Standard Operating Procedure
Laboratory Procedures for Fish Processing and Taxonomic Identification

Commonwealth of Kentucky
Energy and Environment Cabinet
Department for Environmental Protection
Division of Water

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Revision History

Date of Revision	Page(s) Revised	Revision Explanation
January 1, 2009	Section 8. Fish Community Structure	**Standard Methods for Assessing Biological Integrity of Surface Waters in Kentucky** Laboratory Methods for Fish in Wadeable Waters was separated from preceding document and revised/updated for general content regarding laboratory methods.
March 13, 2008		**Standard Methods for Assessing Biological Integrity of Surface Waters in Kentucky** General Content Document was re-formatted for maintaining headers, section titles, etc in a consistent style. All references to detailed water chemistry sampling were removed, and a reference inserted directing the reader to the 'Standard Operating Procedures for Sampling and Monitoring Surface Waters for Kentucky', in draft
July, 2002		**Methods for Assessing Biological Integrity of Surface Waters in Kentucky** original document

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Procedures

Scope and Applicability

This manual has been developed by the KDOW as guidance for the uniform and accurate processing, taxonomic identification and quality assurance/quality control of fish samples collected from the surface waters of Kentucky (KDOW 2009a). The procedures defined herein are required for all fish processing, taxonomic identification and QA/QC activities resulting in information used for the Integrated Report to Congress on Water Quality in Kentucky (305[b] and 303[d] Reports) and other data needs of the KDOW up to the point where data are ready for entry into EDAS. KDOW (2009b) details the procedures for entry of final results into EDAS.

A multi-metric index, the KIBI, is used to assess stream health by examining fish community structure (Compton et al. 2003). Advantages of using fish as biological indicators include their 1) widespread distribution from small streams to all but the most polluted waters; 2) utilization of a variety of trophic levels; 3) stable populations during summer months; and 4) the availability of extensive life history information (Karr et al. 1986). The methods used for laboratory procedures and identification data for use in the KIBI are outlined in this manual.

Any data submitted to KDOW for review will undergo QA/QC and those identified as not following the methods set forth in this document will be flagged as not suitable for the Integrated Report to Congress on Water Quality in Kentucky (305[b] and 303[d] Reports)**.** These data may be retained in KDOW files for other data purposes.

Definitions

EDAS – Ecological Data Application System

ETOH – Ethanol

KDOW – Kentucky Division of Water

KIBI – Kentucky Index of Biotic Integrity

MSDS – Materials Safety Data Sheet

PPE – Personal Protective Equipment

QA – Quality Assurance

QC – Quality Control

Health & Safety Policy/Section

Laboratory safety procedures outlined in the Kentucky Safety Manual (http://eppcintra.ky.gov/EEC/dep/depsafety/) and the Water Quality Branch Health and Safety Manual (KDOW in draft) should be followed by staff employees while working in the laboratories.

Proper PPE shall be worn by all KDOW personnel while processing samples and handling chemicals. Refer to the appropriate MSDS sheet for the correct PPE while handling chemicals. It is recommended that lab coats also be worn to protect clothing from spillage. Protective eyewear should be worn when the potential exist for particulate, vapor, liquid or foreign objects to become lodged in the eye. Forceps should be used to remove specimens from collecting jars to reduce the risk of exposure from chemical preservatives.

When working with chemicals that cause harmful fumes, personnel shall use a fume hood to reduce the threat of inhalation exposure to them and their fellow coworkers. A fume hood shall be used when utilizing any carcinogenic compound (i.e., formalin). Fume hoods will also be used when changing preservatives in collection jars to reduce the potential for adverse effects to the researcher or others.

Toxic or caustic materials should be stored in the chemical storage cabinet. Excess toxic or caustic materials should be stored in the hazardous materials building. Two or more personnel should be involved in retrieving materials from the hazardous materials building. It is recommended that the door of the hazardous materials building be propped open when entering so that ventilation can occur.

When a chemical spill (e.g. a broken mercury thermometer, broken large containers of acids or preservatives, etc.) occurs, the first line supervisor will be notified. The first line supervisor will notify the second line supervisor and the division safety officer. The division safety officer will then notify the department safety officer. Do not attempt to clean-up a chemical spill, if inhalation exposure or skin, throat or eye irritation is a threat.

If injury or exposure occurs within the laboratory facilities, then proper first aid attention will be administered by other lab personnel as soon as possible. If the condition is serious, the victim should be transported to a medical facility as soon as possible. For chemical exposures refer to the appropriate MSDS sheet for first aid treatment. MSDS sheets shall be maintained in a readily accessible location in the lab for each chemical stored or used in the lab. If any exposure occurs while in the laboratory, a 1A1 exposure or injury form needs to be submitted to the Division of Workman's Compensation within 24 hours of exposure or injury.

Cautions

Several cautions exist with regard to activities and negligence that could possibly cause equipment damage, degradation of the sample and possible invalidation of the results. The first is care and maintenance of the optical equipment (i.e., stereomicroscopes). Microscopes should be maintained by the manufacturer or a professional service center. In addition, samples stored

in containers using ETOH are not always airtight. As a consequence, ETOH may evaporate leading to desiccation of the sample. The identifier of these samples should check ETOH levels periodically to ensure that levels are adequate. This should be a common practice not only before the sample is identified, but for the duration of the project after identification to satisfy retention time requirements.

Personnel Qualifications / Responsibilities

All fish taxonomists will meet at least the minimum qualifications for their job classification. In addition, fish taxonomists will be trained in the identification of fish by formal academic instruction. Fish taxonomists that have not had formal academic instruction in collection and identification of fish will be deemed technically competent based on their knowledge, skills and abilities by KDOW management. Taxonomic education will continue with on-the-job training, interaction with experienced taxonomists and continued outside training when education opportunities become available.

Equipment and Supplies

The following is a list of common equipment and supplies typically employed by KDOW fish taxonomists when identifying specimens.

- Stereomicroscope (Dissecting) w/ 10X ocular and appropriate zoom magnification
- Plastic pans (assorted sizes)
- Forceps (specimen and fine-tip)
- Probes
- Compressed air
- Disposable gloves
- Counter
- Fume hood
- 70% ETOH
- Glass specimen jars (assorted sizes)
- Bench sheets
- Sample log
- Taxonomic literature (Appendix A)

Methods

The following sections describe the methods that should be followed when processing, identifying and recording fish samples in the laboratory.

Logging Samples

All samples should be logged into the sample log upon returning from the field. Information included in the logbook (or file) includes DOW Station I.D., stream name, latitude and longitude, date collected, type of sample, number of samples, date-to-lab, date rinsed in tap water and date transferred to ETOH (KDOW 2009).

Preservation

Following initial field collection, fish need to be stored in the formalin (10-15%) solution for at least two weeks (larger fish should be fixed for at least 3–4 weeks unless injected with a formalin solution in the field). After initial preservation in formalin, samples are triple rinsed and soaked in tap water for 1-3 days, with a change of water each day. After rinsing in tap water, fish are then transferred to 70% ETOH for long-term preservation and storage in glass jars. All preservation work done in the laboratory must be performed under a fume hood.

Labeling

If a label was not placed in the container while in the field, a label will be placed in the collection jar when the sample is returned to the laboratory or before identified. The label will include the site number, stream name, location, county, date sampled, collectors' initials and collection method. Additional information may include shock time, seine time and distance sampled.

Laboratory Methods

Before taxonomic identification, fish are triple rinsed in tap water and placed in sorting pans with tap water in the pan. If fish have not been transferred to ETOH before identification, they must be tripled rinsed and soaked for 1-3 days in tap water before identification. Identify and count fish using all available taxonomic keys and distribution records. All taxonomic identifications are made to the lowest practical level using the most current taxonomic references available (Appendix A). A current master taxa list is found in Appendix B. Independent taxonomic verifications of problematic specimens are obtained as needed from recognized experts (e.g. Kentucky State Nature Preserves Commission). The occurrence of species that are listed as rare, endangered or threatened by federal or state agencies is also documented and the appropriate agencies are notified with the Threatened/Endangered Species Report Form (Appendix C). After identification, fish are returned to glass containers with 70% ETOH for storage. At the conclusion of a project, samples are either donated to other institutions for further study or dried and discarded. Samples may be retained for longer periods of time for special studies.

Data and Records Management

Species and number of individuals collected are recorded on bench sheets (Appendix D) and used for evaluating species composition, relative abundance, richness, presence or absence of indicator species and calculation of the KIBI. Bench sheets will be retained in the project file. All data will be entered into EDAS (KDOW 2009b) upon completion of individual samples.

Quality Control and Quality Assurance

To assure quality data and assessments, QA/QC will be performed on a percentage of all samples collected to verify consistent collection, identification and data entry.

Five percent of all identified samples will be re-identified by a second taxonomist. Taxonomic precision is measured by Percent Taxonomic Disagreement (PTD) (Stribling et al. 2003 and 2008) as follows:

$$PTD = [1-(N_{Pos}/N_{Tot})]*100$$

Where:

N_{Pos} = number of agreements, and
N_{Tot} = total number of specimens in the larger of the two counts.

PTD values ≤ 10% is the target criteria. If the sample fails, taxonomy must be reconciled by both taxonomists and a third taxonomist if deemed necessary.

Data entry into EDAS will be according to KDOW (2009b).

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Appendix A. Suggested Taxonomic References

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Appendix B. Master Taxa List

Order	Family	Species	Fish_Type	Native	OMN	FC	INT	INS	WC	TOL	SL
Acipenseriformes	Acipenseridae	Acipenser fulvescens		X		X					X
Acipenseriformes	Acipenseridae	Scaphirhynchus albus		X		X					X
Acipenseriformes	Acipenseridae	Scaphirhynchus platorynchus		X		X					X
Acipenseriformes	Polyodontidae	Polyodon spathula		X		X	X				X
Amiiformes	Amiidae	Amia calva		X		X			X		
Anguilliformes	Anguillidae	Anguilla rostrata		X		X					
Aphredoderiformes	Aphredoderidae	Aphredoderus sayanus		X		X		X			
Atheriniformes	Atherinidae	Labidesthes sicculus		X		X		X			
Atheriniformes	Atherinidae	Menidia beryllina		X		X		X			
Clupeiformes	Clupeidae	Alosa alabamae		X		X					X
Clupeiformes	Clupeidae	Alosa chrysochloris		X		X					
Clupeiformes	Clupeidae	Alosa pseudoharengus				X					
Clupeiformes	Clupeidae	Dorosoma cepedianum		X	X	X					
Clupeiformes	Clupeidae	Dorosoma petenense		X	X	X					
Cypriniformes	Catostomidae	Carpiodes carpio	SUC	X	X	X					
Cypriniformes	Catostomidae	Carpiodes cyprinus	SUC	X	X	X					
Cypriniformes	Catostomidae	Carpiodes velifer	SUC	X	X	X					
Cypriniformes	Catostomidae	Catostomid fry	SUC	X		X				X	X
Cypriniformes	Catostomidae	Catostomus commersonii	SUC	X	X					X	X
Cypriniformes	Catostomidae	Catostomus sp.	SUC	X		X				X	X
Cypriniformes	Catostomidae	Cycleptus elongatus	SUC	X		X	X	X	X		X
Cypriniformes	Catostomidae	Erimyzon oblongus	SUC	X		X		X	X		
Cypriniformes	Catostomidae	Erimyzon sucetta	SUC	X	X	X					
Cypriniformes	Catostomidae	Hypentelium nigricans	SUC	X				X	X		X
Cypriniformes	Catostomidae	Ictiobus bubalus	SUC	X	X	X					
Cypriniformes	Catostomidae	Ictiobus cyprinellus	SUC	X	X	X					
Cypriniformes	Catostomidae	Ictiobus niger	SUC	X	X	X					
Cypriniformes	Catostomidae	Minytrema melanops	SUC	X		X		X	X		X

Order	Family	Species	Fish_Type	Native	OMN	FC	INT	INS	WC	TOL	SL
Cypriniformes	Catostomidae	Moxostoma anisurum	SUC	X		X	X	X	X		X
Cypriniformes	Catostomidae	Moxostoma breviceps	SUC	X			X	X	X		X
Cypriniformes	Catostomidae	Moxostoma carinatum	SUC	X		X	X	X	X		X
Cypriniformes	Catostomidae	Moxostoma duquesnei	SUC	X		X	X	X	X		X
Cypriniformes	Catostomidae	Moxostoma erythrurum	SUC	X		X		X	X		X
Cypriniformes	Catostomidae	Moxostoma lacerum	SUC	X			X	X	X		X
Cypriniformes	Catostomidae	Moxostoma poecilurum	SUC	X		X		X	X		X
Cypriniformes	Catostomidae	Moxostoma sp.	SUC	X		X		X	X		X
Cypriniformes	Catostomidae	Moxostoma valenciennesi	SUC	X		X		X	X		X
Cypriniformes	Catostomidae	Thoburnia atripinne	SUC	X			X	X	X		X
Cypriniformes	Cyprinidae	Campostoma a. pullum	MIN	X							
Cypriniformes	Cyprinidae	Campostoma anomalum	MIN	X		X					
Cypriniformes	Cyprinidae	Campostoma oligolepis	MIN	X		X					
Cypriniformes	Cyprinidae	Carassius auratus	MIN	X	X	X				X	
Cypriniformes	Cyprinidae	Clinostomus elongatus	MIN	X			X	X	X		X
Cypriniformes	Cyprinidae	Clinostomus funduloides	MIN	X			X	X	X		X
Cypriniformes	Cyprinidae	Ctenopharyngodon idella	MIN			X					
Cypriniformes	Cyprinidae	Cyprinella camura	MIN	X		X	X	X	X		
Cypriniformes	Cyprinidae	Cyprinella galactura	MIN	X		X	X	X	X		
Cypriniformes	Cyprinidae	Cyprinella lutrensis	MIN	X	X	X					
Cypriniformes	Cyprinidae	Cyprinella spiloptera	MIN	X		X		X	X		
Cypriniformes	Cyprinidae	Cyprinella spiloptera x Lythrurus fasciolaris	MIN					X	X		
Cypriniformes	Cyprinidae	Cyprinella venusta	MIN	X		X		X	X		
Cypriniformes	Cyprinidae	Cyprinella whipplei	MIN	X		X		X	X		
Cypriniformes	Cyprinidae	Cyprinid sp.	MIN	X		X					
Cypriniformes	Cyprinidae	Cyprinus carpio	MIN		X	X				X	
Cypriniformes	Cyprinidae	Erimystax dissimilis	MIN	X		X	X	X	X		X
Cypriniformes	Cyprinidae	Erimystax insignis	MIN	X		X		X	X		X
Cypriniformes	Cyprinidae	Erimystax x-punctatus	MIN	X			X	X	X		X

Order	Family	Species	Fish_Type	Native	OMN	FC	INT	INS	WC	TOL	SL
Cypriniformes	Cyprinidae	Hemitremia flammea	MIN	X		X		X	X		
Cypriniformes	Cyprinidae	Hybognathus hayi	MIN	X		X					
Cypriniformes	Cyprinidae	Hybognathus nuchalis	MIN	X	X	X					
Cypriniformes	Cyprinidae	Hybognathus placitus	MIN			X					
Cypriniformes	Cyprinidae	Hybopsis amblops	MIN	X		X	X	X	X		X
Cypriniformes	Cyprinidae	Hybopsis amnis	MIN	X		X		X	X		
Cypriniformes	Cyprinidae	Hypophthalmichthys molitrix	MIN			X					
Cypriniformes	Cyprinidae	Hypophthalmichthys nobilis	MIN							X	
Cypriniformes	Cyprinidae	Luxilus chrysocephalus	MIN	X		X		X		X	X
Cypriniformes	Cyprinidae	Luxulus chrysocephalus X Phoxinus erythrogaster	MIN					X		X	X
Cypriniformes	Cyprinidae	Lythrurus fasciolaris	MIN	X		X		X	X		
Cypriniformes	Cyprinidae	Lythrurus fumeus	MIN	X		X		X		X	
Cypriniformes	Cyprinidae	Lythrurus umbratilis	MIN	X		X		X	X		X
Cypriniformes	Cyprinidae	Macrhybopsis gelida	MIN	X		X	X	X	X		
Cypriniformes	Cyprinidae	Macrhybopsis hyostoma	MIN	X		X	X	X	X		
Cypriniformes	Cyprinidae	Macrhybopsis meeki	MIN	X		X	X	X	X		
Cypriniformes	Cyprinidae	Macrhybopsis storeriana	MIN	X		X		X	X		
Cypriniformes	Cyprinidae	Nocomis biguttatus	MIN	X	X	X	X				X
Cypriniformes	Cyprinidae	Nocomis effusus	MIN	X		X	X	X	X		X
Cypriniformes	Cyprinidae	Nocomis micropogon	MIN	X		X	X	X	X		X
Cypriniformes	Cyprinidae	Notemigonus crysoleucas	MIN	X	X	X				X	
Cypriniformes	Cyprinidae	Notropis albizonatus	MIN	X		X	X	X	X		X
Cypriniformes	Cyprinidae	Notropis ariommus	MIN	X		X	X	X	X		X
Cypriniformes	Cyprinidae	Notropis atherinoides	MIN	X	X	X					X
Cypriniformes	Cyprinidae	Notropis blennius	MIN	X		X		X	X		X
Cypriniformes	Cyprinidae	Notropis boops	MIN	X		X		X	X		X
Cypriniformes	Cyprinidae	Notropis buccatus	MIN	X	X	X				X	
Cypriniformes	Cyprinidae	Notropis buchanani	MIN	X		X		X	X		
Cypriniformes	Cyprinidae	Notropis hudsonius	MIN	X		X		X			

Order	Family	Species	Fish_Type	Native	OMN	FC	INT	INS	WC	TOL	SL
Cypriniformes	Cyprinidae	Notropis leuciodus	MIN	X		X	X	X	X		
Cypriniformes	Cyprinidae	Notropis maculatus	MIN	X		X			X		
Cypriniformes	Cyprinidae	Notropis micropteryx	MIN	X		X	X	X	X		X
Cypriniformes	Cyprinidae	Notropis nubilus	MIN	X		X		X			
Cypriniformes	Cyprinidae	Notropis photogenis	MIN	X		X	X	X	X		X
Cypriniformes	Cyprinidae	Notropis rubellus	MIN	X		X	X	X	X		X
Cypriniformes	Cyprinidae	Notropis shumardi	MIN	X		X					
Cypriniformes	Cyprinidae	Notropis sp.	MIN	X		X					
Cypriniformes	Cyprinidae	Notropis sp. cf. N. spectrunculus	MIN	X		X	X	X	X		X
Cypriniformes	Cyprinidae	Notropis stramineus	MIN	X							
Cypriniformes	Cyprinidae	Notropis telescopus	MIN	X		X	X	X	X		
Cypriniformes	Cyprinidae	Notropis volucellus	MIN	X	X	X					
Cypriniformes	Cyprinidae	Notropis wickliffi	MIN	X		X					
Cypriniformes	Cyprinidae	Opsopoeodus emiliae	MIN	X	X	X	X				
Cypriniformes	Cyprinidae	Phenacobius mirabilis	MIN	X		X		X	X		X
Cypriniformes	Cyprinidae	Phenacobius uranops	MIN	X		X	X	X	X		X
Cypriniformes	Cyprinidae	Phoxinus cumberlandensis	MIN	X	X		X				X
Cypriniformes	Cyprinidae	Phoxinus erythrogaster	MIN	X	X		X				X
Cypriniformes	Cyprinidae	Phoxinus oreas	MIN			X					
Cypriniformes	Cyprinidae	Pimephales notatus	MIN	X	X	X				X	
Cypriniformes	Cyprinidae	Pimephales promelas	MIN	X	X	X				X	
Cypriniformes	Cyprinidae	Pimephales sp.	MIN	X	X	X				X	
Cypriniformes	Cyprinidae	Pimephales vigilax	MIN	X	X	X				X	
Cypriniformes	Cyprinidae	Platygobio gracilis	MIN	X		X		X		X	
Cypriniformes	Cyprinidae	Rhinichthys cataractae	MIN			X		X			X
Cypriniformes	Cyprinidae	Rhinichthys obtusus	MIN	X		X		X		X	X
Cypriniformes	Cyprinidae	Semotilus atromaculatus	MIN	X	X					X	
Cyprinodontiformes	Fundulidae	Fundulus catenatus		X		X		X			X
Cyprinodontiformes	Fundulidae	Fundulus chrysotus		X		X		X			

Order	Family	Species	Fish_Type	Native	OMN	FC	INT	INS	WC	TOL	SL
Cyprinodontiformes	Fundulidae	Fundulus dispar		X		X		X			
Cyprinodontiformes	Fundulidae	Fundulus notatus		X		X		X			
Cyprinodontiformes	Fundulidae	Fundulus olivaceus		X		X		X			
Cyprinodontiformes	Poeciliidae	Gambusia affinis		X		X		X		X	
Esociformes	Esocidae	Esox americanus		X		X			X		
Esociformes	Esocidae	Esox lucius				X					
Esociformes	Esocidae	Esox masquinongy		X		X			X		
Esociformes	Esocidae	Esox niger		X		X			X		
Esociformes	Umbridae	Umbra limi		X				X		X	
Gadiformes	Gadidae	Lota lota		X		X					X
Gasterosteiformes	Gasterosteidae	Culaea inconstans				X		X			
Hiodontiformes	Hiodontidae	Hiodon alosoides		X		X		X			
Hiodontiformes	Hiodontidae	Hiodon tergisus		X		X		X			
Lepisosteiformes	Lepisosteidae	Atractosteus spatula		X		X			X		
Lepisosteiformes	Lepisosteidae	Lepisosteus oculatus		X		X			X		
Lepisosteiformes	Lepisosteidae	Lepisosteus osseus		X		X			X		
Lepisosteiformes	Lepisosteidae	Lepisosteus platostomus		X		X			X		
Lepisosteiformes	Lepisosteidae	Lepisosteus sp.		X		X			X		
Mugiliformes	Mugilidae	Mugil cephalus		X							
NA	NA	Hybrid sp.									
NA	NA	No Fish									
Perciformes	Centrarchidae	Ambloplites rupestris	SUN	X		X			X		
Perciformes	Centrarchidae	Centrarchus macropterus	SUN	X		X		X	X		
Perciformes	Centrarchidae	Lepomis auritus	SUN			X		X		X	
Perciformes	Centrarchidae	Lepomis cyanellus	SUN	X		X		X		X	
Perciformes	Centrarchidae	Lepomis cyanellus X L. macrochirus	SUN			X				X	
Perciformes	Centrarchidae	Lepomis cyanellus X L. megalotis	SUN			X				X	
Perciformes	Centrarchidae	Lepomis gibbosus	SUN	X		X		X	X		
Perciformes	Centrarchidae	Lepomis gulosus	SUN	X		X		X	X		

Order	Family	Species	Fish_Type	Native	OMN	FC	INT	INS	WC	TOL	SL
Perciformes	Centrarchidae	Lepomis humilis	SUN	X		X		X	X		
Perciformes	Centrarchidae	Lepomis macrochirus	SUN	X		X		X		X	
Perciformes	Centrarchidae	Lepomis macrochirus X L. cyanellus				X				X	
Perciformes	Centrarchidae	Lepomis macrochirus X L. megalotis	SUN			X					
Perciformes	Centrarchidae	Lepomis marginatus	SUN	X		X		X	X		
Perciformes	Centrarchidae	Lepomis megalotis	SUN	X		X		X	X		
Perciformes	Centrarchidae	Lepomis microlophus	SUN	X		X		X	X		
Perciformes	Centrarchidae	Lepomis miniatus	SUN	X		X	X	X	X		
Perciformes	Centrarchidae	Lepomis sp.	SUN	X		X		X			
Perciformes	Centrarchidae	Lepomis symmetricus	SUN	X		X		X	X		
Perciformes	Centrarchidae	Micropterus coosae				X					
Perciformes	Centrarchidae	Micropterus dolomieu		X		X			X		
Perciformes	Centrarchidae	Micropterus punctulatus		X		X			X		
Perciformes	Centrarchidae	Micropterus salmoides		X		X				X	
Perciformes	Centrarchidae	Micropterus sp.		X		X					
Perciformes	Centrarchidae	Pomoxis annularis		X		X			X		
Perciformes	Centrarchidae	Pomoxis nigromaculatus		X		X			X		
Perciformes	Elassomatidae	Elassoma zonatum		X				X	X		
Perciformes	Moronidae	Morone chrysops		X		X					
Perciformes	Moronidae	Morone chrysops x M. saxatilis				X					
Perciformes	Moronidae	Morone mississippiensis		X		X					
Perciformes	Moronidae	Morone saxatilis				X					
Perciformes	Moronidae	Morone sp				X					
Perciformes	Percidae	Ammocrypta clara	DAR	X		X	X	X			X
Perciformes	Percidae	Ammocrypta pellucida	DAR	X		X	X	X			X
Perciformes	Percidae	Ammocrypta vivax	DAR	X		X	X	X			X
Perciformes	Percidae	Crystallaria cincotta	DAR	X		X	X	X			X
Perciformes	Percidae	Etheostoma asprigene	DAR	X				X			
Perciformes	Percidae	Etheostoma baileyi	DAR	X			X	X			X

Order	Family	Species	Fish_Type	Native	OMN	FC	INT	INS	WC	TOL	SL
Perciformes	Percidae	Etheostoma barbouri	DAR	X			X	X			
Perciformes	Percidae	Etheostoma barrenense	DAR	X			X	X			
Perciformes	Percidae	Etheostoma bellum	DAR	X		X	X	X			
Perciformes	Percidae	Etheostoma bison	DAR	X				X			X
Perciformes	Percidae	Etheostoma blennioides	DAR	X		X		X			X
Perciformes	Percidae	Etheostoma caeruleum	DAR	X				X			X
Perciformes	Percidae	Etheostoma camurum	DAR	X		X	X	X			X
Perciformes	Percidae	Etheostoma cf. spectabile "Mamequit"	DAR	X				X			X
Perciformes	Percidae	Etheostoma cf. spectabile "Sheltowee"	DAR	X				X			X
Perciformes	Percidae	Etheostoma cf. stigmaeum "Bluegrass"	DAR	X		X	X	X			X
Perciformes	Percidae	Etheostoma cf. stigmaeum "Longhunt"	DAR	X		X	X	X			X
Perciformes	Percidae	Etheostoma chienense	DAR	X				X			
Perciformes	Percidae	Etheostoma chlorosoma	DAR	X				X			
Perciformes	Percidae	Etheostoma cinereum	DAR	X		X	X	X			
Perciformes	Percidae	Etheostoma crossopterum	DAR	X				X			
Perciformes	Percidae	Etheostoma derivativum	DAR	X			X	X			
Perciformes	Percidae	Etheostoma flabellare	DAR	X				X			
Perciformes	Percidae	Etheostoma flavum	DAR	X			X	X			X
Perciformes	Percidae	Etheostoma fusiforme	DAR	X			X	X			
Perciformes	Percidae	Etheostoma gracile	DAR	X				X			
Perciformes	Percidae	Etheostoma histrio	DAR	X		X	X	X			X
Perciformes	Percidae	Etheostoma kantuckeense	DAR	X				X			X
Perciformes	Percidae	Etheostoma kennicotti	DAR	X				X			X
Perciformes	Percidae	Etheostoma lawrencei	DAR	X				X			
Perciformes	Percidae	Etheostoma lynceum	DAR	X		X		X			X
Perciformes	Percidae	Etheostoma maculatum	DAR	X		X	X	X			X
Perciformes	Percidae	Etheostoma microlepidum	DAR	X		X	X	X			
Perciformes	Percidae	Etheostoma microperca	DAR	X			X	X			
Perciformes	Percidae	Etheostoma nigrum	DAR	X		X		X			

Order	Family	Species	Fish_Type	Native	OMN	FC	INT	INS	WC	TOL	SL
Perciformes	Percidae	Etheostoma obeyense	DAR	X			X	X			
Perciformes	Percidae	Etheostoma occidentale	DAR	X			X	X			X
Perciformes	Percidae	Etheostoma oophylax	DAR	X				X			
Perciformes	Percidae	Etheostoma orientale	DAR	X			X	X			X
Perciformes	Percidae	Etheostoma parvipinne	DAR	X			X	X			
Perciformes	Percidae	Etheostoma percnurum	DAR	X			X	X			
Perciformes	Percidae	Etheostoma proeliare	DAR	X			X	X			
Perciformes	Percidae	Etheostoma pyrrhogaster	DAR	X			X	X			
Perciformes	Percidae	Etheostoma rafinesquei	DAR	X			X	X			
Perciformes	Percidae	Etheostoma rufilineatum	DAR	X		X	X	X			
Perciformes	Percidae	Etheostoma sagitta	DAR	X			X	X			
Perciformes	Percidae	Etheostoma sanguifluum	DAR	X		X	X	X			
Perciformes	Percidae	Etheostoma simoterum	DAR	X			X	X			X
Perciformes	Percidae	Etheostoma smithi	DAR	X			X	X			X
Perciformes	Percidae	Etheostoma sp.	DAR	X			X	X			X
Perciformes	Percidae	Etheostoma spectabile	DAR	X				X			X
Perciformes	Percidae	Etheostoma squamiceps	DAR	X				X			
Perciformes	Percidae	Etheostoma stigmaeum	DAR	X		X	X	X			X
Perciformes	Percidae	Etheostoma susanae	DAR	X			X	X			
Perciformes	Percidae	Etheostoma swaini	DAR	X			X	X			X
Perciformes	Percidae	Etheostoma tecumsehi	DAR	X				X			X
Perciformes	Percidae	Etheostoma tippecanoe	DAR	X		X	X	X			X
Perciformes	Percidae	Etheostoma variatum	DAR	X		X	X	X			X
Perciformes	Percidae	Etheostoma virgatum	DAR	X			X	X			
Perciformes	Percidae	Etheostoma zonale	DAR	X		X		X			X
Perciformes	Percidae	Etheostoma zonistium	DAR	X			X	X			X
Perciformes	Percidae	Perca flavescens		X		X					
Perciformes	Percidae	Percina burtoni	DAR	X		X	X	X			X
Perciformes	Percidae	Percina caprodes	DAR	X		X		X			X

Order	Family	Species	Fish_Type	Native	OMN	FC	INT	INS	WC	TOL	SL
Perciformes	Percidae	Percina copelandi	DAR	X		X	X	X			X
Perciformes	Percidae	Percina evides	DAR	X		X	X	X			X
Perciformes	Percidae	Percina macrocephala	DAR	X		X	X	X			X
Perciformes	Percidae	Percina maculata	DAR	X		X		X			X
Perciformes	Percidae	Percina oxyrhynchus	DAR	X		X	X	X			X
Perciformes	Percidae	Percina phoxocephala	DAR	X		X	X	X			X
Perciformes	Percidae	Percina sciera	DAR	X		X	X	X			X
Perciformes	Percidae	Percina shumardi	DAR	X		X		X			X
Perciformes	Percidae	Percina squamata	DAR	X		X	X	X			X
Perciformes	Percidae	Percina stictogaster	DAR	X			X	X			X
Perciformes	Percidae	Percina vigil	DAR	X		X	X	X			X
Perciformes	Percidae	Sander canadensis		X		X			X		
Perciformes	Percidae	Sander vitreus		X		X			X		
Perciformes	Sciaenidae	Aplodinotus grunniens		X		X					
Percopsiformes	Amblyopsidae	Amblyopsis spelaea		X							
Percopsiformes	Amblyopsidae	Forbesichthys agassizii		X							
Percopsiformes	Amblyopsidae	Typhlichthys subterraneus		X							
Percopsiformes	Percopsidae	Percopsis omiscomaycus		X			X	X			
Petromyzontiformes	Petromyzontidae	Ichthyomyzon bdellium		X							
Petromyzontiformes	Petromyzontidae	Ichthyomyzon castaneus		X							
Petromyzontiformes	Petromyzontidae	Ichthyomyzon fossor		X							
Petromyzontiformes	Petromyzontidae	Ichthyomyzon gagei		X							
Petromyzontiformes	Petromyzontidae	Ichthyomyzon greeleyi		X							
Petromyzontiformes	Petromyzontidae	Ichthyomyzon unicuspis		X							
Petromyzontiformes	Petromyzontidae	Lampetra aepyptera		X							
Petromyzontiformes	Petromyzontidae	Lampetra appendix		X							
Petromyzontiformes	Petromyzontidae	Lamprey ammocoete		X							
Petromyzontiformes	Petromyzontidae	Lamprey sp.		X							
Salmoniformes	Osmeridae	Osmerus mordax									

Order	Family	Species	Fish_Type	Native	OMN	FC	INT	INS	WC	TOL	SL
Salmoniformes	Salmonidae	Oncorhynchus kisutch									
Salmoniformes	Salmonidae	Oncorhynchus mykiss						X			
Salmoniformes	Salmonidae	Salmo trutta						X			
Salmoniformes	Salmonidae	Salvelinus fontinalis						X			
Salmoniformes	Salmonidae	Salvelinus namaycush									
Scorpaeniformes	Cottidae	Cottus bairdii	COT	X			X	X			
Scorpaeniformes	Cottidae	Cottus carolinae	COT	X			X	X			
Siluriformes	Ictaluridae	Ameiurus catus			X	X		X		X	
Siluriformes	Ictaluridae	Ameiurus melas		X	X	X				X	
Siluriformes	Ictaluridae	Ameiurus natalis		X	X	X				X	
Siluriformes	Ictaluridae	Ameiurus nebulosus		X	X	X		X		X	
Siluriformes	Ictaluridae	Ameiurus sp.		X	X	X				X	
Siluriformes	Ictaluridae	Ictalurus furcatus		X	X	X					
Siluriformes	Ictaluridae	Ictalurus punctatus		X	X	X					
Siluriformes	Ictaluridae	Noturus elegans	MAD	X			X	X			
Siluriformes	Ictaluridae	Noturus eleutherus	MAD	X			X	X			
Siluriformes	Ictaluridae	Noturus exilis	MAD	X			X	X			
Siluriformes	Ictaluridae	Noturus flavus	MAD	X			X	X			
Siluriformes	Ictaluridae	Noturus gyrinus	MAD	X			X	X			
Siluriformes	Ictaluridae	Noturus hildebrandi	MAD	X			X	X			
Siluriformes	Ictaluridae	Noturus miurus	MAD	X			X	X			
Siluriformes	Ictaluridae	Noturus nocturnus	MAD	X			X	X			
Siluriformes	Ictaluridae	Noturus phaeus	MAD	X			X	X			
Siluriformes	Ictaluridae	Noturus stigmosus	MAD	X			X	X			
Siluriformes	Ictaluridae	Pylodictis olivaris		X		X			X		

Appendix C. Threatened/Endangered Species Report Form

THREATENED/ENDANGERED SPECIES REPORT FORM		
Species Collected:		Date Collected:
# Collected:	Released ☐Yes ☐No	
If No, Explain:		
Stream:	Site #:	Basin:
Location:	County:	
Quad:	Collected/Identified by:	
Collection method:		
Comments:		

Appendix D. Fish Bench Sheet

Fish Bench Sheet

Site #: _____ Collect Date: _____

Stream Name _____

Location: _____ County: _____

Lat/Long: _____ Catchment: _____

Collectors: _____ TNI _____

Collection Method: BPEF Time: _____ Seine Time: _____ Distance: _____ TR _____

Identified By: _____ ID Date: _____ Date Entered EDAS: _____

	Species	# of Specimens Released	Voucher	Total	Notes
1					
2					
3					
4					
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