STANDARD OPERATING PROCEDURE FOR COLLECTION AND PREPARATION OF FISH TISSUE SAMPLES FOR MERCURY ANALYSIS

WILLARD SPUR 2011 MONITORING ACTIVITIES

State of Utah
Department of Environmental Quality
Division of Water Quality

Prepared in cooperation with the
Utah Department of Health
Division of Epidemiology and Laboratory Services

Revision 1
Effective 9/9/2011

Utah Division of Water Quality (DWQ) Standard Operating Procedures (SOPs) are adapted from published methods, or developed by in-house technical experts. The primary purpose of this document is for internal DWQ use. This SOP should not replace any official published methods.

Any reference within this document to specific equipment, manufacturers, or supplies is only for descriptive purposes and does not constitute an endorsement of a particular product or service by the author or by DWQ. Additionally, any distribution of this SOP does not constitute an endorsement of a particular procedure or method.

Although DWQ will follow this SOP in most instances, there may be instances in which DWQ will use an alternative methodology, procedure, or process.

REVISION PAGE

Date	Revision #	Summary of Changes	Sections	Other Comments
9/9/2011	1	not applicable	not applicable	Previous version was put into new standardized format, QC section was revised, equipment checklists updated, began document control/revision tracking

TABLE OF CONTENTS

1.0 SCOPE AND APPLICABILITY

The following document presents the Standard Operating Procedure (SOP) used by the Utah Division of Water Quality (DWQ) for the collection and preparation of fish tissue samples for mercury analysis. The presence of mercury in Utah waterbodies is a significant human health concern. People in the U.S. are exposed to mercury primarily through consumption of fish and shellfish contaminated with methylmercury, an inorganic mercury compound (EPA, 2010). Methylmercury exposure can cause impaired neurological development in fetuses, infants, and children. As a result, the DWQ has initiated statewide sampling to provide critical information to the public concerning human health threats. Mercury information and fish advisories for the State of Utah can be found online at http://www.mercury.utah.gov/.

Mercury is known to be bioaccumulative, persistent, and toxic, particularly in the aquatic food chain. Mercury concentrations in the water column and sediment are often below analytical detection limits; but mercury is detectable in fish tissue because of bioaccumulation. For this reason, fish serve as key indicators of waterbodies contaminated by mercury as well as the primary human exposure route.

The Utah DWQ began collecting fish tissue samples for mercury analysis as part of the Utah Comprehensive Assessment of Stream Ecosystems Prog

ram (UCASE) in 2000 and has sampled each year thereafter. DWQ partners with the Utah Division of Wildlife Resources (DWR) for fish collection and with either the Utah Department of Health - Division of Epidemiology and Laboratory Services (hereafter referred to as the State Laboratory) or an equivalent laboratory (such as the USEPA Region 8 Laboratory) for sample analysis. This SOP outlines the methods used by the DWQ and DWR for the collection and preparation of fish tissue samples prior mercury analysis in the laboratory.

2.0 SUMMARY OF METHOD

Depending on the waterbody, fish samples can be collected by electro-shocking, gill netting, and using hook-and-line. A minimum of five fish of each species are required for a statistically significant comparison to human health criteria. After collection, the length, weight, and species are recorded and each specimen is given a unique identification number made up of a seven digit STORET number for the site, the fish species ID code, and fish sequence number (e.g. 4956600CTT01). The whole fish or fillet is wrapped in aluminum foil, labeled, placed in a zip-top plastic bag, and stored on dry ice. Regular ice can be used temporarily if dry ice is not available. The sample is placed in a freezer as soon as possible and frozen until a tissue sample can be prepared at the State Laboratory and analyzed there or at another equivalent lab (such as the USEPA Region 8 Laboratory). Determination of the analyzing laboratory depends on available resources and funding. However, any laboratory utilized must

use approved EPA analytical methods and must have documented quality assurance and quality control procedures.

The field metadata (fish length, fish weight, collection site, date and time, etc.) are entered into the DWQ database. At the State Laboratory, a subsample of tissue is removed from each fish, placed in a sterile tube and stored in the freezer until analysis (or shipped on ice to another equivalent laboratory for analysis). Once the laboratory results are received and validated by DWQ, they are combined with the field metadata set in the DWQ database.

3.0 DEFINITIONS

AB: acid blank

SB: sample blank

TB: tube blank

PET: polyethylene terephthalate

in: inches

ml: milliliters

µl: microliters

mm: millimeters

4.0 HEALTH AND SAFETY WARNINGS

- Field team members should take appropriate precautions when operating watercraft and working on, in, or around water.
- Field team members should use caution when electro-shocking for fish (see the UCASE Field Manual for more safety information).
- Field team members and sample processors should use caution when handling fish as the fins, gills, and/or teeth of some species may be sharp.
- Fish tissue sample processors should use caution when using scalpels and nitric acid. Sample processors must wear safety glasses/goggles, gloves, and lab coats.
- Fish tissue sample processors must follow any additional safety procedures required by the State Laboratory.

5.0 CAUTIONS

It is absolutely critical to follow appropriate quality control procedures throughout the sample collection and tissue preparation process. Maintain sample integrity by keeping samples on ice or in a freezer. Contamination due to inappropriate handling or improper storage and preservation techniques can lead to erroneous data and potentially inappropriate health advisories.

6.0 INTERFERENCES

Methylmercury analysis in fish tissue is a highly sensitive analysis and interference may result from using contaminated equipment, reagents, or sampling containers. Follow all decontamination procedures described throughout this SOP and prepare and analyze the quality control samples listed in Section 11 of this SOP.

7.0 PERSONNEL QUALIFICATIONS/RESPONSIBILITIES

Fish sample collectors and fish tissue sample processors must read this SOP annually and acknowledge they have done so via a signature page (see Appendix).

Additionally, each new fish tissue sample processor will be trained on this SOP by an experienced team member. A signature page (see **Appendix**) will be signed by both sample processor and trainer to confirm that training was successfully completed and that the new sample processor is competent in carrying out this SOP.

The above-mentioned signature page will be kept on-file at DWQ along with the official hard copy of this SOP.

8.0 EQUIPMENT AND SUPPLIES

Equipment/supply checklists for the field and laboratory tasks described in this SOP are included below.

FIELD (for sample collection):

_____Copy of this SOP
_____GPS Unit
_____Fish weigh scale
_____Plastic bags
_____Coolers with dry ice or regular ice
_____DWQ field data sheet (**Figure 1, A** and **B**)
_____DWQ fish sample labels (**Figure 2**)
_____Nitrile gloves
_____Heavy duty aluminum foil
_____Fish collection gear (nets, electro-shocker, etc.)
_____Fish measuring board
_____Clear tape
_____Waterproof pen

LABORATORY (for sample processing):

_____Copy of this SOP
_____Cooler(s) containing fish to be processed
_____Cooler containing ice only (for processed samples)
_____Nitrile gloves
_____Sodium bicarbonate (baking soda)
_____Safety glasses/goggles
_____Scalpel handle and stainless steel blades (size 21)
_____Metal scupula
_____Porcelain mortar and pestle
_____Heavy duty aluminum foil
_____10 percent nitric acid rinse made from ultra-pure certified trace-metal grade concentrated nitric acid and laboratory grade deionized water (prepared by State Laboratory personnel)
_____Laboratory-grade deionized water
_____Teflon wash bottles (fill with the 10% nitric acid solution before beginning procedure)
_____Pipetter and disposable pipettes (for 10 ml)
_____Micropipetter and disposable pipette tips (for 100 µl)
_____Sterile 15 ml PET centrifuge tubes (Fisher cat# 05-539-1) and tube racks
_____Sample Analysis Lab Request forms for State Laboratory (**Figure 6**) or Chain of Custody forms (**Figure 7**) and seals (**Figure 8**) for EPA Laboratory
_____Tube labels (**Figure 5**)
_____Laptop loaded with Excel file (**Figure 4**)

9.0 PROCEDURES

9.1 Field Collection Methods

9.1.1 Wetland Collection

Fish in wetlands are collected using gill nets, fyke nets, and/or hook and line. The preferred sample set from wetlands includes tissue samples from individuals from representative size classes listed below.

Size 1 = 0-60mm (0-2.36 in)

Size 2 = 61-200mm (2.40-7.87 in)

Size 3 = 201-300mm (7.91-11.81 in)

Size 4 = 301-400mm (11.85-15.74 in)

Size 5 = >401mm (>15.78 in).

Wetlands with multiple dominant species should include fish from the pelagic zone and bottom feeding fish. Wetlands may have multiple pelagic species; therefore, individuals from at least two pelagic species should be collected. Multiple sampling sites for large water bodies should be determined on the basis of habitat variability or locations where fish are most accessible to anglers.

Gill or fyke nets are generally set on wetlands in cooperation with DWR or USU (Utah State University). The net is fished overnight and pulled early in the morning. At each net location, fish sample collectors record the name of the site, latitude and longitude of the net placement, the date collected, and notes of any unusual circumstances. As the net is pulled, the crew removes the fish from the net as it emerges from the water and determines which fish are to be kept for processing. The retained fish are processed as described in **Section 9.2.** Fish collectors should record all field data on the field form included in **Figure 1 (A** and **B)**.

9.2 Field Sample Preparation

Whole fish samples are preferred and should be collected whenever possible, but individual fillets can be prepared as described in **Section 9.2.2**. Collecting whole fish reduces the possibility of contamination that might occur while processing fillets in the field. Fillets can be taken when large fish are collected and/or the volume of cold storage space is limited. The following sections describe the procedures for preparing whole fish field samples and filleted field samples.

9.2.1 Whole Fish Field Sample Preparation

Processing begins immediately following collection of the required number of fish.

1. Rinse the measuring board and scales with stream/lake water between each measurement.

2. Euthanize the fish.

3. Record the species, length, and weight on the field data sheet (**Figure 1B**).

4. Place the entire fish on a clean sheet of aluminum foil, dull side toward the sample.

5. Make sure the piece of foil is wide enough to fold up over the ends of the fish. Also, fold down the edges of the foil so that no sharp edges of foil remain exposed. Do not use tape to wrap the sample; use foil only.

6. Attach a label (**Figure 2**) with the required identification and field information to the foil-covered sample and cover the label with a strip of clear tape so that it does not get wet. Place the sample in a plastic zip-top bag and label (using waterproof ink)

with the identification code made up of the site's STORET[1] number, species code, and fish number. Immediately place the sample on dry ice. If dry ice is not available, place the sample on regular ice and transfer to a freezer or dry ice as soon as possible.

7. Complete a field data sheet for each site where fish are collected (**Figure 1, A** and **B**). Make sure entries on this form are consistent with the sample label completed for each individual fish.

9.2.2 Fillet Field Sample Preparation

Fillets are not the preferred field processing method for mercury analysis because of the possibility of contaminating samples in the field. However, if large fish sizes or cooler capacity are limiting, fillets can be prepared. In this situation a clean working area is needed. Stainless steel scalpels, acid rinses, a plastic cutting board, and ultra-purified deionized water are required. Preparation and planning are necessary to assure that all equipment and decontamination supplies are available. If filleted samples are necessary, the DWQ Monitoring Section Manager must be contacted for further detailed instructions. The following is the procedure for fillet preparation in the field:

1. Complete steps 1 through 4 described in **Section 9.2.1.**

2. Follow the steps presented in **Figure 3** for cutting the fillet (EPA, 1991).

3. Complete steps 5, 6, and 7 described in **Section 9.2.1**.

9.3 Preparation of Fish Tissue for Lab Analysis

Preparation of tissue samples from whole fish or fillets is performed in the Utah State Laboratory Environmental Sample Receiving Room. Holding time for fish samples prior to tissue preparation is based on resources available for analysis and fish advisory reporting time frames. However, samples may remain stable in the freezer for up to five years (Peck, 2007). Sample preparation is best performed by two individuals. One person should prepare the sample while the other person cleans and decontaminates the equipment between samples. Fillet sample preparation follows the same guidelines as whole fish sample preparation with one exception. Instead of removing the required sample from the whole fish as described in Step 10 below, the sample is extracted from the fillet. Whole fish sample preparation includes the following steps:

1. Set up laptop and open a preloaded Excel file containing all the samples to be processed that day (**Figure 4**). This file should be created in the office prior to the

[1]DEQ samplers label with STORET, species code, and fish number. DWR samplers may not use a STORET when labeling fish; they may record the name of the lake or reservoir, the date, and the fish species. DEQ will retroactively assign/create a STORET for that sample once DWQ enters the sample metadata in the water quality database.

day of fish processing. To create this file, transfer the sample metadata (fish ID's, collectors name, site name, STORET, collection method, date, etc.) from the field sheets to the Excel file. This file helps to keep track of which fish have been processed, ensures that all fish expected from the field sampling have been accounted for, and serves as an input file for the fish sample metadata to be uploaded into the water quality database.

2. Remove the frozen samples from the freezer and defrost until a scalpel can be inserted into the muscle of the fish.

3. While samples are defrosting, enter the lengths and weights from the field data sheets into the Excel file opened on the laptop.

4. Label sterile 15 ml PET tubes such that the following info is included: STORET; site description; date collected; sampler(s); unique fish ID (see **FIGURE 5** for tube labels).

5. Label one 15 ml PET tube as "acid" and fill with 10% nitric acid and set aside. This acid will be used for preservation of blank samples.

6. Pour the box of sodium bicarbonate into the lab sink to the side of the drain for neutralization of the acid that will be used during the procedure.

7. All individuals handling fish must wear clean nitrile examination gloves, safety glasses/goggles, and lab coats. Replace gloves between each processed fish.

8. Prepare a pestle and mortar, scalpel, and scupula by rinsing them with laboratory grade deionized water followed by a 10% nitric acid solution rinse followed by another laboratory grade deionized water rinse.

9. Place a clean sheet of aluminum foil on the work surface, dull side up.

10. Unwrap the fish sample and place on the foil-covered work surface. Save the foil wrapper.

11. Make an incision with the stainless steel scalpel between the head and the dorsal fin; slightly to one side of the back bone. Cut to the rib cage but not into the body cavity. Cut out a rectangular chunk of muscle that will allow for at least 1 gram of tissue once it is processed. Belly tissues should not be included in the sample. Next, cut (or peel) the skin, fat and blood spots off the chunk of muscle tissue.

12. Place the sample into a sterile mortar.

13. Rewrap the remaining fish in the original foil and return the specimen to the freezer. If the original foil is torn and unable to recover the entire fish, it is acceptable to cover the sample with new foil (dull side "in"). Be careful to maintain all labeling.

14. Using the pestle, grind the tissue in the mortar to a fine homogenized texture (usually 2-5 minutes). The tissue sample must weigh at least 1 gram after it is homogenized.

15. Use the sterile scupula to scoop the tissue into the labeled 15 ml tube.

16. Place the labeled 15 ml tube in a tube rack inside a cooler partially filled with ice. Place the rack of tubes into a freezer as soon as possible.

17. Rinse the pestle and mortar, scupula, and scalpel with laboratory grade deionized water to ensure there are no pieces of tissue on the equipment. Next, decontaminate by rinsing all the equipment with the 10% nitric acid solution. Finish with a laboratory-grade deionized water rinse. Set the equipment aside to drain and prepare the next sample; equipment need not be dry before the next sample is processed.

18. Remove and discard the foil from the work surface after processing all the samples from one sampling location.

19. Discard the nitrile gloves.

20. Repeat steps 8-18 for the remaining samples.

21. Fill out and submit a laboratory request form to the Environmental Sample Receiving Room staff if samples are to be analyzed by the State Laboratory (**Figure 6**). If samples are to be analyzed by the EPA Region 8 Laboratory, prepare a Chain of Custody form (**Figure 7**), package the frozen tubes on ice packs along with a return address label, tape up the cooler, and attach a Chain of Custody seal (**Figure 8**). Ship the cooler to Jack Sheets at the USEPA Region 8 Lab, 16194 West 45th Dr, Golden, CO, 80403, (303) 312-7793.

9.4 Laboratory Analytical Methods

EPA method 7473 (thermal decomposition) requires less than 1 gram of fish tissue to produce analyses with reporting limits as low as 0.005 µg/kg total mercury (EPA, 1998). The methodology and quality assurance and quality control procedures for this analysis and analyzing laboratories can be obtained from:

Sanwat Chaudhuri, Chemical and Environmental Services Bureau Director
Unified State Laboratories: Public Health, Utah Department of Health
4431 South 2700 West
Taylorsville, UT 84119
(801) 965-2400
UPHL@utah.gov

William Batschelet, Quality Assurance Officer

USEPA Region 8 Laboratory
16194 West 45th Dr
Golden, CO 80403
(303) 312-7792
r8eisc@epa.gov

NOTE: *The sample processing procedure described in this SOP can also used to prepare tissue samples for selenium analysis. Selenium analyses are also performed by the USEPA Region 8 (above).*

10.0 DATA AND RECORDS MANAGEMENT

Requirements for recording field data are described throughout **Section 9.0**. Hard copies of field forms are stored at DWQ.

Note: **Figure 4** is only an Excel file template and can be reformatted by the DWQ staff member assigned responsibility for entering the field data for mercury analyses. The purpose of this sheet is to transfer key data from field sheets/labels to one location so it can be uploaded into the water quality database. Key headers are: site name, STORET, gear, sample count, unique fish ID, length, weight, and sampler(s).

Laboratory results for blanks (discussed below) should be reviewed by the DWQ laboratory liaison/database manager. If results are above the detection limit, the data should be flagged in the database, the DWQ Monitoring Section Manager notified, and attempts should be made to determine the source of contamination.

For management of analysis results received from the laboratory, refer to the DWQ's Quality Assurance Program Plan.

11.0 QUALITY CONTROL SAMPLES

11.1 Sample Blanks

Three sample blanks are prepared on each day of sample processing: 1) before the first sample is processed but after the equipment has been cleaned/decontaminated, 2) approximately midway through sample processing, and 3) after the last sample has been processed. The purpose of a sample blank is to ensure that no contamination or carryover from other samples is occurring. Since the tissue processing equipment is used multiple times for different samples it is important that all equipment is properly decontaminated between samples.

1. Put on a clean pair of nitrile gloves.

2. Using the graduated marks on an unused sterile 15 ml tube, fill the tube with 10 ml of laboratory-grade deionized water obtained directly from the sink tap.

3. Pour the deionized water into the decontaminated mortar.

4. Swirl the sample in the mortar with the pestle for 30 seconds.

5. Using a pipetter and an unused, sterile pipette, remove the entire 10 ml sample from the mortar and place into a sterile 15 ml tube labeled with the correct blank sequence number and date. Labeling example: 03032011SB1 (First sample blank performed on March 3, 2011)

6. Using the micropipetter and tips, preserve the sample by adding 100 µl of the 10% nitric acid to the sample tube. Replace the lid and mix briefly.

7. Place the sample in the tube rack inside the cooler with the other fish tissue samples.

8. Fill out a lab sheet for each blank (**Figure 6**). The lab sheet should indicate the sample ID from the 15 ml tube.

9. Discard used pipette/tip and nitrile gloves. Use new nitrile gloves and a new pipette/tip for each sample blank.

11.2 Tube Blanks

When a package containing a new lot of sterile 15 ml PET centrifuge tubes is opened, a tube blank is prepared. The purpose of this tube blank is to ensure that tubes used for sample transport to the analyzing laboratory are not introducing mercury to fish tissue samples.

1. Put on a clean pair of nitrile gloves.

2. Using the graduated marks on an unused sterile 15 ml tube, fill the tube with 10 ml of laboratory-grade deionized water directly from the sink tap and label the tube with the lot number and date. Labeling example: 03032011TBLot3452 (Tube blank performed on March 3, 2011 for a new package of tubes with the lot number 3452)

3. Using the micropipetter and tips, preserve the sample by adding 100 µl of the 10% nitric acid to the sample tube. Replace the lid and mix briefly.

4. Place the sample in the tube rack inside the cooler with the other fish tissue samples.

5. Fill out a lab sheet for each blank (**Figure 6**). The lab sheet should indicate the sample ID from the 15 ml tube.

6. Discard used nitrile gloves and pipette tip.

11.3 Acid Blanks

At the start of each day of fish tissue processing, either one or two acid rinse blanks are prepared (depending on the number of wash bottles used). The purpose of the acid blank is to ensure that 1) the dilute 10% nitric acid used for rinsing and decontaminating equipment is not contaminated with mercury, and 2) the Teflon wash bottles containing the acid rinse are not contaminated with mercury.

1. Put on a clean pair of nitrile gloves.

2. Using the marks on the graduated 15 ml tube, fill the tube with 10 ml of the 10% nitric acid rinse from the Teflon wash bottle.

3. If more than one Teflon bottle is used, perform the previous step for each wash bottle.

4. Label the sample tube(s) with the Teflon wash bottle number and the date. For example: 03032011AB1 (Acid blank performed from Teflon wash bottle #1 on March 3, 2011).

5. Fill out a lab sheet for each blank (**Figure 6**). The lab sheet should indicate the sample ID from the 15 ml tube.

12.0 REFERENCES

EPA. 1991. Environmental Monitoring and Assessment Program (EMAP) Near Coastal Program laboratory methods for filleting and compositing fish for organic and inorganic contaminant analyses (Draft). Office of Research and Development, Environmental Research Laboratory, Narragansett, RI.

EPA. 1998. Method 7473: Mercury in solids and solutions by thermal decomposition, amalgamation, and atomic absorption spectrophotometry. U.S. Environmental Protection Agency, Office of Solid Waste. Washington, DC.

EPA. 2000. Quality assurance project plan for sample collection activities for a national study of chemical residues in lake fish tissue. U.S. Environmental Protection Agency. Washington, DC.

EPA. 2010 (Last updated). U.S. EPA Mercury Web Site. U.S. Environmental Protection Agency. Washington, DC. Available online at http://www.epa.gov/mercury/effects.htm.

Peck, D.V., Herlihy, A.T., Hill, B.H., Hughes, R.M., Kaufmann, P.R. Klemm, D.J., Lazorchak, J.M., McCormick, F.H., Peterson, S.A., Ringold, P.L., Magee, T., and M. Cappaert. 2006. Environmental Monitoring and Assessment Program – Surface Waters Western Pilot Study: Field Operations Manual for Wadeable Streams. EPA/620/6-06/003. U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C.

Peterson, S.A., Peck, D.V., Sickle, J.V., and R.M. Hughes. 2007. Mercury concentration in frozen whole-fish homogenates is insensitive to holding time. Archives of Environmental Contamination and Toxicology 53(3): 411-417.

13.0 FIGURES

FIGURE 1A. DWQ field data sheet (front)

Reviewed by (initial): _____
Updated: 03/2011

DWQ Electro-shocking/Fish Tissue Collection Field Sheet

Please use a new sheet for each site (do not combine multiple sites on one sheet)

Site Name:					
STORET # (not applicable for DWR personnel):					
County:					
Date:					
GPS Coordinates		Degrees	Minutes	Seconds	Other (decimal degrees/UTM)
Datum:	Latitude				
	Longitude				
Reach Length (m):					
Shocker Settings					
Shocking Time (s):					
Volts:					
Pulse Rate (Hz):					
Pulse Width (ms):					

1. Tally final counts for each species and their appropriate sizes in the circles. 2. Species codes on backside of this sheet	**Size 1:** **0-60mm** (0-2.36 in)	**Size 2:** **61-200mm** (2.40-7.87 in)	**Size 3:** **201-300mm** (7.91-11.81 in)	**Size 4:** **301-400mm** (11.85-15.74 in)	**Size 5:** **>401mm** (>15.78 in)
Species code:	◯	◯	◯	◯	◯
Species code:	◯	◯	◯	◯	◯
Species code:	◯	◯	◯	◯	◯
Species code:	◯	◯	◯	◯	◯
Species code:	◯	◯	◯	◯	◯
Species code:	◯	◯	◯	◯	◯
Species code:	◯	◯	◯	◯	◯
Species code:	◯	◯	◯	◯	◯

Comments:	Number of Netters:

FIGURE 1B. DWQ field data sheet (back)

Reviewed by (initial): _____
Updated: 03/2011

Fish Tissue Data (Hg)

Sample ID*	Length (mm)	Weight (g)	Comments
01			
02			
03			
04			
05			
06			
07			
08			
09			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			If there are more than 21 samples, use another sheet and staple all the sheets together.

*Sample ID=STORET-Fish Code (listed below)-Unique Sequence ID per Site (i.e. 4982100CTT01)

Collector(s) Names (for Hg collection only):

_____ _____ _____

_____ _____

Species Codes:

Black bullhead (BBH)	Least chub (LEC)	Utah sucker (UTS)
Black crappie (BLC)	Leatherside chub (LSC)	Virgin spinedace (VSD)
Bluehead sucker (BHS)	Longnose dace (LND)	Walleye (WLE)
Bluegill (BLG)	Mountain whitefish (MWF)	Wiper (WIP)
Bonneville whitefish (BWF)	Mountain sucker (MTS)	White bass (WHB)
Bonneville cisco (BCI)	Mottled sculpin (MOS)	Woundfin (WFN)
Brook trout (BKT)	Paiute sculpin (PTS)	Yellow perch (YLP)
Brown trout (BRT)	Rainbow trout (RBT)	
Channel catfish (CCF)	Redside shiner (RSS)	
Common carp (CMC)	Red-shiner (RES)	Note: Not all spp found in Utah are listed here. If crew collects a spp that is not listed then hand write the spp name on the front side of the sheet under "Species code"
Cutthroat trout (CTT)	Roundtail chub (RTC)	
Desert sucker (DSS)	Smallmouth bass (SMB)	
Flannelmouth sucker (FLS)	Speckled dace (SPD)	
Green sunfish (GSF)	Splake trout (SPT)	
Kokanee (KOK)	Striped bass (STB)	
Lake trout (LKT)	Tiger muskie (TGM)	
Largemouth bass (LMB)	Tiger trout (TGT)	

FIGURE 2. Field sample label

FISH COLLECTION (Dry-Ice) Freezer in Shop
Site ID:_____

_____
STORET: _____ Samplers: _____
Length (mm): _____ Weight (g): _____Date: _____
Fish ID: _____
(STORET #; SPP;Fish Sequence #)(ex: 4959999CTT01)

FIGURE 3. Procedure for removing fillet from whole fish