (US EPA) habitat scores. For the mainstem stations, low flow in the summer was substituted for quantitative ICI scores. The ETR provided a single numerical score of 200 points that allowed comparisons to be made between sites within Leading Creek and tributaries within the watershed. Stressors identified within the watershed and used in the ranking of sites included agricultural sedimentation, sedimentation from AML, poor water quality from AMD and multiple toxic inputs such as acute stormwater runoff. (Currie 1999)."

Sites used or sampled as part of the Leading Creek improvement plan are illustrated in Figure 1 (also Figure 1 of Cherry et al 1999). Summaries of stressors or sources at most sites generated through the Leading Creek improvement plan ETR analyses are summarized in Appendix 6 with



specific details in Currie (1999) or Cherry et al. (1999). Currie (1999) and Cherry (1998) ranked the likely-hood of restorability of streams to a WWH or EWH assemblage based on the stressors identified, and for tributaries whether permanent flow existed. They probably underestimated the restorability of some of the small tributaries in the Leading Creek watershed because of a perceived lack of surface flow during some summer periods. Lack of riffle flow during dry parts of most summers may not limit aquatic communities if pool habitats are of sufficient quality to maintain aquatic life and suitable interstitial flow is present. For example, several very small, "interstitial" streams such as Little Parker Run and Malloons Run usually attain the regional biocriteria even though most years flow through riffles is interstitial for some period. Good pools, natural channel form and function and interstitial flow sustain very diverse macroinvertebrates and populations of sensitive fish such as southern redbelly dace. A number of workers have reported high macroinvertebrate diversity in non-perennial streams (Wipfli and Gregovich. 2002; Muchow and Richardson 2000) where there is sufficient interstitial flow to support these habitats and anthropogenic sources of fines embedding the larger gravels have not literally left the invertebrates between "a rock and a hard place."

Lattimer (1999) complete a study of three Leading Creek tributaries by examining macroinvertebrates, water chemistry, and sediment depth. Sediment depth (depth of fines) was measured as a relative depth by driving a steel pole into the bottom or as an absolute depth by driving a steel rod until a gravel or clay streambed was reached. The patterns in fine substrate that aggrade the Little Leading Creek (and lower Leading Creek) were evident in this data as well as QHEI and pebble count data as will be illustrated later.

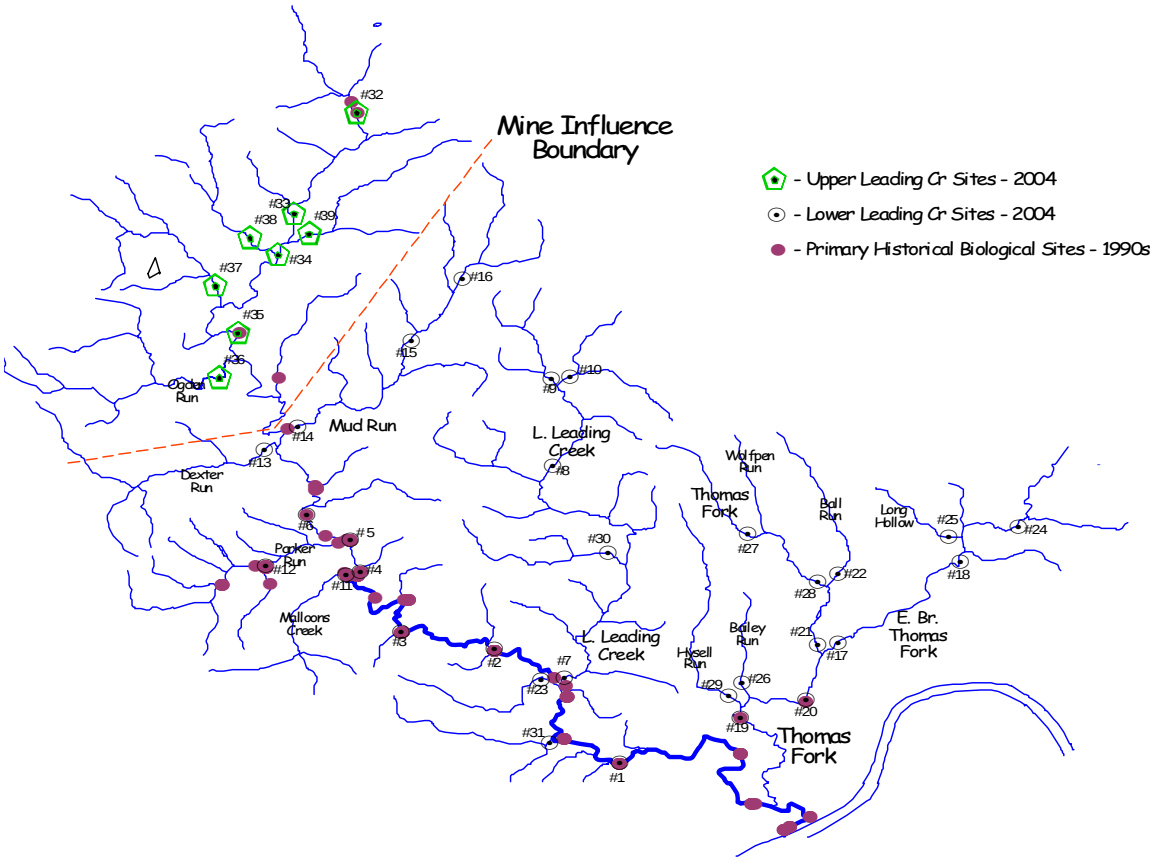
Kennedy et al. (2003) performed a study on the effects of high specific conductivity (SC) and sulfate form the Meigs Mine discharge on aquatic life of Parker Run, Ogden Run, and Leading Creek. Kennedy et al. (2003) collected benthic macroinvertebrates and conducted toxicity tests is vitro on *Ceriodaphnia dubia* and *Pimephales promelas* and in situ for *Corbicula fluminea*. In another study, they performed toxicity testing on the mayfly *Isonychia*, which they found was more sensitive than other test organisms (Kennedy et al. 2004). This matched field patterns in Ohio EPA data which demonstrated the loss of mayfly taxa downstream of the mine discharge (Ohio EPA 1997b). Their work corroborated Ohio EPA conclusions that some constituent or constituents in the treated mine effluent were responsible for some of the aquatic life impairment observed in Leading Creek after the effects of the 1993 spill abated. The biological patterns included the suppression of mayfly taxa downstream of the discharge points. We will refer to the results of these studies and work performed by Ohio EPA prior to and subsequent to the spill during our efforts to identify responsible stressors where we find aquatic life impairment.

*Major Tributaries of Leading Creek*

Table 1 lists the major tributaries to Leading Creek and the mile point (Ohio EPA river mile) of their confluence points in the Leading Creek stream network. These are also illustrated on Map 1.

Table 1. Major tributaries to Leading Creek and their confluence river miles.

| Stream | Tributary To: | Mile Point |
|---|---|---|
| Thomas Fork | Leading Creek | 1.50 |
| Bailey Run | Thomas Fork | 3.32 |
| Little Leading Creek | Leading Creek | 8.49 |
| Malloons Run | Leading Creek | 14.68 |
| Parker Run | Leading Creek | 15.61 |
| Grass Run | Leading Creek | 16.83 |
| Dexter Run | Leading Creek | 18.50 |
| Mud Fork | Leading Creek | 18.93 |
| Ogden Run | Leading Creek | 21.90 |
| Sisson Run | Leading Creek | 23.86 |
| Fivemile Run | Leading Creek | 26.16 |




Map 1. Map of the Leading Creek watershed with historical biological sampling sites and sites sampled during 2004 by MBI.

***Methods***

All chemical, physical, and biological field, laboratory, data processing, and data analysis methodologies and procedures adhere to those specified in the Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices (Ohio Environmental Protection Agency 1989a) and *Biological Criteria for the Protection of Aquatic Life, Volumes I-III* (Ohio Environmental Protection Agency 1987a, 1987b, 1989b, 1989c), and *The Qualitative Habitat Evaluation Index (QHEI): Rationale, Methods, and Application* (Rankin 1989) and Rankin (1995) for aquatic habitat assessment. Biological sampling locations are listed in Table 3. Determining aquatic life use attainment status means describing the degree to which environmental indicators are either above or below criteria specified by the Ohio Water Quality Standards (WQS; Ohio Administrative Code 3745- 1) with the most appropriate indicator typically being the Ohio EPA biological criteria (OAC 3745-1-07; Table 7-14). These are confined to ambient assessments and apply to rivers and streams outside of mixing zones. 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. Numerical endpoints are stratified by ecoregion, use designation, and stream or river size. Three attainment status results are possible at each sampling location - Full, partial, or non-attainment. Full attainment means that all of the applicable indices meet the Ohio WQS biocriteria or the LRW-AMD benchmarks[2]. Partial attainment means that one or more of the applicable indices fails to meet the biocriteria or the LRW-AMD benchmarks. Nonattainment means that none of the applicable indices meet the biocriteria or the LRW-AMD benchmarks; or, for WWH and EWH streams, one of the organism groups reflects poor or very poor performance. An aquatic life use attainment table (see Table 3) is constructed based on the sampling results and is arranged by sampling locations indicated by river mile, the applicable biological indices, the use attainment status (i.e., full, partial, or non), the Qualitative Habitat Evaluation Index (QHEI), and comments and observations for each sampling location.

The IBI and ICI are multimetric indices patterned after an original IBI described by Karr (1981) and Fausch et al. (1984). The ICI was developed by Ohio EPA (1987b) and further described by DeShon (1995). The MIwb is a measure of fish community abundance and diversity using numbers and weight information and is a modification of the original Index of Well- Being originally applied to fish community information from the Wabash River (Gammon 1976; Gammon et al. 1981). Performance expectations for the principal aquatic life uses in the Ohio WQS (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).

[2] LRW targets are included here for reference although Ohio EPA identifies WWH as the base target for AMD streams with ongoing restoration activities.

*Habitat Assessment*

Physical habitat was evaluated using the Qualitative Habitat Evaluation Index (QHEI) developed by the Ohio EPA for streams and rivers in Ohio (Rankin 1989, 1995). Various attributes of the habitat are scored based on the overall importance of each to the maintenance of viable, diverse, and functional aquatic faunas. The type(s) and quality of substrates, amount and quality of instream cover, channel morphology, extent and quality of riparian vegetation, pool, run, and riffle development and quality, and gradient are some of the habitat characteristics used to determine the QHEI score which generally ranges from less than 20 to 100. The QHEI is used to evaluate the characteristics of a stream segment, as opposed to the characteristics of a single sampling site. As such, individual sites may have 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 greater than 60 are generally conducive to the existence of warmwater faunas whereas scores less than 45 generally do not support a warmwater assemblage consistent with the WWH biological criteria. Scores greater than 75 frequently typify habitat conditions that have the ability to support exceptional warmwater faunas. General narrative ranges of the QHEI are as follows: < 30 – Very Poor; 30-44 – Poor; 45-59 – Fair; 60-74 – Good; ≥ 75 Excellent. These are considered general ranges because adjacent habitat also influences the biota within a reach.

*Macroinvertebrate Community Assessment*

The ICI for macroinvertebrates requires a station to be sampled quantitatively using multiple-plate, artificial substrate samplers (modified Hester/Dendy) in conjunction with a qualitative assessment of the available natural substrates. Larger sites were sampled with both methods, but smaller sites were assessed using only the qualitative assessment. Assessments of qualitative macroinvertebrate data result in narrative ratings ranging from very poor to excellent and coincide with narrative ranges applied to the ICI (Table 2). Qualitative Community Tolerance Values (QCTVs), and a draft QUAL ICI were used in association with EPT and other indicator taxa to arrive at a narrative rating for sites. The QCTV approximates an ICI rating by calculating a median of the weighted mean ICI for each taxon (generated from statewide data) from those collecting during a narrative assessment. A weighted ICI is based upon ICI scores from each site where the taxon has been found, weighted by the abundance data for that taxon from artificial substrate (quantitative) samples collected throughout Ohio.

Table 2. Association between narrative macro-invertebrate ratings and Ohio aquatic life use attainment in the IP ecoregion.

| | |
|---|---|
| Excellent (E) | Achieves EWH (ICI ≥ 46) |
| Very Good (VG) | Insignificant departure from EWH (ICI 42-44) |
| Good (G) | Achieves WWH (ICI ≥ 30) |
| Marginally Good (MG) | Insignificant departure from EWH (ICI 26-28) |
| Fair (F) | Achieves MWH (ICI > 22) |
| Poor (P) | Fails biocriteria (ICI 10-20) |
| Very Poor (VP) | Fails biocriteria (ICI 0-8) |

We recently derived a draft "Qual" ICI index by selecting six important metrics from the qualitative macroinvertebrate data and "trained" the index on existing narrative ratings

from the Ohio EPA database (Rankin 2004, draft). This index does not replace the expert narrative assessment because the biologist can extract qualitative information from abundance and condition of the macroinvertebrates or patterns in key taxa that are not available from the qualitative data alone which is only presence/absence data. Nevertheless, this index can help form the narrative assessment and provide a relative rating of sites in a watershed.

The use of the QCTV is limited to relative comparisons between sites and for determining narrative assessments (i.e., it is not used in place of ICI scores). We followed the Ohio EPA lead and used the numerical LRW-AMD benchmark for attainment status as an ICI score of 8. For qualitative only data in a LRW-AMD stream, a very poor narrative evaluation or a poor evaluation at a site where EPT taxa were not considered to be common or predominant on the natural substrates, was assessed as non-attainment status. A poor narrative evaluation at a qualitative only site was assessed as achieving the LRW-AMD benchmark if there were any EPT taxa observed to be common or predominant on the natural substrates.

*Fish Community Assessment*

During 2004 fish were sampled using wading method pulsed DC electrofishing gear at all sites as specified in Ohio EPA (1987b). These methods were used at a frequency of one sample at each stream site. Data here combines sites sampled as part of the Ohio DNR MRM study plan, but includes additional sites sampled during 2004 in the upper watershed funded through the Leading Creek Improvement Process. Several sites were unsamplable because of wet conditions during 2004 and were sampled during June 2005 instead.

*Zig/Zag Pebble Count Data*

The accumulation of fine substrates in aquatic habitat at rates greater than expected naturally has been identified as a primary cause of aquatic life impairment in Ohio (Ohio EPA 2000) and across the United States (U.S. EPA 2002). The effects of fine substrates that smother naturally coarse substrates can be readily observed with qualitative habitat indices such as the QHEI; however there is a need to more precisely identify the sources of these materials and to predict the fate and transport of these materials over time. As a result more precise methods have been proposed to provide data that might identify more precise trends over time with which to measure success or progress of various abatement strategies. For this study we collected zig/zag pebble counts (Bevenger and King 1995; Ohio EPA 1999) from most sites to explore how this data may be used to identify sediment impacts and to act as a baseline to measure reductions in silt and fine sediments in this watershed (i.e., a quantification more precise than QHEI alone).

*Causal Associations*

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). Identifying the causes and sources of the observed impairments relies on an interpretation of multiple lines of evidence including water chemistry data, sediment data, habitat data, effluent data, land use data, knowledge of mining sources, and biological results (Yoder and Rankin 1995, Simon 2003). 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.

*Prevalent Causes and Sources of Impairment in the WAP Ecoregion*

Ecoregions are useful for developing biocriteria because they identify regions of similarity in terms of biological assemblages. They are also useful, however, in identifying important stressors because they tend to be more similar within than across ecoregions. Knowledge of prevalent stressors throughout an ecoregion or subecoregion can be informative for stressor identification in a watershed that is a part of a particular ecoregion. The prevalent stressors in the WAP ecoregion are illustrated in Figure 2. These stressors are dominated by nonpoint sources from mining (metals, pH, siltation) and agriculture (siltation, habitat alterations, nutrients, and flow alterations). As we discuss later, the primary sources of impairment in the Leading Creek include mining, but are also a microcosm of those stressors those identified in Figure 2.

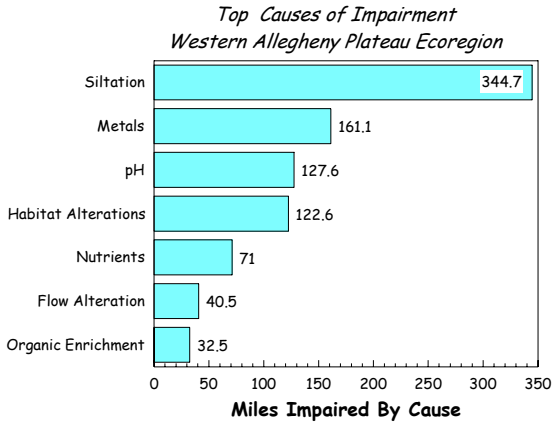



*Figure 2. Prevalent causes of aquatic life impairment in the WAP ecoregion from the Ohio Water Resource Inventory (Ohio EPA 2000).*

## Results

*Watershed Wide Patterns in Biological Condition*

Biological assemblage data was collected at 39 stations (38 w Fish, 35 with macroinvertebrates) in the Leading Creek watershed (Map 1) during 2004 and 2005. Fish species collections and IBI score and metrics are listed in Appendix Tables 1 and 2 and summary fish (IBI) and macroinvertebrate (narrative assessments) data are listed in the

attainment table (Table 3). Macroinvertebrate taxa collections are listed in Appendix Table 3. Figure 5 summarizes longitudinal patterns in the IBI in this watershed; Figure 6 patterns in the QHEI. Table 3 also summarizes the causes and sources of impairment of the based on the most current data from any given stream or location.

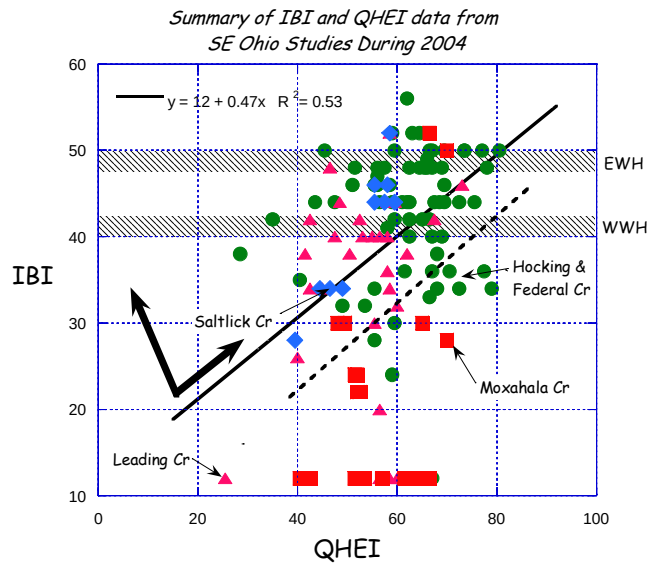



*Figure 3. QHEI vs IBI for stream sampled in 2004 in Southeast Ohio by MBI. Solid line is statewide regression line from natural and modified reference sites. Dashed line represents range where factors other than local habirat strong influence biological performance.*

Figure 3 summarizes the habitat and fish assemblage results from Leading Creek [triangles] in relation to other watersheds sampled during 2004 in Southeast Ohio including Moxahala [red squares], Federal Creek [green dots], and Saltlick Creek (blue diamonds]. These points are graphed in relation a QHEI-IBI regression line (thick line) from reference sites and modified references sites from across Ohio. EWH and WWH biocriteria are also depicted.

A primary goal of watershed restoration efforts is to restore the highest potential aquatic communities for all waters in watershed. Prevalent stressors of concern in SE Ohio include AMD impacts, nonpoint pollution including sediment and nutrients, and habitat destruction. The two thick arrows on Figure 3 represent the direction restoration efforts hope to move the relationship between habitat and IBI: lower slopes and higher mean scores. Watershed approaches are necessary because of the role of cumulative impacts on aquatic life in watersheds. Small oases of good habitat are not sufficient to restore

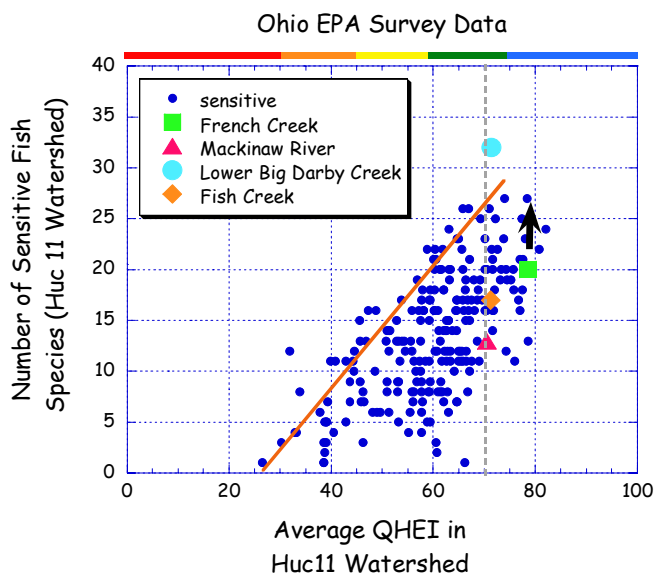



*Figure 4. Plot of cumulative numbers of sensitive fish species in a Huc 11 watershed vs. average habitat quality in that watershed for sites with more than 10 samples in a watershed. Outer line is drawn by eye and represents maximum number of sensitive species expected given average habitat quality in that watershed.*

aquatic communities so watershed perspectives are required to move mean habitat conditions higher and to reduce the slope of the QHEI-IBI association for a watershed.

*Are These Relationships Real or Hypothetical?*

Twenty-five years of biological field data provides strong evidence that these patterns are real. Figure 4 is from a study MBI did for the Nature Conservancy across the Midwest related to scale of agricultural impacts across watersheds. It is clear from Figure 4 that upper limits to populations of sensitive taxa such as fish species are limited by average habitat conditions in watersheds. In figure 4 reductions of every 10 points in the QHEI is associated with a loss or "extirpation" of five sensitive fish species from these watersheds. The same pattern holds for macroinvertebrates and Unionid mussel species (Rankin and Armitage 2005 Draft). We have also been able to document increases in IBI scores over time associated with improvements in tillage practices in the Auglaize River, presumptively due to reductions in sediment loading even though QHEI scores remained essentially unchanged. We have noted similar changes from point source abatement and would expect them from AMD abatement as well. As will be discussed below highly forested waters in Leading Creek and other similar watersheds may perform somewhat better than predicted from habitat data alone because of low concentrations of chemical stressors such as nutrients.

## Stream Specific Results

*Leading Creek Mainstem*

The fish assemblages in the mainstem of Leading Creek either attained or nearly attained the WWH biocriterion from the headwaters until the lower reaches (downstream of about RM 10) where extensive sand sediments smother the stream bottom and below the confluence of Thomas Fork where a high acid load adds an additional major stress. Habitat in Leading Creek was generally good to very good (QHEIs 60-75) with habitat declining where sedimentation was severe in the lower reach (e.g., RM 6.0). Macroinvertebrates were also generally achieving the WWH goal for the ICI or comparable narrative ratings although the population of mayflies was extremely low downstream of the Meigs #31 Mine discharge from Parker Run (RM 15.61). Parker Run contributes high dissolved solids and high conductivity waters to Leading Creek. This pattern was observed by Ohio EPA during their initial assessment of the Meigs #31 Mine

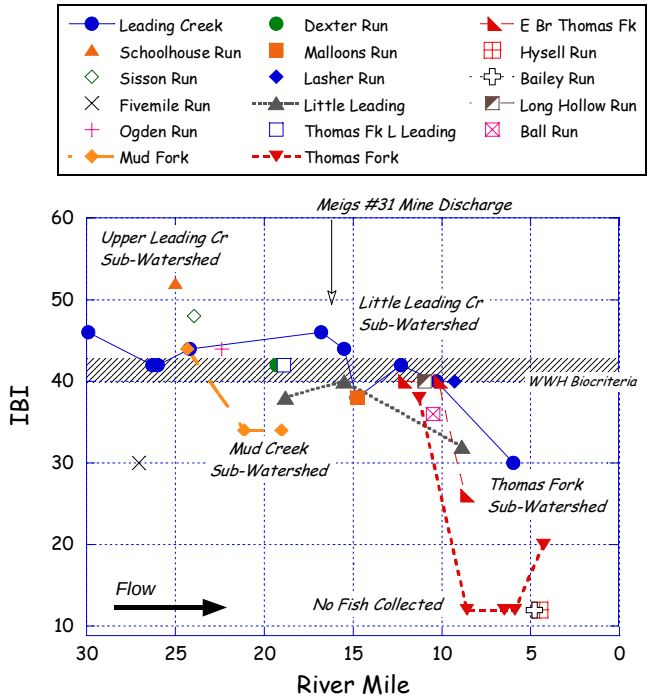



*Figure 5. IBI scores of streams sampled in the Leading Creek Watershed during 2004 and 2005.*

spill (Ohio EPA 1997a, 1998). Toxicity testing by Kennedy et al, (2003, 2004) corroborated that the loss of mayflies was likely due to toxicity from high dissolved solids in the effluent. This association between mayflies and dissolved solids and conductivity has been observed by other workers as well (U.S. EPA 2001).

*Thomas Fork Watershed*

Of the subwatersheds surveyed during 2004 and 2005, the Thomas Fork watershed is the most severely impaired and the most affected by AMD (Figure 5, Table 3). Five sites in the Thomas Fork watershed were devoid of fish (Hysell Run, Bailey Run, and three of the five sites on Thomas Fork). The lower Thomas Fork site and the East Br near the mouth had poor fish communities, however, most other sites in the watershed either attained the WWH fish biocriterion (upper East Branch Thomas Fork sites, Long Hollow Run), or nearly attained this score (upper Thomas Fork site) (see Figure 5). The intact communities in some of these streams and their headwaters should result in rapid recovery when chemical stressors are removed. Several of the fish species (e.g., fantail darter, least brook lamprey, and southern redbelly dace) in these streams are high quality headwater species that indicate good water quality and flow permanence in these streams. Given the downstream chemical barrier in Thomas Fork, it is encouraging that they have been able to maintain viable populations despite the natural stresses that occur occasionally (e.g., drought, flood). The lower several miles of Leading Creek were not sampled during this survey, but are influenced by the impounding effects of the Ohio River and by poor water quality from Thomas Fork. Past data indicates that the lower reach of Leading Creek is severely impaired beyond conditions expected from an impounded reach alone.

*Little Leading Creek and Mud Fork*

Sites in the Little Leading Creek and Mud Fork subwatersheds had biological ratings that ranged from fair to good. These watersheds were characterized by having fine sandy substrates, much of which originated from abandoned mine lands and bank erosion. Bank erosion is made more severe by encroachment on the riparian zone and pool filling which often results in more frequent floods because of diminished channel capacity to hold rain events. The number of stream fish species is expected to increase as stream sizes increases in a logarithmic manner because habitat types increase with increases in stream depth and these habitat are more stable with regard to base flow. The fish assemblage in Little Leading Creek did not become more diverse as stream size

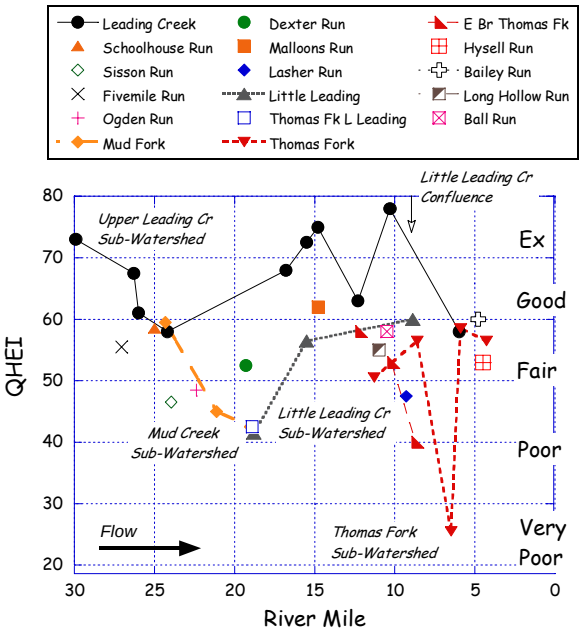



*Figure 6. QHEI scores of streams sampled in the Leading Creek Watershed during 2004 and 2005.*

increased. The mouth site has the same number of fish species (14) at 23 square miles as its most upstream site nearly 10 miles upstream at only 4 sq mi. In Little Leading Creek the high sand bedload generally fills pools and embeds larger substrates and makes such habitats unstable. The unnamed tributary to Little Leading Creek partially attained the WWH aquatic life use (macro rated good, fish rated fair) which is likely related to high sediment loads and the small size of the watershed. Thomas Fork of Little Leading Creek had an IBI that attained the WWH biocriterion for the headwater streams in the WAP despite relatively poor habitat and high sand bedload. All the sites in the this subwatershed are characterized by high populations of "pioneering" fish species (Appendix Table 2) that can rapidly recolonize a stream after being eliminated and are less sensitive to the un-stable sands and habitat features found in these streams. Conversely, the number of sensitive fishes is low for the same reason. The presence of species of intermediate sensitivity suggests that water quality (i.e., chemistry) is not limiting.

*Lasher Run and Mallons Run*

Lasher Run and Mallons Run enter Leading Creek downstream of Parker Run, but upstream of Little Leading Creek. Lasher Run attained the WWH aquatic life use, however, habitat was marginal and sediment were degraded and this tributary can be contributed fines to Leading Creek. Malloons Run (slight deviation from WWH) in contrast has relatively natural substrates and better habitat and is not likely a source for downstream sediments.

*Titus Run and Pawlins Hill Run*

These two small streams are direct tributaries to Leading Creek in the reach downstream of Little Leading Creek. Both have documented AMD impacts (Bauer 2005). We collected macroinvertebrate data from Titus Run and it was rated poor. We plan on collected data in Pawlins Hill Run in 2006 to obtain a more complete biological baseline of AMD sources in the Leading Creek watershed. Results will be added as and addendum to this report.

*Upper Watershed*

The upper part of the Leading Creek watershed, above Mud Fork is generally unaffected by mining activities although severe downstream impacts can cause upstream impacts to aquatic life by hindering migration and removing low-flow refugia in larger waters. This is no longer the case in Leading Creek and the presence of fish species that often move long distances (sauger, freshwater drum, silver lamprey, channel shiner, emerald shiner) suggest Leading Creek is not limited by substantial recolonization barriers. Of the sites sampled in the upper part of the watershed only the site at Fivemile Run had an impaired fish assemblage. The habitat in this tributary showed some degree of impact, but was not substantially different other small tributaries in the vicinity (Sisson Run, Ogden Run, Figure 6) that performed better biologically. Field notes indicate that this site was substantially disturbed by cattle in the vicinity. This same stressor source was identified by Cherry et al. (1999) in the Leading Creek improvement plan (see Appendix 6). The fish assemblage in Fivemile Run was composed almost exclusively of species tolerant to sediment and organic enrichment. Natural features (e.g., low gradient) and cumulative

upstream stressor load (e.g., nutrient inputs) can also influence impacts like the ones we have identified in Fivemile Run. Bauer (2005) note that nitrates and phosphorous concentrations were elevated in Fivemile Run and this stream have livestock with un-restricted access to the stream. The listing of "potential" sources in Appendix 6 underscores the importance of the biological data for interpreting actual impairment. While best management practices should be in place for all land use activities, the biological and stressor data are needed to focus efforts on the most limiting problems in streams.

The general lack of intense development in this watershed generally resulted in good water quality. Figure 7 illustrates the Leading Creek IBI data plotted versus QHEI over the reference regression (solid line) from all Ohio wadeable streams. In general points that fall substantially below the dashed line are more likely to be affected by water quality impacts. Geographic scale influences are embedded in these relationships as well. Two small streams with similar local habitat quality can have different IBI scores because of watershed scale (e.g., upstream impacts) as well as some natural gradients in factors (e.g., flow, natural substrates). The sites with obvious AMD impacts (in Thomas Fork watershed) fall far below the regression or the dashed boundary. In watersheds such as Leading Creek where land uses are less intense and more forested, nutrients, which can cause strong impacts on aquatic life, are generally lower. In small streams, aside from scattered point sources (e.g., septic discharges) or AMD, water quality impacts in Leading Creek small streams are generally minimal. In Figure 7 more sites from Leading Creek cluster upstream of the regression line despite often marginal habitat because of the decent water quality in these streams. Changes in land use (e.g., development, more intense agriculture) that would result in more degraded water chemistry (e.g., higher nutrients) would likely lead to a decline in biological conditions (orange arrow) whereas improvement in stream habitats and sediment reductions would improve QHEI scores and would enhance biological scores by restoring habitat characteristics for sensitive species present but in low abundance in the Leading Creek watershed including rainbow darter, redfin shiner, and possibly the more intolerant rosyface shiner and black redhorse. These would be key fish species to track over time as restoration actions proceed in the watershed.

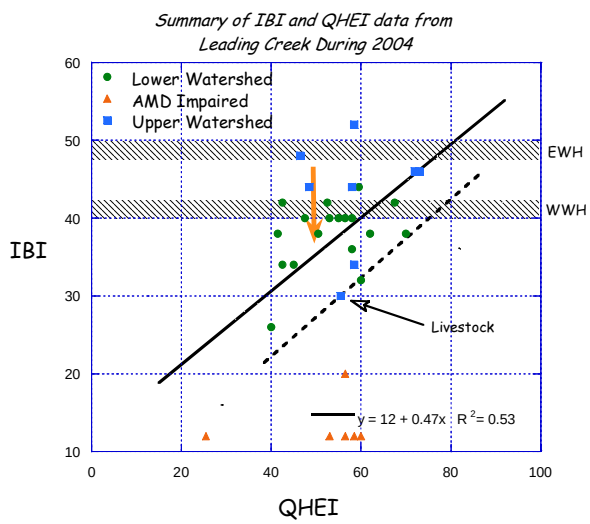



*Figure 7. QHEI vs. IBI for sites in the Leadign Creek waterhed during 2004. Regression line is from statewide analysis.*

*Meigs # 31 Mine Fish Assemblage Trends for Leading Creek*

As was summarized earlier a very large amount of toxic mine water was discharged to Parker Run and Leading Creek in summer 1993 from the Meigs #31 Mine. The result was

a near complete loss of fish, macroinvertebrate, and amphibian populations from these streams. Ohio EPA set out detailed ecological endpoints to measure recovery (Ohio EPA 1997a) one of which was IBI. Ohio EPA (2005) now considers all the streams largely recovered from the effects of the spill (Ohio EPA 2005). Data from this study can be used to examine several of the endpoints for recovery to see how well these are being maintained in the streams. Figures 8a-c illustrate some trends in fish assemblage data from pre-discharge conditions, immediately post-discharge (1993), several years post-discharge (1997-1999) and from this study (2004-2005). The impact from the discharge was substantial and obvious. Although some slight recovery in fish assemblages began in 1993, it took 2-4 years for substantial recovery to occur. Data from this study identified on average the highest IBI scores, sensitive fish species, and biomass, even beyond the pre-discharge year. After the initial spill, conductivity levels from the mine effluent increased because water was treated from the entire mine rather than the active part and thus dissolved loads were higher. Because of the higher conductivity, Ohio EPA and MBI needed to use a more powerful electrofishing device post-discharge. This could partly account for the higher biomass in 2004-2005 compared to pre-discharge sampling, but is the same equipment used for the post discharge sampling. In any case, the fish assemblage has essentially recovered to pre-discharge conditions

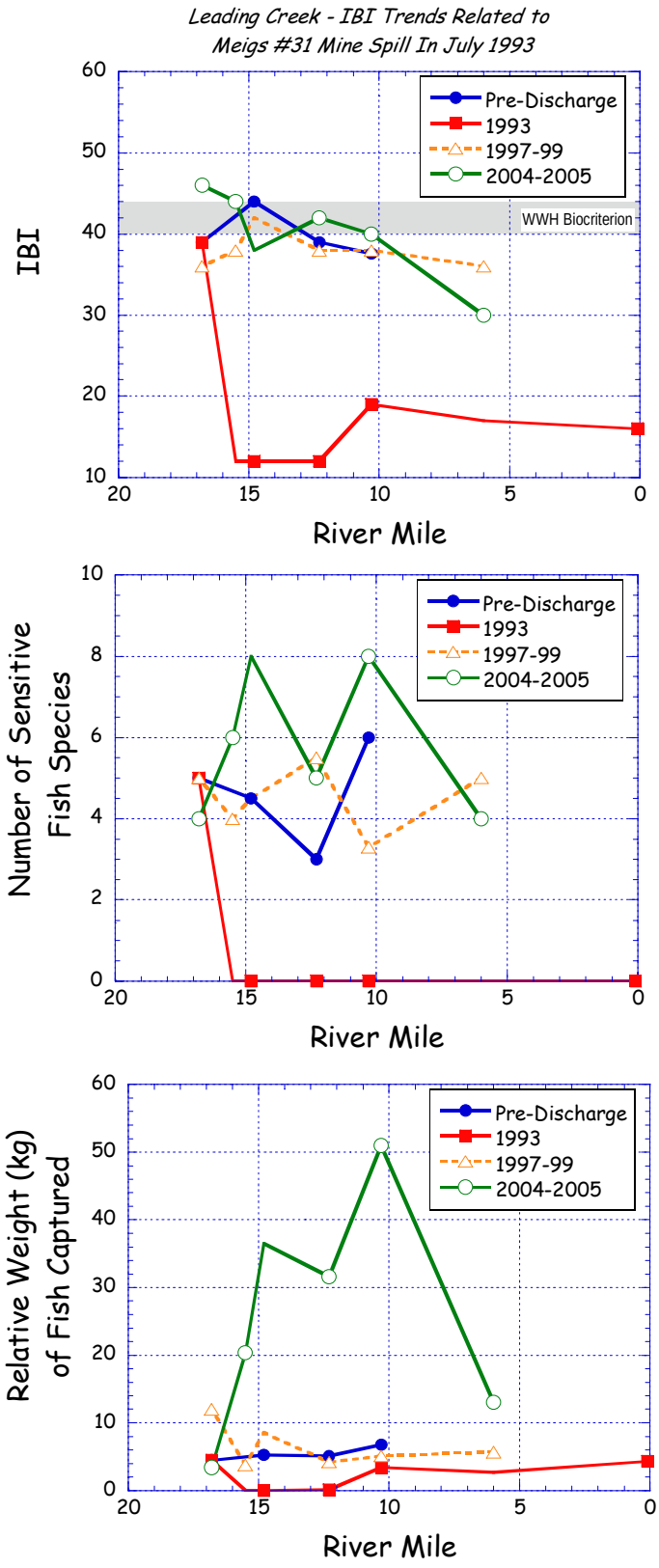



*Figure 8. Trends in IBI (top), sensitive fish species (middle), and relative wt (kg) vs. river mile for four time periods in Leading Creek in relation to the 1993 Meigs #31 Mine discharge.*

Table 3. Attainment table for streams sampled by MBI in the Leading Creek watershed during 2004 and 2005 and associated causes and sources of impairment.

| Station (Map #) | Fish RM | Macro RM | IBI | MIwb | ICI or Narrative | QHEI | Aquatic Life Uses Ex/Rec | Attain-ment Status | Comment | Causes | Sources |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Leading Creek (09-200)** | | | | | | | | | | | |
| S09200 29.902004 (#32) | 29.90 | 29.90 | 46 | na | MG | 73.0 | WWH | **Full** | Dstrm Albany | | |
| S09200 26.302004 (#33) | 26.30 | 26.30 | 42 | na | VG | 67.5 | WWH | **Full** | Upstrm Fivemile Cr | | |
| S09200 26.002004 (#34) | 26.00 | 26.00 | 42 | na | G | 61.0 | WWH | **Full** | Dstrm Fivemile Cr | | |
| S09200 24.202004 (#35) | 24.20 | 22.10 | 44 | na | G | 58.0 | WWH | **Full** | TR 13 | | |
| S09200 16.802004 (#6) | 16.80 | | 46 | 8.1 | - | 69.0 | WWH | **Full** | Upstrm Parker; Historical Control | | |
| S09200 15.502004 (#5) | 15.50 | 15.50 | 44 | 8.6 | 26* | 70.0 | WWH | **Partial** | Immediately Dstrm Parker Run | TDS | Mining |
| S09200 14.802004 (#4) | 14.80 | 14.80 | 38* | 8.1 | G | 75.0 | WWH | **Partial** | Dstrm Meigs Mine #31 | TDS Sedimentation | Mining Agriculture |
| S09200 12.302004 (#3) | 12.30 | 12.30 | 42 | 9.0 | 30* | 63.0 | | **Full** | Langsville | TDS | Mining |
| S09200 10.302004 (#2) | 10.30 | 10.30 | 40 | 8.7 | G | 78.0 | WWH | **Full** | Historical Site | | |
| S09200 6.002004 (#1) | 6.00 | 6.00 | 30* | 7.7* | 24* | 58.0 | WWH | **Non** | Lower Creek | Sedimentation (Severe Sand Bedload) | Mining |
| **Little Leading Creek (09-201)** | | | | | | | | | | | |
| S09201 9.902004 (#9) | 9.90 | 9.90 | 38* | 5.1* | MG | 41.5 | WWH | **Partial** | Mouth | Sedimentation (Severe Sand Bedload) | Mining |
| S09201 6.602004 (#8) | 6.60 | 6.60 | 40 | na | MG | 56.5 | WWH | **Full** | County Road 60 | | |
| S09201 0.402004 (#7) | 0.40 | 0.10 | 32* | na | MG | 60.0 | WWH | **Partial** | TR 177 | Sedimentation (Severe Sand Bedload) | Mining |
| **Malloons Run (09-202)** | | | | | | | | | | | |
| S09202 0.102004 (#11) | 0.10 | 0.10 | 38* | na | MG | 62.0 | WWH | **Partial** | Historical Site | Natural[1] (Low Flow) | Natural[1] |
| **Parker Run (09-203)** | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S09203 | 1.602004 (#12) | 1.60 | 1.60 | 40 | na | F* | 72.5 | WWH | **Partial** | Historical Site; Dst Meigs Mine #31 | TDS | Mining |
| **Dexter Run (09-205)** | | | | | | | | | | | | |
| S09205 | 0.802004 (#13) | 0.80 | 0.80 | 42 | na | MG | 52.5 | WWH | **Full** | Historical | | |
| **Mud Fork (09-206)** | | | | | | | | | | | | |
| S09206 | 5.402004 (#16) | 5.40 | 5.40 | 44 | na | MG | 59.5 | WWH | **Full** | State Route 692 | | |
| S09206 | 2.202004 (#15) | 2.20 | - | 34* | na | - | 45.0 | WWH | **Non** | TR 52 | Sedimentation (Sand Bedload) | Agriculture Mining |
| S09206 | 0.102004 (#14) | 0.10 | 0.10 | 34* | na | MG | 42.5 | WWH | **Partial** | County Rd 17 | Sedimentation (Sand Bedload) | Agriculture Mining |
| **Ogden Run (09-207)** | | | | | | | | | | | | |
| S09207 | 0.502004 (#36) | 0.50 | 0.50 | 44 | na | MG | 48.5 | WWH | **Full** | Adj TR 25 | | |
| **Sisson Run (09-208)** | | | | | | | | | | | | |
| S09208 | 0.102004 (#37) | 0.10 | 0.10 | 48 | na | MG | 46.5 | WWH | **Full** | Lane Off of C1 | | |
| **Fivemile Run (09-209)** | | | | | | | | | | | | |
| S09209 | 0.902004 (#39) | 0.90 | - | 30* | na | - | 55.5 | WWH | **NON** | Lane Across Stream | Sedimentation Nutrients Natural[1] (Low Flow) | Agriculture Livestock Natural[1] |
| **Hysell Run (09-211)** | | | | | | | | | | | | |
| S09211 | 0.802004 (#29) | 0.90 | 0.80 | 12* | na | MG | 53.0 | WWH | **NON** | Hysell Run Rd | pH, TDS (Severe AMD) | Mining |
| **Bailey Run (09-212)** | | | | | | | | | | | | |
| S09212 | 0.502004 (#26) | 0.50 | 0.50 | 12* | na | P* | 60.0 | WWH | **NON** | Adj Bailey Run Rd | pH, TDS (Severe AMD) | Mining |
| **Thomas Fork (09-213)** | | | | | | | | | | | | |
| S09213 | 9.602004 (#27) | 9.80 | 9.60 | 38* | na | VG | 50.5 | WWH | **Partial** | Upstream Site | Natural[1] | Natural[1] |
| S09213 | 7.102004 (#28) | 7.10 | 7.10 | 12* | na | MG | 56.5 | WWH | **NON** | Ust. Ball Run | pH, TDS (Severe AMD) | Mining |
| S09213 | 5.002004 (#21) | 5.00 | 5.00 | 12* | na | P* | 25.5 | WWH | **NON** | Ust East. Branch Thomas Fk | pH, TDS (Severe AMD) | Mining |
| S09213 | 4.402004 (#20) | 4.40 | 4.40 | 12* | 0.0* | 2* | 58.5 | WWH | **NON** | Historical | pH, TDS (Severe AMD) | Mining |
| S09213 | 2.802004 (#19) | 2.80 | 2.80 | 20* | 1.4* | F* | 56.5 | WWH | **NON** | Historical | pH, TDS | Mining |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | (Severe AMD) | |
| **Long Hollow Run (09-214)** | | | | | | | | | | | | | |
| S09214 | 0.102004 (#25) | 0.10 | 0.10 | 40 | na | MG | 55.0 | WWH | **Full** | Adj Long Hollow Road | | | |
| **East Branch Thomas Fork (09-216)** | | | | | | | | | | | | | |
| S09216 | 4.102004 (#24) | 4.10 | 4.10 | 40 | na | G | 58.0 | WWH | **Full** | County Road 20 | | | |
| S09216 | 2.102004 (#18) | 2.10 | 2.10 | 40 | na | G | 53.0 | WWH | **Full** | Willow Creek Road | | | |
| S09216 | 0.602004 (#17) | 0.60 | 0.60 | 26* | na | MG | 40.0 | WWH | **Partial** | Hiland Road | pH, TDS | Mining | |
| **Schoolhouse Run (09-217)** | | | | | | | | | | | | | |
| S09222 | 0.602004 (#38) | 0.60 | 0.60 | 52 | na | G | 58.5 | WWH | **Full** | SR 143 | | | |
| **Ball Run (09-221)** | | | | | | | | | | | | | |
| S09221 | 0.402004 (#22) | 0.40 | 0.00 | 36* | na | G | 58.0 | None/ WWH | **Partial** | TR 20A | Natural[1] (Low Flow) | Natural[1] | |
| **Titus Run** | | | | | | | | | | | | | |
| S09222 | 0.102004 (#31) | - | 0.10 | - | na | P* | | WWH | **Non** | Titus Rd | - pH, TDS (Severe AMD) | Mining | |
| **Lasher Run (09-223)** | | | | | | | | | | | | | |
| S09223 | 0.102004 (#23) | 0.70 | 0.10 | 40 | na | G | 47.5 | None/ WWH | **Full** | Lasher Road | | | |
| **Thomas Fork of Little Leading Creek (09-224)** | | | | | | | | | | | | | |
| S09224 | 0.302004 (#10) | 0.30 | | 42 | na | - | 42.5 | None/ WWH | **Full** | County Road 3 | | | |
| **Unnamed Trib to Little Leading Creek (09-225)** | | | | | | | | | | | | | |
| S09217 | 0.202004 (#30) | 0.20 | 0.20 | 34* | na | MG | 58.5 | WWH | **Partial** | TR57 | Sedimentation (Severe Sand Bedload) | Mining | |

**Ecoregion Biocriteria: Western Allegheny Plateau (WAP)**
**Index**

| Site Type | WWH | EWH | MWH | LRW-AMD |
|---|---|---|---|---|
| IBI – Wading & Headwater | 44 | 50 | 24/24 | 18 |
| Mod. Iwb - Wading | 8.4 | 9.4 | 6.2/5.5 | 4.0 |
| ICI/Narrative | 36/G | 46/E | 22/30F | 8/MF |

Footnotes:

a - A qualitative narrative evaluation based on best professional judgment and sampling attributes such as community composition, EPT taxa richness, and QCTV scores were used when quantitative data were not available (E-exceptional, G-good, MG-marginally good, F-fair, P-poor, VP-very poor).

b - Attainment status is given for existing use designations, except where a use designation change is recommended, in which case, the attainment status for the recommended use is given.

c - Limited Resource Water - acid mine drainage (LRW-AMD) benchmarks based on best professional judgment driven by the need to protect against acutely toxic stream conditions. Macroinvertebrate qualitative only data were evaluated based on densities of EPT taxa on the natural substrates (see Methods Section), a narrative VP* or P* indicates departure from the benchmark.

d – Data not yet compiled for this site

na - MIwb not applicable at headwater sites (< 20 mi ). 2

ns - Nonsignificant departure from biocriteria (<4 IBI or ICI units, or <0.5 MIwb units).

* - Indicates significant departure from applicable biocriteria (>4 IBI or ICI units, or >0.5 MIwb units). Underlined scores are in the Poor or Very Poor range.

[1] - Natural causes and sources of impairment are those that are relative to a least impacted reference condition with a typical level of landscape disturbance for a region (not necessarily compared to a “pristine” setting.

It can be difficult to identify streams that have serious acid mine drainage affects on the basis of chemical data alone, especially when chemical impacts are episodic or seasonal. Impacts in some streams are obvious (frequent extremely low pH or high metal loads), however, biological data can provide accurate measures of the extent and magnitude of impacts and provide a baseline for restoration actions. Perceptions prior to sampling frequently do not match the results and the relative condition among streams is sometimes different than what is expected. Is essence these perceptions are hypotheses of conditions given limited data. Our expectations for Thomas Fork, for example were accurate in the impaired reaches, but the number of upstream sites and tributaries with good biological conditions was better than expected.

As restoration strategies reduce the overall loading of acid and other mining associated parameters, episodic loadings may be more frequent and biological data more important in identifying remaining problems. Although the aggregate indices are important for measuring impairment and attainment, the subcomponents of the biological indices can be very useful in diagnosing impairments. Water chemistry data is essential for understanding the loading of parameters to streams and predicting downstream effects, how they may be affecting biological assemblages, and are critical in engineering solutions to abate AMD.

Table 4 summarizes some of the fish components of the IBI at sites affected by AMD and those unimpaired or affected by other stressors in the Leading Creek watershed and also other recent studies we did in the Federal Creek, Moxahala Creek, and the Middle Basin of Raccoon Creek watersheds. As demonstrated in Table 4, the NPS impaired sites in the Leading Creek watershed are not as severely impaired, on average as sites affected by NPS impacts in Moxahala and Raccoon Creek. Federal Creek impairments are more frequently on EWH streams and score higher for biological attributes than Leading Creek. Thomas Fork where AMD is most severe is essentially an "adjacent" watershed that enters Leading Creek near the mouth. Other mine influences in Leading Creek are more local (Pawlins Hill Run, not sampled in this study) or more sediment dominated (Little Leading Creek) and do not tend to isolate the rest of Leading Creek from recolonization refuges. [We do plan on sampling Pawlins Hill Run during 2006 and to measure the extent of the AMD effects on aquatic life and will add a short addendum in fall of 2006].

One biological signature of AMD affected streams is low numbers and biomass of fish. Acute events (e.g., low pH) that may occur during storm events greatly reduce the abundance of all fish and sensitive species are generally much slower to recolonize such streams. Reversal of the AMD signatures in the Thomas Fork watershed (e.g., extremely low biomass, absence of any sensitive fish species or macroinvertebrate taxa) will be key early indicators to measure progress in AMD abatement. The fact that upstream reaches and some of the tributaries harbor good fish and macroinvertebrate assemblages (Long Hollow Run) indicates that there is sufficient diversity within the watershed to respond when water quality improves.

Table 4. Summary fish community statistics for streams in the Federal Creek watershed compared to data from other recent surveys MBI has conducted in the Middle Basin Raccoon Creek, Moxahala Creek, and Leading Creek watersheds. Sites were classified as AMD impacted, NPS impacted (e.g., siltation, habitat), or un-impacted (for fish assemblages)

| Effect | IBI | Sensitive Species | Total Species | Sculpins & Darters | Headwater Species | Percent Pioneering |
|---|---|---|---|---|---|---|
| Federal Creek | | | | | | |
| AMD | — | — | — | — | — | — |
| NPS | 40.1 | 4.8 | 17.9 | 4.7 | 2.6 | 45.3 |
| Attaining† | 48.4 | 6.1 | 20.5 | 5.3 | 2.6 | 40.1 |
| Raccoon Creek | | | | | | |
| AMD | 18.6 | 0.14 | 4.0 | 0.0 | 0.3 | 53.8 |
| NPS | 32.5 | 0.43 | 7.6 | 0.7 | 1.7 | 62.0 |
| Attaining‡ | 42.0 | 1.43 | 11.4 | 1.6 | 2.1 | 53.5 |
| Moxahala Creek | | | | | | |
| AMD | 16.6 | 0.13 | 2.0 | 0.1 | 0.1 | 31.0 |
| NPS | 31.0 | 0.0 | 9.0 | 1.0 | 1.8 | 69.0 |
| Attaining* | 47.3 | 5.7 | 19.3 | 4.7 | 2.0 | 30.5 |
| Leading Creek | | | | | | |
| AMD | 15.1 | 0.0 | 1.7 | 0.1 | 0.1 | 25.2 |
| NPS | 34.9 | 1.0 | 12.2 | 1.7 | 1.7 | 55.5 |
| Attaining‡ | 43.0 | 1.9 | 14.8 | 2.7 | 2.3 | 55.9 |
| **Effect** | **Percent Insectivores** | **Cyprinid Species** | **DELT Anomalies** | **Percent(No.) Simple Lithophils** | **Total Relative Number** | **Relative Number w/o Tolerants** |
| Federal Creek | | | | | | |
| AMD | — | — | — | — | — | — |
| NPS | 25.5 | 6.2 | 0.00 | 30.9(6.7) | 1246 | 658 |
| Attaining† | 41.9 | 6.8 | 0.01 | 35.6(7.9) | 994 | 523 |
| Raccoon Creek | | | | | | |
| AMD | 15.7 | 1.9 | 0.00 | 5.1(0.6) | 63 | 10 |
| NPS | 27.1 | 3.3 | 0.58 | 21.3(2.5) | 266 | 70 |
| Attaining‡ | 36.1 | 4.6 | 0.13 | 19.4(3.4) | 683 | 215 |
| Moxahala Creek | | | | | | |
| AMD | 26.3 | 0.6 | 0.06 | 2.7(0.3) | 68 | 22 |
| NPS | 32.5 | 3.8 | 0.05 | 8.4(1.8) | 625 | 192 |
| Attaining* | 42.2 | 6.3 | 0.00 | 28.9(6.3) | 1280 | 818 |
| Leading Creek | | | | | | |
| AMD | 9.9 | 0.4 | 0.00 | 0.6((0.1) | 31 | 5 |
| NPS | 29.3 | 6.1 | 0.05 | 28.4(3.9) | 2391 | 667 |
| Attaining‡ | 38.6 | 6.1 | 0.06 | 28.4(4.8) | 1011 | 445 |

†Un-impaired streams consist of a mix of WWH and EWH aquatic life uses.
‡Un-impaired streams primarily WWH aquatic life uses
*Un-impaired streams were Kent Run and Jonathan Creek in an adjacent watershed.

*NPS and Habitat Impacted Waters*

Although a major focus of this report is to identify AMD impacts in this watershed, to distinguish the contribution of AMD it is essential to understand the other stressors that are limiting aquatic life. To accurately attribute impairments to AMD, the relative contribution and overlap with NPS impairments needs to be evaluated. Various data types help in the assessment of NPS stressors. As with AMD impacts, biological signatures help in categorizing and attributing various NPS stressors as limiting factors to biological

integrity. Water chemistry data is also important (e.g., nutrients, dissolved oxygen, TSS and TDS, BOD, etc.). For habitat and sediment related impacts a key tool is the QHEI and its subcomponents.

Appendix Table 4 summarizes mean QHEI and metric scores for the sites in the Leading Creek watershed. Fine sediments have been identified as a moderate to severe problem many watersheds in Ohio (Ohio EPA 2000). A study by U.S.G.S. identified nearby and similar southeast Ohio watersheds as having among the highest yields of fine sediment in Ohio (Antilla and Tobin 1978). In Leading Creek sand substrates have damaged much of the aquatic habitat in the lower reaches of the stream and in streams such as Little Leading Creek. Habitat quality across the watershed ranged widely however, from very poor (scores 25) to excellent (scores > 75). The poorest sites had a combination of channelized conditions with fine sediments from mine activities. Modified, entrenched stream channels tend to amplify the negative influences of sedimentation on aquatic life. Ohio QHEI data can be used to illustrate the strong association between channel condition and substrate condition (Figure 9). Channelizing a stream for drainage or flood control typically results in an entrenched channel where the flood prone areas are cut-off from the wetted channel during most storms. This condition tends to concentrate fines in the wetted stream bottom instead of dropping these sediments in flood prone habitats such as stream margins, flood plains and bars. From our experience, even streams with relatively low sediment loads have poor surface substrates when entrenched in this manner unless the natural materials in the channel are predominantly coarse and base flows are high. In entrenched streams with high sediment loads, substrates are almost always very poor. Because of this upland erosion control alone will not usually restore the substrates necessary for good aquatic life in entrenched, channelized streams. Some form of natural channel restoration that includes re-creating sufficient flood prone areas may be necessary to restore aquatic life. Natural streams with natural channel form with intact connections to their flood prone areas may have good substrates in the wetted channel despite elevated levels of fines moving through a stream system.

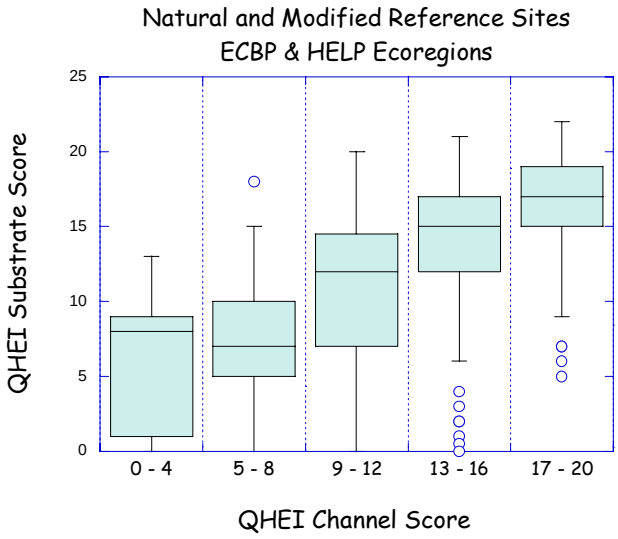



*Figure 9. Association between QHEI channel score and QHEI substrate score in Ohio streams.*

Leading Creek QHEI substrate scores are depicted as cumulative frequency distributions on Figure 10. For comparison we have included substrate score distributions for Little Beaver Creek (Columbiana Co), Big Darby Creek, and the Wabash River watersheds.

Outer "bounds" of the channel-substrate relationship were supplied by plotting all Ohio sites with channel scores > 15 and all Ohio sites with channel scores < 6. The grey line is a general "WWH" endpoint for the QHEI substrate score suggested as a reasonable substrate endpoint for TMDLs (Rankin 2004). Substrate scores in Leading Creek are finer and in poorer condition than Big Darby Creek and Little Beaver Creek with more than 70% of the scores less than 14 compared to about 30-40% of the scores for the Big Darby or Little Beaver watersheds. About 25% of sites with channel scores > 15 have substrate scores < 14 and about 95% of sites with channel scores < 6 have substrate scores < 14. These comparisons are not quite that simple because some basins may have coarser substrate compositions because of glacial history, etc. For most Ohio streams however, QHEI substrate scores of 14 or higher are common features of least disturbed streams. If we take a channel score of greater than 15 as a characteristic of least impacted reference sites, then we should expect only about 25% of streams in a watershed to have substrate scores less than 14.

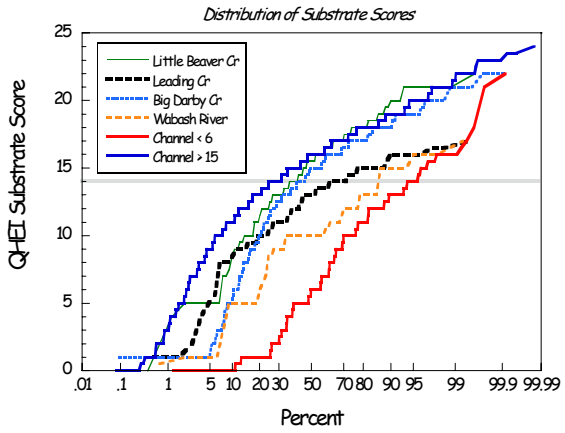



*Figure 10. Cumulative frequency distribution plots for QHEI substrate scores for Leading Creek, Wabash River, Little Beaver Creek, and Big Darby Creek. Also depicted are all Ohio score with a channel score of > 15 and < 6.*

Although we are discussing individual stressors at individual sites, biological conditions are affected by multiple stressors distributed at multiple scales. Because of the relative high forest cover and low population density for the Leading Creek watershed, we would expect water quality stressors such as nutrients, outside of mine drainage areas, to be in low concentrations and not responsible for aquatic life impairment. Low water quality stress may actually compensate somewhat for degraded habitat (compared to similarly habitat degraded streams in more nutrient rich watersheds with high agriculture and low forest, e.g., Wabash River depicted on some graphs). The effects of two stressors can be visualized in an isopleth plot such as shown in Figure 11. Here we present the hypothetical association between water quality stressors (e.g., nutrients), habitat and sediment stressors and fish assemblage condition (IBI). This figure illustrates that we cannot achieve aquatic

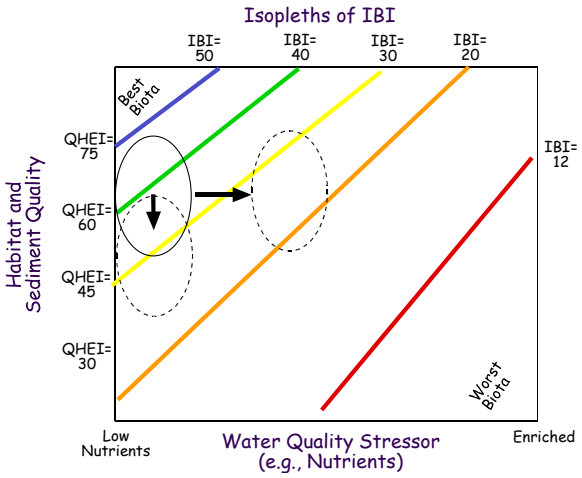



*Figure 11. Hypothetical IBI isopleth plot depicted IBI thresholds as a function of stream habitat and nutrient concentrations.*

life goals by focusing on a single stressor. Reduction of nutrients to a low level will not restore aquatic life unless habitat is sufficient. Similarly, high nutrient concentrations can result in degraded biota despite good habitat, however, for certain ranges of nutrients habitat can compensate to a point and vice versa. On Figure 11 the solid circle represents the current distribution of non-AMD sites in Leading Creek. Increases in chemical stressors (e.g., changing land use) may move these sites to the right and declines in habitat will move these sites down vertically. Restoration strategies need to move the points up in the Leading Creek watershed (i.e., reduce sedimentation and improve habitat). This graph is a bit simplistic and does not include scale influences or other categories of stressors; however, it does provide a conceptual framework for approaching watershed restoration affected by multiple stressors. Further research can be used to provide empirical data to draw such graphs and improve the predictability of stream restoration actions.

*Pebble Count Data*

Fine sediments have been identified as a moderate to severe problem in a large part of the Leading Creek watershed. As mentioned earlier, a study by U.S.G.S. identified nearby SE Ohio watersheds as having among the highest export of fine sediment in Ohio (Antilla and Tobin 1978). Appendix Table 5 provides summary statistics for pebble count data and Figure 12 illustrates cumulative frequency plots for selected sites in site in upper Leading Creek, middle Leading Creek, and in the Thomas Fork (Lower Leading Creek). The small diameter median and 25$^{th}$ percentile statistics in the middle part of the watershed reflect the influence of mining related fine sediments originating from the Little Leading Creek watershed. Although not portrayed in these graphs the huge volume of sand in the lower mainsteam of Leading Creek is influenced by the export from Little Leading Creek.

Sandy rather than silty sediments are more a problem in the Leading Creek watershed at most sites. In the middle reaches of Leading Creek which includes Little Leading Creek all but Parker Run have > 50% of their surface substrates as sand with all of the Little Leading Creek sites have nearly 90% or more of their substrates as fines (silt to fine gravels, Figure 12, middle; Appendix Table 5). Other workers in the Leading Creek watershed have measured depths of fine sediments and have found that Little Leading Creek, Thomas Fork, Sisson Run, and Mud Fork had locations with fines > 18" in depth (Bauers 2005; Cherry et al. 1999)

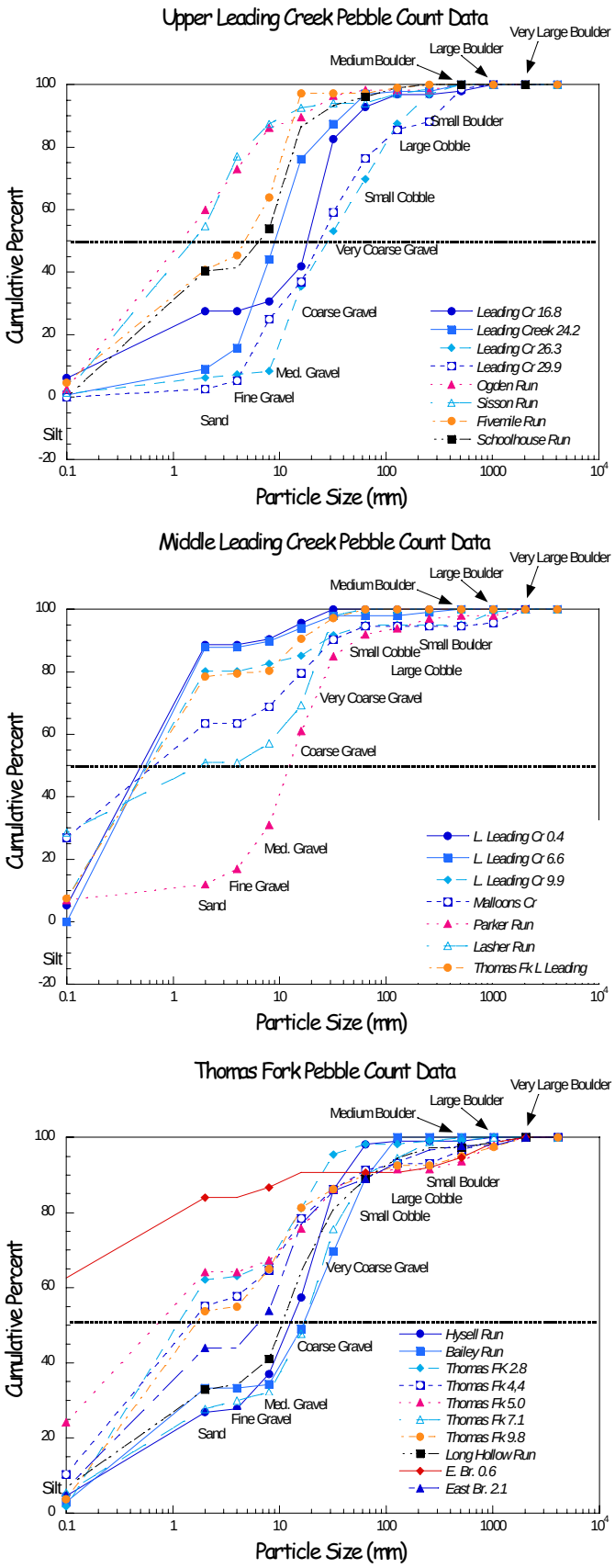



*Figure 12. Zig-zag pebble counts collected in the upper Leading Creek watershed (top), middle Leading Creek watershed (middle) and the Thomas Fork watershed (bottom) during 2004.*

*Ecotoxicological Rating*

Cherry et al. (1999) and Currie (1999) proposed and use an integrated measure of impact using information on AMD, habitat (QHEI and RBP), sediment, macroinvertebrate data, toxicity testing results, and concentrations of selected chemical parameters (sodium, copper, zinc, iron, manganese, chloride, nitrate/nitrite, ammonia, TSS). The goal was to help identify important stressors as a guide for restoration efforts. These ratings range up to 200 points. We correlated the final ETR score with IBI scores from 2004 or the most recent IBI data that existed where stations overlapped and found a strong positive correlation (Figure 13), although there is somewhat less separation at the upper end of the IBI/ETR relationship where sites are not considered impaired, at least for fish assemblages (IBI $\geq$ 40). Some of the identified stressor components that were responsible for low ETR scores are summarized on Appendix Table 6 which summarizes identified and suspected causes and sources of aquatic life impairment.

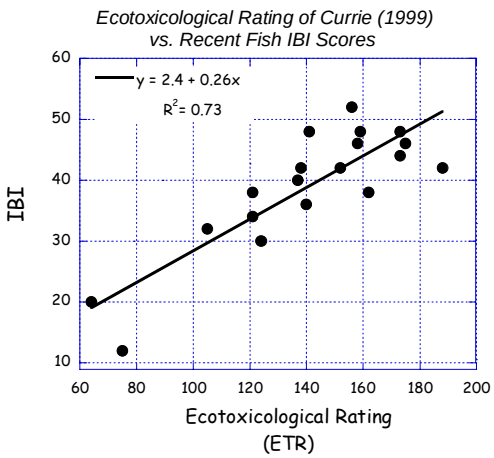



*Figure 13. Ecotoxicological rating score vs. IBI for sites in the Leading Creek watershed.*

*Use Change Recommendations*

Aquatic life use designations are based on the potential of streams to attain Ohio's listed aquatic life uses (EWH, WWH, MWH, and LRW). Recommendations on changes in aquatic life uses designations are based on a combination of biological, chemical, and physical data with biological data being the ultimate arbiter for the aquatic life use. The CWA protect existing uses of waterbodies as of 1975. Thus any stream that has been designated based on ambient monitoring data, subsequent to 1975 cannot have that use lowered (unless the action was in error). Waterbodies can, however, have their designations changed to a higher tier if ambient data indicates that the high use can now be attained.

On the basis of the data we have collected here we suggest minor changes for aquatic life use designations for the Leading Creek watershed. Primarily we are recommending that the streams that were not listed in the most recent WQS table be added as WWH streams. This is the default use for streams in Ohio and all of these have shown the ability or potential to attain the WWH use because they have sufficient habitats and stream flows to support such assemblages. Although the Thomas Fork and some of its tributaries would have been considered as candidates for LRW in past years the beginning of restoration activities indicates that a WWH aquatic life use is the goal for these streams. In addition, attainment and near attainment in the headwaters and some tributaries of Thomas Fork (East Br, Long Hollow Run) suggests that return to a WWH assemblage could be rather rapid if AMD was abated

Table 5. Existing use designations for streams in the Leading Creek watershed.

| Water Body Segment | Use Designations | | | | | | | | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Aquatic Life Habitat | | | | | | Water Supply | | | Recreation | | | |
| | SRW | WWH | EWH | MWH | SSH | CWH | LRW | PWS | AWS | IWS | BW | PCR | SCR | |
| Leading creek | + | + | | | | | | | + | + | | + | | |
| Dirt creek | | * | | | | | | | * | * | | * | | |
| Hysell run | | * | | | | | | | * | * | | * | | |
| Bailey run | | * | | | | | | | * | * | | * | | |
| Thomas fork | | * | | | | | | | * | * | | * | | |
| Long hollow | | * | | | | | | | * | * | | * | | |
| Little Leading creek | | * | | | | | | | * | * | | * | | |
| Malloons run | | * | | | | | | | * | * | | * | | |
| Parker run | | * | | | | | | | * | * | | * | | |
| Muddy fork | | * | | | | | | | * | * | | * | | |
| Dexter run | | * | | | | | | | * | * | | * | | |
| Mud fork | | * | | | | | | | * | * | | * | | |
| Ogden run | | * | | | | | | | * | * | | * | | |
| Sisson run | | * | | | | | | | * | * | | * | | |
| Fivemile run | | * | | | | | | | * | * | | * | | |

*Riparian Systems*

Biological quality was variable in the Leading Creek watershed due to AMD in the Thomas Fork watershed, but more often due to habitat and sedimentation in most other streams in the watershed. Many of the sediment and habitat problems are associated loss of or encroachment upon riparian buffers.

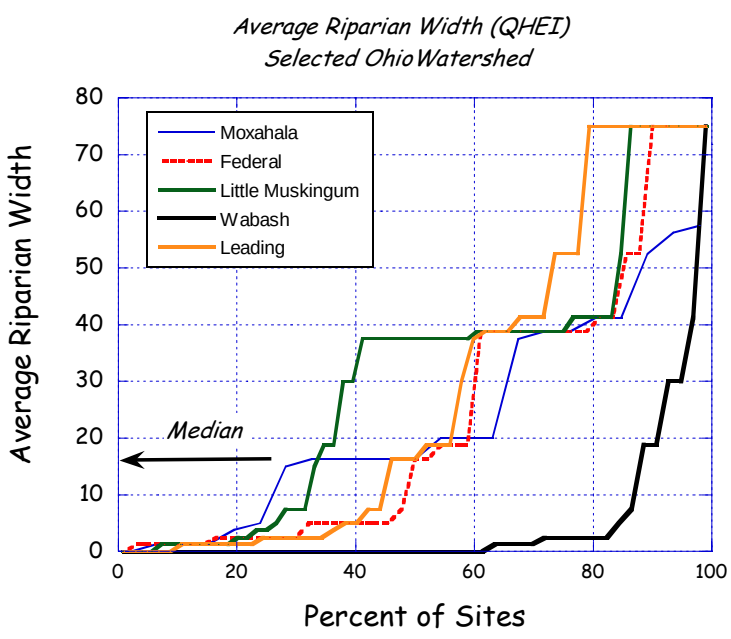



*Figure 14. Cumulativer frequency distributions of widths of riparian vegetation taken with QHEI data for streams in selected Ohio watersheds and streams sampled in the Leading Creek watershed during 2004.*

Fine sediments can fill interstitial spaces between larger rocks and gravels and can result in declines in food resources, spawning failures, reduce habitat space, and reduction in other important ecological functions of streams. The most severe sedimentation in Southeast Ohio typical occur where streams have been channelized or where surface mining activities releases high loads of sands and other fines.

Where these direct sources of sediment are absent, fine sediments from agriculture or residential development reach the streams through loss of or encroachment upon stream buffer vegetation. Even though Leading Creek was relatively forested, many of the stations in that study had various land uses encroaching on the stream, especially agriculture and in some places residential development. The distribution of buffer zone widths in Leading Creek (Figure 14) was similar to those observed in Federal Creek (Rankin 2005b). Half of the Leading Creek sites have widths < 17 m and about 40% are less than 5 m in width. Leading Creek does have a good proportion of sites (about 20%) with wide riparian zones. The proportion of narrow riparian widths are generally intermediate between the Little Muskingum River watershed (40% > 30m in width) and the Wabash River watershed (60% with no riparian).

Establishment of sufficiently wide riparian zones generally keeps most sediment from reaching the stream and intact vegetation protects banks from eroding. Bank erosion can contribute major loadings of fine sediments, especially the sands that are a problem in many Leading Creek streams. Riparian zones can be "short-circuited" by small channels bring large loads of sediment bypassing riparian areas, however intact riparian vegetation reduces bank erosion which can deliver a large proportion of the instream sediment load under certain circumstances. As with many Ohio streams loss of riparian forests is a problem and a threat to aquatic life and protection and expansion of riparian buffers should be part of any watershed enhancement activities. Bauer (2005) summarized the existing riparian conditions for most of the streams in the Leading Creek basin and identifies riparian restoration needs.

## Conclusions

Severe AMD impacts are still an acute problem on many streams within the Thomas Fork of Leading Creek. The most severely impaired streams were Thomas Fork, East Branch Thomas Fork, Bailey Run, and Hysell Run. Hysell Run, Bailey Run and the East Brach of Thomas Fork contributed the greatest acid load in the Thomas Fork subwatershed (Bauer 2005). Surprisingly, the headwaters of several of these streams were still in relatively good shape with multiple sites attaining the WWH aquatic life use. Little Leading Creek and the mainstem of Leading Creek were limited by an extensive sand bedload rather than from AMD. Many of the tributaries in this middle reach of Leading Creek watershed had >50% of their surface sediments as sand with Little Leading Creek having nearly 90% if its substrates as fines. The upper reaches of Leading Creek including its tributaries were generally in good shape with all sites except Fivemile Run attaining the WWH aquatic life use. The Fivemile Run site was influenced by cattle grazing in the reach and upstream. The fish assemblages in Leading Creek have recovered fully from the Meigs #31 Mine spill in 1993 and have good assemblages and good levels of biomass. Early recovering immediately post-discharge was young fish and fish biomass was very low. In 2004-2005 biomass was the highest recorded during the last 20 or more years of sampling. Samplers even captured an adult mudpuppy which were eliminated by the original discharge and are difficult to effectively collect in the complex snap habitats that occur in Leading Creek. Where AMD is not responsible for impairment, NPS stressors, largely excessive fine sediments and

habitat degradation contribute to the observed aquatic impairment. The data we have collected here should provide a suitable baseline for measuring the effectiveness of AMD abatement and other watershed restoration and protection efforts.

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Appendix Table 1. Fish species collected during electrofishing surveys by MBI in 2004 and historical fish data collections by Ohio EPA and Ohio DNR available in electronic form from Ohio EPA (electrofishing and seining [sampler type H or missing]).

| | | |
|---|---|---|
| River Code: **09-200** | Stream: **Leading Creek** | Sample Date: **09/22/2004** |
| River Mile: **29.90** | Location: | Invalid Sample: |
| Time Fished: 1980 sec | Drainage: 4.3 sq mi  Depth: | Data Source: 01 |
| Dist Fished: 0.16 km | Basin: Southeast Ohio River Tribs  Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000  Lat:: 0.00000  County:: | |

| 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 Hog Sucker | R | I | S | M | 2 | 3.75 | 0.75 | | | |
| White Sucker | W | O | S | T | 16 | 30.00 | 5.99 | | | |
| Western Blacknose Dace | N | G | S | T | 5 | 9.38 | 1.87 | | | |
| Creek Chub | N | G | N | T | 104 | 195.00 | 38.95 | | | |
| South. Redbelly Dace | N | H | S | | 1 | 1.88 | 0.37 | | | |
| Scarlet Shiner | N | I | S | M | 2 | 3.75 | 0.75 | | | |
| Striped Shiner | N | I | S | | 14 | 26.25 | 5.24 | | | |
| Silverjaw Minnow | N | I | M | | 6 | 11.25 | 2.25 | | | |
| Bluntnose Minnow | N | O | C | T | 20 | 37.50 | 7.49 | | | |
| Central Stoneroller | N | H | N | | 38 | 71.25 | 14.23 | | | |
| Yellow Bullhead | | I | C | T | 2 | 3.75 | 0.75 | | | |
| Green Sunfish | S | I | C | T | 3 | 5.63 | 1.12 | | | |
| Bluegill Sunfish | S | I | C | P | 26 | 48.75 | 9.74 | | | |
| Longear Sf X Bluegill Sf | | | | | 1 | 1.88 | 0.37 | | | |
| Johnny Darter | D | I | C | | 2 | 3.75 | 0.75 | | | |
| Greenside Darter | D | I | S | M | 6 | 11.25 | 2.25 | | | |
| Fantail Darter | D | I | C | | 19 | 35.63 | 7.12 | | | |
| | *Date Total* | | | | 267 | 500.63 | | | | |
| | *Number of Species* | | | | 16 | | | | | |
| | *Number of Hybrids* | | | | 1 | | | | | |

| | | |
|---|---|---|
| River Code: **09-200** | Stream: **Leading Creek** | Sample Date: **09/23/2004** |
| River Mile: **26.30** | Location: | Invalid Sample: |
| Time Fished: 3300 sec | Drainage: 12.8 sq mi Depth: | Data Source: 01 |
| Dist Fished: 0.17 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Grass Pickerel | | P | M | P | 4 | 7.06 | 0.69 | | | |
| Golden Redhorse | R | I | S | M | 22 | 38.82 | 3.78 | | | |
| White Sucker | W | O | S | T | 15 | 26.47 | 2.58 | | | |
| Western Blacknose Dace | N | G | S | T | 2 | 3.53 | 0.34 | | | |
| Creek Chub | N | G | N | T | 41 | 72.35 | 7.04 | | | |
| Redfin Shiner | N | I | N | | 10 | 17.65 | 1.72 | | | |
| Striped Shiner | N | I | S | | 101 | 178.24 | 17.35 | | | |
| Silverjaw Minnow | N | I | M | | 2 | 3.53 | 0.34 | | | |
| Bluntnose Minnow | N | O | C | T | 231 | 407.65 | 39.69 | | | |
| Central Stoneroller | N | H | N | | 19 | 33.53 | 3.26 | | | |
| Black Bullhead | | I | C | P | 1 | 1.77 | 0.17 | | | |
| Spotted Bass | F | C | C | | 1 | 1.77 | 0.17 | | | |
| Largemouth Bass | F | C | C | | 2 | 3.53 | 0.34 | | | |
| Green Sunfish | S | I | C | T | 3 | 5.29 | 0.52 | | | |
| Bluegill Sunfish | S | I | C | P | 2 | 3.53 | 0.34 | | | |
| Longear Sunfish | S | I | C | M | 21 | 37.06 | 3.61 | | | |
| Logperch | D | I | S | M | 7 | 12.35 | 1.20 | | | |
| Johnny Darter | D | I | C | | 17 | 30.00 | 2.92 | | | |
| Greenside Darter | D | I | S | M | 48 | 84.71 | 8.25 | | | |
| Fantail Darter | D | I | C | | 33 | 58.24 | 5.67 | | | |
| | *Date Total* | | | | 582 | 1,027.06 | | | | |
| | *Number of Species* | | | | 20 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-200** | Stream: **Leading Creek** | Sample Date: **09/30/2004** |
| River Mile: **26.00** | Location: | Invalid Sample: |
| Time Fished: 4680 sec | Drainage: 16.8 sq mi  Depth: | Data Source: 01 |
| Dist Fished: 0.17 km | Basin: Southeast Ohio River Tribs  Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000  Lat:: 0.00000  County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Grass Pickerel | | P | M | P | 2 | 3.53 | 0.56 | 0.19 | 3.86 | 54.50 |
| Golden Redhorse | R | I | S | M | 5 | 8.82 | 1.41 | 0.01 | 0.22 | 1.20 |
| White Sucker | W | O | S | T | 16 | 28.24 | 4.52 | 1.30 | 26.11 | 45.94 |
| Creek Chub | N | G | N | T | 16 | 28.24 | 4.52 | 1.35 | 27.09 | 47.69 |
| Redfin Shiner | N | I | N | | 25 | 44.12 | 7.06 | 0.09 | 1.81 | 2.04 |
| Striped Shiner | N | I | S | | 68 | 120.00 | 19.21 | 0.57 | 11.37 | 4.71 |
| Silverjaw Minnow | N | I | M | | 22 | 38.82 | 6.21 | 0.03 | 0.60 | 0.77 |
| Bluntnose Minnow | N | O | C | T | 63 | 111.18 | 17.80 | 0.26 | 5.15 | 2.30 |
| Central Stoneroller | N | H | N | | 7 | 12.35 | 1.98 | 0.02 | 0.32 | 1.29 |
| Trout-perch | | I | M | | 2 | 3.53 | 0.56 | 0.03 | 0.52 | 7.50 |
| Spotted Bass | F | C | C | | 1 | 1.77 | 0.28 | 0.01 | 0.14 | 4.00 |
| Bluegill Sunfish | S | I | C | P | 5 | 8.82 | 1.41 | 0.04 | 0.89 | 5.00 |
| Longear Sunfish | S | I | C | M | 13 | 22.94 | 3.67 | 0.22 | 4.33 | 9.38 |
| Green Sf X Longear Sf | | | | | 1 | 1.77 | 0.28 | 0.01 | 0.24 | 7.00 |
| Logperch | D | I | S | M | 1 | 1.77 | 0.28 | 0.01 | 0.28 | 8.00 |
| Johnny Darter | D | I | C | | 43 | 75.88 | 12.15 | 0.05 | 0.93 | 0.60 |
| Greenside Darter | D | I | S | M | 58 | 102.35 | 16.38 | 0.79 | 15.94 | 7.74 |
| Fantail Darter | D | I | C | | 6 | 10.59 | 1.69 | 0.01 | 0.14 | 0.67 |
| | *Date Total* | | | | 354 | 624.71 | | 4.97 | | |
| | *Number of Species* | | | | 17 | | | | | |
| | *Number of Hybrids* | | | | 1 | | | | | |

| | | |
|---|---|---|
| River Code: **09-200** | Stream: **Leading Creek** | Sample Date: **09/22/2004** |
| River Mile: **24.20** | Location: | Invalid Sample: |
| Time Fished: 2580 sec | Drainage: 19.0 sq mi Depth: | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Grass Pickerel | | P | M | P | 2 | 4.00 | 0.41 | | | |
| Golden Redhorse | R | I | S | M | 5 | 10.00 | 1.02 | | | |
| Northern Hog Sucker | R | I | S | M | 2 | 4.00 | 0.41 | | | |
| White Sucker | W | O | S | T | 15 | 30.00 | 3.05 | | | |
| Western Blacknose Dace | N | G | S | T | 3 | 6.00 | 0.61 | | | |
| Creek Chub | N | G | N | T | 87 | 174.00 | 17.72 | | | |
| Redfin Shiner | N | I | N | | 23 | 46.00 | 4.68 | | | |
| Striped Shiner | N | I | S | | 111 | 222.00 | 22.61 | | | |
| Silverjaw Minnow | N | I | M | | 20 | 40.00 | 4.07 | | | |
| Bluntnose Minnow | N | O | C | T | 104 | 208.00 | 21.18 | | | |
| Central Stoneroller | N | H | N | | 9 | 18.00 | 1.83 | | | |
| Trout-perch | | I | M | | 6 | 12.00 | 1.22 | | | |
| Spotted Bass | F | C | C | | 1 | 2.00 | 0.20 | | | |
| Green Sunfish | S | I | C | T | 5 | 10.00 | 1.02 | | | |
| Bluegill Sunfish | S | I | C | P | 1 | 2.00 | 0.20 | | | |
| Longear Sunfish | S | I | C | M | 16 | 32.00 | 3.26 | | | |
| Logperch | D | I | S | M | 1 | 2.00 | 0.20 | | | |
| Johnny Darter | D | I | C | | 34 | 68.00 | 6.92 | | | |
| Greenside Darter | D | I | S | M | 26 | 52.00 | 5.30 | | | |
| Fantail Darter | D | I | C | | 19 | 38.00 | 3.87 | | | |
| Freshwater Drum | | | M | P | 1 | 2.00 | 0.20 | | | |
| | *Date Total* | | | | 491 | 982.00 | | | | |
| | *Number of Species* | | | | 21 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-200** | Stream: **Leading Creek** | Sample Date: **07/21/2004** |
| River Mile: **16.80** | Location: | Invalid Sample: |
| Time Fished: 2700 sec | Drainage: 62.7 sq mi Depth: | Data Source: 01 |
| Dist Fished: 0.20 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| 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 | 1.50 | 0.33 | 0.14 | 3.93 | 90.00 |
| Grass Pickerel | | P | M | P | 4 | 6.00 | 1.34 | 0.17 | 4.90 | 28.00 |
| Golden Redhorse | R | I | S | M | 2 | 3.00 | 0.67 | 0.11 | 3.15 | 36.00 |
| Northern Hog Sucker | R | I | S | M | 15 | 22.50 | 5.02 | 0.33 | 9.53 | 14.53 |
| White Sucker | W | O | S | T | 13 | 19.50 | 4.35 | 0.02 | 0.44 | 0.77 |
| Western Blacknose Dace | N | G | S | T | 3 | 4.50 | 1.00 | 0.00 | 0.09 | 0.67 |
| Creek Chub | N | G | N | T | 37 | 55.50 | 12.37 | 0.12 | 3.55 | 2.19 |
| Redfin Shiner | N | I | N | | 1 | 1.50 | 0.33 | 0.01 | 0.35 | 8.00 |
| Striped Shiner | N | I | S | | 69 | 103.50 | 23.08 | 0.38 | 11.01 | 3.65 |
| Silverjaw Minnow | N | I | M | | 9 | 13.50 | 3.01 | 0.02 | 0.61 | 1.56 |
| Bluntnose Minnow | N | O | C | T | 36 | 54.00 | 12.04 | 0.08 | 2.27 | 1.44 |
| Central Stoneroller | N | H | N | | 9 | 13.50 | 3.01 | 0.02 | 0.70 | 1.78 |
| Yellow Bullhead | | I | C | T | 3 | 4.50 | 1.00 | 0.89 | 25.84 | 197.00 |
| Largemouth Bass | F | C | C | | 1 | 1.50 | 0.33 | 0.01 | 0.17 | 4.00 |
| Green Sunfish | S | I | C | T | 5 | 7.50 | 1.67 | 0.06 | 1.84 | 8.40 |
| Longear Sunfish | S | I | C | M | 5 | 7.50 | 1.67 | 0.25 | 7.17 | 32.80 |
| Sauger | F | P | S | | 1 | 1.50 | 0.33 | 0.68 | 19.90 | 455.00 |
| Blackside Darter | D | I | S | | 22 | 33.00 | 7.36 | 0.05 | 1.40 | 1.45 |
| Logperch | D | I | S | M | 6 | 9.00 | 2.01 | 0.03 | 0.96 | 3.67 |
| Johnny Darter | D | I | C | | 19 | 28.50 | 6.35 | 0.02 | 0.44 | 0.53 |
| Orangethroat Darter | D | I | S | | 1 | 1.50 | 0.33 | 0.00 | 0.09 | 2.00 |
| Fantail Darter | D | I | C | | 37 | 55.50 | 12.37 | 0.06 | 1.72 | 1.05 |
| | *Date Total* | | | | 299 | 448.50 | | 3.43 | | |
| | *Number of Species* | | | | 22 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-200** | Stream: **Leading Creek** | Sample Date: **10/12/2004** |
| River Mile: **15.50** | Location: | Invalid Sample: |
| Time Fished: 2100 sec | Drainage: 70.8 sq mi Depth: 35 cm | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Silver Lamprey | | P | N | | 1 | 2.00 | 0.14 | 0.01 | 0.06 | 6.00 |
| Gizzard Shad | | O | M | | 5 | 10.00 | 0.69 | 0.70 | 3.46 | 70.40 |
| Golden Redhorse | R | I | S | M | 12 | 24.00 | 1.67 | 1.32 | 6.47 | 54.83 |
| Northern Hog Sucker | R | I | S | M | 22 | 44.00 | 3.06 | 1.59 | 7.83 | 36.18 |
| White Sucker | W | O | S | T | 2 | 4.00 | 0.28 | 1.21 | 5.95 | 302.50 |
| Creek Chub | N | G | N | T | 9 | 18.00 | 1.25 | 0.03 | 0.16 | 1.78 |
| Emerald Shiner | N | I | S | | 71 | 142.00 | 9.86 | 0.58 | 2.85 | 4.08 |
| Redfin Shiner | N | I | N | | 8 | 16.00 | 1.11 | 0.01 | 0.06 | 0.75 |
| Striped Shiner | N | I | S | | 32 | 64.00 | 4.44 | 0.30 | 1.49 | 4.75 |
| Spotfin Shiner | N | I | M | | 5 | 10.00 | 0.69 | 0.04 | 0.18 | 3.60 |
| Sand Shiner | N | I | M | M | 429 | 858.00 | 59.58 | 1.68 | 8.26 | 1.96 |
| Silverjaw Minnow | N | I | M | | 27 | 54.00 | 3.75 | 0.07 | 0.35 | 1.33 |
| Bluntnose Minnow | N | O | C | T | 43 | 86.00 | 5.97 | 0.14 | 0.68 | 1.60 |
| Central Stoneroller | N | H | N | | 7 | 14.00 | 0.97 | 0.04 | 0.18 | 2.57 |
| Trout-perch | | I | M | | 1 | 2.00 | 0.14 | 0.01 | 0.04 | 4.00 |
| Spotted Bass | F | C | C | | 6 | 12.00 | 0.83 | 0.93 | 4.58 | 77.67 |
| Longear Sunfish | S | I | C | M | 5 | 10.00 | 0.69 | 0.48 | 2.36 | 48.00 |
| | | | | | 3 | 6.00 | 0.42 | 0.20 | 0.98 | 33.33 |
| Sauger | F | P | S | | 1 | 2.00 | 0.14 | 0.48 | 2.36 | 240.00 |
| Blackside Darter | D | I | S | | 6 | 12.00 | 0.83 | 0.02 | 0.10 | 1.67 |
| Logperch | D | I | S | M | 1 | 2.00 | 0.14 | 0.01 | 0.04 | 4.00 |
| Johnny Darter | D | I | C | | 10 | 20.00 | 1.39 | 0.01 | 0.07 | 0.70 |
| Rainbow Darter | D | I | S | M | 5 | 10.00 | 0.69 | 0.01 | 0.05 | 1.00 |
| Fantail Darter | D | I | C | | 6 | 12.00 | 0.83 | 0.01 | 0.07 | 1.17 |
| Freshwater Drum | | | M | P | 3 | 6.00 | 0.42 | 10.45 | 51.38 | 1,741.67 |
| | *Date Total* | | | | 720 | 1,440.00 | | 20.34 | | |
| | *Number of Species* | | | | 25 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-200** | Stream: **Leading Creek** | Sample Date: **06/21/2005** |
| River Mile: **14.80** | Location: | Invalid Sample: |
| Time Fished: 3349 sec | Drainage: 71.8 sq mi Depth: 20 cm | Data Source: 01 |
| Dist Fished: 0.20 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Black Redhorse | R | I | S | I | 1 | 1.50 | 0.26 | 0.18 | 0.49 | 120.00 |
| Golden Redhorse | R | I | S | M | 3 | 4.50 | 0.79 | 0.94 | 2.58 | 209.33 |
| Northern Hog Sucker | R | I | S | M | 45 | 67.50 | 11.84 | 1.43 | 3.92 | 21.22 |
| Creek Chub | N | G | N | T | 25 | 37.50 | 6.58 | 0.19 | 0.51 | 5.00 |
| Emerald Shiner | N | I | S | | 4 | 6.00 | 1.05 | 0.02 | 0.04 | 2.50 |
| Rosyface Shiner | N | I | S | I | 3 | 4.50 | 0.79 | 0.01 | 0.03 | 2.67 |
| Striped Shiner | N | I | S | | 56 | 84.00 | 14.74 | 0.28 | 0.77 | 3.36 |
| Sand Shiner | N | I | M | M | 2 | 3.00 | 0.53 | 0.01 | 0.03 | 4.00 |
| Silverjaw Minnow | N | I | M | | 13 | 19.50 | 3.42 | 0.06 | 0.16 | 2.92 |
| Bluntnose Minnow | N | O | C | T | 46 | 69.00 | 12.11 | 0.19 | 0.53 | 2.80 |
| Central Stoneroller | N | H | N | | 88 | 132.00 | 23.16 | 0.52 | 1.41 | 3.91 |
| Channel Catfish | F | | C | | 1 | 1.50 | 0.26 | 0.47 | 1.27 | 310.00 |
| Spotted Bass | F | C | C | | 7 | 10.50 | 1.84 | 0.26 | 0.72 | 25.00 |
| Bluegill Sunfish | S | I | C | P | 1 | 1.50 | 0.26 | 0.00 | 0.01 | 1.00 |
| Longear Sunfish | S | I | C | M | 13 | 19.50 | 3.42 | 0.99 | 2.70 | 50.62 |
| Blackside Darter | D | I | S | | 2 | 3.00 | 0.53 | 0.01 | 0.03 | 4.00 |
| Logperch | D | I | S | M | 1 | 1.50 | 0.26 | 0.01 | 0.02 | 6.00 |
| Johnny Darter | D | I | C | | 8 | 12.00 | 2.11 | 0.02 | 0.06 | 1.75 |
| Rainbow Darter | D | I | S | M | 3 | 4.50 | 0.79 | 0.02 | 0.04 | 3.33 |
| Fantail Darter | D | I | C | | 48 | 72.00 | 12.63 | 0.05 | 0.15 | 0.75 |
| Freshwater Drum | | | M | P | 10 | 15.00 | 2.63 | 30.86 | 84.51 | 2,057.00 |
| | *Date Total* | | | | 380 | 570.00 | | 36.51 | | |
| | *Number of Species* | | | | 21 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-200** | Stream: **Leading Creek** | Sample Date: **06/21/2005** |
| River Mile: **12.30** | Location: | Invalid Sample: |
| Time Fished: 2176 sec | Drainage: 77.9 sq mi Depth: 20 cm | Data Source: 01 |
| Dist Fished: 0.20 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Quillback Carpsucker | C | O | M | | 5 | 7.50 | 0.66 | 6.26 | 19.80 | 834.00 |
| Golden Redhorse | R | I | S | M | 3 | 4.50 | 0.39 | 0.94 | 2.97 | 208.67 |
| Northern Hog Sucker | R | I | S | M | 34 | 51.00 | 4.47 | 2.23 | 7.06 | 43.71 |
| Western Blacknose Dace | N | G | S | T | 4 | 6.00 | 0.53 | 0.01 | 0.03 | 1.25 |
| Creek Chub | N | G | N | T | 80 | 120.00 | 10.51 | 0.55 | 1.75 | 4.60 |
| Emerald Shiner | N | I | S | | 17 | 25.50 | 2.23 | 0.03 | 0.09 | 1.18 |
| Striped Shiner | N | I | S | | 95 | 142.50 | 12.48 | 0.41 | 1.30 | 2.87 |
| Silverjaw Minnow | N | I | M | | 15 | 22.50 | 1.97 | 0.04 | 0.13 | 1.87 |
| Bluntnose Minnow | N | O | C | T | 56 | 84.00 | 7.36 | 0.16 | 0.49 | 1.84 |
| Central Stoneroller | N | H | N | | 146 | 219.00 | 19.19 | 1.08 | 3.42 | 4.93 |
| Spotted Bass | F | C | C | | 5 | 7.50 | 0.66 | 1.74 | 5.50 | 231.60 |
| Bluegill Sunfish | S | I | C | P | 1 | 1.50 | 0.13 | 0.00 | 0.01 | 1.00 |
| Longear Sunfish | S | I | C | M | 19 | 28.50 | 2.50 | 1.48 | 4.67 | 51.79 |
| Blackside Darter | D | I | S | | 1 | 1.50 | 0.13 | 0.00 | 0.01 | 2.00 |
| Logperch | D | I | S | M | 5 | 7.50 | 0.66 | 0.05 | 0.17 | 7.20 |
| Johnny Darter | D | I | C | | 55 | 82.50 | 7.23 | 0.06 | 0.20 | 0.76 |
| Rainbow Darter | D | I | S | M | 15 | 22.50 | 1.97 | 0.02 | 0.07 | 1.00 |
| Fantail Darter | D | I | C | | 199 | 298.50 | 26.15 | 0.34 | 1.06 | 1.12 |
| Freshwater Drum | | | M | P | 6 | 9.00 | 0.79 | 16.20 | 51.28 | 1,800.00 |
| | *Date Total* | | | | 761 | 1,141.50 | | 31.59 | | |
| | *Number of Species* | | | | 19 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-200** | Stream: **Leading Creek** | Sample Date: **06/21/2005** |
| River Mile: **10.30** | Location: | Invalid Sample: |
| Time Fished: 3518 sec | Drainage: 80.7 sq mi Depth: 25 cm | Data Source: 01 |
| Dist Fished: 0.20 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Quillback Carpsucker | C | O | M | | 2 | 3.00 | 0.37 | 4.35 | 8.52 | 1,450.00 |
| Black Redhorse | R | I | S | I | 1 | 1.50 | 0.19 | 0.45 | 0.88 | 300.00 |
| Golden Redhorse | R | I | S | M | 3 | 4.50 | 0.56 | 1.26 | 2.47 | 280.33 |
| Northern Hog Sucker | R | I | S | M | 45 | 67.50 | 8.33 | 1.95 | 3.82 | 28.84 |
| Western Blacknose Dace | N | G | S | T | 26 | 39.00 | 4.81 | 0.06 | 0.11 | 1.46 |
| Creek Chub | N | G | N | T | 84 | 126.00 | 15.56 | 0.73 | 1.43 | 5.79 |
| South. Redbelly Dace | N | H | S | | 1 | 1.50 | 0.19 | 0.00 | 0.01 | 2.00 |
| Rosyface Shiner | N | I | S | I | 1 | 1.50 | 0.19 | 0.00 | 0.00 | 1.00 |
| Striped Shiner | N | I | S | | 75 | 112.50 | 13.89 | 0.35 | 0.68 | 3.07 |
| Sand Shiner | N | I | M | M | 10 | 15.00 | 1.85 | 0.01 | 0.02 | 0.80 |
| Silverjaw Minnow | N | I | M | | 48 | 72.00 | 8.89 | 0.13 | 0.25 | 1.79 |
| Bluntnose Minnow | N | O | C | T | 98 | 147.00 | 18.15 | 0.27 | 0.52 | 1.81 |
| Central Stoneroller | N | H | N | | 45 | 67.50 | 8.33 | 0.35 | 0.69 | 5.20 |
| Channel Catfish | F | | C | | 2 | 3.00 | 0.37 | 3.57 | 7.00 | 1,190.00 |
| Spotted Bass | F | C | C | | 1 | 1.50 | 0.19 | 0.02 | 0.04 | 14.00 |
| Bluegill Sunfish | S | I | C | P | 2 | 3.00 | 0.37 | 0.02 | 0.04 | 6.00 |
| Longear Sunfish | S | I | C | M | 5 | 7.50 | 0.93 | 0.23 | 0.44 | 30.00 |
| Sauger | F | P | S | | 1 | 1.50 | 0.19 | 0.72 | 1.41 | 480.00 |
| Blackside Darter | D | I | S | | 1 | 1.50 | 0.19 | 0.00 | 0.01 | 2.00 |
| Logperch | D | I | S | M | 4 | 6.00 | 0.74 | 0.02 | 0.03 | 2.50 |
| Johnny Darter | D | I | C | | 21 | 31.50 | 3.89 | 0.05 | 0.09 | 1.43 |
| Rainbow Darter | D | I | S | M | 2 | 3.00 | 0.37 | 0.00 | 0.01 | 1.00 |
| Fantail Darter | D | I | C | | 42 | 63.00 | 7.78 | 0.09 | 0.18 | 1.43 |
| Freshwater Drum | | | M | P | 20 | 30.00 | 3.70 | 36.42 | 71.37 | 1,214.00 |
| | *Date Total* | | | | 540 | 810.00 | | 51.03 | | |
| | *Number of Species* | | | | 24 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-200** | Stream: **Leading Creek** | Sample Date: **06/21/2005** |
| River Mile: **6.00** | Location: | Invalid Sample: |
| Time Fished: 2000 sec | Drainage: 115.0 sq mi Depth: 20 cm | Data Source: 01 |
| Dist Fished: 0.20 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Silver Lamprey | | P | N | | 2 | 3.00 | 0.72 | 0.01 | 0.09 | 4.00 |
| Smallmouth Buffalo | C | I | M | | 1 | 1.50 | 0.36 | 1.65 | 12.69 | 1,100.00 |
| Golden Redhorse | R | I | S | M | 6 | 9.00 | 2.17 | 2.52 | 19.38 | 280.00 |
| Northern Hog Sucker | R | I | S | M | 7 | 10.50 | 2.53 | 0.20 | 1.50 | 18.57 |
| Smallmouth Redhorse | R | I | S | M | 1 | 1.50 | 0.36 | 0.45 | 3.46 | 300.00 |
| Western Blacknose Dace | N | G | S | T | 3 | 4.50 | 1.08 | 0.01 | 0.04 | 1.00 |
| Creek Chub | N | G | N | T | 4 | 6.00 | 1.44 | 0.01 | 0.05 | 1.00 |
| Emerald Shiner | N | I | S | | 19 | 28.50 | 6.86 | 0.05 | 0.35 | 1.58 |
| Striped Shiner | N | I | S | | 8 | 12.00 | 2.89 | 0.02 | 0.18 | 2.00 |
| Silverjaw Minnow | N | I | M | | 69 | 103.50 | 24.91 | 0.14 | 1.08 | 1.35 |
| Bluntnose Minnow | N | O | C | T | 109 | 163.50 | 39.35 | 0.20 | 1.55 | 1.23 |
| Yellow Bullhead | | I | C | T | 2 | 3.00 | 0.72 | 0.03 | 0.23 | 10.00 |
| Spotted Bass | F | C | C | | 4 | 6.00 | 1.44 | 0.45 | 3.46 | 75.00 |
| Green Sunfish | S | I | C | T | 4 | 6.00 | 1.44 | 0.27 | 2.08 | 45.00 |
| Bluegill Sunfish | S | I | C | P | 5 | 7.50 | 1.81 | 0.30 | 2.31 | 40.00 |
| Longear Sunfish | S | I | C | M | 2 | 3.00 | 0.72 | 0.12 | 0.90 | 39.00 |
| Sauger | F | P | S | | 1 | 1.50 | 0.36 | 0.45 | 3.46 | 300.00 |
| Blackside Darter | D | I | S | | 2 | 3.00 | 0.72 | 0.01 | 0.04 | 1.50 |
| Johnny Darter | D | I | C | | 18 | 27.00 | 6.50 | 0.02 | 0.18 | 0.89 |
| Fantail Darter | D | I | C | | 3 | 4.50 | 1.08 | 0.00 | 0.02 | 0.67 |
| Freshwater Drum | | | M | P | 7 | 10.50 | 2.53 | 6.11 | 46.96 | 581.43 |
| | *Date Total* | | | | 277 | 415.50 | | 13.00 | | |
| | *Number of Species* | | | | 21 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-201** | Stream: **Little Leading Creek** | Sample Date: **07/21/2004** |
| River Mile: **9.90** | Location: | Invalid Sample: |
| Time Fished: 1320 sec | Drainage: 4.0 sq mi Depth: 25 cm | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| White Sucker | W | O | S | T | 7 | 14.00 | 0.51 | | | |
| Western Blacknose Dace | N | G | S | T | 337 | 674.00 | 24.56 | | | |
| Creek Chub | N | G | N | T | 511 | 1,022.00 | 37.24 | | | |
| South. Redbelly Dace | N | H | S | | 114 | 228.00 | 8.31 | | | |
| Striped Shiner | N | I | S | | 33 | 66.00 | 2.41 | | | |
| Silverjaw Minnow | N | I | M | | 245 | 490.00 | 17.86 | | | |
| Bluntnose Minnow | N | O | C | T | 27 | 54.00 | 1.97 | | | |
| Central Stoneroller | N | H | N | | 25 | 50.00 | 1.82 | | | |
| Cr Chub X S. Redbelly D | | | | | 1 | 2.00 | 0.07 | | | |
| Yellow Bullhead | | I | C | T | 2 | 4.00 | 0.15 | | | |
| Spotted Bass | F | C | C | | 1 | 2.00 | 0.07 | | | |
| Green Sunfish | S | I | C | T | 28 | 56.00 | 2.04 | | | |
| Bluegill Sunfish | S | I | C | P | 11 | 22.00 | 0.80 | | | |
| Green Sf X Bluegill Sf | | | | | 4 | 8.00 | 0.29 | | | |
| Johnny Darter | D | I | C | | 21 | 42.00 | 1.53 | | | |
| Fantail Darter | D | I | C | | 5 | 10.00 | 0.36 | | | |
| | *Date Total* | | | | 1,372 | 2,744.00 | | | | |
| | *Number of Species* | | | | 14 | | | | | |
| | *Number of Hybrids* | | | | 2 | | | | | |

| | | |
|---|---|---|
| River Code: **09-201** | Stream: **Little Leading Creek** | Sample Date: **07/20/2004** |
| River Mile: **6.60** | Location: | Invalid Sample: |
| Time Fished: 2100 sec | Drainage: 9.4 sq mi Depth: 20 cm | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| White Sucker | W | O | S | T | 7 | 14.00 | 0.51 | | | |
| Western Blacknose Dace | N | G | S | T | 290 | 580.00 | 21.31 | | | |
| Creek Chub | N | G | N | T | 397 | 794.00 | 29.17 | | | |
| South. Redbelly Dace | N | H | S | | 96 | 192.00 | 7.05 | | | |
| Striped Shiner | N | I | S | | 47 | 94.00 | 3.45 | | | |
| Silverjaw Minnow | N | I | M | | 251 | 502.00 | 18.44 | | | |
| Bluntnose Minnow | N | O | C | T | 69 | 138.00 | 5.07 | | | |
| Central Stoneroller | N | H | N | | 100 | 200.00 | 7.35 | | | |
| Spotted Bass | F | C | C | | 4 | 8.00 | 0.29 | | | |
| Bluegill Sunfish | S | I | C | P | 22 | 44.00 | 1.62 | | | |
| Johnny Darter | D | I | C | | 37 | 74.00 | 2.72 | | | |
| Fantail Darter | D | I | C | | 41 | 82.00 | 3.01 | | | |
| | *Date Total* | | | | 1,361 | 2,722.00 | | | | |
| | *Number of Species* | | | | 12 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-201** | Stream: **Little Leading Creek** | Sample Date: **07/21/2004** |
| River Mile: **0.40** | Location: | Invalid Sample: |
| Time Fished: 1920 sec | Drainage: 23.2 sq mi Depth: 35 cm | Data Source: 01 |
| Dist Fished: 0.20 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| 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 Hog Sucker | R | I | S | M | 21 | 31.50 | 1.95 | 0.05 | 2.91 | 1.67 |
| White Sucker | W | O | S | T | 54 | 81.00 | 5.01 | 0.09 | 4.93 | 1.11 |
| Western Blacknose Dace | N | G | S | T | 12 | 18.00 | 1.11 | 0.02 | 1.15 | 1.17 |
| Creek Chub | N | G | N | T | 410 | 615.00 | 38.07 | 0.61 | 33.33 | 0.99 |
| South. Redbelly Dace | N | H | S | | 1 | 1.50 | 0.09 | 0.00 | 0.11 | 1.00 |
| Striped Shiner | N | I | S | | 62 | 93.00 | 5.76 | 0.08 | 4.28 | 0.84 |
| Silverjaw Minnow | N | I | M | | 72 | 108.00 | 6.69 | 0.14 | 7.68 | 1.29 |
| Bluntnose Minnow | N | O | C | T | 20 | 30.00 | 1.86 | 0.08 | 4.55 | 2.75 |
| Central Stoneroller | N | H | N | | 322 | 483.00 | 29.90 | 0.50 | 27.47 | 1.04 |
| Yellow Bullhead | | I | C | T | 1 | 1.50 | 0.09 | 0.15 | 8.22 | 100.00 |
| Spotted Bass | F | C | C | | 1 | 1.50 | 0.09 | 0.01 | 0.44 | 5.00 |
| Blackside Darter | D | I | S | | 2 | 3.00 | 0.19 | 0.01 | 0.27 | 1.50 |
| Johnny Darter | D | I | C | | 77 | 115.50 | 7.15 | 0.06 | 3.29 | 0.52 |
| Fantail Darter | D | I | C | | 22 | 33.00 | 2.04 | 0.03 | 1.59 | 0.86 |
| | *Date Total* | | | | 1,077 | 1,615.50 | | 1.82 | | |
| | *Number of Species* | | | | 14 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-202** | Stream: **Malloons Run** | Sample Date: **07/14/2004** |
| River Mile: **0.10** | Location: | Invalid Sample: |
| Time Fished: 2400 sec | Drainage: 3.8 sq mi Depth: | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Grass Pickerel | | P | M | P | 1 | 2.00 | 1.15 | | | |
| Northern Hog Sucker | R | I | S | M | 2 | 4.00 | 2.30 | | | |
| White Sucker | W | O | S | T | 4 | 8.00 | 4.60 | | | |
| Creek Chub | N | G | N | T | 32 | 64.00 | 36.78 | | | |
| Striped Shiner | N | I | S | | 9 | 18.00 | 10.34 | | | |
| Silverjaw Minnow | N | I | M | | 3 | 6.00 | 3.45 | | | |
| Bluntnose Minnow | N | O | C | T | 5 | 10.00 | 5.75 | | | |
| Central Stoneroller | N | H | N | | 10 | 20.00 | 11.49 | | | |
| Largemouth Bass | F | C | C | | 2 | 4.00 | 2.30 | | | |
| Green Sunfish | S | I | C | T | 3 | 6.00 | 3.45 | | | |
| Longear Sunfish | S | I | C | M | 3 | 6.00 | 3.45 | | | |
| Blackside Darter | D | I | S | | 5 | 10.00 | 5.75 | | | |
| Johnny Darter | D | I | C | | 8 | 16.00 | 9.20 | | | |
| | *Date Total* | | | | 87 | 174.00 | | | | |
| | *Number of Species* | | | | 13 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-203** | Stream: **Parker Run** | Sample Date: **06/20/2005** |
| River Mile: **1.60** | Location: | Invalid Sample: |
| Time Fished: 2181 sec | Drainage: 4.5 sq mi Depth: 40 cm | Data Source: 01 |
| Dist Fished: 0.20 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Quillback Carpsucker | C | O | M | | 10 | 15.00 | 9.17 | | | |
| Northern Hog Sucker | R | I | S | M | 2 | 3.00 | 1.83 | | | |
| Western Blacknose Dace | N | G | S | T | 1 | 1.50 | 0.92 | | | |
| Creek Chub | N | G | N | T | 43 | 64.50 | 39.45 | | | |
| Striped Shiner | N | I | S | | 11 | 16.50 | 10.09 | | | |
| Silverjaw Minnow | N | I | M | | 4 | 6.00 | 3.67 | | | |
| Bluntnose Minnow | N | O | C | T | 1 | 1.50 | 0.92 | | | |
| Central Stoneroller | N | H | N | | 5 | 7.50 | 4.59 | | | |
| Trout-perch | | I | M | | 3 | 4.50 | 2.75 | | | |
| Green Sunfish | S | I | C | T | 19 | 28.50 | 17.43 | | | |
| Bluegill Sunfish | S | I | C | P | 4 | 6.00 | 3.67 | | | |
| Longear Sunfish | S | I | C | M | 2 | 3.00 | 1.83 | | | |
| Redear Sunfish | E | I | C | | 1 | 1.50 | 0.92 | | | |
| Johnny Darter | D | I | C | | 2 | 3.00 | 1.83 | | | |
| Fantail Darter | D | I | C | | 1 | 1.50 | 0.92 | | | |
| | *Date Total* | | | | 109 | 163.50 | | | | |
| | *Number of Species* | | | | 15 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-205** | Stream: **Dexter Run** | Sample Date: **07/13/2004** |
| River Mile: **0.80** | Location: | Invalid Sample: |
| Time Fished: 2400 sec | Drainage: 7.5 sq mi Depth: 50 cm | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Grass Pickerel | | P | M | P | 17 | 34.00 | 7.17 | | | |
| White Sucker | W | O | S | T | 5 | 10.00 | 2.11 | | | |
| Creek Chub | N | G | N | T | 5 | 10.00 | 2.11 | | | |
| Redfin Shiner | N | I | N | | 58 | 116.00 | 24.47 | | | |
| Striped Shiner | N | I | S | | 53 | 106.00 | 22.36 | | | |
| Bluntnose Minnow | N | O | C | T | 4 | 8.00 | 1.69 | | | |
| Yellow Bullhead | | I | C | T | 14 | 28.00 | 5.91 | | | |
| Largemouth Bass | F | C | C | | 6 | 12.00 | 2.53 | | | |
| Green Sunfish | S | I | C | T | 50 | 100.00 | 21.10 | | | |
| Bluegill Sunfish | S | I | C | P | 12 | 24.00 | 5.06 | | | |
| Longear Sunfish | S | I | C | M | 5 | 10.00 | 2.11 | | | |
| Blackside Darter | D | I | S | | 5 | 10.00 | 2.11 | | | |
| Johnny Darter | D | I | C | | 3 | 6.00 | 1.27 | | | |
| | *Date Total* | | | | 237 | 474.00 | | | | |
| | *Number of Species* | | | | 13 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-206** | Stream: **Mud Fork** | Sample Date: **07/13/2004** |
| River Mile: **5.40** | Location: | Invalid Sample: |
| Time Fished: 2100 sec | Drainage: 3.0 sq mi  Depth: 40 cm | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs  Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000  Lat:: 0.00000  County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| White Sucker | W | O | S | T | 13 | 26.00 | 1.84 | | | |
| Western Blacknose Dace | N | G | S | T | 59 | 118.00 | 8.37 | | | |
| Creek Chub | N | G | N | T | 334 | 668.00 | 47.38 | | | |
| South. Redbelly Dace | N | H | S | | 90 | 180.00 | 12.77 | | | |
| Striped Shiner | N | I | S | | 108 | 216.00 | 15.32 | | | |
| Silverjaw Minnow | N | I | M | | 72 | 144.00 | 10.21 | | | |
| Central Stoneroller | N | H | N | | 14 | 28.00 | 1.99 | | | |
| Striped Sh X Creek Chub | | I | | | 0 | 0.00 | 0.00 | | | |
| Yellow Bullhead | | I | C | T | 1 | 2.00 | 0.14 | | | |
| Green Sunfish | S | I | C | T | 1 | 2.00 | 0.14 | | | |
| Blackside Darter | D | I | S | | 1 | 2.00 | 0.14 | | | |
| Johnny Darter | D | I | C | | 8 | 16.00 | 1.13 | | | |
| Fantail Darter | D | I | C | | 4 | 8.00 | 0.57 | | | |
| | *Date Total* | | | | 705 | 1,410.00 | | | | |
| | *Number of Species* | | | | 12 | | | | | |
| | *Number of Hybrids* | | | | 1 | | | | | |

| | | |
|---|---|---|
| River Code: **09-206** | Stream: **Mud Fork** | Sample Date: **07/13/2004** |
| River Mile: **2.20** | Location: | Invalid Sample: |
| Time Fished: 1680 sec | Drainage: 4.7 sq mi  Depth: 35 cm | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs  Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000  Lat:: 0.00000  County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Grass Pickerel | | P | M | P | 6 | 12.00 | 2.94 | | | |
| White Sucker | W | O | S | T | 3 | 6.00 | 1.47 | | | |
| Creek Chub | N | G | N | T | 25 | 50.00 | 12.25 | | | |
| Redfin Shiner | N | I | N | | 2 | 4.00 | 0.98 | | | |
| Striped Shiner | N | I | S | | 84 | 168.00 | 41.18 | | | |
| Silverjaw Minnow | N | I | M | | 24 | 48.00 | 11.76 | | | |
| Bluntnose Minnow | N | O | C | T | 30 | 60.00 | 14.71 | | | |
| Yellow Bullhead | | I | C | T | 16 | 32.00 | 7.84 | | | |
| Largemouth Bass | F | C | C | | 2 | 4.00 | 0.98 | | | |
| Green Sunfish | S | I | C | T | 6 | 12.00 | 2.94 | | | |
| Bluegill Sunfish | S | I | C | P | 4 | 8.00 | 1.96 | | | |
| Johnny Darter | D | I | C | | 2 | 4.00 | 0.98 | | | |
| | *Date Total* | | | | 204 | 408.00 | | | | |
| | *Number of Species* | | | | 12 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-206** | Stream: **Mud Fork** | Sample Date: **07/13/2004** |
| River Mile: **0.10** | Location: | Invalid Sample: |
| Time Fished: 1680 sec | Drainage: 9.4 sq mi  Depth: 15 cm | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs  Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000  Lat:: 0.00000  County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Grass Pickerel | | P | M | P | 1 | 2.00 | 0.02 | | | |
| Northern Hog Sucker | R | I | S | M | 8 | 16.00 | 0.13 | | | |
| White Sucker | W | O | S | T | 20 | 40.00 | 0.33 | | | |
| Western Blacknose Dace | N | G | S | T | 2 | 4.00 | 0.03 | | | |
| Creek Chub | N | G | N | T | 74 | 148.00 | 1.24 | | | |
| Redfin Shiner | N | I | N | | 1 | 2.00 | 0.02 | | | |
| Striped Shiner | N | I | S | | 451 | 902.00 | 7.55 | | | |
| Silverjaw Minnow | N | I | M | | 26 | 52.00 | 0.44 | | | |
| Bluntnose Minnow | N | O | C | T | 5,011 | 10,022.00 | 83.85 | | | |
| Central Stoneroller | N | H | N | | 5 | 10.00 | 0.08 | | | |
| Yellow Bullhead | | I | C | T | 2 | 4.00 | 0.03 | | | |
| Green Sunfish | S | I | C | T | 17 | 34.00 | 0.28 | | | |
| Longear Sunfish | S | I | C | M | 1 | 2.00 | 0.02 | | | |
| Blackside Darter | D | I | S | | 7 | 14.00 | 0.12 | | | |
| Johnny Darter | D | I | C | | 341 | 682.00 | 5.71 | | | |
| Fantail Darter | D | I | C | | 9 | 18.00 | 0.15 | | | |
| | *Date Total* | | | | 5,976 | 11,952.00 | | | | |
| | *Number of Species* | | | | 16 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-207** | Stream: **Ogden Run** | Sample Date: **09/23/2004** |
| River Mile: **0.50** | Location: | Invalid Sample: |
| Time Fished: 2400 sec | Drainage: 4.0 sq mi Depth: | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Golden Redhorse | R | I | S | M | 7 | 14.00 | 1.27 | | | |
| White Sucker | W | O | S | T | 43 | 86.00 | 7.79 | | | |
| Creek Chub | N | G | N | T | 109 | 218.00 | 19.75 | | | |
| Redfin Shiner | N | I | N | | 39 | 78.00 | 7.07 | | | |
| Striped Shiner | N | I | S | | 118 | 236.00 | 21.38 | | | |
| Silverjaw Minnow | N | I | M | | 10 | 20.00 | 1.81 | | | |
| Bluntnose Minnow | N | O | C | T | 88 | 176.00 | 15.94 | | | |
| Central Stoneroller | N | H | N | | 1 | 2.00 | 0.18 | | | |
| Yellow Bullhead | | I | C | T | 4 | 8.00 | 0.72 | | | |
| Trout-perch | | I | M | | 2 | 4.00 | 0.36 | | | |
| Spotted Bass | F | C | C | | 1 | 2.00 | 0.18 | | | |
| Largemouth Bass | F | C | C | | 1 | 2.00 | 0.18 | | | |
| Green Sunfish | S | I | C | T | 5 | 10.00 | 0.91 | | | |
| Bluegill Sunfish | S | I | C | P | 5 | 10.00 | 0.91 | | | |
| Longear Sunfish | S | I | C | M | 55 | 110.00 | 9.96 | | | |
| Johnny Darter | D | I | C | | 41 | 82.00 | 7.43 | | | |
| Greenside Darter | D | I | S | M | 13 | 26.00 | 2.36 | | | |
| Fantail Darter | D | I | C | | 10 | 20.00 | 1.81 | | | |
| | *Date Total* | | | | 552 | 1,104.00 | | | | |
| | *Number of Species* | | | | 18 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-208** | Stream: **Sisson Run** | Sample Date: **09/22/2004** |
| River Mile: **0.10** | Location: | Invalid Sample: |
| Time Fished: 2040 sec | Drainage: 4.0 sq mi Depth: | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Least Brook Lamprey | | F | N | | 1 | 2.00 | 0.16 | | | |
| Golden Redhorse | R | I | S | M | 16 | 32.00 | 2.56 | | | |
| Northern Hog Sucker | R | I | S | M | 8 | 16.00 | 1.28 | | | |
| White Sucker | W | O | S | T | 29 | 58.00 | 4.63 | | | |
| Creek Chub | N | G | N | T | 228 | 456.00 | 36.42 | | | |
| Striped Shiner | N | I | S | | 116 | 232.00 | 18.53 | | | |
| Silverjaw Minnow | N | I | M | | 108 | 216.00 | 17.25 | | | |
| Bluntnose Minnow | N | O | C | T | 68 | 136.00 | 10.86 | | | |
| Central Stoneroller | N | H | N | | 5 | 10.00 | 0.80 | | | |
| Yellow Bullhead | | I | C | T | 1 | 2.00 | 0.16 | | | |
| Green Sunfish | S | I | C | T | 5 | 10.00 | 0.80 | | | |
| Bluegill Sunfish | S | I | C | P | 8 | 16.00 | 1.28 | | | |
| Longear Sunfish | S | I | C | M | 9 | 18.00 | 1.44 | | | |
| Johnny Darter | D | I | C | | 21 | 42.00 | 3.35 | | | |
| Greenside Darter | D | I | S | M | 2 | 4.00 | 0.32 | | | |
| Fantail Darter | D | I | C | | 1 | 2.00 | 0.16 | | | |
| | *Date Total* | | | | 626 | 1,252.00 | | | | |
| | *Number of Species* | | | | 16 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-209** | Stream: **Fivemile Run** | Sample Date: **09/22/2004** |
| River Mile: **0.90** | Location: | Invalid Sample: |
| Time Fished: 1920 sec | Drainage: 4.0 sq mi  Depth: | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs  Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000  Lat:: 0.00000  County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| White Sucker | W | O | S | T | 44 | 88.00 | 20.09 | | | |
| Creek Chub | N | G | N | T | 80 | 160.00 | 36.53 | | | |
| Striped Shiner | N | I | S | | 24 | 48.00 | 10.96 | | | |
| Silverjaw Minnow | N | I | M | | 5 | 10.00 | 2.28 | | | |
| Bluntnose Minnow | N | O | C | T | 53 | 106.00 | 24.20 | | | |
| Yellow Bullhead | | I | C | T | 1 | 2.00 | 0.46 | | | |
| Largemouth Bass | F | C | C | | 2 | 4.00 | 0.91 | | | |
| Green Sunfish | S | I | C | T | 5 | 10.00 | 2.28 | | | |
| Bluegill Sunfish | S | I | C | P | 1 | 2.00 | 0.46 | | | |
| Longear Sunfish | S | I | C | M | 2 | 4.00 | 0.91 | | | |
| Johnny Darter | D | I | C | | 1 | 2.00 | 0.46 | | | |
| Greenside Darter | D | I | S | M | 1 | 2.00 | 0.46 | | | |
| | *Date Total* | | | | 219 | 438.00 | | | | |
| | *Number of Species* | | | | 12 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-211** | Stream: **Hysell Run** | Sample Date: **07/20/2004** |
| River Mile: **0.90** | Location: | Invalid Sample: |
| Time Fished: 1200 sec | Drainage: 4.6 sq mi Depth: 15 cm | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| No Fish | | | | | 0 | 0.00 | 0 | | | |
| | *Date Total* | | | | 0 | | | | | |
| | *Number of Species* | | | | 0 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-212** | Stream: **Bailey Run** | Sample Date: **07/20/2004** |
| River Mile: **0.50** | Location: | Invalid Sample: |
| Time Fished: 1680 sec | Drainage: 1.8 sq mi Depth: 25 cm | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| No Fish | | | | | 0 | 0.00 | 0 | | | |
| | *Date Total* | | | | 0 | | | | | |
| | *Number of Species* | | | | 0 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-213** | Stream: **Thomas Fork** | Sample Date: **07/19/2004** |
| River Mile: **9.80** | Location: | Invalid Sample: |
| Time Fished: 1680 sec | Drainage: 2.0 sq mi  Depth: 15 cm | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs  Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000  Lat:: 0.00000  County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| White Sucker | W | O | S | T | 1 | 2.00 | 0.16 | | | |
| Western Blacknose Dace | N | G | S | T | 121 | 242.00 | 19.00 | | | |
| Creek Chub | N | G | N | T | 288 | 576.00 | 45.21 | | | |
| South. Redbelly Dace | N | H | S | | 149 | 298.00 | 23.39 | | | |
| Silverjaw Minnow | N | I | M | | 38 | 76.00 | 5.97 | | | |
| Central Stoneroller | N | H | N | | 22 | 44.00 | 3.45 | | | |
| Bluegill Sunfish | S | I | C | P | 5 | 10.00 | 0.78 | | | |
| Johnny Darter | D | I | C | | 13 | 26.00 | 2.04 | | | |
| | *Date Total* | | | | 637 | 1,274.00 | | | | |
| | *Number of Species* | | | | 8 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-213** | Stream: **Thomas Fork** | Sample Date: **07/19/2004** |
| River Mile: **7.10** | Location: | Invalid Sample: |
| Time Fished: | Drainage: 4.5 sq mi Depth: | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| No Fish | | | | | 0 | 0.00 | 0 | | | |
| | *Date Total* | | | | 0 | | | | | |
| | *Number of Species* | | | | 0 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-213** | Stream: **Thomas Fork** | Sample Date: **07/19/2004** |
| River Mile: **5.00** | Location: | Invalid Sample: |
| Time Fished: 1380 sec | Drainage: 1.9 sq mi Depth: 45 cm | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| No Fish | | | | | 0 | 0.00 | 0 | | | |
| | *Date Total* | | | | 0 | | | | | |
| | *Number of Species* | | | | 0 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-213** | Stream: **Thomas Fork** | Sample Date: **07/20/2004** |
| River Mile: **4.40** | Location: | Invalid Sample: |
| Time Fished: 1320 sec | Drainage: 22.9 sq mi Depth: 40 cm | Data Source: 01 |
| Dist Fished: 0.20 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| No Fish | | | | | 0 | 0.00 | 0 | | | |
| | *Date Total* | | | | 0 | | | | | |
| | *Number of Species* | | | | 0 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-213** | Stream: **Thomas Fork** | Sample Date: **07/20/2004** |
| River Mile: **2.80** | Location: | Invalid Sample: |
| Time Fished: 1980 sec | Drainage: 30.5 sq mi Depth: 35 cm | Data Source: 01 |
| Dist Fished: 0.20 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| White Sucker | W | O | S | T | 2 | 3.00 | 4.17 | 0.00 | 4.23 | 1.00 |
| Creek Chub | N | G | N | T | 40 | 60.00 | 83.33 | 0.03 | 42.25 | 0.50 |
| Green Sunfish | S | I | C | T | 6 | 9.00 | 12.50 | 0.04 | 53.52 | 4.17 |
| *Date Total* | | | | | 48 | 72.00 | | 0.07 | | |
| *Number of Species* | | | | | 3 | | | | | |
| *Number of Hybrids* | | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-214** | Stream: **Long Hollow** | Sample Date: **07/15/2004** |
| River Mile: **0.10** | Location: | Invalid Sample: |
| Time Fished: 2100 sec | Drainage: 1.7 sq mi Depth: 25 cm | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| White Sucker | W | O | S | T | 11 | 22.00 | 3.24 | | | |
| Western Blacknose Dace | N | G | S | T | 8 | 16.00 | 2.36 | | | |
| Creek Chub | N | G | N | T | 235 | 470.00 | 69.32 | | | |
| South. Redbelly Dace | N | H | S | | 43 | 86.00 | 12.68 | | | |
| Silverjaw Minnow | N | I | M | | 15 | 30.00 | 4.42 | | | |
| Bluntnose Minnow | N | O | C | T | 1 | 2.00 | 0.29 | | | |
| Green Sunfish | S | I | C | T | 5 | 10.00 | 1.47 | | | |
| Johnny Darter | D | I | C | | 17 | 34.00 | 5.01 | | | |
| Fantail Darter | D | I | C | | 4 | 8.00 | 1.18 | | | |
| | *Date Total* | | | | 339 | 678.00 | | | | |
| | *Number of Species* | | | | 9 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-216** | Stream: **East Branch Thomas Fork** | Sample Date: **07/15/2004** |
| River Mile: **4.10** | Location: | Invalid Sample: |
| Time Fished: 2280 sec | Drainage: 2.0 sq mi Depth: 30 cm | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Least Brook Lamprey | | F | N | | 1 | 2.00 | 0.23 | | | |
| White Sucker | W | O | S | T | 33 | 66.00 | 7.67 | | | |
| Western Blacknose Dace | N | G | S | T | 30 | 60.00 | 6.98 | | | |
| Creek Chub | N | G | N | T | 194 | 388.00 | 45.12 | | | |
| Silverjaw Minnow | N | I | M | | 39 | 78.00 | 9.07 | | | |
| Bluntnose Minnow | N | O | C | T | 31 | 62.00 | 7.21 | | | |
| Central Stoneroller | N | H | N | | 3 | 6.00 | 0.70 | | | |
| Green Sunfish | S | I | C | T | 7 | 14.00 | 1.63 | | | |
| Bluegill Sunfish | S | I | C | P | 1 | 2.00 | 0.23 | | | |
| Johnny Darter | D | I | C | | 40 | 80.00 | 9.30 | | | |
| Fantail Darter | D | I | C | | 51 | 102.00 | 11.86 | | | |
| | *Date Total* | | | | 430 | 860.00 | | | | |
| | *Number of Species* | | | | 11 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-216** | Stream: **East Branch Thomas Fork** | Sample Date: **07/15/2004** |
| River Mile: **2.10** | Location: | Invalid Sample: |
| Time Fished: 1980 sec | Drainage: 4.5 sq mi Depth: 35 cm | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Least Brook Lamprey | | F | N | | 2 | 4.00 | 0.65 | | | |
| White Sucker | W | O | S | T | 10 | 20.00 | 3.25 | | | |
| Western Blacknose Dace | N | G | S | T | 12 | 24.00 | 3.90 | | | |
| Creek Chub | N | G | N | T | 199 | 398.00 | 64.61 | | | |
| South. Redbelly Dace | N | H | S | | 1 | 2.00 | 0.32 | | | |
| Silverjaw Minnow | N | I | M | | 10 | 20.00 | 3.25 | | | |
| Bluntnose Minnow | N | O | C | T | 7 | 14.00 | 2.27 | | | |
| Central Stoneroller | N | H | N | | 6 | 12.00 | 1.95 | | | |
| Spotted Bass | F | C | C | | 1 | 2.00 | 0.32 | | | |
| Green Sunfish | S | I | C | T | 3 | 6.00 | 0.97 | | | |
| Johnny Darter | D | I | C | | 25 | 50.00 | 8.12 | | | |
| Fantail Darter | D | I | C | | 32 | 64.00 | 10.39 | | | |
| | *Date Total* | | | | 308 | 616.00 | | | | |
| | *Number of Species* | | | | 12 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-216** | Stream: **East Branch Thomas Fork** | Sample Date: **07/19/2004** |
| River Mile: **0.60** | Location: | Invalid Sample: |
| Time Fished: 1800 sec | Drainage: 9.4 sq mi Depth: 60 cm | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Least Brook Lamprey | | F | N | | 2 | 4.00 | 2.78 | | | |
| Common Carp | G | O | M | T | 1 | 2.00 | 1.39 | | | |
| Creek Chub | N | G | N | T | 24 | 48.00 | 33.33 | | | |
| Bluntnose Minnow | N | O | C | T | 1 | 2.00 | 1.39 | | | |
| Yellow Bullhead | | I | C | T | 1 | 2.00 | 1.39 | | | |
| Spotted Bass | F | C | C | | 3 | 6.00 | 4.17 | | | |
| Green Sunfish | S | I | C | T | 29 | 58.00 | 40.28 | | | |
| Bluegill Sunfish | S | I | C | P | 7 | 14.00 | 9.72 | | | |
| Johnny Darter | D | I | C | | 4 | 8.00 | 5.56 | | | |
| | *Date Total* | | | | 72 | 144.00 | | | | |
| | *Number of Species* | | | | 9 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-217** | Stream: **Schoolhouse Run** | Sample Date: **09/22/2004** |
| River Mile: **0.60** | Location: | Invalid Sample: |
| Time Fished: 2760 sec | Drainage: 2.8 sq mi Depth: | Data Source: 01 |
| Dist Fished: 0.12 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Least Brook Lamprey | | F | N | | 12 | 30.00 | 2.97 | | | |
| Grass Pickerel | | P | M | P | 6 | 15.00 | 1.49 | | | |
| Golden Redhorse | R | I | S | M | 2 | 5.00 | 0.50 | | | |
| Northern Hog Sucker | R | I | S | M | 1 | 2.50 | 0.25 | | | |
| White Sucker | W | O | S | T | 25 | 62.50 | 6.19 | | | |
| Western Blacknose Dace | N | G | S | T | 8 | 20.00 | 1.98 | | | |
| Creek Chub | N | G | N | T | 122 | 305.00 | 30.20 | | | |
| Redfin Shiner | N | I | N | | 5 | 12.50 | 1.24 | | | |
| Striped Shiner | N | I | S | | 103 | 257.50 | 25.50 | | | |
| Silverjaw Minnow | N | I | M | | 13 | 32.50 | 3.22 | | | |
| Bluntnose Minnow | N | O | C | T | 55 | 137.50 | 13.61 | | | |
| Central Stoneroller | N | H | N | | 2 | 5.00 | 0.50 | | | |
| Largemouth Bass | F | C | C | | 1 | 2.50 | 0.25 | | | |
| Green Sunfish | S | I | C | T | 5 | 12.50 | 1.24 | | | |
| Bluegill Sunfish | S | I | C | P | 1 | 2.50 | 0.25 | | | |
| Longear Sunfish | S | I | C | M | 6 | 15.00 | 1.49 | | | |
| Johnny Darter | D | I | C | | 13 | 32.50 | 3.22 | | | |
| Greenside Darter | D | I | S | M | 6 | 15.00 | 1.49 | | | |
| Fantail Darter | D | I | C | | 18 | 45.00 | 4.46 | | | |
| | *Date Total* | | | | 404 | 1,010.00 | | | | |
| | *Number of Species* | | | | 19 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-221** | Stream: **Ball Run (2X)** | Sample Date: **07/19/2004** |
| River Mile: **0.40** | Location: | Invalid Sample: |
| Time Fished: 2520 sec | Drainage: 3.0 sq mi Depth: 35 cm | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| White Sucker | W | O | S | T | 57 | 114.00 | 9.13 | | | |
| Western Blacknose Dace | N | G | S | T | 64 | 128.00 | 10.26 | | | |
| Creek Chub | N | G | N | T | 314 | 628.00 | 50.32 | | | |
| South. Redbelly Dace | N | H | S | | 157 | 314.00 | 25.16 | | | |
| Bluntnose Minnow | N | O | C | T | 7 | 14.00 | 1.12 | | | |
| Central Stoneroller | N | H | N | | 11 | 22.00 | 1.76 | | | |
| Green Sunfish | S | I | C | T | 4 | 8.00 | 0.64 | | | |
| Johnny Darter | D | I | C | | 10 | 20.00 | 1.60 | | | |
| | *Date Total* | | | | 624 | 1,248.00 | | | | |
| | *Number of Species* | | | | 8 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-223** | Stream: **Lasher Run (2Z)** | Sample Date: **07/14/2004** |
| River Mile: **0.70** | Location: | Invalid Sample: |
| Time Fished: 1920 sec | Drainage: 3.0 sq mi Depth: 45 cm | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| White Sucker | W | O | S | T | 1 | 2.00 | 0.15 | | | |
| Western Blacknose Dace | N | G | S | T | 145 | 290.00 | 21.14 | | | |
| Creek Chub | N | G | N | T | 301 | 602.00 | 43.88 | | | |
| South. Redbelly Dace | N | H | S | | 169 | 338.00 | 24.64 | | | |
| Striped Shiner | N | I | S | | 6 | 12.00 | 0.87 | | | |
| Silverjaw Minnow | N | I | M | | 30 | 60.00 | 4.37 | | | |
| Central Stoneroller | N | H | N | | 14 | 28.00 | 2.04 | | | |
| Spotted Bass | F | C | C | | 15 | 30.00 | 2.19 | | | |
| Green Sunfish | S | I | C | T | 1 | 2.00 | 0.15 | | | |
| Bluegill Sunfish | S | I | C | P | 2 | 4.00 | 0.29 | | | |
| Johnny Darter | D | I | C | | 2 | 4.00 | 0.29 | | | |
| *Date Total* | | | | | 686 | 1,372.00 | | | | |
| *Number of Species* | | | | | 11 | | | | | |
| *Number of Hybrids* | | | | | 0 | | | | | |

| | | |
|---|---|---|
| River Code: **09-224** | Stream: **Thomas Fk of L. Leading Cr** | Sample Date: **07/21/2004** |
| River Mile: **0.30** | Location: | Invalid Sample: |
| Time Fished: 1200 sec | Drainage: 3.0 sq mi Depth: 25 cm | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs Flow: I | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| White Sucker | W | O | S | T | 15 | 30.00 | 1.94 | | | |
| Western Blacknose Dace | N | G | S | T | 118 | 236.00 | 15.27 | | | |
| Creek Chub | N | G | N | T | 279 | 558.00 | 36.09 | | | |
| South. Redbelly Dace | N | H | S | | 19 | 38.00 | 2.46 | | | |
| Striped Shiner | N | I | S | | 25 | 50.00 | 3.23 | | | |
| Silverjaw Minnow | N | I | M | | 63 | 126.00 | 8.15 | | | |
| Bluntnose Minnow | N | O | C | T | 53 | 106.00 | 6.86 | | | |
| Central Stoneroller | N | H | N | | 102 | 204.00 | 13.20 | | | |
| Cr Chub X S. Redbelly D | | | | | 1 | 2.00 | 0.13 | | | |
| Spotted Bass | F | C | C | | 5 | 10.00 | 0.65 | | | |
| Green Sunfish | S | I | C | T | 5 | 10.00 | 0.65 | | | |
| Johnny Darter | D | I | C | | 66 | 132.00 | 8.54 | | | |
| Fantail Darter | D | I | C | | 22 | 44.00 | 2.85 | | | |
| | *Date Total* | | | | 773 | 1,546.00 | | | | |
| | *Number of Species* | | | | 12 | | | | | |
| | *Number of Hybrids* | | | | 1 | | | | | |

| | | |
|---|---|---|
| River Code: **09-225** | Stream: **Trib. to Little Leading Creek** | Sample Date: **07/14/2004** |
| River Mile: **0.20** | Location: | Invalid Sample: |
| Time Fished: 1320 sec | Drainage: 3.0 sq mi Depth: | Data Source: 01 |
| Dist Fished: 0.15 km | Basin: Southeast Ohio River Tribs Flow: C | Sampler Type: E |
| Site ID:: | Lat:: 0.00000 Lat:: 0.00000 County:: | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Western Blacknose Dace | N | G | S | T | 23 | 46.00 | 9.91 | | | |
| Creek Chub | N | G | N | T | 150 | 300.00 | 64.66 | | | |
| South. Redbelly Dace | N | H | S | | 11 | 22.00 | 4.74 | | | |
| Striped Shiner | N | I | S | | 3 | 6.00 | 1.29 | | | |
| Bluntnose Minnow | N | O | C | T | 1 | 2.00 | 0.43 | | | |
| Central Stoneroller | N | H | N | | 15 | 30.00 | 6.47 | | | |
| Johnny Darter | D | I | C | | 4 | 8.00 | 1.72 | | | |
| Fantail Darter | D | I | C | | 25 | 50.00 | 10.78 | | | |
| | *Date Total* | | | | 232 | 464.00 | | | | |
| | *Number of Species* | | | | 8 | | | | | |
| | *Number of Hybrids* | | | | 0 | | | | | |

Grand Total of All Streams
Date Range: 07/13/2004
Thru: 06/21/2005

Dist Fished: 6.17 km  No of Streams: 19  No of Passes: 38
Site ID::  Lat:: 0.00000  Lat:: 0.00000  County::

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Silver Lamprey | | P | N | | 3 | 0.13 | 0.01 | 0.00 | 0.01 | 4.67 |
| Least Brook Lamprey | | F | N | | 18 | 1.11 | 0.10 | | | |
| Gizzard Shad | | O | M | | 6 | 0.30 | 0.03 | 0.06 | 0.52 | 73.67 |
| Grass Pickerel | | P | M | P | 43 | 2.25 | 0.21 | 0.03 | 0.22 | 36.83 |
| Smallmouth Buffalo | C | I | M | | 1 | 0.04 | 0.00 | 0.12 | 1.01 | 1,100.00 |
| Quillback Carpsucker | C | O | M | | 17 | 0.67 | 0.06 | 0.76 | 6.52 | 1,010.00 |
| Black Redhorse | R | I | S | I | 2 | 0.08 | 0.01 | 0.05 | 0.39 | 210.00 |
| Golden Redhorse | R | I | S | M | 86 | 4.16 | 0.38 | 0.51 | 4.36 | 132.68 |
| Northern Hog Sucker | R | I | S | M | 214 | 9.05 | 0.82 | 0.56 | 4.78 | 26.02 |
| White Sucker | W | O | S | T | 461 | 23.44 | 2.14 | 0.19 | 1.61 | 16.23 |
| Smallmouth Redhorse | R | I | S | M | 1 | 0.04 | 0.00 | 0.03 | 0.28 | 300.00 |
| Common Carp | G | O | M | T | 1 | 0.05 | 0.00 | | | |
| Western Blacknose Dace | N | G | S | T | 1,276 | 66.59 | 6.07 | 0.01 | 0.06 | 1.29 |
| Creek Chub | N | G | N | T | 4,881 | 248.29 | 22.63 | 0.26 | 2.22 | 3.22 |
| South. Redbelly Dace | N | H | S | | 852 | 44.81 | 4.08 | 0.00 | 0.00 | 1.50 |
| Emerald Shiner | N | I | S | | 111 | 5.32 | 0.48 | 0.05 | 0.41 | 3.15 |
| Rosyface Shiner | N | I | S | I | 4 | 0.16 | 0.01 | 0.00 | 0.01 | 2.25 |
| Redfin Shiner | N | I | N | | 172 | 8.89 | 0.81 | 0.01 | 0.07 | 1.91 |
| Scarlet Shiner | N | I | S | M | 2 | 0.10 | 0.01 | | | |
| Striped Shiner | N | I | S | | 1,882 | 94.37 | 8.60 | 0.17 | 1.47 | 3.19 |
| Spotfin Shiner | N | I | M | | 5 | 0.26 | 0.02 | 0.00 | 0.02 | 3.60 |
| Sand Shiner | N | I | M | M | 441 | 23.05 | 2.10 | 0.12 | 1.05 | 1.94 |
| Silverjaw Minnow | N | I | M | | 1,259 | 63.24 | 5.76 | 0.05 | 0.39 | 1.47 |
| Bluntnose Minnow | N | O | C | T | 6,338 | 327.60 | 29.85 | 0.10 | 0.84 | 1.83 |
| Central Stoneroller | N | H | N | | 1,030 | 45.86 | 4.18 | 0.18 | 1.55 | 2.68 |
| Striped Sh X Creek Chub | | I | | | 0 | 0.00 | 0.00 | | | |
| Cr Chub X S. Redbelly D | | | | | 2 | 0.11 | 0.01 | | | |
| Channel Catfish | F | | C | | 3 | 0.12 | 0.01 | 0.29 | 2.48 | 896.67 |
| Yellow Bullhead | | I | C | T | 50 | 2.55 | 0.23 | 0.08 | 0.66 | 118.50 |
| Black Bullhead | | I | C | P | 1 | 0.05 | 0.00 | | | |
| Trout-perch | | I | M | | 14 | 0.68 | 0.06 | 0.00 | 0.02 | 6.33 |
| Spotted Bass | F | C | C | | 57 | 2.75 | 0.25 | 0.24 | 2.10 | 84.88 |
| Largemouth Bass | F | C | C | | 17 | 0.88 | 0.08 | 0.00 | 0.00 | 4.00 |
| Green Sunfish | S | I | C | T | 224 | 11.38 | 1.04 | 0.03 | 0.23 | 16.47 |
| Bluegill Sunfish | S | I | C | P | 126 | 6.34 | 0.58 | 0.03 | 0.22 | 17.07 |
| Longear Sunfish | S | I | C | M | 182 | 8.84 | 0.81 | 0.27 | 2.30 | 38.65 |
| Redear Sunfish | E | I | C | | 1 | 0.04 | 0.00 | | | |
| Green Sf X Bluegill Sf | | | | | 4 | 0.21 | 0.02 | | | |
| Longear Sf X Bluegill Sf | | | | | 1 | 0.05 | 0.00 | | | |
| Green Sf X Longear Sf | | | | | 1 | 0.05 | 0.00 | 0.00 | 0.01 | 7.00 |
| | | | | | 3 | 0.16 | 0.01 | 0.01 | 0.12 | 33.33 |
| Sauger | F | P | S | | 4 | 0.17 | 0.02 | 0.17 | 1.43 | 368.75 |
| Blackside Darter | D | I | S | | 54 | 2.45 | 0.22 | 0.01 | 0.06 | 1.67 |
| Logperch | D | I | S | M | 26 | 1.11 | 0.10 | 0.01 | 0.08 | 4.78 |
| Johnny Darter | D | I | C | | 983 | 48.90 | 4.46 | 0.02 | 0.18 | 0.74 |
| Greenside Darter | D | I | S | M | 160 | 7.82 | 0.71 | 0.06 | 0.49 | 7.74 |
| Rainbow Darter | D | I | S | M | 25 | 1.05 | 0.10 | 0.00 | 0.03 | 1.28 |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| Orangethroat Darter | D | I | S | | 1 | 0.04 | 0.00 | 0.00 | 0.00 | 2.00 |
| Fantail Darter | D | I | C | | 657 | 29.88 | 2.72 | 0.04 | 0.36 | 1.07 |
| Freshwater Drum | | | M | P | 47 | 1.91 | 0.17 | 7.15 | 61.46 | 1,411.85 |
| No Fish | | | | | 0 | 0.00 | 0.00 | | | |
| | *Grand Total* | | | | 21,749 | 1,097.39 | | 11.63 | | |
| | *Number of Species* | | | | 45 | | | | | |
| | *Number of Hybrids* | | | | 5 | | | | | |

Appendix Table 2a. IBI & metric scores for sites sampled in the Leading Creek watershed during 2004 & 2005 by MBI.

| | | | | Number of | | | | | | Percent of Individuals | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| River Mile | Type | Date | Drainage area (sq mi) | Total species | Minnow species | Headwater species | Sensitive species | Darter & Sculpin species | Simple Lithophils | Tolerant fishes | Omni-vores | Pioneering fishes | Insect-ivores | DELT anomalies | Rel.No. minus tolerants /(0.3km) | IBI |
| *Leading Creek - (09-200)* | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | |
| 29.90 | E | 09/22/2004 | 4.3 | 16(5) | 8(5) | 3(3) | 3(3) | 3(5) | 7(5) | 56(3) | 14(3) | 51(3) | 31(3) | 0.0(5) | 219(3) | 46 |
| 26.30 | E | 09/23/2004 | 12.8 | 20(5) | 7(5) | 2(3) | 4(3) | 4(3) | 6(3) | 50(3) | 42(1) | 51(3) | 46(5) | 0.0(5) | 512(3) | 42 |
| 26.00 | E | 09/30/2004 | 16.8 | 17(5) | 6(3) | 1(1) | 4(3) | 4(3) | 5(3) | 27(5) | 22(3) | 41(3) | 70(5) | 0.0(5) | 457(3) | 42 |
| 24.20 | E | 09/22/2004 | 19.0 | 21(5) | 7(5) | 2(3) | 5(3) | 4(3) | 7(3) | 44(3) | 24(3) | 51(3) | 55(5) | 0.0(5) | 554(3) | 44 |
| *Little Leading Creek - (09-201)* | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | |
| 9.90 | E | 07/21/2004 | 4.0 | 14(5) | 7(5) | 3(3) | 0(1) | 2(3) | 4(3) | 66(1) | 3(5) | 61(1) | 25(3) | 0.1(3) | 920(5) | 38 |
| 6.60 | E | 07/20/2004 | 9.4 | 12(3) | 7(5) | 3(3) | 0(1) | 2(3) | 4(3) | 56(3) | 6(5) | 55(1) | 29(3) | 0.0(5) | 1196(5) | 40 |
| *Malloons Run - (09-202)* | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | |
| 0.10 | E | 07/14/2004 | 3.8 | 13(5) | 5(3) | 0(1) | 2(3) | 2(3) | 4(3) | 51(3) | 10(5) | 59(1) | 38(5) | 0.0(5) | 86(1) * | 38 |
| *Parker Run - (09-203)* | | | | | | | | | | | | | | | | |
| Year: 2005 | | | | | | | | | | | | | | | | |
| 1.60 | E | 06/20/2005 | 4.5 | 14(5) | 6(5) | 2(3) | 2(3) | 2(3) | 3(3) | 59(1) | 10(5) | 63(1) | 45(5) | 0.0(5) | 68(1) * | 40 |
| *Dexter Run - (09-205)* | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | |
| 0.80 | E | 07/13/2004 | 7.5 | 13(3) | 4(3) | 0(1) | 1(1) | 2(3) | 3(3) | 33(5) | 4(5) | 26(5) | 84(5) | 0.4(5) | 318(3) | 42 |
| *Mud Fork - (09-206)* | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | |
| 5.40 | E | 07/13/2004 | 3.0 | 12(5) | 6(5) | 3(3) | 0(1) | 3(5) | 5(5) | 58(1) | 2(5) | 59(1) | 28(3) | 0.0(5) | 594(5) | 44 |
| 2.20 | E | 07/13/2004 | 4.7 | 12(5) | 5(3) | 0(1) | 0(1) | 1(1) | 2(1) | 39(3) | 16(3) | 43(3) | 68(5) | 0.0(5) | 248(3) | 34 |
| 0.10 | E | 07/13/2004 | 9.4 | 16(5) | 7(5) | 2(3) | 2(1) | 3(3) | 5(3) | 86(1) | 84(1) | 92(1) | 14(1) | 0.0(5) | 1700(5) | 34 |
| *Ogden Run - (09-207)* | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | |
| 0.50 | E | 09/23/2004 | 4.0 | 18(5) | 6(5) | 1(1) | 3(3) | 3(5) | 4(3) | 45(3) | 24(1) | 46(3) | 56(5) | 0.0(5) | 606(5) | 44 |
| *Sisson Run - (09-208)* | | | | | | | | | | | | | | | | |

♦ - 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 2a. Continued.

| | | | | Number of | | | | | | Percent of Individuals | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| River Mile | Type | Date | Drainage area (sq mi) | Total species | Minnow species | Headwater species | Sensitive species | Darter & Sculpin species | Simple Lithophils | Tolerant fishes | Omni-vores | Pioneering fishes | Insect-ivores | DELT anomalies | Rel.No. minus tolerants /(0.3km) | IBI |
| Year: 2004 | | | | | | | | | | | | | | | | |
| 0.10 | E | 09/22/2004 | 4.0 | 16(5) | 5(3) | 2(3) | 4(5) | 3(5) | 5(5) | 53(3) | 16(3) | 69(1) | 47(5) | 0.0(5) | 590(5) | 48 |
| *Fivemile Run - (09-209)* | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | |
| 0.90 | E | 09/22/2004 | 4.0 | 12(5) | 4(3) | 0(1) | 2(3) | 2(3) | 3(3) | 84(1) | 44(1) | 66(1) | 18(3) | 0.0(5) | 72(1) | 30 |
| *Hysell Run - (09-211)* | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | |
| 0.90 | E | 07/20/2004 | 4.6 | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0.0(1) | 0(1) * * | 12 |
| *Bailey Run - (09-212)* | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | |
| 0.50 | E | 07/20/2004 | 1.8 | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0.0(1) | 0(1) * * | 12 |
| *Thomas Fork - (09-213)* | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | |
| 9.80 | E | 07/19/2004 | 2.0 | 8(3) | 5(5) | 2(3) | 0(1) | 1(3) | 3(3) | 64(1) | 0(5) | 53(3) | 9(1) | 0.0(5) | 454(5) | 38 |
| 7.10 | E | 07/19/2004 | 4.5 | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0.0(1) | 0(1) * * | 12 |
| 5.00 | E | 07/19/2004 | 1.9 | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0.0(1) | 0(1) * * | 12 |
| *Long Hollow - (09-214)* | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | |
| 0.10 | E | 07/15/2004 | 1.7 | 9(5) | 5(5) | 3(3) | 0(1) | 2(5) | 3(5) | 77(1) | 4(5) | 81(1) | 12(1) | 0.0(5) | 158(3) | 40 |
| *East Branch Thomas F - (09-216)* | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | |
| 4.10 | E | 07/15/2004 | 2.0 | 11(5) | 5(5) | 3(3) | 0(1) | 2(3) | 2(3) | 69(1) | 15(3) | 72(1) | 32(5) | 0.0(5) | 270(5) | 40 |
| 2.10 | E | 07/15/2004 | 4.5 | 12(5) | 6(5) | 4(5) | 0(1) | 2(3) | 3(3) | 75(1) | 6(5) | 79(1) | 23(3) | 0.0(5) | 154(3) | 40 |
| 0.60 | E | 07/19/2004 | 9.4 | 8(3) | 2(1) | 1(1) | 0(1) | 1(1) | 0(1) | 78(1) | 3(5) | 81(1) | 57(5) | 0.0(5) | 32(1) * | 26 |
| *Schoolhouse Run (2Y) - (09-217)* | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | |
| 0.60 | E | 09/22/2004 | 2.8 | 19(5) | 7(5) | 3(3) | 4(5) | 3(5) | 6(5) | 53(3) | 20(3) | 52(3) | 43(5) | 0.0(5) | 473(5) | 52 |
| *Ball Run (2X) - (09-221)* | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | |

♦ - 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 2a. Continued.

| | | | | Number of | | | | | | Percent of Individuals | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| River Mile | Type | Date | Drainage area (sq mi) | Total species | Minnow species | Headwater species | Sensitive species | Darter & Sculpin species | Simple Lithophils | Tolerant fishes | Omni-vores | Pioneering fishes | Insect-ivores | DELT anomalies | Rel.No. minus tolerants /(0.3km) | IBI |
| 0.40 | E | 07/19/2004 | 3.0 | 8(3) | 5(5) | 2(3) | 0(1) | 1(1) | 3(3) | 71(1) | 10(5) | 54(3) | 2(1) | 0.0(5) | 356(5) | 36 |
| *Lasher Run - (09-223)* | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | |
| 0.70 | E | 07/14/2004 | 3.0 | 11(5) | 6(5) | 2(3) | 0(1) | 1(1) | 4(5) | 65(1) | 0(5) | 49(3) | 6(1) | 0.0(5) | 476(5) | 40 |
| *Thomas Fk of L Leading - (09-224)* | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | |
| 0.30 | E | 07/21/2004 | 3.0 | 12(5) | 7(5) | 3(3) | 0(1) | 2(3) | 4(5) | 61(1) | 9(5) | 60(1) | 23(3) | 0.1(5) | 606(5) | 42 |
| *Trib. to Little Leading Creek - (09-225)* | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | |
| 0.20 | E | 07/14/2004 | 3.0 | 8(3) | 6(5) | 3(3) | 0(1) | 2(3) | 3(3) | 75(1) | 0(5) | 67(1) | 14(1) | 0.0(5) | 116(3) | 34 |

♦ - 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 2b IBI & metric scores for sites sampled in the Leading Creek watershed during 2004 & 2005 by MBI.

| | | | | Number of | | | | | Percent of Individuals | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| River Mile | Type | Date | Drainage area (sq mi) | Total species | Sunfish species | Sucker species | Intolerant species | Darter species | Simple Lithophils | Tolerant fishes | Omni-vores | Top carnivores | Insect-ivores | DELT anomalies | Rel.No. minus tolerants /(0.3km) | IBI | Modified Iwb |
| Leading Creek - (09200) | | | | | | | | | | | | | | | | | |
| Year: 2005 | | | | | | | | | | | | | | | | | |
| 14.80 | E | 06/21/2005 | 71 | 21(3) | 2(3) | 3(3) | 2(1) | 5(5) | 31(3) | 19(5) | 12(5) | 1.8(3) | 53(3) | 1.6(1) | 464(3) | 38 | 8.0 |
| 12.30 | E | 06/21/2005 | 77 | 19(3) | 2(3) | 3(3) | 0(1) | 5(5) | 23(3) | 18(5) | 8(5) | 0.7(1) | 60(5) | 1.1(3) | 932(5) | 42 | 9.0 |
| 10.30 | E | 06/21/2005 | 80 | 24(5) | 2(3) | 4(5) | 2(1) | 5(5) | 30(3) | 39(3) | 19(5) | 0.4(1) | 48(3) | 0.6(3) | 498(3) | 40 | 8.7 |
| 6.00 | E | 06/21/2005 | 115 | 21(3) | 3(3) | 4(3) | 0(1) | 3(3) | 17(1) | 44(1) | 39(1) | 2.5(3) | 53(3) | 0.0(5) | 233(3) | 30 | 7.7 |
| Year: 2004 | | | | | | | | | | | | | | | | | |
| 16.80 | E | 07/21/2004 | 62 | 22(5) | 2(3) | 3(3) | 0(1) | 5(5) | 44(5) | 32(3) | 17(5) | 2.0(3) | 65(5) | 0.3(5) | 303(3) | 46 | 8.1 |
| 15.50 | E | 10/12/2004 | 70 | 25(5) | 1(1) | 3(3) | 0(1) | 5(5) | 21(3) | 8(5) | 7(5) | 1.1(3) | 89(5) | 0.3(3) | 1332(5) | 44 | 8.6 |
| Little Leading Creek - (09201) | | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | | |
| 0.40 | E | 07/21/2004 | 23 | 14(3) | 0(1) | 2(3) | 0(1) | 3(3) | 14(1) | 46(3) | 7(5) | 0.1(1) | 24(1) | 0.0(5) | 870(5) | 32 | 7.0 |
| Thomas Fork - (09213) | | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | | |
| 4.40 | E | 07/20/2004 | 22 | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0(1) | 0.0(1) | 0(1) | 0.0(1) | 0(1) * * | 12 | 0.0 |
| 2.80 | E | 07/20/2004 | 30 | 3(1) | 1(1) | 1(1) | 0(1) | 0(1) | 4(1) | 100(1) | 4(5) | 0.0(1) | 13(1) | 0.0(5) | 0(1) * | 20 | 1.4 |

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. Macroinvertebrate taxa collected during quantitative (numeric) or qualitative (+) surveys in the Leading Creek watershed by MBI in 2004.

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 09/16/2004 River Code: 09-200 River: Leading Creek RM: 6.00

| Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|
| 01900 | Nemertea | F | + |
| 03600 | Oligochaeta | T | 38 |
| 06700 | Crangonyx sp | M | 2 |
| 13400 | Stenacron sp | F | 2 |
| 13521 | Stenonema femoratum | F | 8 |
| 15000 | Paraleptophlebia sp | MI | 6 |
| 16700 | Tricorythodes sp | MI | 2 |
| 17200 | Caenis sp | F | + |
| 21200 | Calopteryx sp | F | 3 + |
| 22001 | Coenagrionidae | M | 2 + |
| 22300 | Argia sp | F | 14 + |
| 23804 | Basiaeschna janata | F | + |
| 23909 | Boyeria vinosa | F | 1 + |
| 34130 | Acroneuria frisoni | MI | 1 |
| 47600 | Sialis sp | F | 2 + |
| 50300 | Chimarra sp | MI | 1 |
| 51600 | Polycentropus sp | MI | 16 |
| 52200 | Cheumatopsyche sp | F | 29 |
| 55300 | Ptilostomis sp | F | + |
| 59500 | Oecetis sp | MI | 4 |
| 68130 | Helichus sp | MI | + |
| 68601 | Ancyronyx variegata | MI | + |
| 68700 | Dubiraphia sp | F | 17 |
| 68901 | Macronychus glabratus | MI | 15 + |
| 71100 | Hexatoma sp | MI | + |
| 72700 | Anopheles sp | F | + |
| 77800 | Helopelopia sp | F | 43 |
| 78140 | Labrundinia pilosella | MI | 1 |
| 80370 | Corynoneura lobata | MI | 12 |
| 81650 | Parametriocnemus sp | MI | 9 |
| 81825 | Rheocricotopus (Psilocricotopus) robacki | MI | 60 |
| 83040 | Dicrotendipes neomodestus | F | 51 |
| 83840 | Microtendipes pedellus group | MI | 68 |
| 84210 | Paratendipes albimanus or P. duplicatus | MI | 17 |
| 84300 | Phaenopsectra obediens group | F | 9 |
| 84460 | Polypedilum (P.) fallax group | F | 154 |
| 84540 | Polypedilum (Tripodura) scalaenum group | F | 26 |
| 85500 | Paratanytarsus sp | F | 26 |
| 85800 | Tanytarsus sp | MI | 162 |
| 85802 | Tanytarsus curticornis group | MI | 17 |
| 85840 | Tanytarsus sepp | MI | 68 |
| 87540 | Hemerodromia sp | F | 62 |
| 95100 | Physella sp | T | 2 |
| 96900 | Ferrissia sp | F | 1 |
| 97601 | Corbicula fluminea | MI | + |

| | | | |
|---|---|---|---|
| No. Quantitative Taxa: | 36 | Total Taxa: | 45 |
| No. Qualitative Taxa: | 15 | ICI: | 24 |
| Number of Organisms: | 951 | Qual EPT: | 2 |

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 10/07/2004 River Code: 09-200 River: Leading Creek RM: 10.30

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 05800 | Caecidotea sp | M | + | | | | |
| 08260 | Orconectes (Crokerinus) sanbornii sanbornii | F | + | | | | |
| 13400 | Stenacron sp | F | + | | | | |
| 17600 | Baetisca sp | I | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 22001 | Coenagrionidae | M | + | | | | |
| 22300 | Argia sp | F | + | | | | |
| 23909 | Boyeria vinosa | F | + | | | | |
| 30000 | Plecoptera | | + | | | | |
| 47600 | Sialis sp | F | + | | | | |
| 50315 | Chimarra obscura | MI | + | | | | |
| 52200 | Cheumatopsyche sp | F | + | | | | |
| 63300 | Hydroporus sp | F | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 68708 | Dubiraphia vittata group | F | + | | | | |
| 68901 | Macronychus glabratus | MI | + | | | | |
| 69400 | Stenelmis sp | F | + | | | | |
| 71100 | Hexatoma sp | MI | + | | | | |
| 74100 | Simulium sp | F | + | | | | |
| 77800 | Helopelopia sp | F | + | | | | |
| 84300 | Phaenopsectra obediens group | F | + | | | | |
| 85800 | Tanytarsus sp | MI | + | | | | |
| 97601 | Corbicula fluminea | MI | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 23

No. Qualitative Taxa: 23 ICI: G

Number of Organisms: 0 Qual EPT: 5

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 10/07/2004 River Code: 09-200 River: Leading Creek RM: 12.30

| Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|
| 01900 | Nemertea | F | 8 |
| 03600 | Oligochaeta | T | 32 |
| 05800 | Caecidotea sp | M | + |
| 11130 | Baetis intercalaris | F | + |
| 13521 | Stenonema femoratum | F | 16 + |
| 15000 | Paraleptophlebia sp | MI | 12 + |
| 17200 | Caenis sp | F | 28 + |
| 21200 | Calopteryx sp | F | + |
| 22001 | Coenagrionidae | M | + |
| 22300 | Argia sp | F | 1 + |
| 23909 | Boyeria vinosa | F | + |
| 33100 | Leuctra sp | I | + |
| 34001 | Perlidae | | 5 |
| 47600 | Sialis sp | F | 1 |
| 48410 | Corydalus cornutus | MI | 1 + |
| 50315 | Chimarra obscura | MI | 36 + |
| 52200 | Cheumatopsyche sp | F | 70 + |
| 52315 | Diplectrona modesta | F | + |
| 59720 | Triaenodes ignitus | I | + |
| 63300 | Hydroporus sp | F | + |
| 65800 | Berosus sp | M | + |
| 68708 | Dubiraphia vittata group | F | 24 + |
| 69400 | Stenelmis sp | F | 1 + |
| 71100 | Hexatoma sp | MI | 3 + |
| 72700 | Anopheles sp | F | + |
| 74100 | Simulium sp | F | + |
| 74501 | Ceratopogonidae | F | 8 |
| 77800 | Helopelopia sp | F | 62 |
| 78450 | Nilotanypus fimbriatus | MI | 1 |
| 80370 | Corynoneura lobata | MI | 13 |
| 80410 | Cricotopus (C.) sp | F | 94 |
| 80420 | Cricotopus (C.) bicinctus | M | 62 |
| 81630 | Parakiefferiella sp | F | 15 |
| 81650 | Parametriocnemus sp | MI | 15 |
| 81825 | Rheocricotopus (Psilocricotopus) robacki | MI | 356 + |
| 82121 | Thienemanniella lobapodema | MI | 1 |
| 82141 | Thienemanniella xena | F | 3 |
| 83040 | Dicrotendipes neomodestus | F | 62 |
| 83840 | Microtendipes pedellus group | MI | 62 |
| 84300 | Phaenopsectra obediens group | F | 15 |
| 84460 | Polypedilum (P.) fallax group | F | 15 |
| 84470 | Polypedilum (P.) illinoense | T | + |
| 85625 | Rheotanytarsus sp | MI | 31 |
| 85800 | Tanytarsus sp | MI | 94 |
| 85821 | Tanytarsus glabrescens group sp 7 | MI | 46 |
| 85840 | Tanytarsus sepp | MI | 15 |
| 87540 | Hemerodromia sp | F | 8 |
| 95100 | Physella sp | T | 8 |
| 96900 | Ferrissia sp | F | 55 + |
| 97601 | Corbicula fluminea | MI | 1 |

| | | | |
|---|---|---|---|
| No. Quantitative Taxa: | 37 | Total Taxa: | 50 |
| No. Qualitative Taxa: | 25 | ICI: | 30 |
| Number of Organisms: | 1280 | Qual EPT: | 9 |

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 10/15/2004 River Code: 09-200 River: Leading Creek RM: 14.80

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 08260 | Orconectes (Crokerinus) sanbornii sanbornii | F | + | | | | |
| 11119 | Plauditus dubius or P. virilis | I | + | | | | |
| 11130 | Baetis intercalaris | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 22001 | Coenagrionidae | M | + | | | | |
| 22300 | Argia sp | F | + | | | | |
| 24900 | Gomphus sp | F | + | | | | |
| 25410 | Progomphus obscurus | F | + | | | | |
| 30000 | Plecoptera | | + | | | | |
| 48620 | Nigronia serricornis | F | + | | | | |
| 50315 | Chimarra obscura | MI | + | | | | |
| 51600 | Polycentropus sp | MI | + | | | | |
| 52200 | Cheumatopsyche sp | F | + | | | | |
| 59720 | Triaenodes ignitus | I | + | | | | |
| 60300 | Dineutus sp | F | + | | | | |
| 65800 | Berosus sp | M | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 68601 | Ancyronyx variegata | MI | + | | | | |
| 68708 | Dubiraphia vittata group | F | + | | | | |
| 68901 | Macronychus glabratus | MI | + | | | | |
| 71100 | Hexatoma sp | MI | + | | | | |
| 80420 | Cricotopus (C.) bicinctus | M | + | | | | |
| 81460 | Orthocladius (O.) sp | F | + | | | | |
| 83840 | Microtendipes pedellus group | MI | + | | | | |
| 95100 | Physella sp | T | + | | | | |
| 97601 | Corbicula fluminea | MI | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 26

No. Qualitative Taxa: 26 ICI: G

Number of Organisms: 0 Qual EPT: 7

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 10/15/2004 River Code: 09-200 River: Leading Creek RM: 15.50

| Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|
| 01900 | Nemertea | F | 4 |
| 03600 | Oligochaeta | T | 20 |
| 05800 | Caecidotea sp | M | + |
| 08260 | Orconectes (Crokerinus) sanbornii sanbornii | F | + |
| 11119 | Plauditus dubius or P. virilis | I | + |
| 11130 | Baetis intercalaris | F | + |
| 11150 | Pseudocloeon propinquum | I | + |
| 11250 | Centroptilum sp (w/o hindwing pads) | MI | 8 |
| 11651 | Procloeon sp (w/o hindwing pads) | MI | + |
| 12200 | Isonychia sp | MI | + |
| 13400 | Stenacron sp | F | 8 + |
| 13590 | Stenonema vicarium | MI | + |
| 15000 | Paraleptophlebia sp | MI | + |
| 17200 | Caenis sp | F | + |
| 21200 | Calopteryx sp | F | + |
| 22001 | Coenagrionidae | M | + |
| 22300 | Argia sp | F | + |
| 23909 | Boyeria vinosa | F | + |
| 24900 | Gomphus sp | F | + |
| 25410 | Progomphus obscurus | F | + |
| 30000 | Plecoptera | | + |
| 33100 | Leuctra sp | I | 4 + |
| 35001 | Perlodidae | MI | 40 + |
| 48620 | Nigronia serricornis | F | 2 + |
| 50315 | Chimarra obscura | MI | + |
| 51600 | Polycentropus sp | MI | + |
| 52200 | Cheumatopsyche sp | F | 16 + |
| 52530 | Hydropsyche depravata group | F | + |
| 59720 | Triaenodes ignitus | I | + |
| 60300 | Dineutus sp | F | + |
| 65800 | Berosus sp | M | + |
| 68130 | Helichus sp | MI | + |
| 68601 | Ancyronyx variegata | MI | + |
| 68708 | Dubiraphia vittata group | F | 20 + |
| 68901 | Macronychus glabratus | MI | 4 + |
| 69400 | Stenelmis sp | F | 48 |
| 71100 | Hexatoma sp | MI | 3 + |
| 71900 | Tipula sp | F | + |
| 74100 | Simulium sp | F | 4 + |
| 74501 | Ceratopogonidae | F | 4 |
| 77120 | Ablabesmyia mallochi | F | + |
| 77800 | Helopelopia sp | F | 42 |
| 78140 | Labrundinia pilosella | MI | 1 |
| 80410 | Cricotopus (C.) sp | F | 371 |
| 80420 | Cricotopus (C.) bicinctus | M | 32 + |
| 80870 | Hydrobaenus sp | T | + |
| 81400 | Orthocladius sp | | 11 + |
| 81460 | Orthocladius (O.) sp | F | + |
| 81650 | Parametriocnemus sp | MI | 11 |
| 81825 | Rheocricotopus (Psilocricotopus) robacki | MI | 74 + |
| 82141 | Thienemanniella xena | F | 9 + |
| 82710 | Chironomus (C.) sp | T | 11 + |
| 83040 | Dicrotendipes neomodestus | F | 21 + |
| 83840 | Microtendipes pedellus group | MI | 95 + |
| 84300 | Phaenopsectra obediens group | F | 11 |
| 84460 | Polypedilum (P.) fallax group | F | 11 |
| 84470 | Polypedilum (P.) illinoense | T | + |
| 84700 | Stenochironomus sp | F | + |
| 84750 | Stictochironomus sp | F | 11 |
| 85800 | Tanytarsus sp | MI | 21 |
| 85821 | Tanytarsus glabrescens group sp 7 | MI | 11 |
| 86100 | Chrysops sp | F | + |
| 87540 | Hemerodromia sp | F | 8 |
| 95100 | Physella sp | T | + |
| 96900 | Ferrissia sp | F | 33 |
| 97601 | Corbicula fluminea | MI | 3 + |
| 98600 | Sphaerium sp | F | 4 |

| | | | |
|---|---|---|---|
| No. Quantitative Taxa: | 34 | Total Taxa: | 67 |
| No. Qualitative Taxa: | 50 | ICI: | 28 |
| Number of Organisms: | 976 | Qual EPT: | 19 |

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 10/21/1904 River Code: 09-200 River: Leading Creek RM: 24.20

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 05800 | Caecidotea sp | M | + | | | | |
| 08200 | Orconectes sp | F | + | | | | |
| 13400 | Stenacron sp | F | + | | | | |
| 13590 | Stenonema vicarium | MI | + | | | | |
| 15000 | Paraleptophlebia sp | MI | + | | | | |
| 17200 | Caenis sp | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 22001 | Coenagrionidae | M | + | | | | |
| 22300 | Argia sp | F | + | | | | |
| 23804 | Basiaeschna janata | F | + | | | | |
| 24900 | Gomphus sp | F | + | | | | |
| 35001 | Perlodidae | MI | + | | | | |
| 47600 | Sialis sp | F | + | | | | |
| 48620 | Nigronia serricornis | F | + | | | | |
| 50315 | Chimarra obscura | MI | + | | | | |
| 52200 | Cheumatopsyche sp | F | + | | | | |
| 57900 | Pycnopsyche sp | MI | + | | | | |
| 59730 | Triaenodes melaca | MI | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 68708 | Dubiraphia vittata group | F | + | | | | |
| 68901 | Macronychus glabratus | MI | + | | | | |
| 69400 | Stenelmis sp | F | + | | | | |
| 71100 | Hexatoma sp | MI | + | | | | |
| 71900 | Tipula sp | F | + | | | | |
| 72700 | Anopheles sp | F | + | | | | |
| 77800 | Helopelopia sp | F | + | | | | |
| 83840 | Microtendipes pedellus group | MI | + | | | | |
| 95100 | Physella sp | T | + | | | | |
| 96900 | Ferrissia sp | F | + | | | | |
| 98600 | Sphaerium sp | F | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 30

No. Qualitative Taxa: 30 ICI: G

Number of Organisms: 0 Qual EPT: 9

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 10/21/1904 River Code: 09-200 River: Leading Creek RM: 26.00

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 06201 | Hyalella azteca | F | + | | | | |
| 12200 | Isonychia sp | MI | + | | | | |
| 13400 | Stenacron sp | F | + | | | | |
| 14900 | Leptophlebia sp | I | + | | | | |
| 17200 | Caenis sp | F | + | | | | |
| 17600 | Baetisca sp | I | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 22001 | Coenagrionidae | M | + | | | | |
| 23909 | Boyeria vinosa | F | + | | | | |
| 35001 | Perlodidae | MI | + | | | | |
| 45400 | Trichocorixa sp | F | + | | | | |
| 47600 | Sialis sp | F | + | | | | |
| 50315 | Chimarra obscura | MI | + | | | | |
| 51600 | Polycentropus sp | MI | + | | | | |
| 52200 | Cheumatopsyche sp | F | + | | | | |
| 55300 | Ptilostomis sp | F | + | | | | |
| 57900 | Pycnopsyche sp | MI | + | | | | |
| 60400 | Gyrinus sp | F | + | | | | |
| 63300 | Hydroporus sp | F | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 69400 | Stenelmis sp | F | + | | | | |
| 71900 | Tipula sp | F | + | | | | |
| 72700 | Anopheles sp | F | + | | | | |
| 74100 | Simulium sp | F | + | | | | |
| 82141 | Thienemanniella xena | F | + | | | | |
| 83040 | Dicrotendipes neomodestus | F | + | | | | |
| 85625 | Rheotanytarsus sp | MI | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 27

No. Qualitative Taxa: 27 ICI: G

Number of Organisms: 0 Qual EPT: 11

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 09/22/2004 River Code: 09-200 River: Leading Creek RM: 26.30

| Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|
| 06201 | Hyalella azteca | F | + |
| 08260 | Orconectes (Crokerinus) sanbornii sanbornii | F | + |
| 11130 | Baetis intercalaris | F | + |
| 12200 | Isonychia sp | MI | + |
| 13400 | Stenacron sp | F | + |
| 13521 | Stenonema femoratum | F | + |
| 15000 | Paraleptophlebia sp | MI | + |
| 17200 | Caenis sp | F | + |
| 17600 | Baetisca sp | I | + |
| 21200 | Calopteryx sp | F | + |
| 22300 | Argia sp | F | + |
| 23804 | Basiaeschna janata | F | + |
| 23909 | Boyeria vinosa | F | + |
| 25510 | Stylogomphus albistylus | MI | + |
| 47600 | Sialis sp | F | + |
| 48620 | Nigronia serricornis | F | + |
| 50315 | Chimarra obscura | MI | + |
| 51600 | Polycentropus sp | MI | + |
| 52200 | Cheumatopsyche sp | F | + |
| 55300 | Ptilostomis sp | F | + |
| 59580 | Oecetis persimilis | MI | + |
| 59720 | Triaenodes ignitus | I | + |
| 59730 | Triaenodes melaca | MI | + |
| 63300 | Hydroporus sp | F | + |
| 67500 | Laccobius sp | F | + |
| 68130 | Helichus sp | MI | + |
| 68601 | Ancyronyx variegata | MI | + |
| 68708 | Dubiraphia vittata group | F | + |
| 68901 | Macronychus glabratus | MI | + |
| 69400 | Stenelmis sp | F | + |
| 71100 | Hexatoma sp | MI | + |
| 74100 | Simulium sp | F | + |
| 95100 | Physella sp | T | + |
| 96002 | Helisoma anceps anceps | M | + |
| 97601 | Corbicula fluminea | MI | + |
| 98600 | Sphaerium sp | F | + |

| Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|

| | | | |
|---|---|---|---|
| No. Quantitative Taxa: | 0 | Total Taxa: | 36 |
| No. Qualitative Taxa: | 36 | ICI: | VG |
| Number of Organisms: | 0 | Qual EPT: | 14 |

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 09/23/2004 River Code: 09-200 River: Leading Creek RM: 29.90

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 08260 | Orconectes (Crokerinus) sanbornii sanbornii | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 22001 | Coenagrionidae | M | + | | | | |
| 22300 | Argia sp | F | + | | | | |
| 26100 | Cordulegaster sp | F | + | | | | |
| 34130 | Acroneuria frisoni | MI | + | | | | |
| 48620 | Nigronia serricornis | F | + | | | | |
| 50315 | Chimarra obscura | MI | + | | | | |
| 52530 | Hydropsyche depravata group | F | + | | | | |
| 55300 | Ptilostomis sp | F | + | | | | |
| 60900 | Peltodytes sp | M | + | | | | |
| 63300 | Hydroporus sp | F | + | | | | |
| 67100 | Hydrobius sp | F | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 69400 | Stenelmis sp | F | + | | | | |
| 95100 | Physella sp | T | + | | | | |
| 96002 | Helisoma anceps anceps | M | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 17

No. Qualitative Taxa: 17 ICI: MG

Number of Organisms: 0 Qual EPT: 4

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 07/20/2004 River Code: 09-201 River: Little Leading Creek RM: 0.10

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 08200 | Orconectes sp | F | + | | | | |
| 13590 | Stenonema vicarium | MI | + | | | | |
| 17200 | Caenis sp | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 22300 | Argia sp | F | + | | | | |
| 23804 | Basiaeschna janata | F | + | | | | |
| 23909 | Boyeria vinosa | F | + | | | | |
| 24900 | Gomphus sp | F | + | | | | |
| 27404 | Neurocordulia molesta | MI | + | | | | |
| 47600 | Sialis sp | F | + | | | | |
| 52200 | Cheumatopsyche sp | F | + | | | | |
| 59720 | Triaenodes ignitus | I | + | | | | |
| 60300 | Dineutus sp | F | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 68601 | Ancyronyx variegata | MI | + | | | | |
| 68708 | Dubiraphia vittata group | F | + | | | | |
| 68901 | Macronychus glabratus | MI | + | | | | |
| 72700 | Anopheles sp | F | + | | | | |
| 77800 | Helopelopia sp | F | + | | | | |
| 82710 | Chironomus (C.) sp | T | + | | | | |
| 84460 | Polypedilum (P.) fallax group | F | + | | | | |
| 87540 | Hemerodromia sp | F | + | | | | |
| 97601 | Corbicula fluminea | MI | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 23

No. Qualitative Taxa: 23 ICI: MG

Number of Organisms: 0 Qual EPT: 4

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 07/19/2004 River Code: 09-201 River: Little Leading Creek RM: 6.60

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 08200 | Orconectes sp | F | + | | | | |
| 11250 | Centroptilum sp (w/o hindwing pads) | MI | + | | | | |
| 13521 | Stenonema femoratum | F | + | | | | |
| 17200 | Caenis sp | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 22300 | Argia sp | F | + | | | | |
| 23804 | Basiaeschna janata | F | + | | | | |
| 23909 | Boyeria vinosa | F | + | | | | |
| 24900 | Gomphus sp | F | + | | | | |
| 28500 | Libellula sp | T | + | | | | |
| 47600 | Sialis sp | F | + | | | | |
| 52530 | Hydropsyche depravata group | F | + | | | | |
| 59720 | Triaenodes ignitus | I | + | | | | |
| 59730 | Triaenodes melaca | MI | + | | | | |
| 67700 | Paracymus sp | F | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 68601 | Ancyronyx variegata | MI | + | | | | |
| 68708 | Dubiraphia vittata group | F | + | | | | |
| 68901 | Macronychus glabratus | MI | + | | | | |
| 71900 | Tipula sp | F | + | | | | |
| 72700 | Anopheles sp | F | + | | | | |
| 77120 | Ablabesmyia mallochi | F | + | | | | |
| 84470 | Polypedilum (P.) illinoense | T | + | | | | |
| 84540 | Polypedilum (Tripodura) scalaenum group | F | + | | | | |
| 85500 | Paratanytarsus sp | F | + | | | | |
| 95100 | Physella sp | T | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 26

No. Qualitative Taxa: 26 ICI: MG

Number of Organisms: 0 Qual EPT: 6

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 07/26/2004 River Code: 09-201 River: Little Leading Creek RM: 9.90

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 07701 | Cambaridae | | + | | | | |
| 17200 | Caenis sp | F | + | | | | |
| 18700 | Hexagenia sp | MI | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 22001 | Coenagrionidae | M | + | | | | |
| 22300 | Argia sp | F | + | | | | |
| 23909 | Boyeria vinosa | F | + | | | | |
| 24900 | Gomphus sp | F | + | | | | |
| 26100 | Cordulegaster sp | F | + | | | | |
| 28500 | Libellula sp | T | + | | | | |
| 47600 | Sialis sp | F | + | | | | |
| 57900 | Pycnopsyche sp | MI | + | | | | |
| 59730 | Triaenodes melaca | MI | + | | | | |
| 60400 | Gyrinus sp | F | + | | | | |
| 62200 | Copelatus sp | M | + | | | | |
| 68708 | Dubiraphia vittata group | F | + | | | | |
| 72340 | Dixella sp | F | + | | | | |
| 72700 | Anopheles sp | F | + | | | | |
| 74501 | Ceratopogonidae | F | + | | | | |
| 83040 | Dicrotendipes neomodestus | F | + | | | | |
| 83840 | Microtendipes pedellus group | MI | + | | | | |
| 84800 | Tribelos jucundum | F | + | | | | |
| 85500 | Paratanytarsus sp | F | + | | | | |
| 85625 | Rheotanytarsus sp | MI | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 24

No. Qualitative Taxa: 24 ICI: MG

Number of Organisms: 0 Qual EPT: 4

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 07/19/2004 River Code: 09-202 River: Malloons Run RM: 0.10

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 08200 | Orconectes sp | F | + | | | | |
| 11651 | Procloeon sp (w/o hindwing pads) | MI | + | | | | |
| 13400 | Stenacron sp | F | + | | | | |
| 13521 | Stenonema femoratum | F | + | | | | |
| 17200 | Caenis sp | F | + | | | | |
| 22300 | Argia sp | F | + | | | | |
| 23804 | Basiaeschna janata | F | + | | | | |
| 23909 | Boyeria vinosa | F | + | | | | |
| 27404 | Neurocordulia molesta | MI | + | | | | |
| 47600 | Sialis sp | F | + | | | | |
| 51600 | Polycentropus sp | MI | + | | | | |
| 52200 | Cheumatopsyche sp | F | + | | | | |
| 63300 | Hydroporus sp | F | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 68708 | Dubiraphia vittata group | F | + | | | | |
| 72340 | Dixella sp | F | + | | | | |
| 95100 | Physella sp | T | + | | | | |
| 96900 | Ferrissia sp | F | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 18

No. Qualitative Taxa: 18 ICI: MG

Number of Organisms: 0 Qual EPT: 6

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 07/19/2004 River Code: 09-203 River: Parker Run RM: 1.60

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 08200 | Orconectes sp | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 22001 | Coenagrionidae | M | + | | | | |
| 22300 | Argia sp | F | + | | | | |
| 23804 | Basiaeschna janata | F | + | | | | |
| 24900 | Gomphus sp | F | + | | | | |
| 28500 | Libellula sp | T | + | | | | |
| 47600 | Sialis sp | F | + | | | | |
| 48620 | Nigronia serricornis | F | + | | | | |
| 63300 | Hydroporus sp | F | + | | | | |
| 65800 | Berosus sp | M | + | | | | |
| 67800 | Tropisternus sp | M | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 71100 | Hexatoma sp | MI | + | | | | |
| 87400 | Stratiomys sp | F | + | | | | |
| 95100 | Physella sp | T | + | | | | |
| 97601 | Corbicula fluminea | MI | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 17

No. Qualitative Taxa: 17 ICI: F

Number of Organisms: 0 Qual EPT: 0

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 07/24/2004 River Code: 09-205 River: Dexter Run RM: 0.80

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 05800 | Caecidotea sp | M | + | | | | |
| 11200 | Callibaetis sp | M | + | | | | |
| 13400 | Stenacron sp | F | + | | | | |
| 13521 | Stenonema femoratum | F | + | | | | |
| 17200 | Caenis sp | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 22001 | Coenagrionidae | M | + | | | | |
| 23909 | Boyeria vinosa | F | + | | | | |
| 25510 | Stylogomphus albistylus | MI | + | | | | |
| 28500 | Libellula sp | T | + | | | | |
| 34130 | Acroneuria frisoni | MI | + | | | | |
| 47600 | Sialis sp | F | + | | | | |
| 51600 | Polycentropus sp | MI | + | | | | |
| 52200 | Cheumatopsyche sp | F | + | | | | |
| 57900 | Pycnopsyche sp | MI | + | | | | |
| 59730 | Triaenodes melaca | MI | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 68708 | Dubiraphia vittata group | F | + | | | | |
| 68901 | Macronychus glabratus | MI | + | | | | |
| 71100 | Hexatoma sp | MI | + | | | | |
| 71900 | Tipula sp | F | + | | | | |
| 77120 | Ablabesmyia mallochi | F | + | | | | |
| 78401 | Natarsia species A (sensu Roback, 1978) | T | + | | | | |
| 83840 | Microtendipes pedellus group | MI | + | | | | |
| 95100 | Physella sp | T | + | | | | |
| 98200 | Pisidium sp | F | + | | | | |
| 98600 | Sphaerium sp | F | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 27

No. Qualitative Taxa: 27 ICI: MG

Number of Organisms: 0 Qual EPT: 9

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 07/19/2004 River Code: 09-206 River: Mud Fork RM: 0.10

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 05800 | Caecidotea sp | M | + | | | | |
| 08200 | Orconectes sp | F | + | | | | |
| 11130 | Baetis intercalaris | F | + | | | | |
| 13590 | Stenonema vicarium | MI | + | | | | |
| 17200 | Caenis sp | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 22300 | Argia sp | F | + | | | | |
| 23804 | Basiaeschna janata | F | + | | | | |
| 23909 | Boyeria vinosa | F | + | | | | |
| 24900 | Gomphus sp | F | + | | | | |
| 28500 | Libellula sp | T | + | | | | |
| 47600 | Sialis sp | F | + | | | | |
| 51600 | Polycentropus sp | MI | + | | | | |
| 52200 | Cheumatopsyche sp | F | + | | | | |
| 59730 | Triaenodes melaca | MI | + | | | | |
| 63300 | Hydroporus sp | F | + | | | | |
| 66500 | Enochrus sp | F | + | | | | |
| 67000 | Helophorus sp | F | + | | | | |
| 67700 | Paracymus sp | F | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 68601 | Ancyronyx variegata | MI | + | | | | |
| 68708 | Dubiraphia vittata group | F | + | | | | |
| 68901 | Macronychus glabratus | MI | + | | | | |
| 69400 | Stenelmis sp | F | + | | | | |
| 71100 | Hexatoma sp | MI | + | | | | |
| 71700 | Pilaria sp | F | + | | | | |
| 71900 | Tipula sp | F | + | | | | |
| 87540 | Hemerodromia sp | F | + | | | | |
| 97601 | Corbicula fluminea | MI | + | | | | |
| 98600 | Sphaerium sp | F | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 30

No. Qualitative Taxa: 30 ICI: MG

Number of Organisms: 0 Qual EPT: 6

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 07/19/2004 River Code: 09-206 River: Mud Fork RM: 5.40

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 07800 | Cambarus sp | F | + | | | | |
| 13400 | Stenacron sp | F | + | | | | |
| 17200 | Caenis sp | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 22300 | Argia sp | F | + | | | | |
| 23909 | Boyeria vinosa | F | + | | | | |
| 24900 | Gomphus sp | F | + | | | | |
| 45900 | Notonecta sp | M | + | | | | |
| 47600 | Sialis sp | F | + | | | | |
| 52200 | Cheumatopsyche sp | F | + | | | | |
| 52530 | Hydropsyche depravata group | F | + | | | | |
| 57900 | Pycnopsyche sp | MI | + | | | | |
| 63300 | Hydroporus sp | F | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 69400 | Stenelmis sp | F | + | | | | |
| 71100 | Hexatoma sp | MI | + | | | | |
| 72340 | Dixella sp | F | + | | | | |
| 72700 | Anopheles sp | F | + | | | | |
| 74100 | Simulium sp | F | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 19

No. Qualitative Taxa: 19 ICI: MG

Number of Organisms: 0 Qual EPT: 5

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 10/21/1904 River Code: 09-207 River: Ogden Run RM: 0.20

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 17600 | Baetisca sp | I | + | | | | |
| 22001 | Coenagrionidae | M | + | | | | |
| 23909 | Boyeria vinosa | F | + | | | | |
| 34131 | | | + | | | | |
| 35001 | Perlodidae | MI | + | | | | |
| 42700 | Belostoma sp | F | + | | | | |
| 45900 | Notonecta sp | M | + | | | | |
| 50315 | Chimarra obscura | MI | + | | | | |
| 52200 | Cheumatopsyche sp | F | + | | | | |
| 52530 | Hydropsyche depravata group | F | + | | | | |
| 55300 | Ptilostomis sp | F | + | | | | |
| 60900 | Peltodytes sp | M | + | | | | |
| 63300 | Hydroporus sp | F | + | | | | |
| 67750 | Sperchopsis tesselatus | F | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 68601 | Ancyronyx variegata | MI | + | | | | |
| 68708 | Dubiraphia vittata group | F | + | | | | |
| 71900 | Tipula sp | F | + | | | | |
| 72700 | Anopheles sp | F | + | | | | |
| 74100 | Simulium sp | F | + | | | | |
| 95100 | Physella sp | T | + | | | | |
| 96002 | Helisoma anceps anceps | M | + | | | | |
| 97601 | Corbicula fluminea | MI | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 23

No. Qualitative Taxa: 23 ICI: MG

Number of Organisms: 0 Qual EPT: 6

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 10/21/1904 River Code: 09-208 River: Sisson Run RM: 0.10

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 07800 | Cambarus sp | F | + | | | | |
| 11651 | Procloeon sp (w/o hindwing pads) | MI | + | | | | |
| 13521 | Stenonema femoratum | F | + | | | | |
| 15000 | Paraleptophlebia sp | MI | + | | | | |
| 17200 | Caenis sp | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 22001 | Coenagrionidae | M | + | | | | |
| 22300 | Argia sp | F | + | | | | |
| 23804 | Basiaeschna janata | F | + | | | | |
| 23909 | Boyeria vinosa | F | + | | | | |
| 24900 | Gomphus sp | F | + | | | | |
| 35001 | Perlodidae | MI | + | | | | |
| 55300 | Ptilostomis sp | F | + | | | | |
| 59720 | Triaenodes ignitus | I | + | | | | |
| 63300 | Hydroporus sp | F | + | | | | |
| 63900 | Laccophilus sp | T | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 71900 | Tipula sp | F | + | | | | |
| 72340 | Dixella sp | F | + | | | | |
| 72700 | Anopheles sp | F | + | | | | |
| 74501 | Ceratopogonidae | F | + | | | | |
| 77800 | Helopelopia sp | F | + | | | | |
| 82141 | Thienemanniella xena | F | + | | | | |
| 83840 | Microtendipes pedellus group | MI | + | | | | |
| 84300 | Phaenopsectra obediens group | F | + | | | | |
| 84470 | Polypedilum (P.) illinoense | T | + | | | | |
| 85500 | Paratanytarsus sp | F | + | | | | |
| 98600 | Sphaerium sp | F | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 28

No. Qualitative Taxa: 28 ICI: MG

Number of Organisms: 0 Qual EPT: 7

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 07/20/2004 River Code: 09-211 River: Hysell Run RM: 0.80

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 07701 | Cambaridae | | + | | | | |
| 21300 | Hetaerina sp | F | + | | | | |
| 22001 | Coenagrionidae | M | + | | | | |
| 23804 | Basiaeschna janata | F | + | | | | |
| 45300 | Sigara sp | F | + | | | | |
| 45400 | Trichocorixa sp | F | + | | | | |
| 47600 | Sialis sp | F | + | | | | |
| 52200 | Cheumatopsyche sp | F | + | | | | |
| 52315 | Diplectrona modesta | F | + | | | | |
| 52530 | Hydropsyche depravata group | F | + | | | | |
| 55300 | Ptilostomis sp | F | + | | | | |
| 61400 | Agabus sp | M | + | | | | |
| 62202 | Copelatus glyphicus | M | + | | | | |
| 63300 | Hydroporus sp | F | + | | | | |
| 63900 | Laccophilus sp | T | + | | | | |
| 67700 | Paracymus sp | F | + | | | | |
| 69400 | Stenelmis sp | F | + | | | | |
| 71900 | Tipula sp | F | + | | | | |
| 72900 | Culex sp | VT | + | | | | |
| 81712 | Psectrocladius (P.) psilopterus group | M | + | | | | |
| 82710 | Chironomus (C.) sp | T | + | | | | |
| 84470 | Polypedilum (P.) illinoense | T | + | | | | |
| 85800 | Tanytarsus sp | MI | + | | | | |
| 85840 | Tanytarsus sepp | MI | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 24

No. Qualitative Taxa: 24 ICI: MG

Number of Organisms: 0 Qual EPT: 4

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 07/20/2004 River Code: 09-212 River: Bailey Run RM: 0.50

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 07800 | Cambarus sp | F | + | | | | |
| 23909 | Boyeria vinosa | F | + | | | | |
| 44501 | Corixidae | F | + | | | | |
| 47600 | Sialis sp | F | + | | | | |
| 48620 | Nigronia serricornis | F | + | | | | |
| 61400 | Agabus sp | M | + | | | | |
| 68708 | Dubiraphia vittata group | F | + | | | | |
| 72900 | Culex sp | VT | + | | | | |
| 82710 | Chironomus (C.) sp | T | + | | | | |
| 84470 | Polypedilum (P.) illinoense | T | + | | | | |
| 85800 | Tanytarsus sp | MI | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 11

No. Qualitative Taxa: 11 ICI: P

Number of Organisms: 0 Qual EPT: 0

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 09/16/2004 River Code: 09-213 River: Thomas Fork RM: 2.80

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 07800 | Cambarus sp | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 22001 | Coenagrionidae | M | + | | | | |
| 22300 | Argia sp | F | + | | | | |
| 24900 | Gomphus sp | F | + | | | | |
| 47600 | Sialis sp | F | + | | | | |
| 55300 | Ptilostomis sp | F | + | | | | |
| 59720 | Triaenodes ignitus | I | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 9

No. Qualitative Taxa: 9 ICI: F

Number of Organisms: 0 Qual EPT: 2

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 09/16/2004 River Code: 09-213 River: Thomas Fork RM: 4.40

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 07800 | Cambarus sp | F | + | | | | |
| 13400 | Stenacron sp | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 22001 | Coenagrionidae | M | + | | | | |
| 22300 | Argia sp | F | + | | | | |
| 28500 | Libellula sp | T | + | | | | |
| 47600 | Sialis sp | F | + | | | | |
| 51600 | Polycentropus sp | MI | + | | | | |
| 52200 | Cheumatopsyche sp | F | + | | | | |
| 52530 | Hydropsyche depravata group | F | + | | | | |
| 55300 | Ptilostomis sp | F | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 69400 | Stenelmis sp | F | + | | | | |
| 71100 | Hexatoma sp | MI | + | | | | |
| 82700 | Chironomus sp | T | + | | | | |
| 99995 | QUANT. AND QUAL. SAMPLE COLLECTED BUT NO QUANT. TAXA | | | | | | |

No. Quantitative Taxa: 0 Total Taxa: 15

No. Qualitative Taxa: 15 ICI: 2

Number of Organisms: 0 Qual EPT: 5

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 07/21/2004 River Code: 09-213 River: Thomas Fork RM: 5.00

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 21200 | Calopteryx sp | F | + | | | | |
| 47600 | Sialis sp | F | + | | | | |
| 63900 | Laccophilus sp | T | + | | | | |
| 65800 | Berosus sp | M | + | | | | |
| 71900 | Tipula sp | F | + | | | | |
| 82710 | Chironomus (C.) sp | T | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 6

No. Qualitative Taxa: 6 ICI: P

Number of Organisms: 0 Qual EPT: 0

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 07/26/2004 River Code: 09-213 River: Thomas Fork RM: 7.10

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 13590 | Stenonema vicarium | MI | + | | | | |
| 17200 | Caenis sp | F | + | | | | |
| 24900 | Gomphus sp | F | + | | | | |
| 47600 | Sialis sp | F | + | | | | |
| 52200 | Cheumatopsyche sp | F | + | | | | |
| 55300 | Ptilostomis sp | F | + | | | | |
| 59730 | Triaenodes melaca | MI | + | | | | |
| 69400 | Stenelmis sp | F | + | | | | |
| 82710 | Chironomus (C.) sp | T | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 9

No. Qualitative Taxa: 9 ICI: MG

Number of Organisms: 0 Qual EPT: 5

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 07/26/2004 River Code: 09-213 River: Thomas Fork RM: 9.60

| Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|
| 01801 | Turbellaria | F | + |
| 05900 | Lirceus sp | F | + |
| 08200 | Orconectes sp | F | + |
| 11120 | Baetis flavistriga | F | + |
| 11200 | Callibaetis sp | M | + |
| 12200 | Isonychia sp | MI | + |
| 13400 | Stenacron sp | F | + |
| 13521 | Stenonema femoratum | F | + |
| 13590 | Stenonema vicarium | MI | + |
| 17200 | Caenis sp | F | + |
| 21200 | Calopteryx sp | F | + |
| 21300 | Hetaerina sp | F | + |
| 22300 | Argia sp | F | + |
| 23909 | Boyeria vinosa | F | + |
| 24900 | Gomphus sp | F | + |
| 26100 | Cordulegaster sp | F | + |
| 33100 | Leuctra sp | I | + |
| 48610 | Nigronia fasciatus | MI | + |
| 51600 | Polycentropus sp | MI | + |
| 52200 | Cheumatopsyche sp | F | + |
| 52530 | Hydropsyche depravata group | F | + |
| 53800 | Hydroptila sp | F | + |
| 57900 | Pycnopsyche sp | MI | + |
| 59730 | Triaenodes melaca | MI | + |
| 68130 | Helichus sp | MI | + |
| 68201 | Scirtidae | F | + |
| 68901 | Macronychus glabratus | MI | + |
| 69400 | Stenelmis sp | F | + |
| 70700 | Dicranota sp | MI | + |
| 71100 | Hexatoma sp | MI | + |
| 71900 | Tipula sp | F | + |
| 77800 | Helopelopia sp | F | + |
| 80420 | Cricotopus (C.) bicinctus | M | + |
| 84210 | Paratendipes albimanus or P. duplicatus | MI | + |
| 84450 | Polypedilum (Uresipedilum) flavum | F | + |
| 84750 | Stictochironomus sp | F | + |

| Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|

| | | | |
|---|---|---|---|
| No. Quantitative Taxa: | 0 | Total Taxa: | 36 |
| No. Qualitative Taxa: | 36 | ICI: | VG |
| Number of Organisms: | 0 | Qual EPT: | 14 |

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 07/26/2004 River Code: 09-214 River: Long Hollow RM: 0.10

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 07800 | Cambarus sp | F | + | | | | |
| 08200 | Orconectes sp | F | + | | | | |
| 11250 | Centroptilum sp (w/o hindwing pads) | MI | + | | | | |
| 17200 | Caenis sp | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 22001 | Coenagrionidae | M | + | | | | |
| 22300 | Argia sp | F | + | | | | |
| 23909 | Boyeria vinosa | F | + | | | | |
| 25410 | Progomphus obscurus | F | + | | | | |
| 33100 | Leuctra sp | I | + | | | | |
| 52200 | Cheumatopsyche sp | F | + | | | | |
| 55300 | Ptilostomis sp | F | + | | | | |
| 57900 | Pycnopsyche sp | MI | + | | | | |
| 59730 | Triaenodes melaca | MI | + | | | | |
| 63300 | Hydroporus sp | F | + | | | | |
| 63900 | Laccophilus sp | T | + | | | | |
| 67500 | Laccobius sp | F | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 68601 | Ancyronyx variegata | MI | + | | | | |
| 68708 | Dubiraphia vittata group | F | + | | | | |
| 69400 | Stenelmis sp | F | + | | | | |
| 71100 | Hexatoma sp | MI | + | | | | |
| 71300 | Limonia sp | F | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 23

No. Qualitative Taxa: 23 ICI: MG

Number of Organisms: 0 Qual EPT: 7

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 07/21/2004 River Code: 09-216 River: East Branch Thomas Fork RM: 0.60

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 05900 | Lirceus sp | F | + | | | | |
| 08200 | Orconectes sp | F | + | | | | |
| 11250 | Centroptilum sp (w/o hindwing pads) | MI | + | | | | |
| 13590 | Stenonema vicarium | MI | + | | | | |
| 17200 | Caenis sp | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 22001 | Coenagrionidae | M | + | | | | |
| 22300 | Argia sp | F | + | | | | |
| 23804 | Basiaeschna janata | F | + | | | | |
| 23909 | Boyeria vinosa | F | + | | | | |
| 24900 | Gomphus sp | F | + | | | | |
| 28500 | Libellula sp | T | + | | | | |
| 45900 | Notonecta sp | M | + | | | | |
| 47600 | Sialis sp | F | + | | | | |
| 48620 | Nigronia serricornis | F | + | | | | |
| 59720 | Triaenodes ignitus | I | + | | | | |
| 59730 | Triaenodes melaca | MI | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 68601 | Ancyronyx variegata | MI | + | | | | |
| 68708 | Dubiraphia vittata group | F | + | | | | |
| 68901 | Macronychus glabratus | MI | + | | | | |
| 74501 | Ceratopogonidae | F | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 22

No. Qualitative Taxa: 22 ICI: MG

Number of Organisms: 0 Qual EPT: 5

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 07/21/2004 River Code: 09-216 River: East Branch Thomas Fork RM: 2.10

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 06800 | Gammarus sp | F | + | | | | |
| 08200 | Orconectes sp | F | + | | | | |
| 11670 | Procloeon irrubrum | MI | + | | | | |
| 12200 | Isonychia sp | MI | + | | | | |
| 13400 | Stenacron sp | F | + | | | | |
| 13590 | Stenonema vicarium | MI | + | | | | |
| 17200 | Caenis sp | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 22300 | Argia sp | F | + | | | | |
| 23909 | Boyeria vinosa | F | + | | | | |
| 24900 | Gomphus sp | F | + | | | | |
| 48620 | Nigronia serricornis | F | + | | | | |
| 52200 | Cheumatopsyche sp | F | + | | | | |
| 52530 | Hydropsyche depravata group | F | + | | | | |
| 57900 | Pycnopsyche sp | MI | + | | | | |
| 59720 | Triaenodes ignitus | I | + | | | | |
| 59730 | Triaenodes melaca | MI | + | | | | |
| 63300 | Hydroporus sp | F | + | | | | |
| 67700 | Paracymus sp | F | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 68708 | Dubiraphia vittata group | F | + | | | | |
| 68901 | Macronychus glabratus | MI | + | | | | |
| 69400 | Stenelmis sp | F | + | | | | |
| 71100 | Hexatoma sp | MI | + | | | | |
| 71900 | Tipula sp | F | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 25

No. Qualitative Taxa: 25 ICI: G

Number of Organisms: 0 Qual EPT: 10

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 07/21/2004 River Code: 09-216 River: East Branch Thomas Fork RM: 4.10

| Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|
| 03600 | Oligochaeta | T | + |
| 05800 | Caecidotea sp | M | + |
| 06201 | Hyalella azteca | F | + |
| 07800 | Cambarus sp | F | + |
| 08200 | Orconectes sp | F | + |
| 11130 | Baetis intercalaris | F | + |
| 11250 | Centroptilum sp (w/o hindwing pads) | MI | + |
| 11651 | Procloeon sp (w/o hindwing pads) | MI | + |
| 13521 | Stenonema femoratum | F | + |
| 13590 | Stenonema vicarium | MI | + |
| 17200 | Caenis sp | F | + |
| 21200 | Calopteryx sp | F | + |
| 22300 | Argia sp | F | + |
| 23804 | Basiaeschna janata | F | + |
| 23909 | Boyeria vinosa | F | + |
| 24900 | Gomphus sp | F | + |
| 28500 | Libellula sp | T | + |
| 44501 | Corixidae | F | + |
| 47600 | Sialis sp | F | + |
| 51400 | Nyctiophylax sp | MI | + |
| 52200 | Cheumatopsyche sp | F | + |
| 52530 | Hydropsyche depravata group | F | + |
| 57900 | Pycnopsyche sp | MI | + |
| 59730 | Triaenodes melaca | MI | + |
| 60300 | Dineutus sp | F | + |
| 67811 | Staphylinidae | | + |
| 68130 | Helichus sp | MI | + |
| 68601 | Ancyronyx variegata | MI | + |
| 68700 | Dubiraphia sp | F | + |
| 68901 | Macronychus glabratus | MI | + |
| 69400 | Stenelmis sp | F | + |
| 71100 | Hexatoma sp | MI | + |
| 72340 | Dixella sp | F | + |
| 72700 | Anopheles sp | F | + |
| 74100 | Simulium sp | F | + |
| 74501 | Ceratopogonidae | F | + |
| 77120 | Ablabesmyia mallochi | F | + |
| 77800 | Helopelopia sp | F | + |
| 82710 | Chironomus (C.) sp | T | + |
| 82820 | Cryptochironomus sp | F | + |
| 83840 | Microtendipes pedellus group | MI | + |
| 84450 | Polypedilum (Uresipedilum) flavum | F | + |
| 84470 | Polypedilum (P.) illinoense | T | + |
| 95100 | Physella sp | T | + |
| 96120 | Menetus (Micromenetus) dilatatus | T | + |
| 97601 | Corbicula fluminea | MI | + |
| 98600 | Sphaerium sp | F | + |

No. Quantitative Taxa: 0 Total Taxa: 47

No. Qualitative Taxa: 47 ICI: G

Number of Organisms: 0 Qual EPT: 11

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 08/23/2004 River Code: 09-217 River: Schoolhouse Run RM: 0.60

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 13400 | Stenacron sp | F | + | | | | |
| 13521 | Stenonema femoratum | F | + | | | | |
| 13590 | Stenonema vicarium | MI | + | | | | |
| 15000 | Paraleptophlebia sp | MI | + | | | | |
| 17200 | Caenis sp | F | + | | | | |
| 17600 | Baetisca sp | I | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 23804 | Basiaeschna janata | F | + | | | | |
| 23909 | Boyeria vinosa | F | + | | | | |
| 50315 | Chimarra obscura | MI | + | | | | |
| 52200 | Cheumatopsyche sp | F | + | | | | |
| 55300 | Ptilostomis sp | F | + | | | | |
| 58320 | Psilotreta indecisa | I | + | | | | |
| 60900 | Peltodytes sp | M | + | | | | |
| 63300 | Hydroporus sp | F | + | | | | |
| 67500 | Laccobius sp | F | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 71100 | Hexatoma sp | MI | + | | | | |
| 71900 | Tipula sp | F | + | | | | |
| 72340 | Dixella sp | F | + | | | | |
| 96002 | Helisoma anceps anceps | M | + | | | | |
| 98600 | Sphaerium sp | F | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 22

No. Qualitative Taxa: 22 ICI: G

Number of Organisms: 0 Qual EPT: 10

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 07/27/2004 River Code: 09-221 River: Ball Run (2X) RM: 0.30

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 05800 | Caecidotea sp | M | + | | | | |
| 06800 | Gammarus sp | F | + | | | | |
| 08200 | Orconectes sp | F | + | | | | |
| 11130 | Baetis intercalaris | F | + | | | | |
| 11250 | Centroptilum sp (w/o hindwing pads) | MI | + | | | | |
| 12200 | Isonychia sp | MI | + | | | | |
| 13521 | Stenonema femoratum | F | + | | | | |
| 13590 | Stenonema vicarium | MI | + | | | | |
| 13590 | Stenonema vicarium | MI | + | | | | |
| 17200 | Caenis sp | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 23804 | Basiaeschna janata | F | + | | | | |
| 23909 | Boyeria vinosa | F | + | | | | |
| 24900 | Gomphus sp | F | + | | | | |
| 26100 | Cordulegaster sp | F | + | | | | |
| 33100 | Leuctra sp | I | + | | | | |
| 52200 | Cheumatopsyche sp | F | + | | | | |
| 52530 | Hydropsyche depravata group | F | + | | | | |
| 57900 | Pycnopsyche sp | MI | + | | | | |
| 59730 | Triaenodes melaca | MI | + | | | | |
| 63300 | Hydroporus sp | F | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 68708 | Dubiraphia vittata group | F | + | | | | |
| 68901 | Macronychus glabratus | MI | + | | | | |
| 69400 | Stenelmis sp | F | + | | | | |
| 71100 | Hexatoma sp | MI | + | | | | |
| 72340 | Dixella sp | F | + | | | | |
| 74100 | Simulium sp | F | + | | | | |
| 86100 | Chrysops sp | F | + | | | | |
| 95100 | Physella sp | T | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 30

No. Qualitative Taxa: 30 ICI: G

Number of Organisms: 0 Qual EPT: 12

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 07/20/2004 River Code: 09-222 River: RM: 0.10

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 07800 | Cambarus sp | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 22300 | Argia sp | F | + | | | | |
| 23909 | Boyeria vinosa | F | + | | | | |
| 26100 | Cordulegaster sp | F | + | | | | |
| 47600 | Sialis sp | F | + | | | | |
| 52315 | Diplectrona modesta | F | + | | | | |
| 59730 | Triaenodes melaca | MI | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 8

No. Qualitative Taxa: 8 ICI: P

Number of Organisms: 0 Qual EPT: 2

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 07/20/2004 River Code: 09-223 River: Lasher Run (2Z) RM: 0.10

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 05800 | Caecidotea sp | M | + | | | | |
| 06700 | Crangonyx sp | M | + | | | | |
| 08200 | Orconectes sp | F | + | | | | |
| 11250 | Centroptilum sp (w/o hindwing pads) | MI | + | | | | |
| 11651 | Procloeon sp (w/o hindwing pads) | MI | + | | | | |
| 13400 | Stenacron sp | F | + | | | | |
| 13521 | Stenonema femoratum | F | + | | | | |
| 13590 | Stenonema vicarium | MI | + | | | | |
| 17200 | Caenis sp | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 23804 | Basiaeschna janata | F | + | | | | |
| 23909 | Boyeria vinosa | F | + | | | | |
| 24900 | Gomphus sp | F | + | | | | |
| 26100 | Cordulegaster sp | F | + | | | | |
| 29000 | Sympetrum sp | T | + | | | | |
| 45900 | Notonecta sp | M | + | | | | |
| 47600 | Sialis sp | F | + | | | | |
| 51600 | Polycentropus sp | MI | + | | | | |
| 60400 | Gyrinus sp | F | + | | | | |
| 62202 | Copelatus glyphicus | M | + | | | | |
| 63300 | Hydroporus sp | F | + | | | | |
| 66500 | Enochrus sp | F | + | | | | |
| 67700 | Paracymus sp | F | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 68601 | Ancyronyx variegata | MI | + | | | | |
| 72700 | Anopheles sp | F | + | | | | |
| 82710 | Chironomus (C.) sp | T | + | | | | |
| 83840 | Microtendipes pedellus group | MI | + | | | | |
| 84470 | Polypedilum (P.) illinoense | T | + | | | | |
| 85500 | Paratanytarsus sp | F | + | | | | |
| 85800 | Tanytarsus sp | MI | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 31

No. Qualitative Taxa: 31 ICI: G

Number of Organisms: 0 Qual EPT: 7

**Appendis Table 3. Macroinvertebrate taxa collected during the 2004 study in Leading Creek.**

Collection Date: 07/21/2004 River Code: 09-225 River: Trib. to Little Leading Creek RM: 0.20

| Taxa Code | Taxa | Tol. | Qt./Ql. | Taxa Code | Taxa | Tol. | Qt./Ql. |
|---|---|---|---|---|---|---|---|
| 08200 | Orconectes sp | F | + | | | | |
| 11651 | Procloeon sp (w/o hindwing pads) | MI | + | | | | |
| 13521 | Stenonema femoratum | F | + | | | | |
| 13590 | Stenonema vicarium | MI | + | | | | |
| 17200 | Caenis sp | F | + | | | | |
| 21200 | Calopteryx sp | F | + | | | | |
| 22300 | Argia sp | F | + | | | | |
| 23804 | Basiaeschna janata | F | + | | | | |
| 24900 | Gomphus sp | F | + | | | | |
| 52200 | Cheumatopsyche sp | F | + | | | | |
| 68130 | Helichus sp | MI | + | | | | |
| 68708 | Dubiraphia vittata group | F | + | | | | |
| 71100 | Hexatoma sp | MI | + | | | | |
| 72340 | Dixella sp | F | + | | | | |
| 84210 | Paratendipes albimanus or P. duplicatus | MI | + | | | | |
| 84300 | Phaenopsectra obediens group | F | + | | | | |

No. Quantitative Taxa: 0 Total Taxa: 16

No. Qualitative Taxa: 16 ICI: MG

Number of Organisms: 0 Qual EPT: 5

**Table 4. QHEI scores and metric values for stations in the Leading Creek watershed during 2004 and 2005.**

Key QHEI Components

| | | | WWH Attributes | | | | | | | | | | | MWH Attributes | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | High Influence | | | | | Moderate Influence | | | | | | | | | | | | | | | | | | | | |
| River Mile | QHEI | Gradient (ft/mile) | No Channelization or Recovered | Boulder/Cobble/Gravel Substrates | Silt Free Substrates | Good/Excellent Substrates | Moderate/High Sinuosity | Extensive/Moderate 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 HL 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 | High/Mod. Overall Embeddedness | High/Mod. Riffle Embeddedness | No Riffle | **Total ML MWH Attributes** | **(MWH HL+1)/(WWH+1) Ratio** | **(MWH ML+1)/(WWH+1) Ratio** |
| (09200) Leading Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2005 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.0 | 58.0 | 3.11 | | | | | | ■ | | | ■ | | 2 | | | | | | 0 | ■ | | | | ■ | ■ | | | ■ | ■ | ■ | | 6 | 0.33 | 2.33 |
| 10.3 | 78.0 | 3.93 | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | 9 | | | | | | 0 | | | | | | | | | | | | | 0 | 0.10 | 0.10 |
| 12.3 | 63.0 | 3.93 | | ■ | | | | ■ | | ■ | ■ | | 4 | | | | | | 0 | ■ | ■ | | | ■ | ■ | | | ■ | | ■ | | 6 | 0.20 | 1.40 |
| 14.8 | 75.0 | 3.93 | | ■ | | ■ | ■ | ■ | | ■ | ■ | | 6 | | | | | | 0 | ■ | | | ■ | | | | | ■ | | ■ | | 4 | 0.14 | 0.71 |
| Year: 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15.5 | 70.0 | 3.17 | ■ | ■ | | ■ | ■ | ■ | | ■ | ■ | | 8 | | | | | | 0 | ■ | ■ | | | ■ | ■ | | | ■ | ■ | ■ | | 7 | 0.11 | 0.89 |
| 24.2 | 58.0 | 2.22 | ■ | ■ | | | ■ | ■ | ■ | ■ | ■ | ■ | 8 | | | ◆ | ◆ | | 2 | | | | | ■ | ■ | ■ | | | | | 3 | 0.33 | 0.67 |
| 26.0 | 61.0 | 11.44 | ■ | ■ | | ■ | ■ | ■ | ■ | | ■ | | 8 | | | | | | 0 | | ■ | | | ■ | | | | | ■ | ■ | | 4 | 0.11 | 0.56 |
| 26.3 | 67.5 | 11.44 | ■ | ■ | | ■ | ■ | ■ | ■ | | ■ | | 8 | | | ◆ | ◆ | | 2 | | ■ | | | | ■ | | | | ■ | ■ | | 4 | 0.33 | 0.78 |
| 29.9 | 73.0 | 26.90 | ■ | | | ■ | ■ | ■ | ■ | ■ | ■ | | 8 | | | | | | 0 | | | | | | | | | | | | | 0 | 0.11 | 0.11 |
| (09201) Little Leading Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.4 | 60.0 | 12.50 | ■ | | | | | ■ | | ■ | ■ | | 5 | | | | ◆ | | 1 | | ■ | | | ■ | ■ | | | ■ | ■ | ■ | | 6 | 0.33 | 1.33 |
| 6.6 | 56.5 | 6.90 | ■ | | | | | | | ■ | ■ | ■ | 4 | | | ◆ | ◆ | | 2 | | | | | ■ | ■ | | | ■ | | | | 3 | 0.60 | 1.20 |
| 9.9 | 41.5 | 16.67 | | | | | | | | ■ | ■ | | 2 | ◆ | | ◆ | ◆ | | 3 | | ■ | | | ■ | ■ | | | ■ | ■ | | ■ | 6 | 1.33 | 3.33 |
| (09202) Malloons Run | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.1 | 62.0 | 13.61 | ■ | | | | ■ | | | ■ | ■ | | 5 | | | ◆ | ◆ | | 2 | | ■ | | | ■ | ■ | | | ■ | ■ | ■ | | 6 | 0.50 | 1.50 |
| (09203) Parker Run | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6 | 72.5 | 16.67 | ■ | ■ | | ■ | ■ | ■ | | ■ | ■ | | 7 | | | ◆ | | | 1 | ■ | | | | ■ | ■ | | | ■ | ■ | ■ | | 6 | 0.25 | 1.00 |
| Year: 2005 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.6 | 72.5 | 16.67 | | ■ | | ■ | ■ | ■ | | ■ | ■ | | 6 | | | | | | 0 | ■ | ■ | | | | | | | ■ | | ■ | | 4 | 0.14 | 0.71 |
| (09205) Dexter Run | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.8 | 52.5 | 7.41 | ■ | | | | | | | | ■ | | 2 | | ◆ | ◆ | ◆ | | 3 | | ■ | | | ■ | ■ | | | ■ | ■ | ■ | ■ | 7 | 1.33 | 3.67 |
| (09206) Mud Fork | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.1 | 42.5 | 2.94 | ■ | | | | | | | ■ | | | 2 | | | ◆ | ◆ | ◆ | 3 | | ■ | | | ■ | ■ | | | ■ | | ■ | ■ | 6 | 1.33 | 3.33 |

**Table 4. QHEI scores and metric values for stations in the Leading Creek watershed during 2004 and 2005.**

Key QHEI Components

| | | | WWH Attributes | | | | | | | | | | MWH Attributes | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | High Influence | | | | | Moderate Influence | | | | | | | | | | | | |
| River Mile | QHEI | Gradient (ft/mile) | No Channelization or Recovered | Boulder/Cobble/Gravel Substrates | Silt Free Substrates | Good/Excellent Substrates | Moderate/High Sinuosity | Extensive/Moderate 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 HL 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 | High/Mod. Overall Embeddedness | High/Mod. Riffle Embeddedness | No Riffle | Total ML MWH Attributes | (MWH HL+1)/(WWH+1) Ratio | (MWH ML+1)/(WWH+1) Ratio |
| (09206) Mud Fork | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.2 | 45.0 | 2.94 | ■ | | | | | | | ■ | ■ | | 3 | | | ◆ | ◆ | ◆ | 3 | ■ | | | | ■ | ■ | | | ■ | | ■ | ■ | 6 | 1.00 | 2.50 |
| 5.4 | 59.5 | 17.44 | ■ | | | | ■ | ■ | | ■ | ■ | | 5 | | | ◆ | ◆ | | 2 | | | | | ■ | ■ | | | ■ | | ■ | ■ | 5 | 0.50 | 1.33 |
| (09207) Ogden Run | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.5 | 48.5 | 7.41 | ■ | | | | ■ | | | | ■ | | 3 | | | ◆ | ◆ | | 2 | | ■ | | | ■ | ■ | | | ■ | ■ | ■ | | 6 | 0.75 | 2.25 |
| (09208) Sisson Run | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.1 | 46.5 | 13.72 | ■ | | | | | | | ■ | ■ | | 3 | | | ◆ | ◆ | | 2 | | ■ | | | ■ | ■ | ■ | | ■ | ■ | ■ | | 7 | 0.75 | 2.50 |
| (09209) Fivemile Run | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.9 | 55.5 | 29.97 | ■ | ■ | | | | ■ | | | ■ | | 4 | | | ◆ | ◆ | | 2 | | ■ | | | ■ | ■ | | | ■ | ■ | ■ | | 6 | 0.60 | 1.80 |
| (09211) Hysell Run | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.9 | 53.0 | 9.09 | ■ | ■ | | | | | | ■ | | | 4 | | | ◆ | ◆ | ◆ | 3 | ■ | | | | ■ | ■ | | | ■ | | ■ | | 5 | 0.80 | 1.80 |
| (09212) Bailey Run | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.5 | 60.0 | 29.73 | ■ | ■ | | | | | | ■ | ■ | | 5 | | | ◆ | ◆ | | 2 | | | | | ■ | ■ | | | ■ | | ■ | | 4 | 0.50 | 1.17 |
| (09213) Thomas Fork | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.8 | 56.5 | 4.31 | ■ | | | | | ■ | | ■ | ■ | | 5 | | | | ◆ | | 2 | | | | | ■ | ■ | | | ■ | ■ | ■ | | 5 | 0.50 | 1.33 |
| 4.4 | 58.5 | 4.31 | ■ | | | | | | | | ■ | | 2 | | | | ◆ | | 2 | ■ | ■ | | | ■ | ■ | | | ■ | ■ | ■ | | 7 | 1.00 | 3.33 |
| 5.0 | 25.5 | 4.31 | | | | | | | | | ■ | | 1 | ◆ | ◆ | ◆ | ◆ | | 4 | | ■ | | | ■ | ■ | | | ■ | ■ | | ■ | 6 | 2.50 | 5.50 |
| 7.1 | 56.5 | 4.31 | ■ | ■ | | | ■ | | | ■ | ■ | | 6 | | | ◆ | ◆ | | 2 | | | | | ■ | ■ | | | ■ | ■ | ■ | | 5 | 0.43 | 1.14 |
| 9.8 | 50.5 | 4.31 | | ■ | | | | | | ■ | | | 3 | | | ◆ | ◆ | ◆ | 3 | ■ | | | | ■ | ■ | | | ■ | | ■ | | 5 | 1.00 | 2.25 |
| (09214) Long Hollow | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.1 | 55.0 | 33.59 | ■ | ■ | | | | | | ■ | ■ | | 5 | | | ◆ | ◆ | | 2 | | ■ | | | ■ | ■ | | | ■ | | ■ | | 5 | 0.50 | 1.33 |

**Table 4. QHEI scores and metric values for stations in the Leading Creek watershed during 2004 and 2005.**

Key
QHEI
Components

| | | | WWH Attributes | | | | | | | | | | MWH Attributes | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | High Influence | | | | | Moderate Influence | | | | | | | | | | | | | | | | | | |
| River Mile | QHEI | Gradient (ft/mile) | No Channelization or Recovered | Boulder/Cobble/Gravel Substrates | Silt Free Substrates | Good/Excellent Substrates | Moderate/High Sinuosity | Extensive/Moderate 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 HL 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 | High/Mod. Overall Embeddedness | High/Mod. Riffle Embeddedness | No Riffle | **Total ML MWH Attributes** | **(MWH HL+1)/(WWH+1) Ratio** | **(MWH ML+1)/(WWH+1) Ratio** |
| (09216) East Branch Thomas Fork | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.6 | 40.0 | 15.87 | | | | | | | | | ■ | | 1 | ◆ | ◆ | ◆ | ◆ | | 4 | | ■ | | | ■ | ■ | | | ■ | ■ | | ■ | 6 | 2.50 | 5.50 |
| 2.1 | 53.0 | 15.87 | ■ | ■ | | | | | | ■ | ■ | | 5 | | | ◆ | ◆ | | 2 | ■ | | | | ■ | ■ | | | ■ | | ■ | | 5 | 0.50 | 1.33 |
| 4.1 | 58.0 | 11.11 | ■ | ■ | | | ■ | ■ | | ■ | ■ | | 6 | | | ◆ | ◆ | | 2 | | | | | ■ | ■ | | | ■ | | | | 3 | 0.43 | 0.86 |
| (09217) Schoolhouse Run | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.6 | 58.5 | 7.63 | ■ | ■ | | | ■ | ■ | | ■ | ■ | | 6 | | | ◆ | ◆ | | 2 | | ■ | | | ■ | ■ | | | ■ | ■ | ■ | | 6 | 0.43 | 1.29 |
| (09221) Ball Run (2X) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.4 | 58.0 | 46.85 | ■ | ■ | | ■ | ■ | | | ■ | ■ | | 7 | | | | ◆ | | 1 | | | | | ■ | | | | ■ | | ■ | | 3 | 0.25 | 0.63 |
| (09223) Lasher Run (2Z) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.7 | 47.5 | 43.21 | ■ | | | | | | | | ■ | | 2 | | ◆ | ◆ | ◆ | | 3 | | ■ | | | ■ | ■ | | | ■ | ■ | ■ | ■ | 7 | 1.33 | 3.67 |
| (09224) Thomas Fk of L. Leading Cr | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.3 | 42.5 | 17.22 | | | | | | | | ■ | | | 1 | ◆ | | ◆ | ◆ | ◆ | 4 | ■ | | | | ■ | ■ | | ■ | ■ | ■ | | ■ | 7 | 2.50 | 6.00 |
| (09225) Trib. to Little Leading Creek | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.2 | 58.5 | 17.75 | ■ | ■ | | | | ■ | | ■ | ■ | | 6 | | | ◆ | ◆ | | 2 | | | | | ■ | ■ | | | ■ | | ■ | | 4 | 0.43 | 1.00 |

Appendix Table 5. Pebble count statistics and selected QHEI substrate-related metrics for stations in the Leading Creek watershed.

| | | | | | | | Zig-Zag Pebble Count Data | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| River Mile | QHEI | Substrate Score | Channel Score | Silt Score | Embed. Score | Riffle Substr | Percent Silt | Percent Sand | Percent Fines | Percent Coarse | D5 | D25 | D50 | D75 | D95 |
| (09200) | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | |
| 16.80 | | | | | | No Riffle | 4.6 | 18.1 | 25.1 | 63.7 | 2 | 10 | 32 | 32 | 128 |
| 24.20 | 58.0 | 14.0 | 13.5 | 2.0 | 2.0 | Medium | 0.5 | 7.0 | 42.0 | 24.5 | 2 | 8 | 16 | 16 | 64 |
| 26.00 | 61.0 | 11.0 | 15.0 | 3.0 | 3.0 | No Riffle | 3.2 | 36.8 | 65.5 | 16.3 | 2 | 2 | 4 | 16 | 64 |
| 26.30 | 67.5 | 9.0 | 16.0 | 3.0 | 3.0 | Medium | 0.6 | 3.4 | 5.5 | 71.0 | 7 | 16 | 64 | 128 | 256 |
| 29.90 | 73.0 | 11.0 | 17.0 | 2.0 | 2.0 | Large | 0.0 | 1.1 | 10.9 | 82.9 | 8 | 32 | 384 | 4096 | 4096 |
| (09201) Little Leading Creek | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | |
| 0.40 | 60.0 | 13.0 | 12.5 | 2.5 | 2.5 | Fine | 5.0 | 83.0 | 89.5 | 5.0 | 0 | 2 | 2 | 2 | 26 |
| 6.60 | 56.5 | 14.0 | 13.0 | 2.0 | 2.0 | Fine | 0.0 | 86.7 | 89.2 | 6.0 | 2 | 2 | 2 | 2 | 32 |
| 9.90 | 41.5 | 11.0 | 6.0 | 2.5 | 2.5 | No Riffle | 10.0 | 67.4 | 81.1 | 16.0 | 0 | 2 | 2 | 2 | 64 |
| (09202) Malloons Run | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | |
| 0.10 | 62.0 | 13.0 | 13.0 | 2.5 | 2.5 | Fine | 25.3 | 32.1 | 61.6 | 25.3 | 0 | 0 | 2 | 32 | 4096 |
| (09203) Parker Run | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | |
| 1.60 | 72.5 | 14.5 | 12.5 | | | Fine-Medium | 8.1 | 6.4 | 32.7 | 39.7 | 0 | 8 | 16 | 32 | 256 |
| (09207) Ogden Run | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | |
| 0.50 | 48.5 | 10.0 | 10.5 | 3.0 | 3.0 | Fine | 2.0 | 53.6 | 81.8 | 15.4 | 2 | 2 | 2 | 8 | 691 |
| (09208) Sisson Run | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | |
| 0.10 | 46.5 | 11.0 | 11.0 | 2.5 | 2.5 | Fine | 1.8 | 57.6 | 89.6 | 4.5 | 2 | 2 | 2 | 4 | 16 |
| (09209) Fivemile Run | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | |
| 0.90 | 55.5 | 11.0 | 12.0 | 3.0 | 3.0 | Fine | 3.5 | 30.7 | 58.7 | 2.1 | 2 | 2 | 8 | 16 | 16 |
| (09211) Hysell Run | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | |
| 0.90 | 53.0 | 16.0 | 10.5 | 2.0 | 2.0 | Fine-Medium | 5.1 | 24.6 | 38.1 | 42.4 | 0 | 2 | 16 | 32 | 64 |
| (09212) Bailey Run | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | |
| 0.50 | 60.0 | 15.0 | 12.5 | 2.0 | 2.0 | Fine | 3.0 | 29.2 | 32.7 | 52.8 | 2 | 2 | 32 | 64 | 128 |
| (09213) Thomas Fork | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | |
| 2.80 | 56.5 | 13.5 | 12.5 | 2.0 | 2.5 | Fine | 2.0 | 61.2 | 67.3 | 19.3 | 2 | 2 | 2 | 16 | 32 |

Appendix Table 5. Pebble count statistics and selected QHEI substrate-related metrics for stations in the Leading Creek watershed.

| | | | | | | | Zig-Zag Pebble Count Data | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| River Mile | QHEI | Substrate Score | Channel Score | Silt Score | Embed. Score | Riffle Substr | Percent Silt | Percent Sand | Percent Fines | Percent Coarse | D5 | D25 | D50 | D75 | D95 |
| (09213) Thomas Fork | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | |
| 4.40 | 58.5 | 12.5 | 11.0 | 2.5 | 3.0 | Fine | 12.7 | 37.7 | 59.4 | 24.4 | 0 | 2 | 2 | 16 | 128 |
| 5.00 | 25.5 | 2.0 | 4.0 | 3.0 | 3.0 | No Riffle | 27.2 | 38.3 | 68.6 | 23.2 | 0 | 0 | 2 | 16 | 1024 |
| 7.10 | 56.5 | 14.5 | 13.0 | 2.0 | 2.5 | Fine-Medium | 6.5 | 25.1 | 34.9 | 51.3 | 0 | 2 | 32 | 32 | 256 |
| 9.80 | 50.5 | 15.0 | 9.5 | 2.0 | 2.0 | Fine | 4.8 | 49.4 | 62.6 | 18.0 | 1 | 2 | 2 | 16 | 1024 |
| (09214) Long Hollow | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | |
| 0.10 | 55.0 | 14.5 | 12.0 | 2.5 | 2.0 | Fine-Medium | 4.6 | 24.0 | 37.9 | 33.3 | 1 | 2 | 16 | 32 | 140 |
| (09216) East Branch Thomas Fork | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | |
| 0.60 | 40.0 | 4.0 | 4.5 | 3.0 | 3.0 | No Riffle | 61.4 | 24.1 | 87.9 | 8.4 | 0 | 0 | 0 | 2 | 691 |
| 2.10 | 53.0 | 15.0 | 11.0 | 2.0 | 2.0 | Fine | 6.6 | 36.5 | 51.7 | 23.8 | 0 | 2 | 8 | 16 | 128 |
| 4.10 | 58.0 | 15.0 | 13.0 | 2.0 | 2.0 | Medium-Large | 1.4 | 66.6 | 69.6 | 22.9 | 2 | 2 | 2 | 16 | 256 |
| (09217) Schoolhouse Run | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | |
| 0.60 | 58.5 | 12.0 | 13.5 | 2.5 | 2.5 | Fine | 0.0 | 36.1 | 51.2 | 10.2 | 2 | 2 | 8 | 16 | 38 |
| (09221) Ball Run (2X) | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | |
| 0.40 | 58.0 | 15.0 | 14.5 | 2.0 | 2.0 | Fine | 4.3 | 50.3 | 61.0 | 25.5 | 2 | 2 | 2 | 32 | 64 |
| (09223) Lasher Run (2Z) | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | |
| 0.70 | 47.5 | 8.0 | 12.5 | 3.0 | 3.0 | Fine | 30.1 | 26.0 | 60.2 | 28.7 | 0 | 0 | 2 | 32 | 32 |
| (09224) Thomas Fk of L. Leading Cr | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | |
| 0.30 | 42.5 | 11.5 | 7.5 | 2.0 | 2.5 | No Riffle | 7.9 | 68.5 | 78.8 | 9.5 | 0 | 2 | 2 | 2 | 32 |
| (09225) Trib. to Little Leading Creek | | | | | | | | | | | | | | | |
| Year: 2004 | | | | | | | | | | | | | | | |
| 0.20 | 58.5 | 15.0 | 12.5 | 2.0 | 2.0 | Fine | 9.5 | 18.4 | 42.2 | 26.1 | 0 | 2 | 16 | 32 | 64 |

Appendix 6. Sampling locations for data summarized in the Leading Creek Improvement Plan and potential sources of aquatic impairment (from Currie et al. 1999).

Table 1. Station identification, including Virginia Tech stations and EA ES&T stations with mileage to the Ohio River and factors affecting each site.

| Virginia Tech Stations | Site Name | EA ES&T Stations | Ohio River Influence Stations | (km) | Influential Factors |
|---|---|---|---|---|---|
| TS1 | West Fork | | | 51.0 | Municipal airport runoff |
| TS2 | East Fork | | | 51.0 | Albany township and golf course runoff |
| LCS1 | Albany | | | 48.9 | Abandoned landfill runoff, stone quarry permitted discharge, inputs from TS1 and TS2 |
| TS3 | Five Mile Run | | | 42.5 | Dairy farm runoff, stockyard runoff, cattle grazing |
| LCS2 | Carpenter | | | 42.3 | None |
| TS4 | Sharps Run (Plowed Run) | | | 41.0 | Lack of riparian vegetation and crop rows into the tributary channel |
| LCS3 | Sisson | | | 38.8 | Tractor crossing, lack of riparian vegetation, bare soil and animal intrusion into the creek |
| TS5 | Sissons Run | | | 38.5 | Lack of riparian vegetation and animal intrusion, one stockyard along tributary |
| TS6 | Ogden Run | | | 35.3 | Meigs #2 effluent, lack of riparian vegetation, channelization |
| LCS4 | Dyesville | | | 34.3 | Natural erosion |
| | | LC-1 | | | |
| TS8A | Mud Fork up | | | 30.0 | Lack of riparian vegetation, sedimentation from reclaimed mine land, bridge construction, poor agricultural practices |
| TS8B | Mud Fork down | | | 29.3 | Below wetland, decreased sedimentation |
| TS9 | Dexter Run | | | 29.1 | Minimal agricultural input |
| TS10 | Grass Run | | | 27.2 | Minimal agricultural input |
| LCS5 | Dexter | LC-2 | | 27.0 | Minimal agricultural input |
| | | LC-3 | | | |
| TS11 | Parker Run | PR-2 | | 25.1 | Meigs #31 effluent |
| | | LC-4 | | | |
| LCS6 | Malloons | LC-5 | | 23.8 | Effects from Parker Run effluent |
| TS12 | Malloons Run | | | 23.5 | Natural erosion |
| | | LC-6 | | | |
| LCS7 | Corn Hollow | LC-7 | | 16.6 | Minimal agricultural input |
| TS13 | Lasher Run | | | 14.7 | Eroded AML sites, minimal AMD and sedimentation from poor agricultural practices |
| TS14 | Little Leading Creek | | | 13.8 | AMD influences, sedimentation from AML and poor agricultural practices, WWTP permitted discharge |
| TS15 | Titus Run | | | 11.9 | Sedimentation from AML and agricultural practices with acute toxicity from AMD |
| LCS8 | Twin Bridge | LC-8 | | 11.6 | None |
| TS16 | Paulins Hill Run | | | 10.3 | Severe AMD and AML influences, acutely toxic |
| LCS9 | Iron Bridge | LC-9 | Station I | 5.6 | Sediments accumulating from upstream |
| | | | Station II | | Sediments accumulating from upstream |
| TS17 | Thomas Fork | | Station IV | 2.4 | Severe sedimentation from AML and toxicity from AMD |
| LCS10 | Middleport | LC-10 | | 2.25 | Backflow of the Ohio River, heavy sediment accumulation, alteration of channel habitat |
| | | | Stations V & VI | 2.0 | Backflow of the Ohio River |
| | | | Stations VII & VIII | 1.0 | Backflow of the Ohio River |
| | | | Station IX | 0.1 | Backflow of the Ohio River |
| | Ohio River | | Station X | | |

Table 28. Summary of ICI and IBI scores at various LCM stations obtained by EA ES&T from 1995-1997.

| STATIONS | | | 1995 | | 1996 | | 1997 | | MEAN SCORES | |
|---|---|---|---|---|---|---|---|---|---|---|
| EA | VA Tech | Creekmile | ICI[a] | IBI[b] | ICI[a] | IBI[b] | ICI[a] | IBI[b] | ICI[a] | IBI[b] |
| LC1a | LCS1 | 30.4 | -- | -- | 23 | -- | -- | -- | 23 | -- |
| LC2a | LCS2 | 26.3 | -- | --- | 43 | -- | --- | -- | 43 | -- |
| LC3a | LCS3 | 24.1 | -- | -- | 41 | -- | -- | -- | 41 | -- |
| LC4a | LCS4 | 21.3 | -- | -- | 39 | -- | -- | -- | 39 | -- |
| LC1 | Dexter | 17.3 | 34 | 37 | 40 | 43 | 32 | 44 | 35 | 41 |
| LC2 | LCS5 | 16.9 | N/A | 41 | 34 | 43 | 34 | 41 | 34 | 42 |
| LC3 | AbovePR | 15.6 | 20 | 42 | ** | 41 | -- | 37 | 20 | 40 |
| LC4 | BelowPR | 15.5 | 34 | 40 | 28 | 41 | -- | 43 | 31 | 41 |
| LC5 | LCS6 | 14.8 | 30 | 42 | 32 | 38 | 30 | 35 | 31 | 38 |
| LC6 | | 12.9 | 36 | 44 | 40 | 40 | 26 | 39 | 34 | 41 |
| LC7 | LCS7 | 10.3 | 40 | 38 | 38 | 39 | 22 | 39 | 33 | 39 |
| LC8 | LCS8 | 7.2 | 28 | 33 | 34 | 35 | ** | 38 | 31 | 35 |
| LC9 | LCS9 | 3.5 | (sand) | 33 | (sand) | 29 | 28 | 37 | 28 | 33 |
| LC10 | LCS10 | 1.8/1.4 | 32 | 25 | 18 | 31 | ** | 33 | 25 | 30 |
| Tributary Stations: Parker Run | | | | | | | | | | |
| PR1 | REF. | 2.9 | 20 | 46 | (sand) | 47 | 32 | 46 | 26 | 46 |
| PR2 | TS11 | 1.5 | 22 | 45 | (sand) | 31 | 24 | 39 | 23 | 38 |
| PR3 | LC-conf | 0.1 | 24 | 36 | 28 | 37 | 26 | 33 | 26 | 35 |
| Tributary: Malloons Creek | | | | | | | | | | |
| MC1 | TS12 | 0.1 | N/A | 44 | N/A | 40 | N/A | 36 | -- | 40 |
| Tributary: Little Leading Creek | | | | | | | | | | |
| LL1 | TS14 | 0.1 | N/A | 31 | N/A | 26 | N/A | N/A | -- | 28 |

N/A: no data available from this site

Sand: Hester Dendy lost due to excessive sedimentation of sand

** Low flow prevented sampling

--: Site not sampled

[a]: Western Allegheny Plateau Ecoregion (WAP) scores for ICI's are 36 for WWH and 46 for EWH

[b]: WAP scores for IBI's are 44 for WWH and 50 for EWH

able 51. Ecotoxicological ratings (ETR) of Leading Creek tributary stations based upon 23 physical, chemical, ecological and toxicological parameters.

| Tributary | Station | ETR | Ranking | Creek Mile (km) | Drainage Area (hectares) |
|---|---|---|---|---|---|
| TS1 | Headwaters | 118 | 10 | 51.0 | 124 |
| TS2 | Headwaters | 140 | 6 | 51.0 | 169 |
| TS3 | Five Mile Run | 124 | 8 | 42.5 | 1,126 |
| TS4 | Plowed Run | 156 | 3 | 41.0 | 969 |
| TS5 | Sisson Run | 141 | 5 | 38.5 | 1,446 |
| TS6 | Ogden Run | 173 | 1 | 35.3 | 1,894 |
| TS8A | Mud Fork Up | 121 | 9 | 32.7 | 11 |
| TS8B | Mud Fork Down | 121 | 9 | 30.0 | 21 |
| TS9 | Dexter Run | 152 | 4 | 29.3 | 1,897 |
| TS10 | Grass Run | 141 | 5 | 29.1 | 482 |
| TS11 | Parker Run | 140 | 6 | 27.2 | 1,477 |
| TS12 | Malloons Ck | 162 | 2 | 25.1 | 1,072 |
| TS13 | Lasher Run | 137 | 7 | 23.5 | 459 |
| TS14 | Little Leading Ck | 105 | 11 | 14.7 | 6,467 |
| TS15 | Titus Run | 77 | 12 | 13.8 | 693 |
| TS16 | Paulins Hill Run | 70 | 13 | 11.9 | 157 |
| TS17 | Thomas Fork | 64 | 14 | 10.3 | 7,963 |
| Federal Ck | reference | 173 | * | 2.4 | 37,545 |

*Reference site not ranked.

Table 50. Ecotoxicological ratings (ETR) of Leading Creek mainstem stations based upon 23 physical, chemical, ecological and toxicological parameters.

| Mainstem | Station | ETR | Ranking | Creek Mile (km) | Drainage Area (hectares) |
|---|---|---|---|---|---|
| LCS1 | Albany | 157 | 6 | 48.9 | 998 |
| LCS2 | Carpenter | 188 | 1 | 42.3 | 3,447 |
| LCS3 | Sisson | 168 | 3 | 38.8 | 4,829 |
| LCS4 | Dyesville | 175 | 3 | 34.3 | 8,609 |
| LCS5 | Dexter | 158 | 5 | 27.0 | 16,229 |
| LCS6 | Malloons | 138 | 7 | 23.8 | 18,453 |
| LCS7 | Corn Hollow | 159 | 4 | 16.6 | 20,918 |
| LCS8 | Twin Bridge | 121 | 8 | 11.6 | 29,243 |
| LCS9 | Iron Bridge | 118 | 9 | 5.6 | 30,328 |
| LCS10 | Middleport | 75 | 10 | 2.25 | 38,800 |