

ATTACHMENT SEVEN – PROTOCOL FOR FISH REMOVAL AND EXCLUSION*

Fish Capture – General Guidelines

1. Fish Capture Methods
 - a. Minnow traps. Optional. Traps may be left in place prior to dewatering and may be used in conjunction with seining. Once dewatering starts, minnow traps should only be used if there is someone present to check the traps every few hours, and remove the traps once the water level becomes too low.
 - b. Seining. Where Practical. Use seine with mesh of a size to ensure entrapment of the residing fish and age classes.
 - c. Dip nets. Required. Use in conjunction with other methods as area is dewatered.
 - d. Electrofishing. Optional. Use electrofishing only after other means of fish capture have been exhausted or where other means of fish capture are not be feasible.
2. Seining shall be the preferred method for fish capture. Other methods shall be used when seining is not possible, or when /after attempts at seining have proven ineffective.
3. Only dip nets and seines composed of soft (non-abrasive) material shall be used.
4. Electrofishing equipment shall not be used unless and until other, less injurious methods have been used. A minimum of three complete passes without capture using seines and/or nets shall be conducted before electrofishing is used.
5. Only a backpack electrofisher shall be used.
6. A biologist or staff person with 100 hours of electrofishing field experience or appropriate training shall supervise the capture and safe removal of food fish, game fish, and other fish life from the job site. Training can be acquired from WDFW, US Fish and Wildlife Service, National Marine Fisheries Service, Smith-Root, or the Northwest Environmental Training Center. The biologist or staff person supervising the fish capture shall train the crew to ensure they have the necessary knowledge, skills, and abilities to handle the fish safely. Training shall occur before an inexperienced crew begins electrofishing.

The training shall cover the following elements:

- a. Fish handling techniques and fish identification.
- b. How to monitor and install block nets.
- c. A demonstration of the proper use of seines and electrofishing equipment, the role each member of the crew performs, and basic gear maintenance.
- d. An explanation of how electrofishing attracts fish.
- e. An explanation of how gear can injure fish and how to recognize signs of injury.
- f. Definitions of basic terminology: e.g. galvanotaxis and tetany.

- g. A review of these guidelines and the equipment manufacturer's recommendations.
 - h. A field session in which trainees actually perform each role on the netting and electrofishing crew.
7. Fish shall be handled with extreme care and kept in water at all times during transfer procedures. A healthy environment for the stressed fish shall be provided. The transfer of fish shall be conducted using shaded or dark large buckets (five gallon minimum to prevent overcrowding) and minimal handling of fish. There should not be overcrowding in the buckets and holding time should be minimized. Large fish should be kept separated from smaller prey-sized fish to avoid predation during containment. The water temperature in the transfer buckets should not exceed the temperature of cold pool water in the subject stream. Retain fish the minimum time possible to ensure that stress is minimized, temperatures do not rise, and dissolved oxygen remains suitable. Supplemental oxygen (aeration) shall be considered in designing fish handling operations. Release fish as near as possible to the isolated reach in a pool or area that provides cover and flow refuge.

B. Dewater Instream Work Area and Fish Capture

Fish screen. Except for gravity diversions that have gradual and small outfall drops directly into water, all water intake structures shall have a fish screen installed, operated, and maintained in accordance with the General HPA Provision.

The sequence for stream flow diversion will be:

1. Install flow conveyance devices (pumps, discharge lines, gravity drain lines, conduits, and channels), but do not divert flow.
2. Install upstream barrier. Allow water to flow over upstream barrier.
3. Install block net at upstream end of work area in an area of low water velocity to minimize potential impingement. Block nets will be checked regularly. If any fish are impinged or killed on the nets they will be checked hourly.
4. Slowly reduce flow over upstream barrier by one-third.
5. Inspect as discharge is diminishing and in dewatered areas for stranded and trapped fish and remove them with dip nets.
6. Reduce flow over upstream barrier by an additional one-third.
7. Again, inspect dewatered areas for stranded and trapped fish and remove them with dip nets.
8. Divert upstream flow completely.
9. Install downstream barrier if necessary (only in low gradient, backwatered reaches).

10. If water remains within the work area; seine, dip net, and lastly electrofish (if using this technique), the project area until catch rates have reached no fish for 3 consecutive passes. Move rocks as needed to flush fish and effectively electrofish the work area.
11. If needed, pump water out of isolated pools within the project area to a temporary storage and treatment site or into upland areas and filter through vegetation prior to reentering the stream channel. Continue to seine, dip net and electrofish while pumping.
12. If fish continue to be captured, shut pump off before average water depths reach one foot. Continue to seine, dip net and electrofish until no fish are caught for 3 consecutive passes.
13. Pump dry and check substrate for remaining fish.
14. Continue to pump water from the project area as needed for the duration of the project.

Electrofishing Guidelines

1. Electrofishing is employed when other methods prove ineffective.
2. Equipment shall be in good working condition and operators should go through the manufacturer’s preseason checks, adhere to all provisions, and record major maintenance work in a logbook.
3. Measure conductivity and set voltage. Each electrofishing session shall start with all settings (voltage, pulse width and pulse rate) set to the minimums needed to capture fish. The settings should be gradually increased only to the point where fish are immobilized and captured.
4. Only Direct Current (DC) or Pulsed Direct Current (PDC) should be used.

Table 1. Guidelines for minimum (initial) and maximum settings for backpack electrofishing.

	Initial Settings	Maximum Settings	Notes
Voltage	100 V	Conductivity ($\mu\text{S}/\text{cm}$) Max. Voltage <100 1100 V 100 – 300 800 V >300 400 V	
Pulse width	500 μs	5 ms	

Pulse rate	30 Hz	70 Hz	In general, exceeding 40 Hz will injure more fish
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8. Fish should not come in contact with the anode. The zone of potential fish injury is 0.5m from the anode. Care should be taken in shallow waters, undercut banks, near structures such as wood, or where fish can be concentrated in high numbers because in such areas the fish are more likely to come into close contact with the anode.
9. Electrofishing should be performed in a manner that minimizes harm to fish. The stream segment should be worked systematically, moving the anode continuously in a herringbone pattern through the water. Do not electrofish one area for an extended period of time. Remove fish from the electrical field immediately; do not hold fish in net while continuing to net additional fish.
10. Crew members should carefully observe the condition of the excluded fish. Dark bands on the body and longer recovery times are signs of injury or handling stress. When such signs are noted, the settings for the electrofishing unit may need adjusting. Each fish should be completely revived before releasing. Fish will be released as soon as possible downstream of the block nets in an area that provides refuge.

* *Adapted from the National Marine Fisheries Service Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act, June 2000.*