DRAFT

# STANDARD OPERATING PROCEDURE FOR:

# FISH SAMPLING WITH SEINES

TVA-KIF-SOP-32

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## 1.0 PURPOSE

The objective of this Standard Operating Procedure (SOP) is to describe the standard methods for seine sampling (seining) of fish relative to the ash spill at the Kingston Fossil Plant (KIF). These procedures have been developed so that samples are collected, preserved, and prepared for shipping in a systematic manner and that appropriate documentation is maintained.

## 2.0 GENERAL CONSIDERATIONS

Potential hazards associated with the planned tasks are thoroughly evaluated prior to conducting field activities. The *Site-Wide Safety and Health Plan* (SWSHP) provides a description of potential hazards and associated safety and control measures. A pre-job safety analysis (JSA) highlighting potential hazards is discussed at each sampling event. Sampling is only conducted by properly trained personnel.

Sampling personnel wear powder-free nitrile gloves while performing the procedures described in this SOP. Specifically, powder-free nitrile gloves are worn while preparing sample bottleware, preparing and decontaminating sampling equipment, collecting samples, and packing samples. At a minimum, nitrile gloves are changed prior to the collection of each sample or as necessary to prevent the possibility of cross-contamination with the sample, the sample bottleware, or the sampling equipment.

Field sampling equipment that may come in contact with fish that have been collected is decontaminated in accordance with *Decontamination of Equipment* SOP (TVA-KIF-SOP-08) procedures prior to use.

Seining is widely used in the fisheries profession as a method for sampling fish in streams, ponds, and reservoirs. There are two basic techniques for collecting fish with a seine. The seine can be pulled through the water to trap fish (seine hauling) or fish in streams can be driven downstream into a seine held stationary in the current (driving). Variations of the latter technique include different ways fish can be moved into the seine. Fish can be driven by personnel either kicking the substrate, snorkeling and bumping bars along the substrate, driving with another seine, or backpack electrofishing downstream to the seine. Quantitative samples can be collected over a series of measured transects using a stationary seine and any one of the three driving techniques. The mean number of each species captured per transect is used as an indication of abundance.

Another aspect of seining that should be considered is the size of the seine and size of the mesh to be used. A seine 1.5 m by 4.5 m or larger is usually more suitable for collecting large quantities of fish and larger fish than a smaller seine, but it is also more awkward and requires more effort to handle. A smaller seine is more suitable for sampling heavy

cover. Selection of mesh size is based on the objectives of the sampling. For mesh size, ¼-inch to 3/16-inch bar mesh is commonly used and is suitable for collecting a large size range of fish. Smaller mesh sizes are required if very small juvenile or larval fish are to be collected.

## 3.0 PROCEDURES

The following sections describe the procedures for seining. If deviations from these procedures are anticipated, the Project Manager and Quality Assurance (QA) Officer is contacted and the deviation is fully documented. Field work progresses as deviations are approved or resolved.

### 3.1 Pre-Job Preparation

The Project Manager is responsible for overall implementation of this procedure and ensuring that it complies with current regulations and standards as these are subject to change. The Project Manager is also responsible for the following activities:

a. Coordination with appropriate regulatory agencies to ensure that appropriate documentation and/or permits are obtained.

b. Review project work control documents including the *Quality Assurance Project Plan* (TVA-KIF-QAPP), SWSHP, and appropriate SOPs to determine appropriate field protocols.

c. Develop a Sampling and Analysis Plan (SAP) to ensure project objectives are met such as sample type (individual animal, composite), sample size (necessary biomass/volume of material needed and number of specimens needed to meet those requirements), number of replicates, and sample locations (transects, random, stratified).

d. Identify approximate sampling locations. If necessary, perform a reconnaissance visit of perspective sampling locations to evaluate their suitability.

e. Obtain legal right-of-entry from appropriate landowners and jurisdictions as needed.

f. Discuss project objectives and potential hazards with project personnel.

g. Coordinate with Field Team Leader to ensure that appropriate field equipment and safety gear are available.

h. Indentify appropriate laboratories to perform analyses and confirm that they have been contacted and are prepared to receive the samples.

i. Make sure that the training requirements and needs have been identified and that project personnel complete the necessary training.

## 3.2 Field Preparation

The Field Team Leader is responsible for implementation of the field collection process. The Field Team Leader confirms that samples are safely collected, that decontamination protocols are used to maintain sample integrity, and that the associated data are accurate and well-documented. The Field Team Leader is also responsible for the following activities:

a. Gather equipment necessary for completing the collection and sampling activities (refer to Table 1 for an example checklist).

b. Provide a summary of potential hazards (or review appropriate JSA) and provide appropriate safety equipment to the field sampling team.

c. Confirm that QA and quality control (QC) protocols are followed.

d. Maintain documentation of field activities and Chain-of-Custody (COC) records in accordance with the *Field Documentation* SOP (TVA-KIF-SOP-06).

## 3.3 Sampling Methods for Fish Collection using Seines

Fish are collected either by seine hauling, using a stationary seine, or by driving fish into a seine. A minimum of three transects are made per habitat type to obtain statistically reliable quantitative data. Quantitative samples are taken from a transect (4.9 by 15.2 m) marked off by a floating nylon rope anchored at the upstream end. A 6.25-m (20-ft) seine is used to collect fish at the end of the transect.

### 3.3.1 Seine Hauling

a. With a person holding both brails of the seine, walk downstream pulling the seine through the water to trap the fish. Seining in a downstream direction is the most effective way to capture midwater oriented species. Keep the leadline on the bottom as much as possible during the haul.

b. Have one or more people wade in front of the seine so as to disturb the substrate causing the benthic dwelling species to swim off the bottom and other fish to become disoriented and more susceptible to capture.

c. Terminate the seine hauls at the shoreline. When using a seine less than 4.6 m (15 feet) wide, terminate the seine haul by lifting the seine prior to reaching shore.

d. Maintain a bag in the seine while hauling and lifting.

e. Alternatively, hold one brail stationary at the shore or bank and pull the other brail from a perpendicular position to complete the quadrant haul as shown in Figure 1.

3.3.2 Stationary Seine

a. Hold the seine stationary in the current while fish move downstream into the seine.

b. Keep the leadline on the substrate as much as possible by having each brail holder place one foot on the leadline.

c. Make a minimum of three transects per transect site (habitat type) to obtain statistically reliable quantitative data.

3.3.3 Driving Fish into Seine

a. Method one: Have one to five individuals kick the substrate as they move downstream towards the stationary seine. Because the amount of effort spent kicking is so variable, this technique is only used for qualitative sampling.

b. Method two: Use a backpack electrofishing unit to stun fish, which are then carried by the current downstream into the seine. This is only effective if there is sufficient current to carry the fish to the seine. When shocking in slow current areas, take care to not move downstream faster than the current which might result in the net being lifted before the fish have time to drift into the seine. As workers shock toward the seine, move the cathode and anode simultaneously from side to side in a sweeping motion, completely covering the area between the seine and themselves. This method of sampling is suitable for both qualitative and quantitative sampling.

## 3.4 Sample Processing

To minimize introduction of contaminants into samples and on equipment that may come into contact with samples, clean disposable nitrile gloves are worn and changed regularly when handling samples and equipment that could or will come into direct contact with samples. Regardless of seining technique, at the completion of each run the seine is lifted out of the water to collect the trapped fish.

a. Sort and count the fish by species. Record the results in the data logger. If data logger is not available, enter results on a *Fisheries Index of Biological Integrity Form* (Table 2). Record the relative abundance expressed as the mean number of each species in each transect.

b. Release live fish not needed for the project. Puncture the air bladder of dead fish not needed with a knife and allow them to sink to the bottom of the reservoir or river in water deeper than three meters.

c. Preserve fish of questionable identity or rarely captured species in 10% formalin and send to the Walnut Orchard Complex in Norris, Tennessee for verification. Pierce the body cavity of large specimens (≥ 210 inches in length) to allow penetration by the preservative.

**Note:** This does not include any threatened or endangered species which might be captured alive in the nets. Pictures of specimens taken with a camera can substitute for preservation; however, include in the picture a numbered tag or some other method of identifying which fish is being photographed and record the tag number on the data logger or *Fisheries Index of Biological Integrity Form* (Table 2). Photographs are taken in accordance with the *Photograph Management* SOP (TVA-KIF-SOP-26).

d. Release immediately any specimen known to be an endangered species unless prior arrangements (such as permits) have been made for the collection of endangered species. Endangered species collected can be photographed before release in accordance with the *Photograph Management* SOP (TVA-KIF-SOP-26). If a mortality of an endangered species occurs, the specimen is preserved and the Project Manager notified within 12 hours of the mortality.

e. Preserve voucher specimens in 10% formalin solution. Pierce the body cavity of large specimens (≥ 210 inches in length) to allow penetration by the preservative.

f. Place fish in a pre-labeled sample jar or clean holding tank filled with water from the site.

g. Sample labels include site/location (with reservoir or river name), date and time, sample replicate number, name of collector(s), and unique sample identification number.

h. After collecting the pre-determined number of fish, transfer fish from the clean bucket to the labeled sample jar. Replace the water in the sample jar with fresh water from the collection site, place the lid on the jar, and then place the jar into a cooler of ice.

i. Obtain and record geographic coordinates with a portable GPS unit at each sampling location.

j. Repeat Steps *a* through *h* for each sample replicate at each sample site.

k. Maintain jars containing samples on ice in a cooler unil final sample processing in the laboratory.

l. At the end of the day of the sample, review the data in the data logger and check for errors (such as key punch errors). If the *Fisheries Index of Biological Integrity Form* is used, the Field Team Leader or his/her designate completes, signs, and dates the data form.

m. Transfer preserved voucher specimens collected in Step *e* to the Walnut Orchard Complex in Norris, Tennessee to confirm field identifications.

## 3.5 Recording Data

Data are recorded in the data loggers as soon as possible, using the appropriate computer program, following sampling events. In the absence of a data logger, the *Fisheries Index of Biological Integrity Form* (Table 2) is used.

### 3.5.1 Data Loggers

Site information not already contained in the data logger is recorded upon arrival at the KIF Project Site. Site information includes reservoir name, river name, river mile and other abiotic site information to help describe location. GPS receivers are used to indentify exact sample locations. GPS coordinates taken in the field are down loaded to laptop computer upon returning from the field.

a. Using attached pen, double click on “survey” icon.

b. Click “Data Entry” tab. Scroll to find river or stream name. Once the correct site is highlighted, click “Selected Station” tab.

c. Enter date, crew leaders’ initials, level of sampling protocol for benthics and fish, level of flow (high, average, low). Then click on “New Effort” tab.

d. Highlight “Fish” tab. Then enter habitat, substrate, gear type, and width and distance of area to be sampled. The click “Enter Data” tab.

e. Select species of fish collected and enter number collected of each. Enter abnormalities by clicking on the “Ab” tab and select appropriate abnormality. Click on the “Done” tab when finished with the effort.

f. Repeat steps c. through e. for each subsequent effort.

3.5.2 Fisheries Index of Biological Integrity Form

In the absence of a data logger, the *Fisheries Index of Biological Integrity Form* (Table 2) is used

a. Enter the name of the river or stream from which the samples are collected, stream ID/station ID numbers, collection method, sample date, and names of crew members participating in sample on the top lines of the form.

b. Record stream and station identification numbers (for example, 482-4 which is Station 4 on Bear Creek). ID numbers are stored in the databases and included in the work plan.

c. Record the collection methods (such as backpack electrofishing or boat electrofishing).

d. Record the date (such as February 3, 2010, is entered as 02 03 10).

e. Record the habitat type (run-RN, riffle-RF, pool-PO, shore line-SL) and substrate type (sand-SA, silt-SI, gravel-GR, cobble-CB, boulder-BO, rubble-RB, bedrock-BR, vegetation-VG, undefined-UN). Habitat type is recorded with a two-letter code at the head of each column under each effort (such as GRRN = gravel run). The crew leader makes this designation before each effort.

f. Record the fish collected by common name (such as large-scale stoneroller).

g. Record the number of each species collected in the column corresponding to the correct effort and habitat heading. Spaces are provided on the back of the form when the front of the sheet is filled.

h. Check the field form for completeness and correctness of data entered. Data from field forms are entered into data logger as soon as possible. Once entered in the data logger, sign and date the appropriate section at the top right section of the field form.

## 3.6 Sample Labeling and Sealing

Samples are labeled and custody sealed in accordance with the *Sample Labeling, Packing, and Shipping* SOP (TVA-KIF-SOP-07).

Once samples are labeled and packed, a *Biota Field Sampling Form* (Table 3) is prepared, and the samples are shipped or delivered to the preferred laboratory in Norris or Chattanooga, Tennessee. If photographs were taken, these are sent via e-mail to the Project Manager.

### 3.7 Field Logbook Documentation

Field logbooks to record daily activities, including sample collection and tracking information, are maintained by the Field Team Leader. Information is entered into the field logbook by the appropriate field team member using waterproof ink. In addition to the minimum requirements discussed in the *Field Documentation* SOP (TVA-KIF-SOP-06), the field logbooks document those collection and sampling characteristics specific to this SOP and as defined in the SAP.

The Field Team Leader and/or designee reviews the field logbook entries on a weekly basis at a minimum (daily review is preferred) for completeness and accuracy and indicates this review by initialing the entries. The Field Team Leader is also responsible for the completion of required data collection forms.

### 3.8 Decontamination and Waste Management

Sampling equipment decontamination is performed in a manner consistent with the *Decontamination of Equipment* SOP (TVA-KIF-SOP-08). Investigation-derived wastes produced during field sampling or decontamination will be managed in accordance with *Management of Investigation-Derived Waste* SOP (TVA-KIF-SOP-12).

## 4.0 REFERENCES


- American Fisheries Society. A list of common and scientific names of fishes from the United States and Canada. Reeve M. Bailey, Editor. Special Publication No. 6, Washington, D.C. 4th ed, 1980.
- NR OPS-FO-BR-23.5, "Fish Surveys Using Snorkeling and SCUBA Divers."
- NR OPS-FO-BR-23.7, "Reservoir Cove Rotenone Sampling."
- NR OPS-FO-BR-23.10, "Electrofishing - Backpack Units."
- NR OPS-FO-NRE-45.1, "Streamflow."
- Pflieger, W.L. The Fishes of Missouri. Missouri Dept. of Conservation. 343 pp, 1975.
- Tennessee Valley Authority (TVA). *Decontamination of Equipment* SOP (TVA-KIF-SOP-08), March 2009.
- TVA. *Field Documentation* SOP (TVA-KIF-SOP-06), 2010.
- TVA. *Management of Investigation-Derived Waste* SOP (TVA-KIF-SOP-12).
- TVA. *Photograph Management* SOP (TVA-KIF SOP 26).
- TVA. *Quality Assurance Project Plan for the Tennessee Valley Authority Kingston Ash Recovery Project* (TVA-KIF-QAPP), Environmental Standards, Inc., 2009.
- TVA. *Sample Labeling, Packing, and Shipping* SOP (TVA-KIF-SOP-07), 2009

- TVA. *Site-Wide Safety and Health Plan for the TVA Kingston Fossil Plant Ash Release Response* (SWSHP), June 2009.
- U.S. Environmental Protection Agency (EPA). *Biological Field and Laboratory Methods*. Environmental Monitoring Service, EPA *670/4-73-001,* Cincinnati, Ohio, 1973.

| Table 1: Suggested Seine Sampling Equipment and Materials Checklist | |
|---|---|
| **Item Description** | **Check** |
| **Health & Safety** | |
| Nitrile gloves | |
| Field first-aid kit | |
| Rubber waders (per person) and repair kit | |
| **Paperwork** | |
| Job Safety Analysis (generic) | |
| Bound field logbook | |
| One set of maps of the sampling area and vicinity | |
| Indelible ink pens and permanent markers | |
| Two sheets each of label paper (waterproof paper type for inside of collection jar and adhesive label for outside) | |
| Chain-of-custody forms and custody seals | |
| **Equipment/Materials** | |
| One hatchet or machete | |
| One or more seines (duplicate seines for backup) | |
| Camera with film or digital camera | |
| Pocket thermometer, graduated in °C | |
| Formalin (1L) | |
| One quart collection jars | |
| Plastic bags for fish samples, ice and coolers | |
| Data logger (Intermec CT60 XRT; Windows XP Tablet PC Edition) | |
| One set transect bars and rope (optional) | |
| One set backpack electrofishing equipment (optional) | |
| **Decontamination and Waste Management Equipment** | |
| Deionized water | |
| Laboratory-grade detergent (such as Liqui-Nox™ or Alconox® Powdered Precision Cleaner) | |

# TABLE 2. FISHERIES INDEX OF BIOLOGICAL INTEGRITY (IBI) FORM

**RIVER** _____ **CREW** _____

**STATION** _____ **DATA ON REVERSE?** ☐ YES ☐ NO

**GEAR** _____ **PAGE** _____ **OF** _____

**DATE** _____ **ENTERED BY** _____ **DATE** _____

## IBI – Continuation to back side (for additional species)

**COMMENTS:**

| SPECIES NAME | SAMPLE 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | ABNORMALITIES | | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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## TABLE 2. IBI – Continuation of front side (for additional species)

| SPECIES NAME | SAMPLE | | | | | | | | | | | | ABNORMALITIES | | REMARKS |
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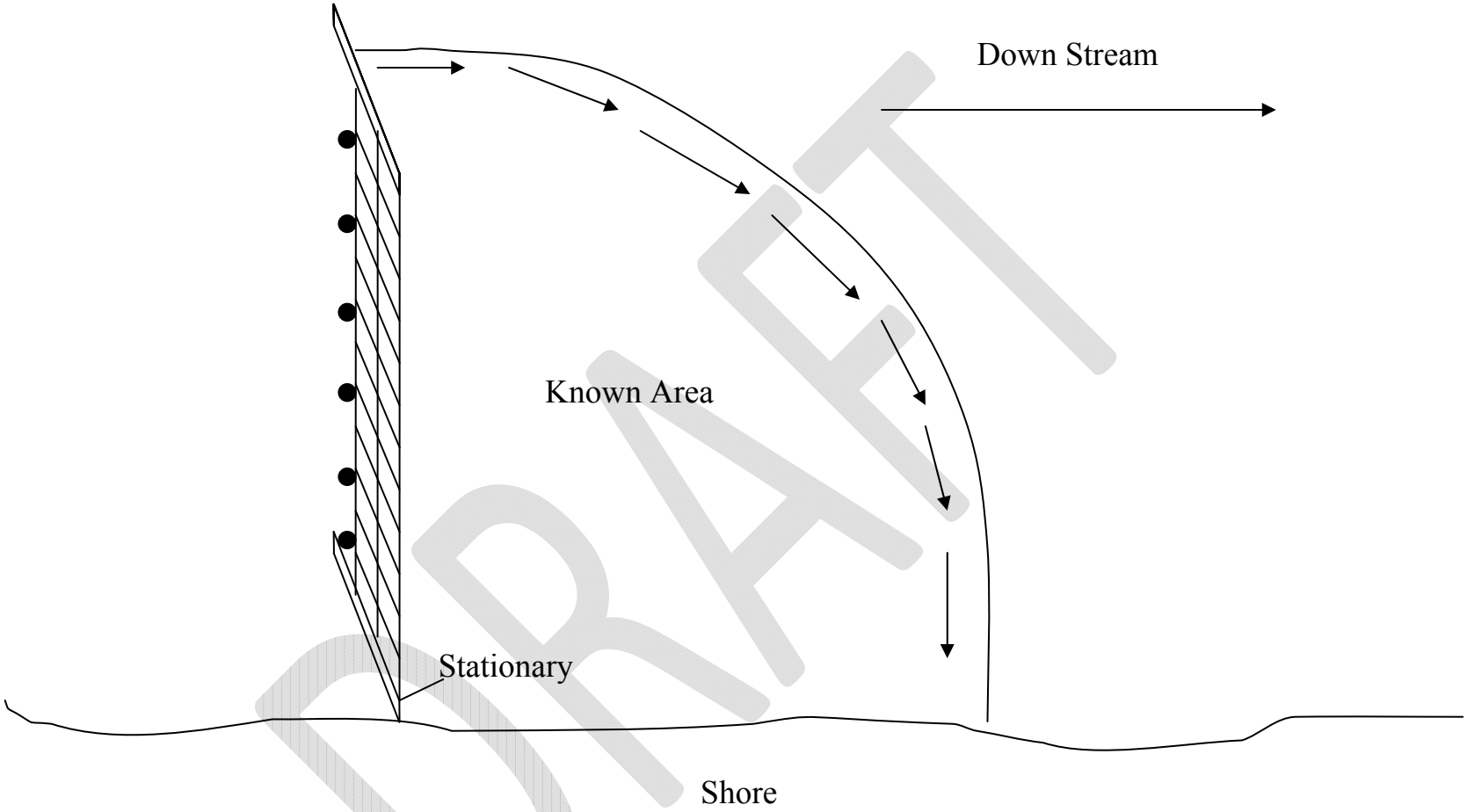


**Figure 1. Illustration of quadrant seine haul.**

Table 3. Biota Field Sampling Form

TVA-KIF-SOP-32

Sampling Event Name/WorkPlan/
Description of Study: _____

Collection Method(s)/
Sampling Method(s) Used: _____

Page____of____

| Sample Collection Location Description | | | Date of Collection | Time/Time of Collection Range | Species (Common Name) | Lab Sample ID No. | Requested Analyses |
|---|---|---|---|---|---|---|---|
| Common Descriptor | Lattitude | Longitude | | | | | |
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| Collection Team | Processing Team | | | | |
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