DEPARTMENT OF ECOLOGY
State of Washington

Standard Operating Procedure EAP124, Version 2.0

Vertebrate Assemblage Sampling

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Purpose of this Document

The Washington State Department of Ecology develops Standard Operating Procedures (SOPs) to document agency practices related to sampling, field and laboratory analysis, and other aspects of the agency's technical operations.

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SOP Revision History

Revision Date	Revision History	Summary of Changes	Sections	Reviser(s)
4/11/2022	2.0	Transferred to new template, removed images and table from Appendix	All	Meghan Rosewood-Thurman

1.0 Purpose and Scope

1.1 This document is the Environmental Assessment Program (EAP) Standard Operating Procedure (SOP) for sampling the vertebrate assemblage in rivers and streams for the Watershed Health Monitoring program (WHM) or related studies during a Data Collection Event (DCE).

1.2 This SOP includes procedures for sites sampled with the Narrow and Wide protocols. See SOP EAP106 (Merritt, 2022), which describes the site verification and layout procedures for the WHM Narrow Protocol and SOP EAP105 (Hartman, 2020a) which describes site layout for the Wide Protocol.

2.0 Applicability

2.1 This SOP is derived from methods from the U.S. Environmental Protection Agency's Environmental Monitoring and Assessment Program, Western Pilot (EMAP-W; see Peck et al. (2005a, 2005b) cited in Stoddard et.al., 2005).

2.2 This SOP is used in combination with other SOPs to complete a DCE for the WHM program. This method explains how to sample fishes and amphibians to estimate the relative abundance of vertebrate taxa inhabiting a sampling site during a DCE.

2.3 Follow the method outlined in this SOP only after the site verification and layout procedures have been completed (Merritt, 2022, and Hartman, 2020a). Crews should also sample water chemistry SOP EAP095 (Hartman, 2020b), sediment chemistry SOP EAP110 (Hartman, 2022), macroinvertebrates SOP EAP073 (Larson, 2022a), and periphyton SOP EAP111 (Larson, 2022b).

3.0 Definitions

3.1 Ambient conductivity: Conductivity (µS/cm) of the water for the ambient water temperature. Electrofishing success depends on the ambient conductivity (C_a) rather than specific conductivity (C_s). Calculate ambient conductivity with this formula from Reynolds (1996): $Ca = Cs/[1.02^{(Ts-Ta)}]$ where Ts = 25°C and Ta= the ambient water temperature in °C. Ambient conductivity is the most important habitat factor affecting electrofishing efficiency.

3.2 DCE: The Data Collection Event is the sampling event for the given protocol. Data for a DCE are indexed using a code which includes the site ID followed by the year, month, day, and the time (military) for the start time of the sampling event. For example: WHM07620-000222-DCE-YYYY-MMDD-HH:MM. One DCE should be completed within one working day, lasting 4 - 6 hours, on average.

3.3 Duty cycle: Duty cycle is the percentage of time in a second that voltage is applied during a pulse. On the Smith-Root LR-20 electrofisher, the duty cycle switch is located on the upper left center of the control panel (Figure 1). Increasing duty cycle might increase stress to fish.

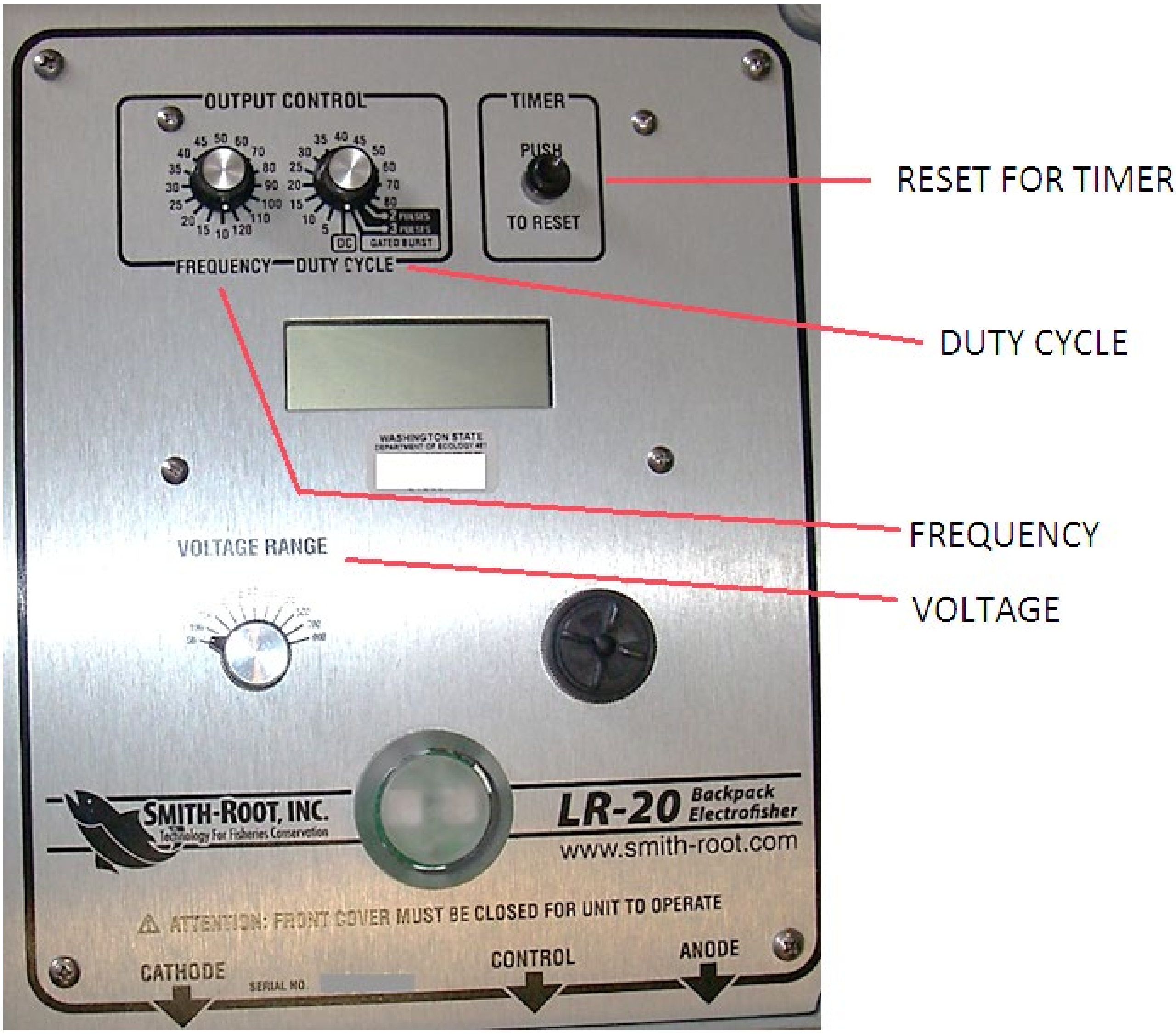

Figure 1: The Smith-Root LR-20 backpack electrofisher, showing output control dials for frequency and duty cycle, timer reset button, and voltage range dial.

3.4 EAP: Environmental Assessment Program

3.5 Ecology: Washington State Department of Ecology

3.6 eforms: Electronic data forms. Term for an application saved into a web browser cache on a device such as a tablet computer. eforms allow collection and storage of data at remote locations when disconnected from the internet.

3.7 EIM: The Environmental Information Management System (EIM)[1] is the Department of Ecology's main database for environmental monitoring data. EIM contains records on physical, chemical, and biological analyses and measurements. Supplementary information about the data (metadata) is also stored, including information about environmental studies, monitoring locations, and data quality. The "Search by map" feature enables plotting coordinates over orthophotographic imagery. EIM also includes a searchable component for Watershed Health Monitoring Data[2]

3.8 Frequency: This describes the pulse rate per second or Hertz (Hz). On the Smith-Root LR-20 electrofisher, the frequency switch is located on upper left of the control panel (Figure 1). Most pulsed DC backpack electrofishing is done at 30-60 Hz.

3.9 Galvanotaxis: Electrically-induced movement of fish (toward the anode or cathode). When a pulsed DC current is applied to water, fish are electrically induced to swim toward the electrode. This is called galvanotaxis (Reynolds, 1983).

3.10 Habitat units: As assessed for WHM, all habitat units are part of the main channel. They are based on the Hawkins et al. (1993) classification system. Habitat units are "quasi-discrete areas of relatively homogeneous depth and flow that are bounded by sharp physical gradients… Different types of units are usually in close enough proximity to one another that mobile stream organisms can select the type of unit that provides the most suitable habitat" (Hawkins et al. 1993).

[1] http://www.ecy.wa.gov/eim/

[2] https://fortress.wa.gov/ecy/eimreporting/Stream/STREAMSearch.aspx?SearchType=Stream&State=newsearch&Section=all

3.11 HUC: Hydrologic Unit Code assigned by the United States Geological Survey (USGS, 2016b). Scale depends on number of digits. In Washington State, 4-digit HUCS (also known as subregions) reside within the Pacific Northwest Region (2-digit = HUC 17). Four-digit HUCs that overlap Washington are listed below.

- 17**01** Kootenai-Pend Oreille-Spokane
- 17**02** Upper Columbia
- 17**03** Yakima
- 17**06** Lower Snake
- 17**07** Middle Columbia
- 17**08** Lower Columbia
- 17**10** Coastal
- 17**11** Puget Sound

These 4-digit HUCs are NOT a basis for how WHM allocates monitoring; we use Status and Trends Regions (STRs). The 4-digit HUCs however, serve us as a basis for evaluating aquatic vertebrate species origins (native/alien).

3.12 Major Transect: One of 11 equidistant transects across the length of a site. These transects run perpendicular to the thalweg and are labeled as follows: A (furthest downstream), B, C, D, E, F, G, H, I, J, and K (furthest upstream).

3.13 Narrow Protocol: The set of Watershed Health Monitoring SOPs that describe data collection at wadeable sites with an average bankfull width of less than 25 m at the index station.

3.14 Narcosis: A state of electrically-induced immobility with slack muscles. As fish are induced into galvanotaxis and approach the anode, their reaction changes to narcosis (muscle relaxation and loss of equilibrium). While under narcosis, fish may continue to swim, upside down, toward the anode. Narcosis can happen near the cathode (Reynolds, 1996).

3.15 Paedomorph: This is a mature individual that displays juvenile body characteristics (Whiteman, 1994; e.g. a neotenic Pacific giant salamander).

3.16 Power: This is the energy delivery rate (Reynolds, 2008). Electrofishing can be viewed as a power-based phenomenon. Electrofishing effectiveness is based on how much power is transferred to the fish. Power transfer is most efficient when water conductivity matches the conductivity of fish flesh (near 100 µS/cm for most species).

3.17 Protocol: A collection of SOPs used to accomplish a DCE. Watershed Health Monitoring uses two protocols: The Narrow Protocol for sampling wadeable streams that are less than 25m average bankfull width. The Wide Protocol for rivers or streams that are wider than 25m average bankfull width or too deep to wade.

3.18 QAMP: Quality Assurance Monitoring Plan. The QAMP for WHM is Cusimano et al. (2006). An updated version will be released in 2022.

3.19 Segment: Wetted stream area between major transects. There are 10 segments in each site.

3.20 Site: A site is defined by the coordinates provided to a sampling crew and the boundaries established by the protocol's site layout method, Hartman, 2020a (SOP EAP105) for the Wide Protocol; Merritt, 2021 (SOP EAP106) for the Narrow Protocol). Typically, a site is centered on the index station and equal in length to 20 times the average of 5 bankfull width measurements. Sites cannot be longer than 2 km nor shorter than 150 m. Narrow protocol sites are 150 m to 500 m long. Wide Protocol sites are 500 m to 2 km long. The most downstream end of a site coincides with major transect A; the most upstream end coincides with major transect K.

3.21 SITE ID: Identity code for the proposed sampling site from the Washington Master Sample 2021 (Larson, in prog.).
The Format is WHM07620 - # # # # # #

3.22 Random sites have a WHM07620-prefix.

3.23 Statewide sentinel sites have a SEN06600- prefix.

3.24 Ambient Bioassessment Sites have a BIO06600- prefix

3.25 SOP: Standard Operating Procedure

3.26 Species-life stage: The age status for each species captured: juvenile, adult, or unknown. Habitat requirements and characteristics can change for species as their status changes from juvenile to adult. Some species undergo metamorphosis from larvae (e.g. lamprey and frogs). For others, size may be the best indication. In this SOP, most non-game fishes (e.g., sculpin, dace, suckers) are assigned an "unknown" life stage.

3.27 Specific conductivity: Electrical conductivity is a measure of water's ability to conduct electricity, and therefore a measure of ionic activity and content. It is the reciprocal of specific resistivity. Specific conductivity is conductivity adjusted to 25˚ C (reported in µS/cm at 25˚ C). This is what most field conductivity meters report.

3.28 SRR: The Governor's Salmon Recovery Office established a map of Salmon Recovery Regions[3] for the management and the recovery of salmonid fish populations listed as threatened or endangered by the federal government.

3.29 Station: Any location within the site where an observation is made or part of a sample is collected.

[3] https://fortress.wa.gov/dfw/score/score/maps/map_salmon_recovery.jsp

3.30 STR: Status and Trends Regions (STRs) based on Salmon Recovery Regions (SRRs) described by the Governor's Salmon Recovery Office (JNRC, 1999). Membership is as follows:

- Puget STR________Puget Sound, & Hood Canal/Puget Sound SRRs
- Coastal STR________Coastal SRR
- Lower Columbia STR Lower Columbia SRR
- Mid Columbia STR__Mid Columbia SRR
- Upper Columbia STR_Upper Columbia SRR
- Snake STR________Snake SRR
- Northeast Wash. STR_Northeast Washington SRR
- Unlisted STR_______No SRR identified

3.31 Tetany: A state of electrically-induced immobility with rigid muscles. Tetany is common near the anode, but can happen near the cathode. Fish captured before they reach tetany experience a lower risk of injury (Reynolds, 2008).

3.32 Thalweg: Path of a stream that follows the deepest part of the channel (Armantrout, 1998). For WHM, we emphasize Armantrout's use of the word "path" because the thalweg longitudinal profile excludes (sometimes deeper) side pools that are not part of the dominant flow path.

3.33 Thalweg station or transect: One of one hundred (100) equidistant measurement locations in the thalweg, across the length of a site. For example, the thalweg stations at/above each major transect are:

- A0, A1, A2, A3, A4, A5, A6, A7, A8, A9,
- B0. B1, B2, B3, B4, B5, B6, B7, B8, B9,
- C0, C1, C2, C3, C4, C5, C6, C7, C8, C9,
- …
- J0, J1, J2, J3, J4, J5, J6, J7, J8, J9, and K0.

3.34 WHM: Watershed Health Monitoring, a status and trends monitoring program within the Environmental Assessment Program at the Washington State Department of Ecology.

3.35 Wide protocol: The set of WHM SOPs that describes the sample and data collection at non-wadeable sites or sites wider than 25 m bankfull width. It is an abbreviated version of the Narrow Protocol and normally done by rafts.

3.36 WRIA: Water Resources Inventory Areas[4]. There are 62 mapped watershed-based management units for the State of Washington

[4] https://fortress.wa.gov/dfw/score/score/maps/map_wria.jsp

4.0 Personnel Qualifications/Responsibilities

4.1 This SOP pertains to all Ecology staff in EAP and any other technicians collecting and entering data for the WHM program.

4.2 All field staff must comply with the requirements of the EA Safety Manual (Ecology, 2021). A full working knowledge of the procedures in Chapter 1 "General Field Work," especially the sections "Working in Rivers and Streams," and "Fall Protection," is expected. Sampling from a boat requires one person onboard to be a qualified boat operator as defined by the EAP Boating Plan in Chapter 3 of the EA Safety Manual. All persons onboard must be familiar with Chapter 3 of the EA Safety Manual, "Boating."

4.3 All field staff must have completed the annual WHM program field training and be familiar with the WHM protocols for the given DCE. All field staff must be familiar with the electronic data recording tablet and web-based field forms to record and submit data for the WHM program. Contact the Watershed Health Monitoring Data Coordinator for further information.

4.4 The field crew leaders must be knowledgeable of all aspects of the project's Quality Assurance Monitoring Plan (QAMP) to ensure that credible and useable data are collected. All field staff should be briefed by the field crew leader or project manager on the sampling goals and objectives prior to arriving to the site.

4.5 All field staff must be familiar with the electronic data recording tablet and web-based field forms to record and submit data for the WHM program.

4.6 Field staff must be annually trained to minimize the spread of invasive species. See SOP EAP070 (Parsons et.al, 2021).

5.0 Equipment, Reagents, and Supplies

5.1 Field tablet (charged), electronic field forms

5.2 Clip board with blank paper data forms, fishing logs and pencils (contingency)

5.3 Safety Gear (pre-cleaned of organisms)

- 5.3.1 Electrically insulated waders and wading boots
- 5.3.2 Electrically insulated gloves
- 5.3.3 Polarized sun glasses; caps with visor
- 5.3.4 Personal floatation devices (PFD)

5.4 Backpack Electrofishing Gear

- 5.4.1 Backpack electrofishing unit (e.g. Smith-Root LR-20)
- 5.4.2 Anode with ring (with as large a diameter bore as possible)
- 5.4.3 Cathode (rat-tail)
- 5.4.4 Batteries (fully charged)
- 5.4.5 Abrasive cloth for electrode maintenance

5.5 Fish Handling Equipment

5.5.1 Buckets or live wells

5.5.2 Nets: long-handled dip net (1/8” mesh) and aquarium net

5.5.3 Photarium

5.5.4 Measuring board

5.5.5 Taxonomic keys

5.5.6 Jewelers loop or magnifying glass

5.5.7 Calipers

5.6 Fish Voucher Equipment

5.6.1 Polyethylene, wide-mouth jars (500-mL)

5.6.2 MS-222 (Tricaine-S) to humanely euthanize fishes (SDS available here)

5.6.3 95% ethanol

5.6.4 Digital camera with close-up lens

5.6.5 Fish jar labels

5.6.6 Electrical tape

5.6.7 Packing tape

5.7 Disinfection solutions, brushes, or other equipment necessary to minimize the spread of invasive species from site to site.

6.0 Summary of Procedure

6.1 Pre-Season Tasks

6.1.1 Train staff in the principles and techniques of electrofishing prior to the start of the season to minimize harm to fish. Train for both roles of operator and netter. A low-fee, on-line course is often available from the United States Fish and Wildlife Service, National Conservation Training Center (e.g., USFWS, 2016).

6.1.2 Carefully read the sampling permits and NOAA (2000) guidance to determine special requirements.

6.1.3 Verify that no spawning salmonids will be present. Use pre-season research on the distribution and timing of runs to help. For example, see SalmonScape (2016) and Status Reviews for Salmon and Steelhead (NOAA, 2016), especially these reports:

- NMFS-NWFSC-24 (Appendix C-3 shows Coho salmon timing)
- NMFS-NWFSC-25 (pages 27-28 show pink salmon timing)
- NMFS-NWFSC-27 (pages 16-22 show steelhead timing)
- NMFS-NWFSC-32 (pages 25-28 show chum salmon timing)
- NMFS-NWFSC-33 (Appendix C, Tables 6,7 show sockeye salmon timing)

- NMFS-NWFSC-35 (pages 41-45 show Chinook salmon timing).

6.2 Prepare fish anesthesia

6.2.1 Attain a 500 mL, wide-mouth polyethylene jar.

6.2.2 Ensure interior is completely dry. If re-using a jar previously containing MS-222, wear a glove and use a paper towel to dry out any droplets.

6.2.3 Retrieve MS-222 from the OC refrigerator. If unfamiliar, review the SDS before opening.

6.2.4 Assemble scale, MS-222, weighing boat, and weighing spoon. Wear gloves and eye protection while handling.

6.2.5 Tare weighing boat and measure 0.075 grams of MS-222. (If using a container larger than 500 mL adjust the amount to achieve a 150 mg/L ratio.)

6.2.6 Add measured MS-222 into dry jar and close lid.

6.2.7 If possible, try to keep in a cold, dark location when not in use. The solution will last for three days at room temperature, and potency will slowly decrease after three days.

6.3 Arrive at the site.

6.3.1 To preserve sample integrity, vertebrate sampling is conducted after sampling water chemistry SOP EAP095 (Hartman, 2020b), sediment chemistry SOP EAP110 (Hartman, 2022), macroinvertebrates SOP EAP073 (Larson, 2022a), and periphyton SOP EAP111 (Larson, 2022b).

6.3.2 Confirm that spawning salmonids are absent at the site.

6.3.3 Perform backpack electrofishing at all Narrow Protocol DCEs if conditions permit. If crews opt to backpack electrofish at Wide Protocol DCEs, take caution while wading in swift and deep areas. Always wear a PFD when electrofishing. Do not electrofish if sampling conditions are unsafe.

6.3.4 Crewmembers must stop all electrofishing activities and make a note in the eforms if any of the following conditions exist (see Figure 2):

- Brush obscures the stream
- Bull Trout or adult salmon are present
- Equipment malfunction or failure
- Streams that have low or subsurface flows
- If there are no suitable places to net
- If there is no permit or permit limitations
- If the stream or river is too deep to wade
- If there are spawning salmon present
- Storm or swift water from a recent storm

- If there is little or no visibility in the water column
- If stream temperature exceeds 18 C.

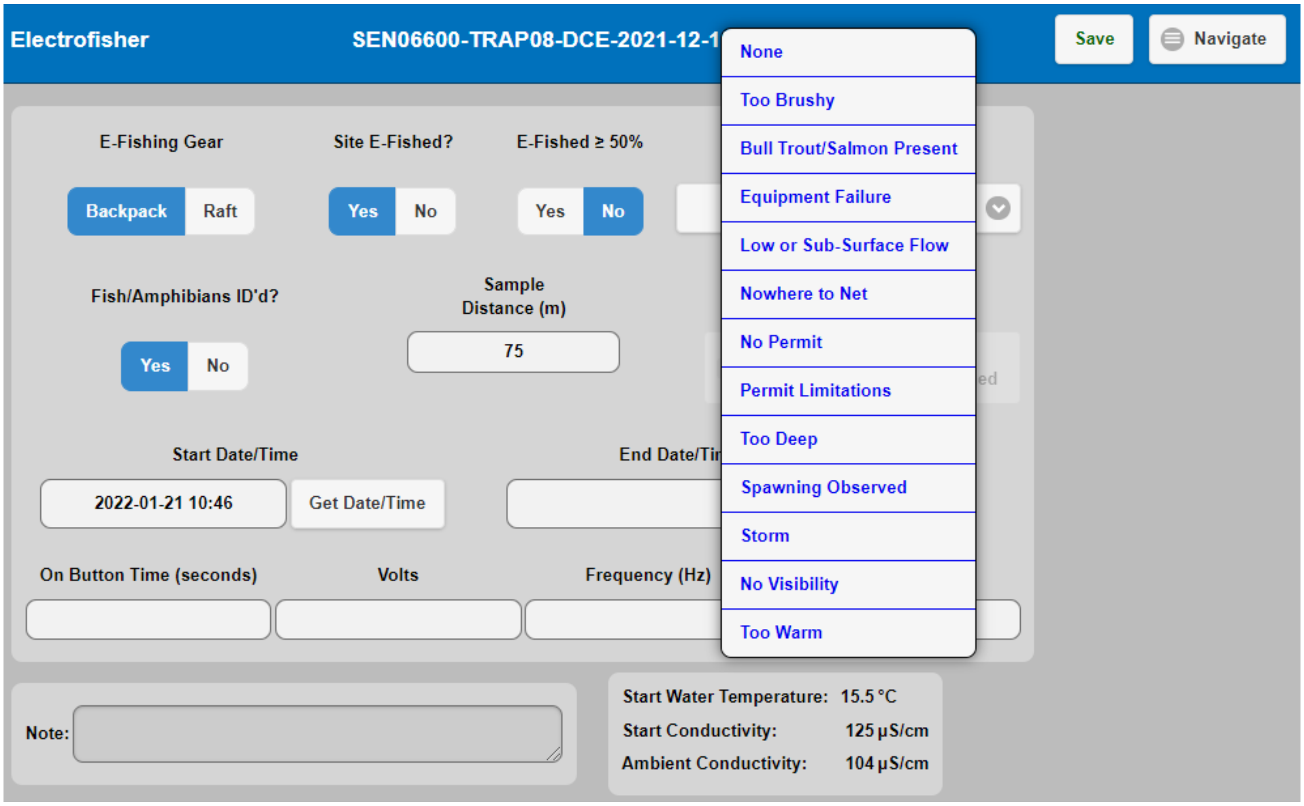

Figure 2. Select a reason from the dropdown list if you cannot fish more than 50% of the reach.

6.4 Set-up the equipment and test

6.4.1 Set-up the electrofisher components according to manufacturer's instructions (e.g., Smith-Root, 2012).

6.4.2 Complete a backpack electrofisher log (e.g. Figure 3) to determine that the instrument settings (Figure 1) will maximize capture efficiency and minimize harm to aquatic vertebrates. The log provides guidelines for settings and tracks settings that work well for each stream.

6.4.3 Record the backpack unit serial number, Site ID, date and time.

6.4.4 Measure the stream temperature and retrieve the ambient conductivity from the bottom right of the electrofisher page (Figure 2).

6.4.5 Select direct current on the backpack first (DC, where duty cycle= 100% and frequency=0, Figure 1) and see if fish respond. DC is the least harmful setting to fish. Pulsed direct currents with high frequency can cause spinal injury in fish.

BACKPACK ELECTROFISHER LOG

	Backpack Unit ID (SN):			Stream: Date ___ ___/___ ___/ 2016	
				SITE ID __ __ __ __6600-__ __ __ __ __ __	
				Ambient Cond ___ ___ ___ ___ uS/cm	Water Temp ____ ____ ˚C
TRIAL	FREQ (HZ)	Duty Cycle (%)	Voltage (V)	RESPONSE OF FISH	
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
	15 Hz	10%	50 V	Start testing here (if no info. available)	NOTES
	35 Hz	20%	300 V	example for low conductivity water	
	30 Hz	15%	250 V	example for high conductivity water	
	60 Hz	35%	600 V	Try to stay below these	

Figure 3. Backpack electrofisher log.

6.4.6 Run pre-sampling tests while situated downstream of the sampling reach. Evaluate settings to ensure that the audio and light signals are emitting at a standard pace.

6.4.7 Check to see that fish are attracted to the anode (wand) with the least possible application of electrical intensity. If captured fish show signs of harm, lower the settings (voltage first; then, if necessary, frequency).

NOTE: When ambient conductivity is approximately 100 µS/cm (about the same as most fish flesh), little power is required to effectively fish. For lower conductivity water, use higher voltage. For higher conductivity water, use lower voltage. Details on set-up and testing is in the instrument manual (e.g., Smith-Root, 2012).

6.5 Sample the assemblage by backpack

6.5.1 Measure and record the temperature immediately prior to fishing. Do not fish if you exceed the permit temperature limit of 18 C.

6.5.2 Reset the on-button timer to zero.

6.5.3 Before you start, all field staff should acknowledge that they know where the safety switch is located and that they are ready for you to begin. Tell all staff nearby that you are ready to begin electrofishing. Verify there are no persons, pets, or livestock in the water.

6.5.4 Record the Site ID, water visibility, ambient conductivity, water temperature, and start time on a Vertebrate Collection form (contact WHM for a copy of this form).

6.5.5 Start at transect A and work upstream. Electrofish all habitat types in proportion to their frequency of occurrence in the site. One person operates the electrofisher while another nets the vertebrates.

6.5.5.1 If working in open sunlight, wear polarized sunglasses and a brimmed cap so you can see the fish in the water.

6.5.5.2 Net any vertebrates that move toward the anode and place the animals into a bucket (live well) of fresh stream water. Net the fish away from the electrodes.

6.5.5.3 After each pass with the anode, ensure that the net is empty before resuming electrofishing.

6.5.5.4 When transferring the fish from the net to the live well, minimize animals' exposure to air, sunlight, and handling.

6.5.5.5 Do not crowd the live well and process mid-transect if needed.

6.5.5.6 Keep fresh, well-aerated water in the live well and refresh as necessary to maintain a cool temperature.

6.5.6 Stop at each major transect (or more frequently) to record the data, and to process and release the animals. Spend no more than about 20 minutes in each segment (≤ 3.5 hours total per site) and break between habitat units whenever possible.

- Process salmonids and large fishes first.
- Process the live well contents quickly (at least once per segment).

6.5.7 Identify each species. (Contact WHM staff for a list of encountered species).

6.5.8 Record the species (common name).

6.5.8.1 Identify these taxa to a courser level than species:

- Juvenile lamprey are identified to the family level (common name = "LAMPREY (FAMILY)").
- Pacific giant salamanders and Copes giant salamanders co-occur on the range map, identify them to the genus level (common name = "GIANT SALAMANDER (GENUS)").
- Adult frogs (common name = "FROG (ORDER)" often escape before finer-level identification can be made.
- Tailed frog larvae to the genus level (common name = "TAILED FROG (GENUS)").

6.5.8.2 Identify and record vertebrates by life-stage (juvenile, adult, unknown) of each species or taxa for permit reporting. The data assists in tracking threatened or endangered fish for permits.

6.5.8.3 Use the size classes listed below to distinguish between adult and juvenile. The lengths between bins are "unknown" life stages. Also, refer to the cheat sheet in the eforms (figure 6).

- Chinook salmon < 135 mm are juvenile (Parker and Larkin, 1959).
- Coho salmon < 290 mm are juvenile (NOAA, 1995).
- Cutthroat trout < 150 mm are juvenile (Carlander, 1969).
- Cutthroat trout > 180 mm are adult (Carlander, 1969).
- Rainbow trout < 150 mm are juveniles (Scott and Crossman, 1973).
- Rainbow trout > 250 mm are adult (Scott and Crossman, 1973).
- Bull trout < 150 mm are juvenile (Rieman and McIntyre, 1993).
- Bull trout > 300 mm are recorded as adult (permit language).
- Brook trout are recorded as unknown life stage.
- Lamprey with hidden eyes & toothless are juvenile (Scholz et al., 2010).
- Frogs/Toads as tadpoles (legs not fully formed) are juvenile.
- Frogs/Toads with legs (and no swimming tail) are adults.
- Frogs/Toads with legs and a swimming tail are recorded as unknown life stage.
- Salamanders as larvae/paedomorphs are recorded as juvenile.
- Other non-salmon fishes are reported as unknown life stage.

6.5.9 Tally the number of fish you encounter for each life stage bin.

6.5.10 Record the number of voucher species (see 6.5.14) and if you have any unintentional mortalities that resulted from fishing activities.

NOTE: Whenever you detect any harm to fish, re-evaluate the fishing methods. You might adjust settings, decrease handling time, or cease fishing.

6.5.11 Record length (mm) of the animal if it is the smallest or largest for the species size class/life stage in the DCE.

6.5.11.1 Measure the natural length of the fish from the most anterior part of the head to the most posterior extent of its tail. Be sure the tail is not pinched but resting in a "natural position" (Anderson and Gutreuter, 1983). Measure adult frogs and toads from snout-to-vent.

6.5.12 Record each transect that you encounter each species (A, B, C,…J),

6.5.13 Photograph each species life-stage encountered, focusing on key features for taxonomy (see Lyons et al. (2006), Stauffer et al., (2001)). Take multiple photos if unsure of your identification.

6.5.14 Collect voucher specimens. These are for identification in a laboratory and by a professional taxonomist.

6.5.14.1 Vouch difficult-to-identify species (e.g., members of Cottidae, Catostomidae, Cyprinidae, or non-native species). Do not mix species in any jar. Use one jar per species. **Do not** voucher any of the fishes below:

- Large specimens that won't fit into a 500 mL wide-mouth jar
- Salmonids (except in cases of mortality as required by permits).
- Amphibians
- Lamprey

6.5.15 Using MS-222 in the Field

6.5.15.1 Prior to vouching a species, fill prepared MS-222 jar with stream water (shake to ensure mixture dissolves).

6.5.15.2 Add fish to the jar and wait 5-10 minutes (or until gills slow and specimen is less reactive to touch).

6.5.15.3 Remove fish from the jar using rubber glove or fishing net. (If using a rubber glove, turn the glove inside out after each use to prevent MS-222 skin contact.)

6.5.15.4 Place fish in a jar containing 25% ethanol solution.

6.5.15.5 Label lid with species, date, and length.

6.5.15.6 Replace with 95% ethanol at the end of the field day.

6.5.16 Label each jar. Fill out two waterproof Voucher Jar Tags (Figure 4) using a number 2 pencil. Tape one to the exterior and insert one inside the jar.

STREAM NAME:	UPPER PILCHUCK RIVER
SITE ID:	WHM07620- 495336
LAT (DD):	48.00012
LONG (DD):	-121.77953
Common Name:	TORRENT SCULPIN
Genus species:	COTTUS RHOTHEUS
Total Lengths (mm):	88, 98

Figure 4. Fill out the fish voucher tag with the stream name, site ID, latitude and longitude of the index station, common name, genus, species and total lengths of the voucher specimens.

6.5.17 Seal each jar lid securely using electrical tape. Write a consecutive jar identity number (for your crew, per year) on the jar lid.

6.5.18 Photograph the jar with label and jar id.

6.5.19 Release all other animals alive. Find quiet water downstream of electrofishing activity. Do this frequently to avoid holding animals any longer than necessary.

6.5.20 When finished electrofishing, record on button time, end time, ending voltage, frequency and duty cycle for the electrofishing backpack settings on the vertebrate collection form.

6.6 Transfer the vertebrate collection data into the eforms (Figure 5)

6.6.1 Enter the sample distance in meters. This is often the same as site length; however, it may be shorter than the site length if you had to avoid areas for safety or permit limitations.

6.6.2 For sites with dry patches, do NOT subtract those distances from site length. Wetted area information will be available from the habitat survey (other SOPs).

6.6.3 Hit save and navigate to the vertebrate collection page. Transfer the vertebrate data recorded on the vertebrate collection form to the eforms (Figure 6).

6.6.4 Common names listed are available on the eform by typing the first three characters in the “Common Name” field. See Appendix A for additional common name databases.

6.6.5 Save and back-up the DCE to file.

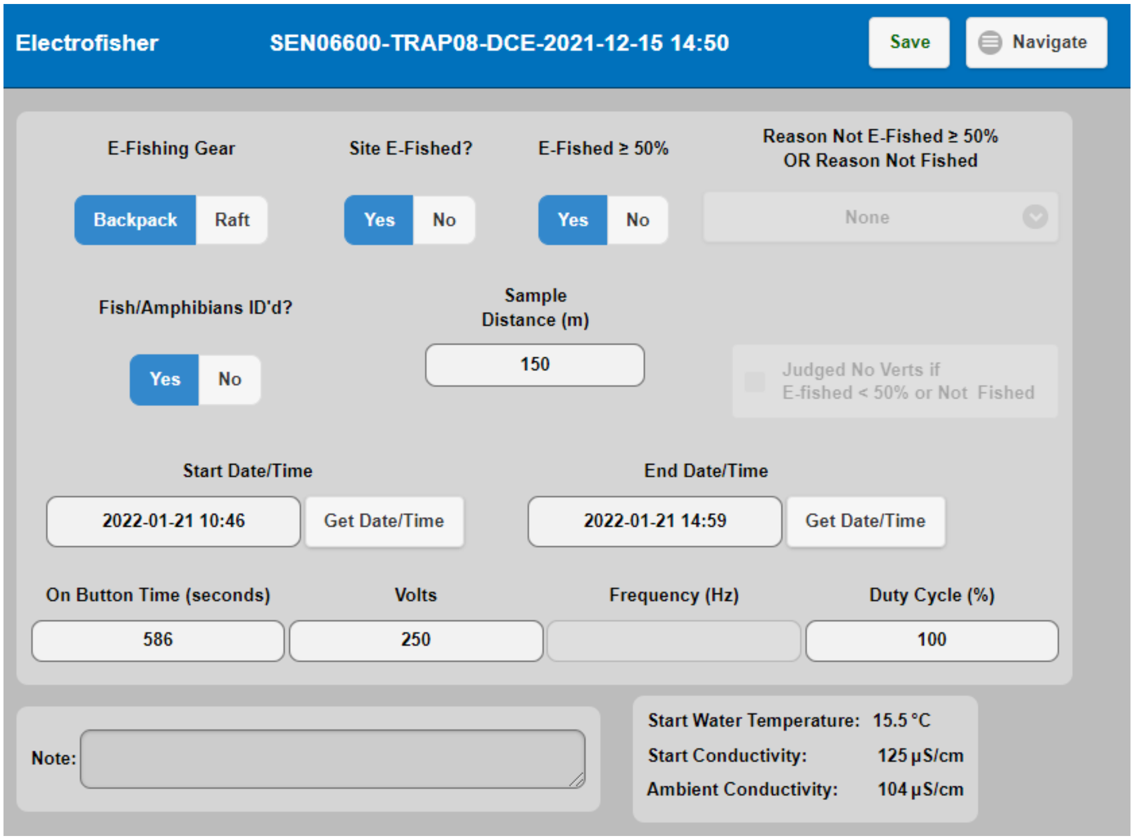

Figure 5. A completed electrofisher page.

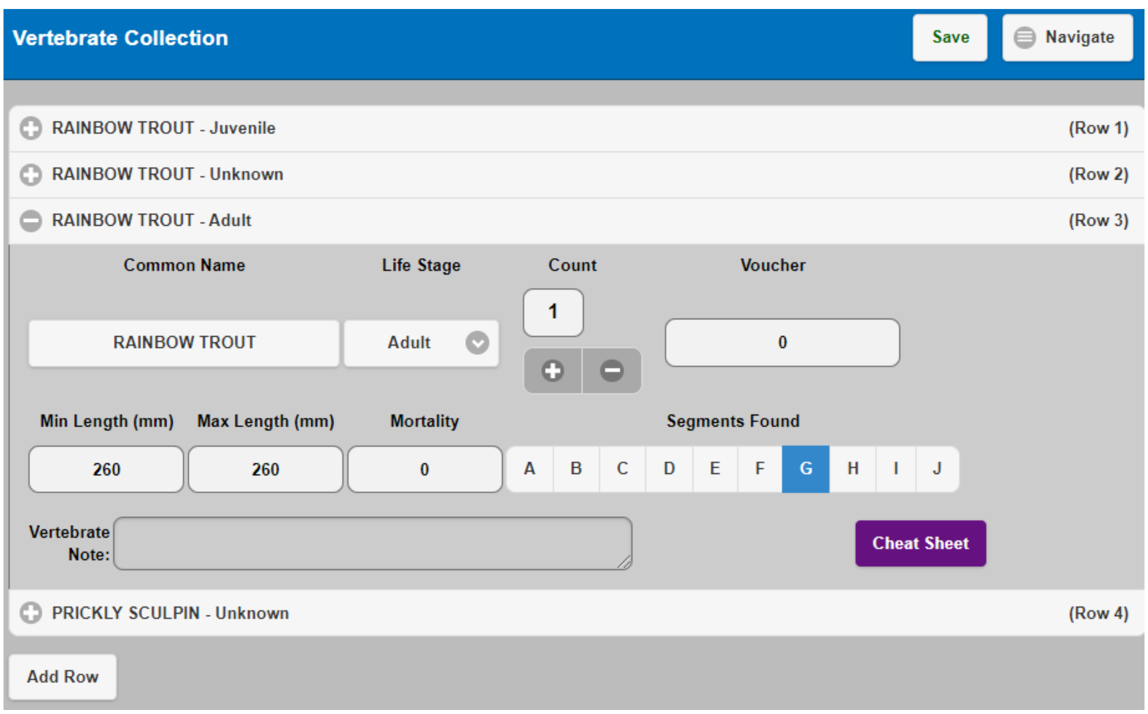

Figure 6. Enter each species on the vertebrate collection page, one row for each size class.

7.0 Records Management

7.1 Contact the Watershed Health Monitoring Data Coordinator for the latest guidance document describing how to validate, complete, and load WHM field forms to the WHM database.

7.2 Upload fish photographs to a network drive after each DCE.

8.0 Quality Control and Quality Assurance

8.1 PROJECT QA/QC procedures are discussed in the Quality Assurance Monitoring Plan (Cusimano et al., 2006); a new version will be available 2022.

9.0 Safety

9.1 All field staff must comply with the requirements of the EAP Safety Manual (Ecology, 2017).

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11.0 Appendix

11.1 Appendix A. Find common names for other taxa by searching the Integrated Taxonomic Information System (ITIS, 2016) or the Peterson Field Guide to Freshwater Fishes of North America North of Mexico, Page et al., (2013). Additional sources for species identification and range are below:

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