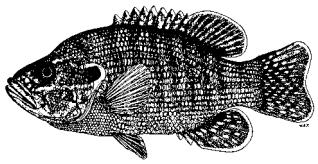
State of Ohio
Environmental Protection Agency

Division of Surface Water

Biological and Water Quality Study of Salt Lick Creek

Jackson County Landfill
Ohio



February 25, 2005

Bob Taft, Governor
Joseph P. Koncelik, Director

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Jackson County Landfill

2004

Jackson County, Ohio

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NOTICE TO USERS

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

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

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

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

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

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

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

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

Since the publication of the preceding guidance documents, the following new publications by the Ohio EPA have become available. These publications should also be consulted as they represent the latest information and analyses used by the Ohio EPA to implement the biological criteria.

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

Rankin, E. T. 1995. The use of habitat assessments in water resource management programs, pp. 181-208. in W. Davis and T. Simon (eds.). Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making. Lewis Publishers, Boca Raton, FL.

Yoder, C.O. and E.T. Rankin. 1995. Biological criteria program development and implementation in Ohio, pp. 109-144. in W. Davis and T. Simon (eds.). Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making. Lewis Publishers, Boca Raton, FL.

Yoder, C.O. and E.T. Rankin. 1995. Biological response signatures and the area of degradation value: new tools for interpreting multimetric data, pp. 263-286. in W. Davis and T. Simon (eds.). Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making. Lewis Publishers, Boca Raton, FL.

Yoder, C.O. 1995. Policy issues and management applications for biological criteria, pp. 327-344. in W. Davis and T. Simon (eds.). Biological Assessment and Criteria: Tools for Water Resource Planning and Decision Making. Lewis Publishers, Boca Raton, FL.

Yoder, C.O. and E.T. Rankin. 1995. The role of biological criteria in water quality monitoring, assessment, and regulation. Environmental Regulation in Ohio: How to Cope With the Regulatory Jungle. Inst. of Business Law, Santa Monica, CA. 54 pp.

These documents and this report may be obtained by writing to:

Ohio EPA, Division of Surface Water
Ecological Assessment Section
4675 Homer Ohio Lane
Groveport, Ohio 43125
(614) 836-8777

FOREWORD

What is a Biological and Water Quality Survey?
A biological and water quality survey, or "biosurvey", is an interdisciplinary monitoring effort coordinated on a waterbody specific or watershed scale. This effort may involve a relatively simple setting focusing on one or two small streams, one or two principal stressors, and a handful of sampling sites or a much more complex effort including entire drainage basins, multiple and overlapping stressors, and tens of sites. Each year Ohio EPA conducts biosurveys in 6-10 different study areas with an aggregate total of 350-400 sampling sites.

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

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

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,

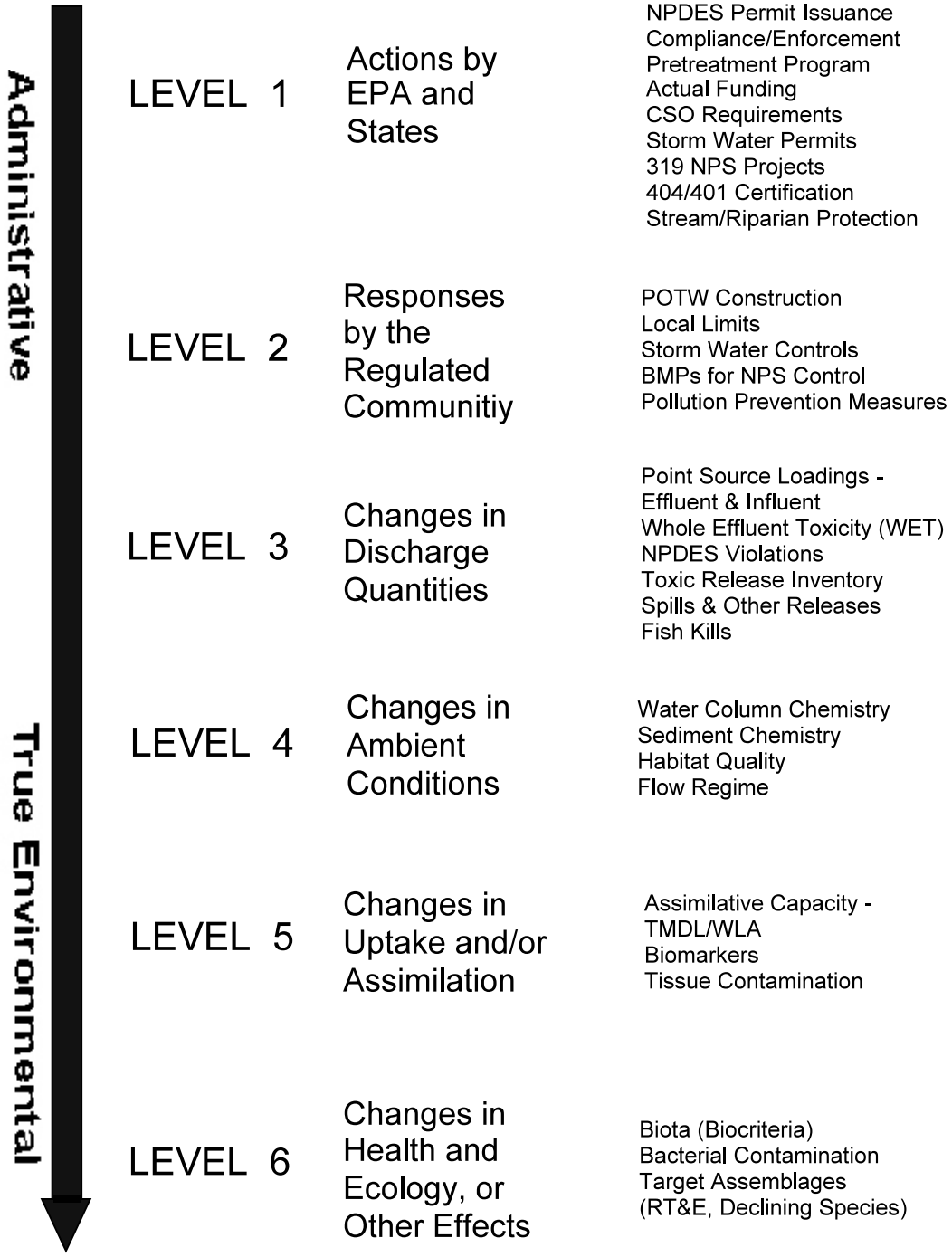

Figure 1. Hierarchy of administrative and environmental indicators which can be used for water quality management activities such as monitoring and assessment, reporting, and the evaluation of overall program effectiveness. This is patterned after a model developed by U.S. EPA (1995).

ecology, or other effects (ecological condition, pathogens). In this process the results of administrative activities (levels 1 and 2) can be linked to efforts to improve water quality (levels 3, 4, and 5) which should translate into the environmental "results" (level 6). Thus, the aggregate effect of billions of dollars spent on water pollution control since the early 1970s can now be determined with quantifiable measures of environmental condition.

Superimposed on this hierarchy is the concept of stressor, exposure, and response indicators. *Stressor* indicators generally include activities which have the potential to degrade the aquatic environment such as pollutant discharges (permitted and unpermitted), land use effects, and habitat modifications. *Exposure* indicators are those which measure the effects of stressors and can include whole effluent toxicity tests, tissue residues, and biomarkers, each of which provides evidence of biological exposure to a stressor or bioaccumulative agent. *Response* indicators are generally composite measures of the cumulative effects of stress and exposure and include the more direct measures of community and population response that are represented here by the biological indices which comprise Ohio's biological criteria. Other response indicators could include target assemblages, *i.e.,* rare, threatened, endangered, special status, and 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 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 Uses

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

The five different aquatic life uses currently defined in the Ohio WQS are described as follows:

1) *Warmwater Habitat (WWH)* - this use designation defines the "typical" warmwater assemblage of aquatic organisms for Ohio rivers and streams; *this use represents the principal restoration target for the majority of water resource management efforts in Ohio.*
2) *Exceptional Warmwater Habitat (EWH)* - this use designation is reserved for waters which support "unusual and exceptional" assemblages of aquatic organisms which are characterized by a high diversity of species, particularly those which are highly intolerant and/or rare, threatened, endangered, or special status (*i.e.,* declining species); *this designation represents a protection goal for water resource management efforts dealing with Ohio's best water resources.*
3) *Coldwater Habitat (CWH)* - this use is intended for waters which support assemblages of cold water organisms and/or those which are stocked with salmonids with the intent of providing a put-and-take fishery on a year round basis which is further sanctioned by the Ohio DNR, Division of Wildlife; this use should not be confused with the Seasonal Salmonid Habitat (SSH) use which applies to the Lake Erie tributaries which support periodic "runs" of salmonids during the spring, summer, and/or fall.
4) *Modified Warmwater Habitat (MWH)* - this use applies to streams and rivers which have been subjected to extensive, maintained, and essentially permanent hydromodifications such that the biocriteria for the WWH use are not attainable *and where the activities have been sanctioned and permitted 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.^{2} drainage area) and other water courses which have been irretrievably altered to the extent that no appreciable assemblage of aquatic life can be supported; such waterways generally include small streams in extensively urbanized areas, those which lie in watersheds with extensive drainage modifications, those which completely lack water on a recurring annual basis (*i.e.,* true ephemeral streams), or other irretrievably altered waterways.

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

Ohio Water Quality Standards: Non-Aquatic Life Uses

In addition to assessing the appropriateness and status of aquatic life uses, each biological and water quality survey also addresses non-aquatic life uses such as recreation, water supply, and human health concerns as appropriate. The recreation uses most applicable to rivers and streams are the Primary Contact Recreation (PCR) and Secondary Contact Recreation (SCR) uses. The criterion for designating the PCR use is simply having a water depth of at least one meter over an area of at least 100 square feet or where canoeing is a feasible activity. If a water body is too small and shallow to meet either criterion the SCR use applies. The attainment status of PCR and SCR is determined using bacterial indicators (*e.g.,* fecal coliforms, *E. coli)* and the criteria for each are specified in the Ohio WQS.

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

ACKNOWLEDGMENTS

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INTRODUCTION

The Jackson County Landfill operated from 1970 until 1987. During its operation it accepted both municipal and industrial wastes. The Goodyear Tire and Rubber Company notified U.S. EPA on June 4, 1984 that they had sent in excess of 5700 drums of waste to the landfill. The material sent by Goodyear included waste acetone (acetone and polyester resin mixture), waste paint mixture (cyclohexanone, dichloromethane, isobutyl alcohol, methyl ethyl ketone, toluene, and xylene) and waste styrene mixture (styrene and polyester resin). Although the landfill ceased accepting waste in 1987, it was never properly closed. Leachate seeps are present throughout the landfill and leachate was first documented as migrating into Little Salt Creek, now known as Salt Lick Creek, in 1984.

Specific objectives of this evaluation were to:

1) Establish the present biological condition in Salt Lick Creek in the vicinity of the Jackson County Landfill by evaluating fish and macroinvertebrate communities,

2) Evaluate surface water and sediment chemical quality in Salt Lick Creek, and

3) Determine the aquatic life use attainment status of Salt Lick Creek with regard to the Warmwater Habitat (WWH) aquatic life use designation codified in the Ohio Water Quality Standards.

SUMMARY

A total of 3.4 miles of Salt Lick Creek were assessed by the Ohio EPA in 2004 to evaluate the Jackson County Landfill. Based on the performance of the biological communities, 1.1 miles of Salt Lick Creek were in partial attainment and 2.3 miles were in full attainment of the Warmwater Habitat aquatic life use (Table 1). The partial attainment was caused by fair fish results and a fair macroinvertebrate community. The partial attainment of the biological community appears largely associated with past fish kills occurring in the upper reaches of Salt Lick Creek. Biological communities within the study segment of Salt Lick Creek have improved since 1986, when the last water quality survey was performed by Ohio EPA.

Sediment chemical quality were good within the study segment, and did not negatively contribute to the impaired biological conditions within Salt Lick Creek. Sediment chemical levels [except bis-2(ethylhexyl)phthalate] were below ecological screening values. Surface water results were below Ohio Water Quality Standards (WQS) criteria; however, moderately enriched conditions were noted based on elevated nitrate and phosphorus levels. Leachate associated with the Jackson County Landfill is not having a negative influence on the fish and macroinvertebrate communities of Salt Lick Creek.

Sampling during 2004 confirmed the appropriateness of the Warmwater Habitat aquatic life use designation for Salt Lick Creek within the study area. Presently, Salt Lick Creek is listed as Warmwater Habitat in the Ohio Water Quality Standards (WQS).

RECOMMENDATIONS

Status of Aquatic Life Uses
The aquatic life use designation of Warmwater Habitat (WWH) for Salt Lick Creek has been confirmed in a previous Ohio EPA biological and water quality study. This study reaffirmed the WWH use designation for Salt Lick Creek within the study area.

Status of Non-Aquatic Life Uses
This study verified that the Primary Contact Recreation use is appropriate for Salt Lick Creek within the study area.

Table 1. Attainment status of the aquatic life use for Salt Lick Creek based on biological sampling conducted during July and August, 2004.

RIVER MILE Fish/Invert.	IBI	MIwb	ICI	QHEI	Attainment Status	Sample Location
Ecoregion - *Western Allegheny Plateau (WAP)*						
Salt Lick Creek *- WWH Use Designation (Existing)*						
20.6/ 20.6	45	7.2*	36	62.5	PARTIAL	Background for Jackson Landfill
20.4/ 20.4	44	7.8*	30*	62.5	PARTIAL	Adj landfill
19.5/ 19.5	49	8.3[ns]	40	65.5	FULL	Adj. landfill
18.2/ 18.2	48	8.6	42	76.5	FULL	Rock Run Rd, dst. Landfill

Ecoregion Biocriteria: Western Allegheny Plateau (WAP)
(Ohio Administrative Code 3745-1-07, Table 7-15)

INDEX	WWH	EWH	MWH[a]
IBI-Wading	44	50	24
MIwb-Wading	8.4	9.4	6.2
ICI	36	46	22

[a] Modified Warmwater Habitat for channel modified areas.
* Significant departure from ecoregion biocriterion; poor and very poor results are underlined.
[ns] Nonsignificant departure from ecoregion biocriterion ($\leq$4 IBI and ICI units).

Table 2. Sampling locations in Salt Lick Creek, 2004. Type of sampling included fish community (F), macroinvertebrate community (M), sediment (S) and surface water (W).

Stream/ River Mile	Type of Sampling	Latitude	Longitude	Landmark
Salt Lick Creek				
20.6	F,M,S,W	39.0738	82.6674	Upstream Jackson Landfill, dst. Jackson WWTP
20.4	F,M,S,W	39.0742	82.6693	Adjacent Jackson Landfill
19.5	F,M,S,W	39.0829	82.6658	Adjacent Jackson Landfill
18.2	F,M,S,W	39.0944	82.6638	Downstream Jackson Landfill; Rock Run Road

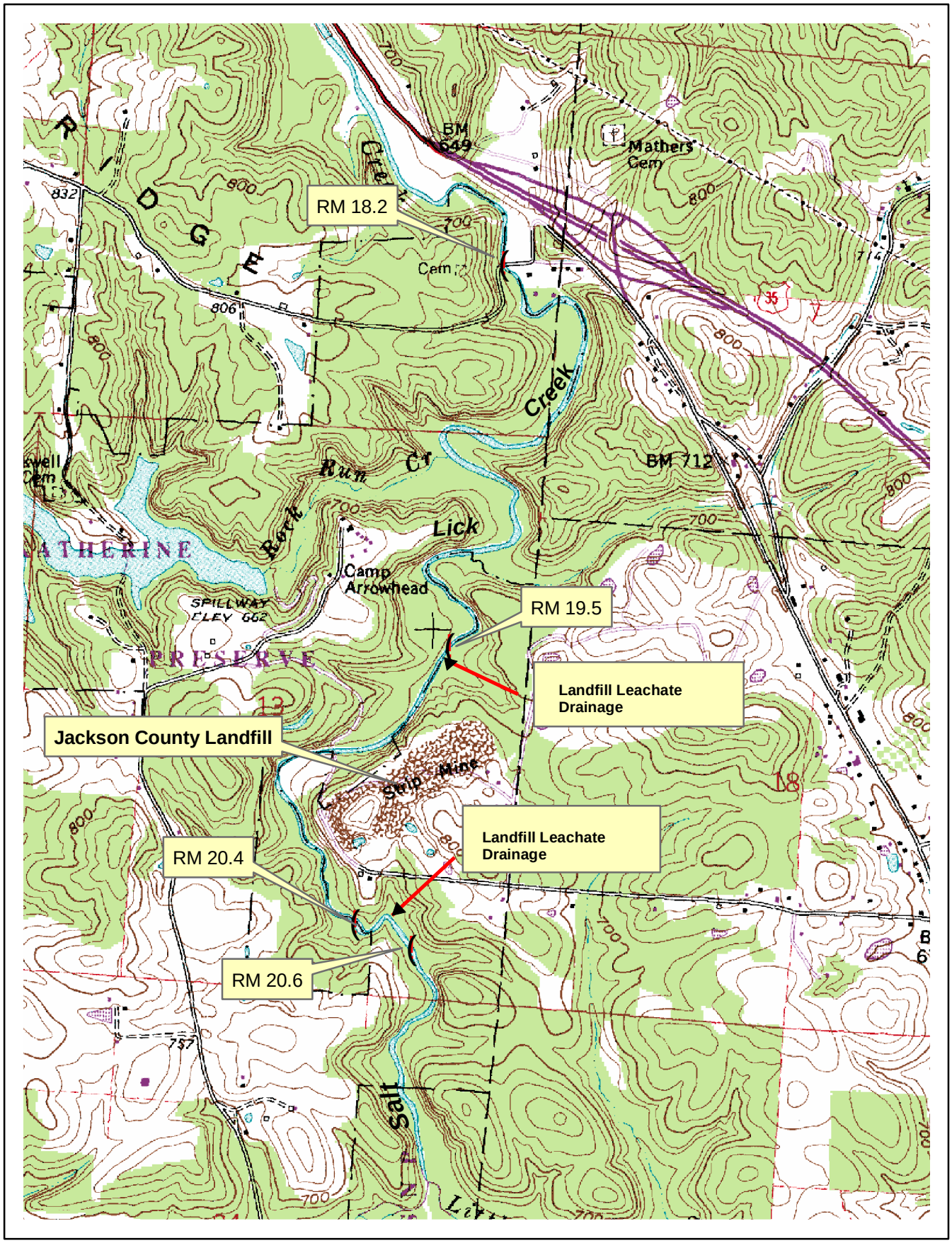

Figure 2. Stream sampling locations in Salt Lick Creek, 2004.

METHODS

All physical, chemical, 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 2003a) and Biological Criteria for the Protection of Aquatic Life, Volumes I-III (Ohio Environmental Protection Agency 1987a, 1987b, 1989a, 1989b), The Qualitative Habitat Evaluation Index (QHEI): Rationale, Methods, and Application (Rankin 1989, 1995) for aquatic habitat assessment, and the Ohio EPA Sediment Sampling Guide and Methodologies (Ohio EPA 2001). Sampling locations are listed in Table 2.

Determining Use Attainment Status

Use attainment status is a term 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). Assessing aquatic use attainment status involves a primary reliance on the Ohio EPA biological criteria (OAC 3745-1-07; Table 7-15). 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. 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 biocriteria. Partial attainment means that one or more of the applicable indices fails to meet the biocriteria. Non-attainment means that none of the applicable indices meet the biocriteria or one of the organism groups reflects poor or very poor performance. An aquatic life use attainment table (Table 1) is constructed based on the sampling results and is arranged from upstream to downstream and includes the 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 a sampling location description.

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 20 to less than 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 cannot support a warmwater assemblage consistent with the WWH biological criteria. Scores greater

than 75 frequently typify habitat conditions which have the ability to support exceptional warmwater faunas.

Sediment and Surface Water Assessment

Fine grain sediment samples were collected in the upper 4 inches of bottom material at each Salt Lick Creek location using decontaminated stainless steel scoops. Decontamination of sediment sampling equipment followed the procedures outlined in the Ohio EPA sediment sampling guidance manual (Ohio EPA 2001). Sediment composite samples were homogenized in stainless steel pans (material for VOC analysis was not homogenized), transferred into glass jars with teflon lined lids, placed on ice (to maintain 4°C) in a cooler, and shipped to an Ohio EPA contract lab. Sediment data is reported on a dry weight basis. Surface water samples were collected directly into appropriate containers, preserved and delivered to an Ohio EPA contract lab. Surface water samples were evaluated using comparisons to Ohio Water Quality Standards criteria, reference conditions, or published literature. Sediment evaluations were conducted using guidelines established in MacDonald *et al.* (2000), USEPA Region 5 Ecological ScreeningLevels - ESLs (2003), and Ohio EPA sediment reference values - SRVs (2003b).

Macroinvertebrate Community Assessment

Macroinvertebrates were collected from artificial substrates and from the natural habitats at the four Salt Lick Creek sites. The artificial substrate collection provided quantitative data and consisted of a composite sample of five modified Hester-Dendy multiple-plate samplers colonized for seven weeks. At the time of the artificial substrate collection, a qualitative multihabitat composite sample was also collected. This sampling effort consisted of an inventory of all observed macroinvertebrate taxa from the natural habitats at each site with no attempt to quantify populations other than notations on the predominance of specific taxa or taxa groups within major macrohabitat types (e.g., riffle, run, pool, margin). Detailed discussion of macroinvertebrate field and laboratory procedures is contained in Biological Criteria for the Protection of Aquatic Life: Volume III, Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities (Ohio EPA 1989a).

Fish Community Assessment

Fish were sampled twice at each site using pulsed DC electrofishing methods, with sampling distances of 200 meters at each site in Salt Lick Creek. Fish were processed in the field, and included identifying each individual to species, counting, weighing, and recording any external abnormalities. Discussion of the fish community assessment methodology used in this report is contained in Biological Criteria for the Protection of Aquatic Life: Volume III, Standardized Biological Field Sampling and Laboratory Methods for Assessing Fish and Macroinvertebrate Communities (Ohio EPA 1989a).

Causal Associations

Using the results, conclusions, and recommendations of this report requires an understanding of the methodology used to determine the use attainment status and assigning probable causes and sources of impairment. The identification of impairment in rivers and streams is straightforward - the numerical biological criteria are used to judge aquatic life use attainment and impairment (partial and non-attainment). The rationale for using the biological criteria, within a weight of

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

RESULTS

Surface Water Quality

Chemical analyses were conducted on surface water samples collected on August 11 and September 29, 2004 from four locations in Salt Lick Creek (Table 3, Appendix Tables 1 and 2). Surface water samples were analyzed for nitrate-nitrite, ammonia-N, total phosphorus, pH, total analyte list inorganics, cyanide, pesticides, PCBs, volatile organic compounds, and semivolatile organic compounds. Parameters which were in exceedence of Ohio WQS criteria are reported in Table 3.

For the four Salt Lick Creek locations, there were no exceedences of the Ohio WQS aquatic life or human health nondrinking (fish consumption) criteria. Slightly elevated bromodichloromethane and dibromochloromethane concentrations were documented at each sampling location; measurements were below human health nondrinking (fish consumption) criteria (aquatic life criteria do not exist for these compounds). Concentrations of nearly all of the organic parameters tested (semivolatiles, volatiles, PCBs, and pesticides) were reported as not detected. Total phosphorus measurements at three of the sampling locations (RMs 20.6, 20.4, and 19.5) were elevated in the August sample, with levels above the phosphorus surface water guideline of 1.0 mg/l. Nitrate-nitrite concentrations from all samples collected were elevated, with reported values above ecoregional reference conditions (greater than 90th percentile) as determined in Ohio EPA 1999 (Association Between Nutrients, Habitat, and the Aquatic Biota in Ohio Rivers and Streams). Ammonia-N levels were below Ohio WQS criteria; however, values were above regional reference conditions.

Sediment Chemistry

Sediment samples were collected at four locations in Salt Lick Creek by the Ohio EPA on September 29, 2004. All stream sampling locations are indicated by river mile in Figure 2. Samples were analyzed for volatile and semivolatile organic compounds, pesticides, PCBs, total analyte list inorganics, percent solids, cyanide, and diesel and gasoline range organics. Specific chemical parameters tested and results are listed in Appendix Table 3.

Sediment data were evaluated using guidelines established in *Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems* (MacDonald *et.al.* 2000), USEPA Region 5, RCRA Appendix IX compounds - Ecological Screening Levels (ESLs) (USEPA 2003), and sediment reference values (SRVs) for metals (Ohio EPA 2003b). The consensus-based sediment guidelines define two levels of ecotoxic effects. A *Threshold Effect Concentration* (TEC) is a level of sediment chemical quality below which harmful effects are unlikely to be observed. A *Probable Effect Concentration* (PEC) indicates a level above which harmful effects are likely to be observed. Ecological screening levels (ESLs) are initial screening levels used by USEPA to evaluate RCRA site constituents. Sediment reference values were determined from sediment sites co-located at Ohio EPA biological reference locations in streams and rivers.

Sediment collected in Salt Lick Creek at all four sampling locations was not contaminated. Aside from one silver measurement (RM 19.5) slightly above the statewide reference value of 0.43 mg/kg,

all sediment inorganic chemical results were below Ohio SRVs. Results of semivolatile organic compounds measurements documented nearly all parameters below detectable levels. Three polycyclic aromatic compounds (PAHs) were measured at detectable levels, but all three were below ecological screening levels (ESL or TEC). Only bis(2-ethylhexyl)phthalate was detected above ecological screening levels (at all four locations); however, all values were estimated concentrations and phthalates are typical lab contaminants. Organochlorinated pesticides and PCBs, tested in each sediment sample, were reported as not detected.

Physical Habitat For Aquatic Life

Physical habitat was evaluated in Salt Lick Creek at each fish sampling location. Qualitative Habitat Evaluation Index (QHEI) scores are detailed in Table 5.

The three upper sampling locations in Salt Lick Creek (RMs 20.6, 20.4 and 19.5) were very similar in habitat qualities. A wide forested riparian corridor and flood plain occurred along each sampling location. Similar habitat features included bottom substrates predominated by sand and detritus, moderate siltation, extensive embeddedness, instream cover comprised of moderate amounts of logs and woody debris, a natural stream channel, fair quality riffles comprised of unstable sands and pea gravel, and sparse amounts of cobbles or boulders. QHEI scores were similar between these three sites, ranging from 62.5 to 65.5, adequate for supporting WWH biological communities.

Habitat conditions improved at the most downstream sampling location located at RM 18.2. An improvement in bottom substrates occurred compared with upstream stations. Cobbles and boulders were the predominant substrates, along with lesser amounts of sand, gravel, and some exposed sandstone bedrock. Less embeddedness of the stream bottom was evident, along with greater overall habitat diversity. The QHEI score for Salt Lick Creek at RM 18.2 was 76.5. This score is indicative of excellent stream habitat and shows the potential to support WWH and EWH biological communities.

The entire survey segment of Salt Lick Creek was bordered on one side by Lake Katherine State Nature Preserve.

Fish Community Assessment

Fish communities were assessed at four locations in Salt Lick Creek (Figure 2, Table 6, Appendix Tables 4 and 5). Sampling locations were selected to assess contributions of contaminants from the Jackson County Landfill.

Fish communities ranged from fair to very good in Salt Lick Creek. IBI scores were in the good to very good range, with scores of 44 - 49. These IBI scores achieved the ecoregional biocriterion for Warmwater Habitat (WWH) streams. MIwb scores were in the fair to good range, with the two most upstream sites (RMs 20.6 and 20.4) not attaining the applicable MIwb biocriterion. The two most downstream sampling locations (RMs 19.5 and 18.2) achieved the MIwb biocriterion. The variability of sample results between the two fish sampling passes at each site could be related to past fish kills within this area of stream. Large sized pollution sensitive fish (redhorse suckers, bass) were not collected at any of the sampling locations, suggesting that full recovery has not occurred. With reduced fish populations associated with past fish kills, a higher degree of sample collection

variability can occur between sampling passes. The lower two sites in Salt Lick Creek (RMs 19.5 and 18.2) fully attained the fish biocriteria standards. There were no indications that impairment in the fish community was associated with the Jackson County Landfill leachate seeps, or that past fish kills were caused by landfill leachate outbreaks.

Past Ohio EPA fish collections in Salt Lick Creek included samples collected at RM 18.2 during 1986, where the IBI and MIwb scores were 41 and 8.0, respectively. The 2004 results from RM 18.2 (IBI=48, MIwb=8.6) revealed an improvement in the fish community compared with 1986, although the results for both sampling years fully attained the fish biocriteria.

Macroinvertebrate Community Assessment

The macroinvertebrate communities at four Salt Lick Creek sites were sampled in 2004 using qualitative (multi-habitat composite) and quantitative (artificial substrate) sampling protocols. Results are summarized in Table 7. The ICI metrics with the associated scores for the Western Allegheny Plateau ecoregion and the raw data are attached as Appendix Tables 6 and 7 .

The Salt Lick Creek sampling locations at RMs 20.6, 19.5, and 18.2 attained the WWH biocriterion for the macroinvertebrate community with ICI scores of 36, 40, and 42. The narrative evaluation of these sites ranged from good to very good. The site at RM 20.4, located downstream from the most upstream landfill leachate discharge, did not attain the WWH biocriterion. The macroinvertebrate community evaluation was fair with an ICI score of 30. The decline in the macroinvertebrate community at this location, relative to upstream and downstream locations, did not appear to be related to toxic impacts from the landfill leachate. The percentage of tolerant organisms at all locations was similar. The sample from the upstream site at RM 20.6 supported a macroinvertebrate fauna similar to the adjacent site at RM 20.4. Small differences in the total number of taxa, number of dipteran taxa and an increased percentage of other diptera and non insect taxa resulted in the lower ICI score for the RM 20.4 site (Appendix Table 6). There did not appear to be impacts from the Jackson County landfill upon the macroinvertebrate community in Salt Lick Creek.

In 1986, Ohio EPA conducted a survey of Salt Lick Creek. A sampling location at RM 18.1 had an ICI score of 40, comparable to the 42 score from 2004 at RM 18.2. Sampling locations at RMs 23.7, 23.0, 22.6, 22.1, and 20.0 from the 1986 survey all had macroinvertebrate communities evaluated as fair, with ICI scores ranging from 14-26.

Table 3. Exceedences of Ohio Water Quality Standards criteria (OAC 3745-1) for chemical/physical parameters measured in the Salt Lick Creek study area, 2004.

River Mile	Parameter (value)
Salt Lick Creek	
20.6	T-Phosphorus* (1.69)
20.4	T-Phosphorus* (1.73)
19.5	T-Phosphorus* (1.13)
18.2	None

* Exceedence of phosphorus surface water guideline (1 mg/l) established to prevent nuisance growths of algae, weeds, and slimes that result in a violation of OAC 3745-1-04(E)(waters shall be free from nutrients entering the waters as a result of human activity in concentrations that create nuisance growths of aquatic weeds and algae).

Table 4. Chemical parameters measured above screening levels in sediment samples collected by Ohio EPA from Salt Lick Creek, September, 2004. Contamination levels were determined for parameters using either consensus-based sediment quality guidelines (MacDonald et.al. 2000), ecological screening levels for RCRA appendix IX constituents (USEPA 2003), or sediment reference values listed in the Ohio EPA Ecological Risk Assessment Guidance (2003b).

Parameter	Salt Lick Creek RM 20.6	Salt Lick Creek RM 20.4	Salt Lick Creek RM 20.4	Salt Lick Creek RM 19.5	Salt Lick Creek RM 18.2	Reference Levels SRVs
Silver (mg/kg)	<0.288	<0.246	<0.33	0.455J	<0.363	0.43
Potassium (mg/kg)	271	319	346	716	66,700	14,000
bis(2-ethylhexyl) phthalate (ug/kg)	184J [E]	210J [E]	<115	280J [E]	229J [E]	NA

J - The analyte was positively identified, but the quantitation was below the reporting limit (RL).
T - Above Threshold Effect Concentration (below which harmful effects are unlikely to occur; MacDonald *et.al.* 2000).
P - Above Probable Effect Concentration (above which harmful effects are likely to occur; MacDonald *et.al.* 2000).
E - Above Ecological Screening Level (USEPA 2003).

Table 5. Qualitative Habitat Evaluation Index (QHEI) scores, and matrix of modified and warmwater attributes for sites in Salt Lick Creek, 2004.

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**
(02-610) Salt Lick Creek																																		
Year: 2004																																		
20.6	**62.5**	3.51	■			■	■	■			■		5						0		•				•		•		•	•	•		5	0.17	1.00
20.4	**62.5**	3.51	■			■	■	■			■		5						0		•				•		•		•	•	•		5	0.17	1.00
19.5	**65.5**	3.51	■			■	■	■			■		5						0		•				•		•		•	•	•		5	0.17	1.00
18.2	**76.5**	3.51	■	■		■	■	■	■	■	■	■	9						0		•									•			2	0.10	0.30

Table 6. Fish community summaries based on pulsed DC electrofishing sampling conducted by Ohio EPA in Salt Lick Creek from August and September, 2004. Relative numbers and weight for the Salt Lick Creek sites are per 0.3 km.

Stream/ River Mile	Mean Number of Species	Total Number Species	Mean Relative Number	Mean Relative Weight (kg)	QHEI	Mean Modified Index of Well-Being	Mean Index of Biotic Integrity	Narrative Evaluation
Salt Lick Creek (2004)								
20.6	20.5	25	208	5.97	62.5	7.2*	45	Fair/Good
20.4	23.0	27	226	6.47	62.5	7.8*	44	Fair/Good
19.5	26.0	31	259	3.48	65.5	8.3[ns]	49	Marginally Good/ Very Good
18.2	25.0	32	411	9.82	76.5	8.6	48	Good/ Very Good

Ecoregion Biocriteria: Western Allegheny Plateau (WAP)
(Ohio Administrative Code 3745-1-07, Table 7-15)

INDEX	WWH	EWH	MWH[a]
IBI-Wading	44	50	24
MIwb - Wading	8.4	9.4	6.2

[a] Modified Warmwater Habitat for channel modified areas.
* Significant departure from ecoregion biocriterion; poor and very poor results are underlined.
[ns] Nonsignificant departure from ecoregion biocriterion (≤4 IBI units, ≤0.5 MIwb units).

Table 7. Summary of macroinvertebrate data collected from artificial substrates (quantitative sampling) and natural substrates (qualitative sampling) in Salt Lick Creek, 2004.

River Mile	Density Number/ft^2	Total Taxa	Quantitative Taxa	Qualitative Taxa	Qualitative EPT[a]	ICI	Evaluation
				WWH Use Designation			
Salt Lick Creek							
20.6	461	54	38	29	5	36	Good
20.4	331	55	31	39	6	30*	Fair
19.5	294	68	48	30	8	40	Good
18.2	352	55	42	22	5	42	Very Good

Ecoregion Biocriteria: Western Allegheny Plateau (WAP)
(Ohio Administrative Code 3745-1-07, Table 7-15)

INDEX	WWH	EWH	MWH[b]
ICI	36	46	22

[a] EPT= total Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) taxa richness, a measure of pollution sensitive organisms.
[b] Modified Warmwater Habitat for channel modified areas.
* Significant departure from ecoregional biocriterion; poor and very poor results are underlined.

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APPENDICES

Appendix Table 1. Results of chemical surface water sampling conducted by Ohio EPA in Salt Lick Creek on August 11, 2004. Less than values were reported by the lab as not detetected at or above the method detection limit.

Stream	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**
River Mile	**20.6**	**20.4**	**20.4**	**19.5**	**18.2**
Date Sampled	08/11/04	08/11/04	08/11/04	08/11/04	08/11/04
Time Sampled	11:20 AM	11:00 AM	11:00 AM	12:45 PM	02:00 PM
			Duplicate		
Nitrite	0.0348	0.0351	0.0362	0.0376	0.0124
Ammonia-N	0.331	0.319	0.354	0.34	0.264
Nitrate-Nitrite, N	8.02	7.81	7.32	6	0.763
Phosphorus-T	1.69	1.76	1.7	1.13	0.553
Cyanide-T	<0.005	<0.005	<0.005	<0.005	<0.005
TAL Metals (ug/l)					
Mercury	<0.1	<0.1	<0.1	<0.1	<0.1
Aluminum	252	270	274	171	272
Silver	<5	<5	<5	<5	<5
Arsenic	<2	<2	<2	2.28J	2.4J
Barium	46.8	47.6	47.7	42	39.5
Beryllium	<0.25	<0.25	<0.25	<0.25	<0.25
Calcium	28,100	28,700	28,500	28,100	27,700
Cadmium	<2.5	<2.5	<2.5	<2.5	<2.5
Cobalt	<2.5	<2.5	<2.5	<2.5	<2.5
Chromium	<2.5	<2.5	<2.5	<2.5	<2.5
Copper	<5	<5	<5	<5	<5
Iron	733	760	760	592	685
Potassium	17,000	17,500	17,300	15,300	13,500
Magnesium	8,180	8,360	8,330	8,420	8,430
Manganese	288	291	291	304	286
Sodium	112,000	114,000	113,000	97,600	85,200
Nickel	<5	<5	<5	<5	<5
Lead	<2.5	<2.5	<2.5	<2.5	<2.5
Vanadium	<5	<5	<5	<5	<5
Zinc	23.2	23.7	23.2	12.5J	11.2J
Antimony	0.51J	0.7J	0.68J	0.572J	0.513J
Selenium	<1.5	<1.5	<1.5	<1.5	<1.5
Thallium	<0.1	0.2J	<0.1	<0.1	<0.1
Volatile Organic Analytes (ug/l)					
Acetone	<2.5	<2.5	<2.5	<2.5	<2.5
Benzene	<0.125	<0.125	<0.125	<0.125	<0.125
Bromobenzene	<0.125	<0.125	<0.125	<0.125	<0.125
Bromochloromethane	<0.20	<0.20	<0.20	<0.20	<0.20
Bromodichloromethane	3.47	3.33	3.4	1.13	0.363J
Bromoform	0.609J	<0.54	0.566J	<0.54	<0.54
Bromomethane	<0.5	<0.5	<0.5	<0.5	<0.5
2-Butanone	<2.5	<2.5	<2.5	<2.5	<2.5
n-Butylbenzene	<0.25	<0.25	<0.25	<0.25	<0.25
sec-Butylbenzene	<0.25	<0.25	<0.25	<0.25	<0.25

Appendix Table 1. Continued.

Stream	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**
River Mile	**20.6**	**20.4**	**20.4**	**19.5**	**18.2**
Date Sampled	08/11/04	08/11/04	08/11/04	08/11/04	08/11/04
Time Sampled	11:20 AM	11:00 AM	11:00 AM	12:45 PM	02:00 PM
Volatile Organic Analytes (ug/l)			Duplicate		
tert-Butylbenzene	<0.25	<0.25	<0.25	<0.25	<0.25
Carbon disulfide	<0.5	<0.5	<0.5	<0.5	<0.5
Carbon tetrachloride	<0.25	<0.25	<0.25	<0.25	<0.25
Chlorobenzene	<0.125	<0.125	<0.125	<0.125	<0.125
Chlorodibromomethane	2.68	2.75	2.65	0.895J	0.274J
Chloroethane	<0.5	<0.5	<0.5	<0.5	<0.5
2-Chloroethyl vinyl ether	<2.0	<2.0	<2.0	<2.0	<2.0
Chloroform	3.5	3.31	3.39	1.3	0.513J
1,2-Dichlorobenzene	<0.125	<0.125	<0.125	<0.125	<0.125
1,3-Dichlorobenzene	<0.25	<0.25	<0.25	<0.25	<0.25
1,4-Dichlorobenzene	<0.125	<0.125	<0.125	<0.125	<0.125
Dichlorodifluoromethane	<0.25	<0.25	<0.25	<0.25	<0.25
1,1-Dichloroethane	<0.125	<0.125	<0.125	<0.125	<0.125
1,2-Dichloroethane	<0.25	<0.25	<0.25	<0.25	<0.25
1,1-Dichloroethene	<0.5	<0.5	<0.5	<0.5	<0.5
cis-1,2-Dichloroethene	<0.25	<0.25	<0.25	<0.25	<0.25
trans-1,2-Dichloroethene	<0.25	<0.25	<0.25	<0.25	<0.25
1,2-Dichloropropane	<0.125	<0.125	<0.125	<0.125	<0.125
1,3-Dichloropropane	<0.20	<0.20	<0.20	<0.20	<0.20
2,2-Dichloropropane	<0.25	<0.25	<0.25	<0.25	<0.25
cis-1,3-Dichloropropene	<0.25	<0.25	<0.25	<0.25	<0.25
trans-1,3-Dichloropropene	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloropropene	<0.25	<0.25	<0.25	<0.25	<0.25
Ethylbenzene	<0.25	<0.25	<0.25	<0.25	<0.25
2-Hexanone	<2.5	<2.5	<2.5	<2.5	<2.5
Hexachlorobutadiene	<0.25	<0.25	<0.25	<0.25	<0.25
Isopropylbenzene	<0.25	<0.25	<0.25	<0.25	<0.25
p-Isopropyltoluene	<0.25	<0.25	<0.25	<0.25	<0.25
4-Methyl-2-pentanone	<2.5	<2.5	<2.5	<2.5	<2.5
Methylene chloride	<0.25	<0.25	<0.25	<0.25	<0.25
Naphthalene	<0.20	<0.20	<0.20	<0.20	<0.20
n-Propylbenzene	<0.125	<0.125	<0.125	<0.125	<0.125
Styrene	<0.125	<0.125	<0.125	<0.125	<0.125
1,1,1,2-Tetrachloroethane	<0.25	<0.25	<0.25	<0.25	<0.25
1,1,2,2-Tetrachloroethane	<0.125	<0.125	<0.125	<0.125	<0.125
Tetrachloroethene	<0.25	<0.25	<0.25	<0.25	<0.25
Toluene	<0.25	<0.25	<0.25	<0.25	<0.25
1,2,3-Trichlorobenzene	<0.125	<0.125	<0.125	<0.125	<0.125
1,2,4-Trichlorobenzene	<0.20	<0.20	<0.20	<0.20	<0.20
1,1,1-Trichloroethane	<0.25	<0.25	<0.25	<0.25	<0.25
1,1,2-Trichloroethane	<0.25	<0.25	<0.25	<0.25	<0.25
Trichloroethene	<0.25	<0.25	<0.25	<0.25	<0.25
Trichlorofluoromethane	<0.25	<0.25	<0.25	<0.25	<0.25
1,2,3-Trichloropropane	<0.75	<0.75	<0.75	<0.75	<0.75
1,2,4-Trimethylbenzene	<0.25	<0.25	<0.25	<0.25	<0.25
1,3,5-Trimethylbenzene	<0.25	<0.25	<0.25	<0.25	<0.25

Appendix Table 1. Continued.

Stream	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**
River Mile	**20.6**	**20.4**	**20.4**	**19.5**	**18.2**
Date Sampled	08/11/04	08/11/04	08/11/04	08/11/04	08/11/04
Time Sampled	11:20 AM	11:00 AM	11:00 AM	12:45 PM	02:00 PM
Volatile Organic Analytes (ug/l)			Duplicate		
Vinyl acetate	<2.5	<2.5	<2.5	<2.5	<2.5
Vinyl chloride	<0.25	<0.25	<0.25	<0.25	<0.25
o-Xylene	<0.25	<0.25	<0.25	<0.25	<0.25
m-,p-Xylene	<0.5	<0.5	<0.5	<0.5	<0.5
Semi-volatile Organic Analytes (ug/l)					
Phenol	<2.5	<2.5	<2.5	<2.5	<2.5
bis-(2-Chloroethyl) ether	<2.5	<2.5	<2.5	<2.5	<2.5
2-Chlorophenol	<2.5	<2.5	<2.5	<2.5	<2.5
1,3-Dichlorobenzene	<2.5	<2.5	<2.5	<2.5	<2.5
1,4-Dichlorobenzene	<2.5	<2.5	<2.5	<2.5	<2.5
Benzyl alcohol	<2.5	<2.5	<2.5	<2.5	<2.5
1,2-Dichlorobenzene	<2.5	<2.5	<2.5	<2.5	<2.5
2-Methylphenol	<2.5	<2.5	<2.5	<2.5	<2.5
3-,4-Methylphenol	<2.5	<2.5	<2.5	<2.5	<2.5
bis(2-Chloroisopropyl) ether	<2.5	<2.5	<2.5	<2.5	<2.5
N-Nitroso-di-n-propylamine	<2.5	<2.5	<2.5	<2.5	<2.5
Hexachloroethane	<2.5	<2.5	<2.5	<2.5	<2.5
Nitrobenzene	<2.5	<2.5	<2.5	<2.5	<2.5
Isophorone	<2.5	<2.5	<2.5	<2.5	<2.5
2-Nitrophenol	<2.5	<2.5	<2.5	<2.5	<2.5
2,4-Dimethylphenol	<2.5	<2.5	<2.5	<2.5	<2.5
Benzoic acid	<12.5	<12.5	<12.5	<12.5	<12.5
bis(2-Chloroethoxy)methane	<2.5	<2.5	<2.5	<2.5	<2.5
2,4-Dichlorophenol	<2.5	<2.5	<2.5	<2.5	<2.5
1,2,4-Trichlorobenzene	<2.5	<2.5	<2.5	<2.5	<2.5
Naphthalene	<2.5	<2.5	<2.5	<2.5	<2.5
4-Chloroaniline	<2.5	<2.5	<2.5	<2.5	<2.5
Hexachlorobutadiene	<2.5	<2.5	<2.5	<2.5	<2.5
4-Chloro-3-methylphenol	<2.5	<2.5	<2.5	<2.5	<2.5
2-Methylnaphthalene	<2.5	<2.5	<2.5	<2.5	<2.5
Hexachlorocyclopentadiene	<2.5	<2.5	<2.5	<2.5	<2.5
2,4,6-Trichlorophenol	<2.5	<2.5	<2.5	<2.5	<2.5
2,4,5-Trichlorophenol	<2.5	<2.5	<2.5	<2.5	<2.5
2-Chloronaphthalene	<2.5	<2.5	<2.5	<2.5	<2.5
2-Nitroaniline	<12.5	<12.5	<12.5	<12.5	<12.5
Dimethylphthalate	<2.5	<2.5	<2.5	<2.5	<2.5
Acenaphthylene	<2.5	<2.5	<2.5	<2.5	<2.5
2,6-Dinitrotoluene	<2.5	<2.5	<2.5	<2.5	<2.5
3-Nitroaniline	<12.5	<12.5	<12.5	<12.5	<12.5
Acenaphthene	<2.5	<2.5	<2.5	<2.5	<2.5
2,4-Dinitrophenol	<12.5	<12.5	<12.5	<12.5	<12.5
4-Nitrophenol	<12.5	<12.5	<12.5	<12.5	<12.5
Dibenzofuran	<2.5	<2.5	<2.5	<2.5	<2.5

Appendix Table 1. Continued.

Stream	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**
River Mile	**20.6**	**20.4**	**20.4**	**19.5**	**18.2**
Date Sampled	08/11/04	08/11/04	08/11/04	08/11/04	08/11/04
Time Sampled	11:20 AM	11:00 AM	11:00 AM	12:45 PM	02:00 PM
Semi-volatile Organic Analytes (ug/l)			Duplicate		
2,4-Dinitrotoluene	<2.5	<2.5	<2.5	<2.5	<2.5
Diethylphthalate	<2.5	<2.5	<2.5	<2.5	<2.5
4-Chlorophenyl-phenyl ether	<2.5	<2.5	<2.5	<2.5	<2.5
Fluorene	<2.5	<2.5	<2.5	<2.5	<2.5
4-Nitroaniline	<12.5	<12.5	<12.5	<12.5	<12.5
4,6-Dinitro-2-methylphenol	<12.5	<12.5	<12.5	<12.5	<12.5
N-Nitrosodiphenylamine	<2.5	<2.5	<2.5	<2.5	<2.5
4-Bromophenyl-phenylether	<2.5	<2.5	<2.5	<2.5	<2.5
Hexachlorobenzene	<2.5	<2.5	<2.5	<2.5	<2.5
Pentachlorophenol	<12.5	<12.5	<12.5	<12.5	<12.5
Phenanthrene	<2.5	<2.5	<2.5	<2.5	<2.5
Anthracene	<2.5	<2.5	<2.5	<2.5	<2.5
Di-N-butylphthalate	<2.5	<2.5	<2.5	<2.5	<2.5
Fluoranthene	<2.5	<2.5	<2.5	<2.5	<2.5
Pyrene	<2.5	<2.5	<2.5	<2.5	<2.5
Butylbenzylphthalate	<2.5	<2.5	<2.5	<2.5	<2.5
3,3'-Dichlorobenzidine	<2.5	<2.5	<2.5	<2.5	<2.5
Benzo(a)anthracene	<2.5	<2.5	<2.5	<2.5	<2.5
Chrysene	<2.5	<2.5	<2.5	<2.5	<2.5
bis(2-Ethylhexyl) phthalate	<2.5	<2.5	<2.5	<2.5	<2.5
Di-n-octylphthalate	<2.5	<2.5	<2.5	<2.5	<2.5
Benzo(b)fluoranthene	<2.5	<2.5	<2.5	<2.5	<2.5
Benzo(k)fluoranthene	<2.5	<2.5	<2.5	<2.5	<2.5
Benzo(a)pyrene	<2.5	<2.5	<2.5	<2.5	<2.5
Indeno(1,2,3-cd)pyrene	<2.5	<2.5	<2.5	<2.5	<2.5
Dibenzo(a,h)anthracene	<2.5	<2.5	<2.5	<2.5	<2.5
Benzo(g,h,i)perylene	<2.5	<2.5	<2.5	<2.5	<2.5
PCBs (ug/l)					
Aroclor 1016	<0.25	<0.25	<0.25	<0.25	<0.25
Aroclor 1221	<0.25	<0.25	<0.25	<0.25	<0.25
Aroclor 1232	<0.25	<0.25	<0.25	<0.25	<0.25
Aroclor 1242	<0.25	<0.25	<0.25	<0.25	<0.25
Aroclor 1248	<0.25	<0.25	<0.25	<0.25	<0.25
Aroclor 1254	<0.25	<0.25	<0.25	<0.25	<0.25
Aroclor 1260	<0.25	<0.25	<0.25	<0.25	<0.25
Pesticides (ug/l)					
4,4'-DDD	<0.025	<0.025	<0.025	<0.025	<0.025
4,4'-DDE	<0.025	<0.025	<0.025	<0.025	<0.025
4,4'-DDT	<0.025	<0.025	<0.025	<0.025	<0.025
Aldrin	<0.01	<0.01	<0.01	<0.01	<0.01
alpha-BHC	<0.01	<0.01	<0.01	<0.01	<0.01

Appendix Table 1. Continued.

Stream	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**
River Mile	**20.6**	**20.4**	**20.4**	**19.5**	**18.2**
Date Sampled	08/11/04	08/11/04	08/11/04	08/11/04	08/11/04
Time Sampled	11:20 AM	11:00 AM	11:00 AM	12:45 PM	02:00 PM
Pesticides (ug/l)			Duplicate		
beta-BHC	<0.01	<0.01	<0.01	<0.01	<0.01
delta-BHC	<0.01	<0.01	<0.01	<0.01	<0.01
Dieldrin	<0.025	<0.025	<0.025	<0.025	<0.025
Endosulfan I	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan II	<0.025	<0.025	<0.025	<0.025	<0.025
Endosulfan sulfate	<0.025	<0.025	<0.025	<0.025	<0.025
Endrin	<0.025	<0.025	<0.025	<0.025	<0.025
Endrin aldehyde	<0.025	<0.025	<0.025	<0.025	<0.025
gamma-BHC (Lindane)	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor epoxide	<0.01	<0.01	<0.01	<0.01	<0.01
Methoxychlor	<0.025	<0.025	<0.025	<0.025	<0.025
Endrin ketone	<0.025	<0.025	<0.025	<0.025	<0.025
alpha Chlordane	<0.01	<0.01	<0.01	<0.01	<0.01
gamma Chlordane	<0.01	<0.01	<0.01	<0.01	<0.01
Toxaphene	<0.5	<0.5	<0.5	<0.5	<0.5

J - The analyte was positively identified, but the quantitation was below the reporting limit.
< - Not detected at or above the method detection limit (the value reported with the less than symbol).

Appendix Table 2. Results of chemical surface water sampling conducted by Ohio EPA in Salt Lick Creek on September 29, 2004. Less than values were reported by the lab as not detected at or above the method detection limit.

Stream	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**
River Mile	**20.6**	**20.4**	**19.5**	**18.2**
Date Sampled	09/29/04	09/29/04	09/29/04	09/29/04
Time Sampled	10:10 AM	10:00 AM	03:10 PM	05:30 PM
Nutrients/Others (mg/l)				
Nitrite	0.0212	0.0216	0.0227	0.0227
Ammonia-N	0.153	0.196	0.182	0.21
Nitrate-Nitrite, N	2.13	2.21	2.46	4.13
Phosphorus-T	0.433	0.423	0.353	0.266
Cyanide-T	<0.005	<0.005	<0.005	<0.005
Temperature (oC) - field	19	19	20	20
pH (S.U.) - field	6.8	6.8	6.8	6.8
TAL Metals (ug/l)				
Mercury	<0.1	<0.1	<0.1	<0.1
Aluminum	218	314	140	145
Silver	<5	<5	<5	<5
Arsenic	<2	<2	<2	2.58J
Barium	55.4	58.7	50.5	52
Beryllium	<0.25	<0.25	<0.25	<0.25
Calcium	31,500	32,600	30,400	33,100
Cadmium	<2.5	<2.5	<2.5	<2.5
Cobalt	<2.5	<2.5	<2.5	<2.5
Chromium	<2.5	<2.5	<2.5	<2.5
Copper	<5	<5	<5	<5
Iron	680	886	480	425
Potassium	8,090	8,290	7,390	6,910
Magnesium	8,700	9,030	8,560	9,600
Manganese	190	216	152	144
Sodium	47,400	48,400	43,300	42,200
Nickel	<5	<5	<5	<5
Lead	<2.5	<2.5	<2.5	<2.5
Vanadium	<5	<5	<5	<5
Zinc	8.57J	9.11J	<5	<5
Antimony	<0.5	<0.5	<0.5	0.719J
Selenium	<1.5	<1.5	<1.5	<1.5
Thallium	0.115J	0.116J	<0.1	0.103J
Semi-volatile Organic Analytes (ug/l)				
Phenol	<2.6	<2.5	<2.5	<2.5
bis-(2-Chloroethyl) ether	<2.6	<2.5	<2.5	<2.5
2-Chlorophenol	<2.6	<2.5	<2.5	<2.5
1,3-Dichlorobenzene	<2.6	<2.5	<2.5	<2.5
1,4-Dichlorobenzene	<2.6	<2.5	<2.5	<2.5
Benzyl alcohol	<2.6	<2.5	<2.5	<2.5
1,2-Dichlorobenzene	<2.6	<2.5	<2.5	<2.5
2-Methylphenol	<2.6	<2.5	<2.5	<2.5
3-,4-Methylphenol	<2.6	<2.5	<2.5	<2.5
bis(2-Chloroisopropyl) ether	<2.6	<2.5	<2.5	<2.5
N-Nitroso-di-n-propylamine	<2.6	<2.5	<2.5	<2.5
Hexachloroethane	<2.6	<2.5	<2.5	<2.5
Nitrobenzene	<2.6	<2.5	<2.5	<2.5
Isophorone	<2.6	<2.5	<2.5	<2.5
2-Nitrophenol	<2.6	<2.5	<2.5	<2.5
2,4-Dimethylphenol	<2.6	<2.5	<2.5	<2.5
Benzoic acid	<13.0	<12.5	<12.5	<12.5
bis(2-Chloroethoxy)methane	<2.6	<2.5	<2.5	<2.5

Appendix Table 2. Continued.

Stream	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**
River Mile	**20.6**	**20.4**	**19.5**	**18.2**
Date Sampled	09/29/04	09/29/04	09/29/04	09/29/04
Time Sampled	10:10 AM	10:00 AM	03:10 PM	05:30 PM
Semi-volatile Organic Analytes (ug/l)				
2,4-Dichlorophenol	<2.6	<2.5	<2.5	<2.5
1,2,4-Trichlorobenzene	<2.6	<2.5	<2.5	<2.5
Naphthalene	<2.6	<2.5	<2.5	<2.5
4-Chloroaniline	<2.6	<2.5	<2.5	<2.5
Hexachlorobutadiene	<2.6	<2.5	<2.5	<2.5
4-Chloro-3-methylphenol	<2.6	<2.5	<2.5	<2.5
2-Methylnaphthalene	<2.6	<2.5	<2.5	<2.5
Hexachlorocyclopentadiene	<2.6	<2.5	<2.5	<2.5
2,4,6-Trichlorophenol	<2.6	<2.5	<2.5	<2.5
2,4,5-Trichlorophenol	<2.6	<2.5	<2.5	<2.5
2-Chloronaphthalene	<2.6	<2.5	<2.5	<2.5
2-Nitroaniline	<13.0	<12.5	<12.5	<12.5
Dimethylphthalate	<2.6	<2.5	<2.5	<2.5
Acenaphthylene	<2.6	<2.5	<2.5	<2.5
2,6-Dinitrotoluene	<2.6	<2.5	<2.5	<2.5
3-Nitroaniline	<13.0	<12.5	<12.5	<12.5
Acenaphthene	<2.6	<2.5	<2.5	<2.5
2,4-Dinitrophenol	<13.0	<12.5	<12.5	<12.5
4-Nitrophenol	<13.0	<12.5	<12.5	<12.5
Dibenzofuran	<2.6	<2.5	<2.5	<2.5
2,4-Dinitrotoluene	<2.6	<2.5	<2.5	<2.5
Diethylphthalate	<2.6	<2.5	<2.5	<2.5
4-Chlorophenyl-phenyl ether	<2.6	<2.5	<2.5	<2.5
Fluorene	<2.6	<2.5	<2.5	<2.5
4-Nitroaniline	<13.0	<12.5	<12.5	<12.5
4,6-Dinitro-2-methylphenol	<13.0	<12.5	<12.5	<12.5
N-Nitrosodiphenylamine	<2.6	<2.5	<2.5	<2.5
4-Bromophenyl-phenylether	<2.6	<2.5	<2.5	<2.5
Hexachlorobenzene	<2.6	<2.5	<2.5	<2.5
Pentachlorophenol	<13.0	<12.5	<12.5	<12.5
Phenanthrene	<2.6	<2.5	<2.5	<2.5
Anthracene	<2.6	<2.5	<2.5	<2.5
Di-N-butylphthalate	<2.6	<2.5	<2.5	<2.5
Fluoranthene	<2.6	<2.5	<2.5	<2.5
Pyrene	<2.6	<2.5	<2.5	<2.5
Butylbenzylphthalate	<2.6	<2.5	<2.5	<2.5
3,3'-Dichlorobenzidine	<2.6	<2.5	<2.5	<2.5
Benzo(a)anthracene	<2.6	<2.5	<2.5	<2.5
Chrysene	<2.6	<2.5	<2.5	<2.5
bis(2-Ethylhexyl) phthalate	7.14	<2.5	5.11	5.78
Di-n-octylphthalate	6.23	6.52	<2.5	5.97
Benzo(b)fluoranthene	<2.6	<2.5	<2.5	<2.5
Benzo(k)fluoranthene	<2.6	<2.5	<2.5	<2.5
Benzo(a)pyrene	<2.6	<2.5	<2.5	<2.5
Indeno(1,2,3-cd)pyrene	<2.6	<2.5	<2.5	<2.5
Dibenzo(a,h)anthracene	<2.6	<2.5	<2.5	<2.5
Benzo(g,h,i)perylene	<2.6	<2.5	<2.5	<2.5

J - The analyte was positively identified, but the quantitation was below the reporting limit.
< - Not detected at or above the method detection limit (the value reported with the less than symbol).

Appendix Table 3. Results of Ohio EPA sediment sampling conducted in Salt Lick Creek, September 29, 2004. NA - not applicable.

Stream	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**	
River Mile	**20.6**	**20.4**	**20.4**	**19.5**	**18.20**	Sediment
Date Sampled	09/29/04	09/29/04	09/29/04	09/29/04	09/29/04	Reference
Time Sampled	10:25 AM	12:20 PM	12:20 PM	03:30 PM	05:00 PM	Values (SRV)
TAL Metals (mg/kg)			Duplicate			
Mercury	0.0247J	0.0172J	0.0115J	0.0452J	0.0304J	0.12
Aluminum	2,240	2,710	2,780	5,920	<14.5	53,000
Silver	<0.288	<0.246	<0.33	0.455J	<0.363	NA
Arsenic	1.21	1.97	1.5	2.23	1.73	19
Barium	32.1	37.7	39.8	63.5	<0.145	360
Beryllium	0.284J	0.31J	0.322J	0.606J	<0.0174	NA
Calcium	633	1,110	886	1,500	<7.27	27,000
Cadmium	0.119J	0.127J	0.138J	0.197J	<0.0727	0.8
Cobalt	3.47	4.41	5.07	7.98	<0.174	NA
Chromium	3.76	4.48	4.88	8.96	<0.174	53
Copper	5.21	4.7	5.35	9.7	<0.727	33
Iron	5,530	7,660	7,180	13,200	1.9J	51,000
Potassium	271	319	346	716	66,700	14,000
Magnesium	372	443	467	1000	<17.4	9,900
Manganese	181	277	322	353	0.929	3,000
Sodium	41.3	38.2	45.7	67.8	210	NA
Nickel	4.56	5.55	5.66	11.9	<0.727	61
Lead	10.9	10.1	7.18	15.1	11.7	47
Vanadium	4.56	5.89	5.82	11.4	<0.363	NA
Zinc	24.1	27	29.2	57.5	<0.727	170
Antimony	<0.144	<0.145	<0.146	<0.204	<0.148	NA
Selenium	<0.576	0.838J	<0.659	0.892J	<0.727	2.6
Thallium	<0.072	<0.0723	<0.0728	<0.102	<0.074	NA
Semi-volatile Organic Analytes (ug/kg)						
Phenol	<111	<111	<115	<156	<131	NA
bis-(2-Chloroethyl) ether	<111	<111	<115	<156	<131	NA
2-Chlorophenol	<111	<111	<115	<156	<131	NA
1,3-Dichlorobenzene	<111	<111	<115	<156	<131	NA
1,4-Dichlorobenzene	<111	<111	<115	<156	<131	NA
Benzyl alcohol	<111	<111	<115	<156	<131	NA
1,2-Dichlorobenzene	<111	<111	<115	<156	<131	NA
2-Methylphenol	<111	<111	<115	<156	<131	NA
3-,4-Methylphenol	<111	<111	<115	<156	<131	NA
bis(2-Chloroisopropyl) ether	<111	<111	<115	<156	<131	NA
N-Nitrosodipropylamine	<111	<111	<115	<156	<131	NA
Hexachloroethane	<111	<111	<115	<156	<131	NA
Nitrobenzene	<111	<111	<115	<156	<131	NA
Isophorone	<111	<111	<115	<156	<131	NA
2-Nitrophenol	<111	<111	<115	<156	<131	NA
2,4-Dimethylphenol	<111	<111	<115	<156	<131	NA
Benzoic acid	<445	<445	<459	<623	<523	NA

Appendix Table 3. Continued.

Stream	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**	
River Mile	**20.6**	**20.4**	**20.4**	**19.5**	**18.20**	Sediment
Date Sampled	09/29/04	09/29/04	09/29/04	09/29/04	09/29/04	Reference
Time Sampled	10:25 AM	12:20 PM	12:20 PM	03:30 PM	05:00 PM	Values (SRV)
Semi-volatile Organic Analytes (ug/kg)			Duplicate			
bis(2-Chloroethoxy)methane	<111	<111	<115	<156	<131	NA
2,4-Dichlorophenol	<111	<111	<115	<156	<131	NA
1,2,4-Trichlorobenzene	<111	<111	<115	<156	<131	NA
Naphthalene	<111	<111	<115	<156	<131	NA
4-Chloroaniline	<111	<111	<115	<156	<131	NA
Hexachlorobutadiene	<111	<111	<115	<156	<131	NA
4-Chloro-3-methylphenol	<111	<111	<115	<156	<131	NA
2-Methylnaphthalene	<111	<111	<115	<156	<131	NA
Hexachlorocyclopentadiene	<111	<111	<115	<156	<131	NA
2,4,6-Trichlorophenol	<111	<111	<115	<156	<131	NA
2,4,5-Trichlorophenol	<111	<111	<115	<156	<131	NA
2-Chloronaphthalene	<111	<111	<115	<156	<131	NA
2-Nitroaniline	<445	<445	<459	<623	<523	NA
Dimethylphthalate	<111	<111	<115	<156	<131	NA
Acenaphthylene	<111	<111	<115	<156	<131	NA
2,6-Dinitrotoluene	<111	<111	<115	<156	<131	NA
3-Nitroaniline	<445	<445	<459	<623	<523	NA
Acenaphthene	<111	<111	<115	<156	<131	NA
2,4-Dinitrophenol	<445	<445	<459	<623	<523	NA
4-Nitrophenol	<445	<445	<459	<623	<523	NA
Dibenzofuran	<111	<111	<115	<156	<131	NA
2,4-Dinitrotoluene	<111	<111	<115	<156	<131	NA
Diethylphthalate	<111	<111	<115	<156	<131	NA
4-Chlorophenyl-phenyl ether	<111	<111	<115	<156	<131	NA
Fluorene	<111	<111	<115	<156	<131	NA
4-Nitroaniline	<445	<445	<459	<623	<523	NA
4,6-Dinitro-2-methylphenol	<445	<445	<459	<623	<523	NA
N-Nitrosodiphenylamine	<111	<111	<115	<156	<131	NA
4-Bromophenyl-phenylether	<111	<111	<115	<156	<131	NA
Hexachlorobenzene	<111	<111	<115	<156	<131	NA
Pentachlorophenol	<445	<445	<459	<623	<523	NA
Phenanthrene	<111	<111	<115	<156	<131	NA
Anthracene	<111	<111	<115	<156	<131	NA
Di-N-butylphthalate	<111	<111	<115	<156	<131	NA
Fluoranthene	188J	130J	<115	219J	200J	NA
Pyrene	155J	<111	<115	179J	151J	NA
Butylbenzylphthalate	<111	<111	<115	<156	<131	NA
3,3'-Dichlorobenzidine	<222	<222	<229	<311	<262	NA
Benzo(a)anthracene	<111	<111	<115	<156	<131	NA
Chrysene	<111	<111	<115	<156	<131	NA
bis(2-Ethylhexyl) phthalate	184J	210J	<115	280J	229J	NA
Di-n-octylphthalate	<111	<111	<115	<156	<131	NA
Benzo(b)fluoranthene	120J	<111	<115	167J	<131	NA

Appendix Table 3. Continued.

Stream	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**	**Salt Lick Creek**	
River Mile	**20.6**	**20.4**	**20.4**	**19.5**	**18.20**	Sediment
Date Sampled	09/29/04	09/29/04	09/29/04	09/29/04	09/29/04	Reference
Time Sampled	10:25 AM	12:20 PM	12:20 PM	03:30 PM	05:00 PM	Values (SRV)
Semi-volatile Organic Analytes (ug/kg)			Duplicate			
Benzo(k)fluoranthene	<111	<111	<115	<156	<131	NA
Benzo(a)pyrene	<111	<111	<115	<156	<131	NA
Indeno(1,2,3-cd)pyrene	<111	<111	<115	<156	<131	NA
Dibenzo(a,h)anthracene	<111	<111	<115	<156	<131	NA
Benzo(g,h,i)perylene	<111	<111	<115	<156	<131	NA
PCBs (ug/kg)						
Aroclor 1016	<11.3	<11.3	<11.2	<15.8	<13.1	NA
Aroclor 1221	<11.3	<11.3	<11.2	<15.8	<13.1	NA
Aroclor 1232	<11.3	<11.3	<11.2	<15.8	<13.1	NA
Aroclor 1242	<11.3	<11.3	<11.2	<15.8	<13.1	NA
Aroclor 1248	<11.3	<11.3	<11.2	<15.8	<13.1	NA
Aroclor 1254	<11.3	<11.3	<11.2	<15.8	<13.1	NA
Aroclor 1260	<11.3	<11.3	<11.2	<15.8	<13.1	NA
Pesticides (ug/kg)						
alpha-BHC	<2.75	<2.75	<2.72	<7.66	<3.17	NA
beta-BHC	<2.75	<2.75	<2.72	<7.66	<3.17	NA
delta-BHC	<2.75	<2.75	<2.72	<7.66	<3.17	NA
gamma-BHC (Lindane)	<2.75	<2.75	<2.72	<7.66	<3.17	NA
Heptachlor	<2.75	<2.75	<2.72	<7.66	<3.17	NA
Aldrin	<2.75	<2.75	<2.72	<7.66	<3.17	NA
Heptachlor epoxide	<2.75	<2.75	<2.72	<7.66	<3.17	NA
Endosulfan I	<2.75	<2.75	<2.72	<7.66	<3.17	NA
Dieldrin	<5.67	<5.67	<5.61	<15.8	<6.54	NA
4,4'-DDE	<5.67	<5.67	<5.61	<15.8	<6.54	NA
Endrin	<5.67	<5.67	<5.61	<15.8	<6.54	NA
Endosulfan II	<5.67	<5.67	<5.61	<15.8	<6.54	NA
4,4'-DDD	<5.67	<5.67	<5.61	<15.8	<6.54	NA
Endosulfan sulfate	<5.67	<5.67	<5.61	<15.8	<6.54	NA
4,4'-DDT	<5.67	<5.67	<5.61	<15.8	<6.54	NA
Methoxychlor	<5.67	<5.67	<5.61	<15.8	<6.54	NA
Endrin ketone	<5.67	<5.67	<5.61	<15.8	<6.54	NA
Endrin aldehyde	<5.67	<5.67	<5.61	<15.8	<6.54	NA
alpha Chlordane	<2.75	<2.75	<2.72	<7.66	<3.17	NA
gamma Chlordane	<2.75	<2.75	<2.72	<7.66	<3.17	NA
Toxaphene	<115	<115	<113	<320	<132	NA
Other						
Percent Solids	72.3	72	71.6	52.2	62.6	NA
Cyanide (mg/kg)	<0.287	<0.31	<0.306	<0.433	<0.371	NA

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

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

APPENDIX TABLE 4 – FISH SAMPLING RESULTS BY SAMPLING SITE
SALT LICK CREEK, 2004

Species List

River Code: **02-610**	Stream: **Salt Lick Creek**	Sample Date: **2004**
River Mile: **20.60**	Location: upst. Jackson Landfill	Date Range: 08/12/2004
Time Fished: 7620 sec	Drainage: 71.0 sq mi	Thru: 09/29/2004
Dist Fished: 0.40 km	Basin: Scioto River No of Passes: 2	Sampler Type: E

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		11	8.25	3.97	0.55	9.15	66.18
Grass Pickerel		P	M	P	18	13.50	6.50	0.25	4.17	18.39
Northern Hog Sucker	R	I	S	M	1	0.75	0.36	0.04	0.65	52.00
White Sucker	W	O	S	T	17	12.75	6.14	2.42	40.59	189.82
Spotted Sucker	R	I	S		4	3.00	1.44	1.30	21.83	434.00
Creek Chub	N	G	N	T	11	8.25	3.97	0.14	2.36	17.00
Striped Shiner	N	I	S		11	8.25	3.97	0.17	2.77	20.00
Spotfin Shiner	N	I	M		29	21.75	10.47	0.05	0.82	2.24
Bluntnose Minnow	N	O	C	T	22	16.50	7.94	0.03	0.54	1.95
Central Stoneroller	N	H	N		2	1.50	0.72	0.03	0.48	19.00
Yellow Bullhead		I	C	T	1	0.75	0.36	0.00	0.05	4.00
Blackstripe Topminnow		I	M		1	0.75	0.36	0.00	0.03	2.00
Trout-perch		I	M		5	3.75	1.81	0.04	0.60	9.60
Brook Silverside		I	M	M	1	0.75	0.36	0.00	0.02	1.00
Spotted Bass	F	C	C		8	6.00	2.89	0.05	0.77	7.63
Warmouth Sunfish	S	C	C		1	0.75	0.36	0.01	0.23	18.00
Green Sunfish	S	I	C	T	21	15.75	7.58	0.26	4.42	16.70
Bluegill Sunfish	S	I	C	P	52	39.00	18.77	0.43	7.29	11.14
Longear Sunfish	S	I	C	M	6	4.50	2.17	0.10	1.68	22.17
Green Sf X Longear Sf					5	3.75	1.81	0.04	0.67	10.60
Dusky Darter	D	I	S	M	4	3.00	1.44	0.01	0.13	2.50
Blackside Darter	D	I	S		5	3.75	1.81	0.01	0.12	1.80
Johnny Darter	D	I	C		14	10.50	5.05	0.01	0.21	1.14
Greenside Darter	D	I	S	M	17	12.75	6.14	0.02	0.35	1.65
Banded Darter	D	I	S	I	3	2.25	1.08	0.00	0.04	1.00
Fantail Darter	D	I	C		7	5.25	2.53	0.01	0.12	1.29
	Mile Total				277	207.75		5.96		
	Number of Species				25					
	Number of Hybrids				1					

Species List

River Code: **02-610**	Stream: **Salt Lick Creek**	Sample Date: **2004**
River Mile: **20.40**	Location: adj. Jackson Landfill	Date Range: 08/12/2004
Time Fished: 7500 sec	Drainage: 71.0 sq mi	Thru: 09/29/2004
Dist Fished: 0.40 km	Basin: Scioto River No of Passes: 2	Sampler Type: E

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		3	2.25	0.99	0.18	2.78	79.67
Grass Pickerel		P	M	P	16	12.00	5.30	0.13	2.08	11.19
Northern Hog Sucker	R	I	S	M	4	3.00	1.32	0.35	5.34	115.00
White Sucker	W	O	S	T	12	9.00	3.97	0.59	9.18	66.00
Spotted Sucker	R	I	S		2	1.50	0.66	0.86	13.27	572.00
Creek Chub	N	G	N	T	6	4.50	1.99	0.04	0.66	9.33
Striped Shiner	N	I	S		10	7.50	3.31	0.27	4.17	35.90
Spotfin Shiner	N	I	M		45	33.75	14.90	0.16	2.48	4.76
Silverjaw Minnow	N	I	M		1	0.75	0.33	0.00	0.02	1.00
Bluntnose Minnow	N	O	C	T	47	35.25	15.56	0.03	0.53	0.98
Yellow Bullhead		I	C	T	5	3.75	1.66	0.69	10.61	183.00
Blackstripe Topminnow		I	M		2	1.50	0.66	0.00	0.02	1.00
Trout-perch		I	M		2	1.50	0.66	0.00	0.07	3.00
Brook Silverside		I	M	M	2	1.50	0.66	0.00	0.02	0.50
Rock Bass	S	C	C		3	2.25	0.99	0.23	3.52	101.00
Spotted Bass	F	C	C		5	3.75	1.66	0.11	1.65	28.40
Green Sunfish	S	I	C	T	12	9.00	3.97	0.18	2.84	20.42
Bluegill Sunfish	S	I	C	P	53	39.75	17.55	0.72	11.09	18.05
Longear Sunfish	S	I	C	M	8	6.00	2.65	0.22	3.45	37.13
Green Sf X Bluegill Sf					2	1.50	0.66	0.05	0.83	35.50
Dusky Darter	D	I	S	M	8	6.00	2.65	0.01	0.19	2.00
Blackside Darter	D	I	S		11	8.25	3.64	0.02	0.32	2.45
Johnny Darter	D	I	C		14	10.50	4.64	0.01	0.20	1.25
Greenside Darter	D	I	S	M	21	15.75	6.95	0.02	0.28	1.14
Banded Darter	D	I	S	I	5	3.75	1.66	0.01	0.09	1.40
Orangethroat Darter	D	I	S		1	0.75	0.33	0.00	0.02	2.00
Fantail Darter	D	I	C		1	0.75	0.33	0.00	0.02	2.00
Freshwater Drum			M	P	1	0.75	0.33	1.58	24.35	2,100.00
	Mile Total				302	226.50		6.47		
	Number of Species				27					
	Number of Hybrids				1					

Species List

River Code: **02-610**	Stream: **Salt Lick Creek**	Sample Date: **2004**
River Mile: **19.50**	Location: lower end of Jackson Landfill	Date Range: 08/12/2004
Time Fished: 6780 sec	Drainage: 72.0 sq mi	Thru: 09/29/2004
Dist Fished: 0.40 km	Basin: Scioto River No of Passes: 2	Sampler Type: E

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	15	11.25	4.35	0.14	4.13	12.73
Northern Hog Sucker	R	I	S	M	14	10.50	4.06	0.08	2.37	7.86
White Sucker	W	O	S	T	9	6.75	2.61	0.79	22.77	117.22
Spotted Sucker	R	I	S		2	1.50	0.58	0.56	16.05	372.00
Creek Chub	N	G	N	T	27	20.25	7.83	0.04	1.05	1.81
Suckermouth Minnow	N	I	S		1	0.75	0.29	0.00	0.03	1.00
Silver Shiner	N	I	S	I	3	2.25	0.87	0.01	0.17	2.67
Rosefin Shiner	N	I	S	M	7	5.25	2.03	0.01	0.30	2.00
Striped Shiner	N	I	S		15	11.25	4.35	0.15	4.30	13.27
Spotfin Shiner	N	I	M		41	30.75	11.88	0.08	2.20	2.49
Silverjaw Minnow	N	I	M		2	1.50	0.58	0.00	0.12	2.50
Fathead Minnow	N	O	C	T	4	3.00	1.16	0.01	0.17	2.00
Bluntnose Minnow	N	O	C	T	18	13.50	5.22	0.03	0.76	1.94
Central Stoneroller	N	H	N		9	6.75	2.61	0.01	0.37	1.89
Yellow Bullhead		I	C	T	2	1.50	0.58	0.15	4.27	99.00
Blackstripe Topminnow		I	M		3	2.25	0.87	0.01	0.14	2.00
Trout-perch		I	M		3	2.25	0.87	0.02	0.60	9.33
Brook Silverside		I	M	M	1	0.75	0.29	0.00	0.03	1.00
Rock Bass	S	C	C		3	2.25	0.87	0.25	7.29	112.67
Spotted Bass	F	C	C		4	3.00	1.16	0.25	7.24	83.75
Largemouth Bass	F	C	C		1	0.75	0.29	0.01	0.17	8.00
Warmouth Sunfish	S	C	C		3	2.25	0.87	0.03	0.98	15.00
Green Sunfish	S	I	C	T	13	9.75	3.77	0.21	6.00	21.38
Bluegill Sunfish	S	I	C	P	46	34.50	13.33	0.23	6.70	6.75
Longear Sunfish	S	I	C	M	10	7.50	2.90	0.29	8.21	38.03
Green Sf X Bluegill Sf					1	0.75	0.29	0.01	0.37	17.00
Dusky Darter	D	I	S	M	13	9.75	3.77	0.03	0.76	2.69
Blackside Darter	D	I	S		16	12.00	4.64	0.03	0.86	2.50
Johnny Darter	D	I	C		13	9.75	3.77	0.01	0.29	1.00
Greenside Darter	D	I	S	M	28	21.00	8.12	0.04	1.02	1.68
Banded Darter	D	I	S	I	16	12.00	4.64	0.01	0.32	0.90
Fantail Darter	D	I	C		2	1.50	0.58	0.00	0.07	1.50
	Mile Total				345	258.75		3.48		
	Number of Species				31					
	Number of Hybrids				1					

Species List

River Code: **02-610**	Stream: **Salt Lick Creek**	Sample Date: **2004**
River Mile: **18.20**	Location: Rock Run Rd.	Date Range: 08/12/2004
Time Fished: 5400 sec	Drainage: 75.0 sq mi	Thru: 09/29/2004
Dist Fished: 0.40 km	Basin: Scioto River No of Passes: 2	Sampler Type: E

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	0.75	0.18	0.08	0.76	100.00
Grass Pickerel		P	M	P	11	8.25	2.01	0.27	2.79	33.18
Northern Hog Sucker	R	I	S	M	19	14.25	3.47	1.98	20.21	139.26
White Sucker	W	O	S	T	15	11.25	2.74	0.48	4.85	42.33
Spotted Sucker	R	I	S		1	0.75	0.18	0.27	2.76	362.00
Creek Chub	N	G	N	T	15	11.25	2.74	0.34	3.44	30.00
Suckermouth Minnow	N	I	S		49	36.75	8.94	0.15	1.51	4.02
Silver Shiner	N	I	S	I	1	0.75	0.18	0.00	0.03	4.00
Rosefin Shiner	N	I	S	M	15	11.25	2.74	0.03	0.30	2.60
Striped Shiner	N	I	S		60	45.00	10.95	1.02	10.40	22.69
Spotfin Shiner	N	I	M		27	20.25	4.93	0.07	0.67	3.22
Sand Shiner	N	I	M	M	3	2.25	0.55	0.00	0.04	1.67
Silverjaw Minnow	N	I	M		1	0.75	0.18	0.00	0.02	2.00
Bluntnose Minnow	N	O	C	T	51	38.25	9.31	0.18	1.85	4.75
Central Stoneroller	N	H	N		19	14.25	3.47	0.15	1.48	10.21
Yellow Bullhead		I	C	T	5	3.75	0.91	0.65	6.62	173.20
Blackstripe Topminnow		I	M		2	1.50	0.36	0.00	0.03	2.00
Trout-perch		I	M		1	0.75	0.18	0.00	0.03	4.00
Rock Bass	S	C	C		7	5.25	1.28	0.49	5.01	93.57
Spotted Bass	F	C	C		5	3.75	0.91	0.51	5.17	135.40
Warmouth Sunfish	S	C	C		1	0.75	0.18	0.03	0.29	38.00
Green Sunfish	S	I	C	T	13	9.75	2.37	0.22	2.24	22.54
Bluegill Sunfish	S	I	C	P	25	18.75	4.56	0.14	1.42	7.40
Longear Sunfish	S	I	C	M	128	96.00	23.36	2.60	26.48	27.08
Dusky Darter	D	I	S	M	3	2.25	0.55	0.00	0.05	2.00
Blackside Darter	D	I	S		11	8.25	2.01	0.02	0.18	2.09
Logperch	D	I	S	M	5	3.75	0.91	0.05	0.55	14.40
Johnny Darter	D	I	C		9	6.75	1.64	0.01	0.10	1.44
Greenside Darter	D	I	S	M	30	22.50	5.47	0.06	0.64	2.77
Banded Darter	D	I	S	I	12	9.00	2.19	0.01	0.09	1.00
Orangethroat Darter	D	I	S		1	0.75	0.18	0.00	0.02	2.00
Fantail Darter	D	I	C		2	1.50	0.36	0.00	0.04	2.50
	Mile Total				548	411.00		9.82		
	Number of Species				32					
	Number of Hybrids				0					

Appendix Table 5. Fish IBI (Index of Biotic Integrity) scores and metrics for sampling locations in Salt Lick Creek, 2004.

				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
Salt Lick Creek - (02610)																		
Year: 2004																		
20.60	E	08/12/2004	71	23(5)	4(5)	3(3)	1(1)	6(5)	15(1)	24(5)	17(5)	11.6(5)	64(5)	0.5(5)	218(3)		48	8.1
20.60	E	09/29/2004	71	18(3)	2(3)	2(3)	1(1)	6(5)	39(5)	31(3)	20(3)	5.8(5)	70(5)	0.0(5)	90(1)	*	42	6.3
20.40	E	08/12/2004	71	23(5)	4(5)	3(3)	1(1)	5(5)	26(3)	12(5)	6(5)	8.4(5)	81(5)	0.0(5)	236(3)		50	8.3
20.40	E	09/29/2004	71	23(5)	4(5)	3(3)	1(1)	7(5)	22(3)	49(1)	42(1)	7.3(5)	50(3)	0.0(5)	95(1)	*	38	7.2
19.50	E	08/12/2004	72	28(5)	5(5)	3(3)	2(1)	6(5)	32(3)	24(5)	7(5)	6.6(5)	71(5)	0.4(3)	261(3)		48	8.6
19.50	E	09/29/2004	72	24(5)	4(5)	2(3)	1(1)	6(5)	44(5)	16(5)	13(5)	9.4(5)	77(5)	0.0(5)	147(1)	*	50	8.0
18.20	E	08/12/2004	75	29(5)	5(5)	2(3)	1(1)	7(5)	32(3)	13(5)	8(5)	5.1(5)	82(5)	0.3(5)	405(3)		50	8.9
18.20	E	09/29/2004	75	23(5)	3(3)	2(3)	2(1)	7(5)	51(5)	24(3)	17(5)	3.4(3)	71(5)	0.0(5)	269(3)		46	8.4

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 6 - Salt Lick Creek macroinvertebrate sampling results by station, 2004.

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/29/2004 River Code: 02-610 RM: 20.60 Site: Salt Lick Creek upst. Jackson Landfill

Taxa Code	Taxa	Quant/Qual	
01801	*Turbellaria*	3	+
03600	*Oligochaeta*	121	+
04901	*Erpobdellidae*	1	
06201	*Hyalella azteca*	1	+
08201	*Orconectes (Procericambarus) cristavarius*		+
11018	*Acerpenna macdunnoughi*	1	
11130	*Baetis intercalaris*	120	+
11670	*Procloeon irrubrum*		+
13400	*Stenacron sp*	6	
13590	*Stenonema vicarium*	17	+
21200	*Calopteryx sp*		+
22001	*Coenagrionidae*		+
22300	*Argia sp*		+
23909	*Boyeria vinosa*		+
28955	*Plathemis lydia*		+
35001	*Perlodidae*	2	
43300	*Ranatra sp*		+
44501	*Corixidae*		+
45900	*Notonecta sp*		+
50315	*Chimarra obscura*	2	
52200	*Cheumatopsyche sp*	527	+
52530	*Hydropsyche depravata group*		+
60800	*Haliplus sp*		+
65800	*Berosus sp*	1	
68130	*Helichus sp*	1	+
69400	*Stenelmis sp*	2	+
71900	*Tipula sp*	4	+
74100	*Simulium sp*	22	+
77500	*Conchapelopia sp*	56	
77750	*Hayesomyia senata or Thienemannimyia norena*	19	+
78655	*Procladius (Holotanypus) sp*		+
80351	*Corynoneura n.sp 1*	16	
80370	*Corynoneura lobata*	96	
80420	*Cricotopus (C.) bicinctus*	56	
81650	*Parametriocnemus sp*	19	
81825	*Rheocricotopus (Psilocricotopus) robacki*	540	
82101	*Thienemanniella taurocapita*	24	
82141	*Thienemanniella xena*	16	
82820	*Cryptochironomus sp*		+
83840	*Microtendipes pedellus group*	37	
84000	*Parachironomus sp*	19	
84440	*Polypedilum (Uresipedilum) aviceps*	56	
84450	*Polypedilum (Uresipedilum) flavum*	112	
84460	*Polypedilum (P.) fallax group*	37	
84470	*Polypedilum (P.) illinoense*	19	
84540	*Polypedilum (Tripodura) scalaenum group*	56	
84800	*Tribelos jucundum*		+
85500	*Paratanytarsus sp*	19	
85625	*Rheotanytarsus sp*	37	+
85800	*Tanytarsus sp*	112	
85821	*Tanytarsus glabrescens group sp 7*	112	
95100	*Physella sp*	8	
97601	*Corbicula fluminea*		+
98600	*Sphaerium sp*	9	+

No. Quantitative Taxa: 38 Total Taxa: 54
No. Qualitative Taxa: 29 ICI: **36**
Number of Organisms: 2306 Qual EPT: 5

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/24/2004 River Code: 02-610 RM: 20.40 Site: Salt Lick Creek adj. Jackson Landfill

Taxa Code	Taxa	Quant/Qual	
01801	*Turbellaria*	22	+
03600	*Oligochaeta*	81	+
04666	*Helobdella triserialis*		+
04935	*Erpobdella punctata punctata*	3	
05800	*Caecidotea sp*	2	+
06201	*Hyalella azteca*		+
08201	*Orconectes (Procericambarus) cristavarius*		+
11130	*Baetis intercalaris*	70	+
12200	*Isonychia sp*	1	
13400	*Stenacron sp*	27	+
13521	*Stenonema femoratum*	1	
13590	*Stenonema vicarium*	18	+
21200	*Calopteryx sp*		+
22001	*Coenagrionidae*		+
23909	*Boyeria vinosa*		+
24900	*Gomphus sp*		+
27500	*Somatochlora sp*		+
28955	*Plathemis lydia*		+
35001	*Perlodidae*	2	
45400	*Trichocorixa sp*		+
48620	*Nigronia serricornis*		+
50315	*Chimarra obscura*	6	+
52200	*Cheumatopsyche sp*	280	+
52530	*Hydropsyche depravata group*		+
60900	*Peltodytes sp*		+
65800	*Berosus sp*		+
68130	*Helichus sp*		+
68901	*Macronychus glabratus*		+
69400	*Stenelmis sp*	10	+
71900	*Tipula sp*	5	+
74100	*Simulium sp*	28	+
74501	*Ceratopogonidae*	4	
77120	*Ablabesmyia mallochi*		+
77500	*Conchapelopia sp*	23	
80370	*Corynoneura lobata*	88	
80420	*Cricotopus (C.) bicinctus*	35	
81631	*Parakiefferiella n.sp 1*		+
81650	*Parametriocnemus sp*	23	
81825	*Rheocricotopus (Psilocricotopus) robacki*	501	+
82121	*Thienemanniella lobapodema*	16	
82141	*Thienemanniella xena*	44	
82820	*Cryptochironomus sp*		+
83040	*Dicrotendipes neomodestus*	12	
83840	*Microtendipes pedellus group*		+
84450	*Polypedilum (Uresipedilum) flavum*	163	+
84460	*Polypedilum (P.) fallax group*	12	
84800	*Tribelos jucundum*		+
85500	*Paratanytarsus sp*	23	
85625	*Rheotanytarsus sp*	35	+
85821	*Tanytarsus glabrescens group sp 7*	105	+
87540	*Hemerodromia sp*	8	
96900	*Ferrissia sp*	6	
97601	*Corbicula fluminea*		+
98600	*Sphaerium sp*		+
99001	*Unionidae*		+

No. Quantitative Taxa: 31 Total Taxa: 55
No. Qualitative Taxa: 39 ICI: **30**
Number of Organisms: 1654 Qual EPT: 6

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/29/2004 River Code: 02-610 RM: 19.50 Site: Salt Lick Creek lower end of Jackson

Taxa Code	Taxa	Quant	Qual
01320	*Hydra sp*	8	
01801	*Turbellaria*	35	+
03600	*Oligochaeta*	69	+
04935	*Erpobdella punctata punctata*		+
04960	*Mooreobdella sp*		+
05800	*Caecidotea sp*	5	+
06201	*Hyalella azteca*		+
08201	*Orconectes (Procericambarus) cristavarius*		+
11018	*Acerpenna macdunnoughi*	2	
11130	*Baetis intercalaris*	18	
11200	*Callibaetis sp*		+
11250	*Centroptilum sp (w/o hindwing pads)*		+
13400	*Stenacron sp*	50	+
13590	*Stenonema vicarium*	11	
14950	*Leptophlebia sp or Paraleptophlebia sp*	1	
16200	*Eurylophella sp*	1	
17200	*Caenis sp*	6	+
17600	*Baetisca sp*		+
18700	*Hexagenia sp*		+
21200	*Calopteryx sp*		+
22001	*Coenagrionidae*		+
22300	*Argia sp*	3	+
24900	*Gomphus sp*		+
45400	*Trichocorixa sp*		+
50315	*Chimarra obscura*	1	
50804	*Lype diversa*	1	
52200	*Cheumatopsyche sp*	189	+
52530	*Hydropsyche depravata group*	1	
55300	*Ptilostomis sp*		+
65800	*Berosus sp*	2	
68130	*Helichus sp*	2	+
68601	*Ancyronyx variegata*		+
68700	*Dubiraphia sp*	4	
71900	*Tipula sp*	3	+
74100	*Simulium sp*	2	
74501	*Ceratopogonidae*	4	
77120	*Ablabesmyia mallochi*		+
77500	*Conchapelopia sp*	28	
77750	*Hayesomyia senata or Thienemannimyia norena*	85	
78401	*Natarsia species A (sensu Roback, 1978)*	9	
80370	*Corynoneura lobata*	152	
80410	*Cricotopus (C.) sp*	9	
81231	*Nanocladius (N.) crassicornus or N. (N.) "rectinervis"*	9	
81631	*Parakiefferiella n.sp 1*	28	
81650	*Parametriocnemus sp*	9	
81712	*Psectrocladius (P.) psilopterus group*		+
81825	*Rheocricotopus (Psilocricotopus) robacki*	131	
82121	*Thienemanniella lobapodema*	8	
82141	*Thienemanniella xena*	12	
82820	*Cryptochironomus sp*		+
83840	*Microtendipes pedellus group*	47	
84300	*Phaenopsectra obediens group*	9	
84450	*Polypedilum (Uresipedilum) flavum*	19	
84460	*Polypedilum (P.) fallax group*	38	
84470	*Polypedilum (P.) illinoense*		+
84540	*Polypedilum (Tripodura) scalaenum group*	75	
84700	*Stenochironomus sp*	9	
84800	*Tribelos jucundum*	19	
85500	*Paratanytarsus sp*	28	
85501	*Paratanytarsus n.sp 1*	9	+
85625	*Rheotanytarsus sp*	75	
85800	*Tanytarsus sp*	38	
85821	*Tanytarsus glabrescens group sp 7*	188	
86100	*Chrysops sp*	1	
87540	*Hemerodromia sp*	8	
96900	*Ferrissia sp*	9	
97601	*Corbicula fluminea*		+
98600	*Sphaerium sp*		+

No. Quantitative Taxa:	48	Total Taxa:	68
No. Qualitative Taxa:	30	ICI:	**40**
Number of Organisms:	1470	Qual EPT:	8

Ohio EPA/DSW Ecological Assessment Section
Macroinvertebrate Collection

Collection Date: 09/29/2004 River Code: 02-610 RM: 18.20 Site: Salt Lick Creek Rock Run Rd.

Taxa Code	Taxa	Quant/Qual	
01801	*Turbellaria*	4	
03600	*Oligochaeta*	38	+
04666	*Helobdella triserialis*		+
04935	*Erpobdella punctata punctata*		+
05800	*Caecidotea sp*	8	+
06201	*Hyalella azteca*	1	+
07800	*Cambarus sp*		+
08201	*Orconectes (Procericambarus) cristavarius*		+
11130	*Baetis intercalaris*	42	
12200	*Isonychia sp*	4	
13400	*Stenacron sp*	94	+
13521	*Stenonema femoratum*		+
13590	*Stenonema vicarium*	49	+
17200	*Caenis sp*	4	
21200	*Calopteryx sp*	1	+
22300	*Argia sp*		+
23804	*Basiaeschna janata*		+
23909	*Boyeria vinosa*		+
24900	*Gomphus sp*		+
25010	*Hagenius brevistylus*		+
26700	*Macromia sp*		+
50315	*Chimarra obscura*	4	
51600	*Polycentropus sp*	1	
52200	*Cheumatopsyche sp*	403	+
52530	*Hydropsyche depravata group*	22	
55300	*Ptilostomis sp*		+
65800	*Berosus sp*	1	
68130	*Helichus sp*		+
68601	*Ancyronyx variegata*	19	
68700	*Dubiraphia sp*	4	
68901	*Macronychus glabratus*	1	
69400	*Stenelmis sp*	6	
71900	*Tipula sp*	5	
74100	*Simulium sp*	1	+
77750	*Hayesomyia senata or Thienemannimyia norena*	12	
78350	*Meropelopia sp*	73	
80360	*Corynoneura "celeripes" (sensu Simpson & Bode, 1980)*	4	
80370	*Corynoneura lobata*	148	
80410	*Cricotopus (C.) sp*	12	
81825	*Rheocricotopus (Psilocricotopus) robacki*	159	
82101	*Thienemanniella taurocapita*	16	
82121	*Thienemanniella lobapodema*	4	
82141	*Thienemanniella xena*	8	
82200	*Tvetenia bavarica group*	25	
83040	*Dicrotendipes neomodestus*	25	
84000	*Parachironomus sp*	12	
84300	*Phaenopsectra obediens group*	12	
84450	*Polypedilum (Uresipedilum) flavum*	37	
84460	*Polypedilum (P.) fallax group*	49	
85625	*Rheotanytarsus sp*	233	
85800	*Tanytarsus sp*	25	
85821	*Tanytarsus glabrescens group sp 7*	122	
87540	*Hemerodromia sp*	25	
96900	*Ferrissia sp*	36	
98600	*Sphaerium sp*	12	+

No. Quantitative Taxa: 42 Total Taxa: 55
No. Qualitative Taxa: 22 ICI: **42**
Number of Organisms: 1761 Qual EPT: 5

Appendix Table 7. Macroinvertebrate ICI (Invertebrate Community Index) scores and metrics for sampling locations in Salt Lick Creek, 2004.

		Number of				Percent:							
River Mile	Drainage Area (sq mi)	Total Taxa	Mayfly Taxa	Caddisfly Taxa	Dipteran Taxa	Mayflies	Caddis-flies	Tany-tarsini	Other Dipt/NI	Tolerant Organisms	Qual. EPT	Eco-region	ICI
Salt Lick Creek (02-610)													
Year: 2004													
20.60	71.0	38(6)	4(2)	2(4)	22(6)	6.2(2)	22.9(6)	12.1(2)	58.4(2)	10.5(4)	5(2)	4	36
20.40	71.0	31(4)	5(2)	2(4)	17(4)	7.1(2)	17.3(6)	9.9(2)	65.1(0)	8.1(4)	6(2)	4	30
19.50	72.0	48(6)	7(4)	4(6)	28(6)	6.1(2)	13.1(4)	23.0(4)	57.1(2)	7.9(4)	8(2)	4	40
18.20	75.0	42(6)	5(2)	4(6)	21(6)	11.0(2)	24.4(6)	21.6(4)	41.2(4)	7.0(4)	5(2)	4	42