

**Washington Fish and Wildlife Office  
U. S. Fish and Wildlife Service**

# **Recommended Fish Exclusion, Capture, Handling, and Electroshocking Protocols and Standards**



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## **INTRODUCTION**

The Washington Fish and Wildlife Office, U. S. Fish and Wildlife Service (FWS) recommends the following protocols and standards for fish exclusion, capture, handling, and relocation where conducted within the range of the federally listed as threatened bull trout. Electroshocking guidelines and references are also included in this document.

This guidance is to provide methods to isolate, capture, and move/relocate fish to minimize effects of construction activities to federally listed bull trout and unlisted species that are present within the affected area. These measures are intended to reduce exposure and risk of potential injury associated with construction activities. Although these measures may result in negative behavioral and, in some cases, physical injury or death to fish, proper implementation of these methods will reduce the likelihood of these effects. These measures are recommended where their implementation will result in the avoidance of the more severe effects fish would experience if they remained in the work area during construction. Implementation of less protective measures may result in additional requirements as part of the Endangered Species Act (ESA) consultation process and/or recommendations provided under the Fish and Wildlife Coordination Act.

## **WHEN TO USE THIS GUIDANCE**

Work below the Ordinary High-Water Mark (or Mean Higher High-Water Mark) will typically be conducted in isolation from flowing waters. Exceptions to this general rule include the following:

- 1) Implementation of the work area isolation and fish capture and removal protocols described in this document.
- 2) Placement or removal of small quantities of material (e.g., wood or rock), or installation of structural best management practices (e.g., turbidity curtain), under site conditions where potential exposures and effects to fish are minimized without isolation from flowing waters<sup>1</sup>.
- 3) Work conducted under a declared emergency or under emergency conditions.
- 4) Work conducted where flow conditions prevent safe implementation of work area isolation and fish capture and removal protocols.

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<sup>1</sup> The applicant shall make this determination with consultation or input from the regulatory agencies with jurisdiction, including the Washington State Department of Fish and Wildlife (WDFW), U.S. Fish and Wildlife Service (FWS), and NOAA-National Marine Fisheries Service (NMFS) as appropriate; also, this exception shall not permit work that requires in-water excavation or that presents a risk of increased turbidity beyond the immediate work area or for a duration of more than 15 minutes.

## **RESPONSIBILITIES AND TRAINING REQUIREMENTS**

Implementation of the work area isolation and fish capture and removal protocols will be planned and directed by a qualified biologist (referred to in this document as the directing biologist), possessing all necessary knowledge, training, and experience. We also recommend that the project proponent/consulting agency coordinate with the FWS as early in the planning process as possible to determine the most appropriate in-water work window and identify any conflicts with effects to other listed species, such as the marbled murrelet (*Brachyramphus marmoratus*) or the northern spotted owl (*Strix occidentalis caurina*).

If electrofishing is proposed as a means of fish capture, the directing biologist will have a minimum of 100 hours electrofishing experience in the field using similar equipment, and any individuals operating electrofishing equipment will have a minimum of 40 hours electrofishing experience under direct supervision. All individuals participating in fish capture and removal operations will have the training, knowledge, skills, and ability to ensure safe handling of fish, and to ensure the safety of staff conducting the operations.

## **STAGING AND SEQUENCING OF WORK**

The directing biologist will work with the appropriate person (such as the construction and equipment operators for the project) to plan the staging and sequence for work area isolation, fish capture and removal, and dewatering. This plan will consider the size and channel characteristics of the area to be isolated, the method(s) of dewatering (e.g., diversion with bypass flume or culvert; diversion with sandbag, sheet pile or similar cofferdam; etc.), and what sequence of activities will provide the best conditions for safe capture and removal of fish. Where the area to be isolated is small, depths are shallow, hiding cover is limited, and/or conditions are conducive to fish capture, it may be possible to isolate the work area and remove all fish life prior to dewatering or flow diversion. Where the area to be isolated is large, water is deeper, uncut banks and other hiding cover is present, flow volumes or velocities are high, and/or conditions are not conducive to easy fish capture, it may be necessary to commence with dewatering or flow diversion staged in conjunction with fish capture and removal. The directing biologist will use his/her best professional judgment in deciding what sequence of activities is likely to minimize exposure of fish to conditions causing stress or injury (including stranding, exposure to temperature extremes or reduced dissolved oxygen levels, risk of injury resulting from electrofishing, etc.).

The directing biologist will plan work area isolation, fish capture and removal, and dewatering with consideration for the following: habitat connectivity and fish habitat requirements; the duration and extent of planned in-water work; anticipated flow and temperature conditions over the duration of planned in-water work; and, the risk of exposure to turbidity or other unfavorable conditions during construction. If the area to be isolated includes only a portion of the wetted channel width (e.g., large or deep rivers where diversion from the entirety of the wetted channel is difficult or impossible), or if the bypass flume or culvert will effectively maintain connectivity and fish passage for the

duration of construction activities, it may be less important whether fish are herded (and/or captured and released) upstream or downstream of the isolated work area. However, if the area to be isolated includes the entire wetted channel width, or if conditions make it unlikely that connectivity (i.e., upstream/downstream fish passage) can be effectively maintained for the duration of construction activities, then the directing biologist will carefully consider whether to herd fish (and/or capture and release fish) upstream or downstream of the isolated work area to minimize effects to individuals. For example, if conditions upstream of the isolated work area may become unfavorable during construction, then fish will not be herded or released to an upstream location; this situation is probably most common where the waterbody in question is small, where seasonal flows are substantially diminished, and conditions of elevated temperature and/or reduced dissolved oxygen are foreseeable. However, the directing biologist will also consider whether planned in-water work presents a significant risk of downstream turbidity and sedimentation and exposure of fish herded or released to a downstream location.

If large numbers of fish are to be herded (and/or captured and released), and to avoid overcrowding or concentrating fish in areas where their habitat needs cannot be met, it may be appropriate to relocate fish both upstream and downstream of the isolated work area. At locations where habitat connectivity or quality is poor, including along reaches upstream and/or downstream of the isolated work area, the directing biologist will carefully consider whether relocated fish can meet their minimum habitat requirements for the duration of planned in-water work. On rare occasions it may be appropriate to relocate fish at a greater distance upstream and/or downstream (e.g., thousands of feet or miles), so as to ensure fish are not concentrated in areas where their habitat needs cannot be met, or where they may be exposed to unfavorable conditions, including increased predation, during construction. On those rare occasions where relocation to a greater distance is deemed necessary, the entity will provide notice to the FWS field office<sup>2</sup> with jurisdiction in that area in advance of the operations.

### **Work Area Isolation - Block Nets**

The directing biologist will determine appropriate locations for the placement of block nets, based on site characteristics and a consideration of the type and extent of planned in-water work. Sites that exhibit reduced flow volume or velocity, uniformity of depth, and good accessibility are preferred; sites with heavy vegetation, large cobble or boulders, undercut banks, deep pools, etc. should be avoided due to the difficulty of securing and/or maintaining nets. Sites with a narrow channel cross-section (“constriction”) will be avoided if foreseeable flow conditions might overwhelm or dislodge the block nets, posts, or anchors.

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<sup>2</sup> Lacey Field Office, Central Washington Field Office (Wenatchee), or Eastern Washington Field Office (Spokane)

The directing biologist will select suitable block nets. Type of material, length, and depth may vary based on site conditions. Typically block nets will be composed of 9.5 millimeter stretched nylon mesh and will be installed at an angle to the direction of flow (i.e., not directly perpendicular to flow) so as to reduce the risk of impinging fish. Block nets must be secured along both banks and the channel bottom to prevent erosion and failure due to debris accumulation, high flows, and/or flanking. Some locations may require additional block net support (e.g., galvanized hardware cloth, affixed metal fence posts, etc.). Anchor bags filled (or half-filled) with clean, washed gravel are preferred over sandbags, especially for nets and anchors that will or may remain in-place for a long duration (i.e., more than 2 weeks). Native materials will not be used as fill for anchor bags. Any use or movement<sup>3</sup> of native substrates or other materials will be incidental and will not appreciably affect channel bed or bank conditions.

Except when planning and intending to herd fish upstream, an upstream block net will be placed first. With a block net secured to prevent movement of fish into the work area from upstream, a second block net will be used as a seine to herd fish in a downstream direction. Where the area to be isolated includes a culvert(s), deep pools, undercut banks, or other cover attractive to fish (e.g., thick overhanging vegetation, rootwads, logjams, etc.) it may be appropriate to isolate a portion or portions of the work area in phases, rather than attempting to herd fish from the entirety of the work area in a single downstream pass. Fish capture and removal will be most successful if an effort is made to strategically focus and concentrate fish in areas where they can be easily seined and netted. Care will be taken not to concentrate fish where they are exposed to sources of stress, or to leave them concentrated in such areas for a long duration (e.g., more than 30 minutes).

Field staff will be assigned the responsibility of frequently checking and maintaining the nets for accumulated debris, general stability, and proper function. A qualified biologist, or other field staff trained in safe fish handling, will be assigned the responsibility of inspecting the nets and safely capturing and relocating any impinged fish. The frequency of these inspections will be determined by the directing biologist on a case-by-case basis, dependent upon the site, seasonal, and weather conditions. Block nets placed within a local population of bull trout (defined as areas used by bull trout for spawning and/or rearing) will be checked every 4 hours, 24 hours a day, for the duration the block net is in operation. If any bull trout are impinged or killed on or by the nets, the frequency of net inspection will be increased to once hourly, 24 hours a day, for the duration the block net is in operation. If any bull trout are impinged or killed on or by the nets, the frequency of net inspection will be increased to once hourly, 24 hours a day. In the event fish are found impinged on the net(s), or if weather or flow conditions change significantly, the directing biologist will re-consider and adjust the frequency of net inspections so as to

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<sup>3</sup> Small instream boulders may be used temporarily to hold net in place and returned to their previous instream position upon removal of net.

minimize the risk of impinging and injuring fish. Block nets will remain in-place until work is complete and conditions are suitable for the reintroduction of fish<sup>4</sup>.

Depending upon site characteristics, and the planned staging and sequence for work area isolation and dewatering, it may or may not be necessary to place a downstream block net. Typically, however, site characteristics and/or the duration of planned in-water work will necessitate placement of a net(s) to prevent upstream movement of fish into the work area. If groundwater seepage or site drainage has a tendency to re-wet the area, if the area to be isolated is low-gradient or subject to a backwatering influence, or if the area to be isolated is large and considerable effort will be expended in capturing and removing fish, a downstream block net will be placed. If foreseeable flow conditions over the duration of planned in-water work might enable fish to re-enter the work area from downstream, a downstream block net will be placed.

In most instances where gradual dewatering or flow diversion is staged in conjunction with fish capture and removal, it is appropriate to delay installation of the downstream block net(s) until after fish have been given sufficient time to move downstream by their own choosing. If flows are reduced gradually over the course of several hours, or the length of an entire workday, some (perhaps many) fish will make volitional movements downstream beyond the area to be isolated. Gradual dewatering can be an effective means by which to reduce the risk of fish stress or injury. Gradual dewatering and the encouragement of volitional movement are particularly important where the area to be isolated is large and may hold many fish. However, where the area to be isolated includes a culvert(s), deep pools, undercut banks, or other cover attractive to fish, some (perhaps many) fish will not choose to move downstream regardless of how gradually flows are reduced. The directing biologist will use his/her best professional judgment in deciding what sequence of activities is likely to minimize fish stress or injury (including stranding).

Where the area to be isolated is small, depths are shallow, and conditions are conducive to fish capture, it may be possible to remove all fish life prior to dewatering or to implement plans for dewatering staged with fish capture over a relatively short timeframe (e.g., 1 to 2 hours). Where the area to be isolated is large, depths are not shallow, where flow volumes or velocities are high, and/or conditions are not conducive to easy fish capture, dewatering or flow diversion will be staged in conjunction with fish capture and removal over a longer timeframe (e.g., 3 to 6 hours). The largest areas and/or most difficult site conditions may warrant or require that plans for dewatering and fish capture proceed over the length of an entire workday, or multiple workdays. Where this is the case, fish will be given sufficient time and a means to move downstream by their own

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<sup>4</sup> If plans for work area isolation and fish capture and removal include the installation of temporary cofferdams, and once the directing biologist has confirmed fish have been successfully excluded from the entire area enclosed by the cofferdam(s), it may be appropriate to remove block nets and allow fish to re-enter the previously isolated work area; this approach is particularly relevant and appropriate where many weeks or months of construction are planned for completion within temporary cofferdams (i.e., isolated from flowing waters).

choosing to reduce the total number of fish exposed to sources of stress and injury (including fish handling). Extra time needed for this voluntary fish movement needs to be considered and provided for as part of the dewatering process.

### **Dewatering and Flow Diversion**

If dewatering and/or flow diversion are necessary, this work (including related fish capture and removal operations) will comply with any provisions contained in the Hydraulic Project Approval (HPA), or applicable General HPA, issued by the WDFW. If the FWS has provided relevant Terms and Conditions from a Biological Opinion addressing the work (or action), this work will also comply with those Terms and Conditions.

If pumps are used to temporarily bypass water or to dewater residual pools or cofferdams, pump intakes will be screened to prevent aquatic life from entering the intake. Fish screens or guards will comply with Washington State law (RCW 77.57.010 and 77.57.070), with guidelines prescribed by the NMFS<sup>5</sup>, and any more stringent requirements contained in the HPA or General HPA issued by the WDFW. If pumps are to be used on a more permanent basis, as the primary or secondary method for diverting flow around the isolated work area, plans for dewatering will address contingencies (i.e., extremes of flow or weather). These plans will include ready access to a larger or additional “back-up” pump with screened intake. If the directing biologist has confirmed that all fish have been successfully excluded from the area, if there is no risk of entraining fish, and adequate plans are in-place to address contingencies (including a routine schedule for inspection), then pumps may be operated without a screened intake. Use of an unscreened intake pump shall be documented.

### **Fish Capture and Removal**

Methods for safe capture and removal of fish from the isolated work area are described below. These methods are given in order of preference. At most locations, a combination of methods will be necessary. To avoid and minimize the risk of injury to fish, attempts to seine and/or net fish will always precede the use of electrofishing equipment. Visual observation techniques (e.g., snorkeling, surveying with polarized glasses or Plexiglas bottomed buckets, etc.) may be used to assess the effectiveness of these methods, to identify locations where fish are concentrating, or otherwise adjust methods for greater effectiveness.

If the planned fish capture and removal operations have not been addressed through section 7 consultation (for example, due to an emergency), seining and netting are impracticable (i.e., electrofishing is deemed the only viable means of fish capture), and

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<sup>5</sup> National Marine Fisheries Service. 1997. Fish screening criteria for anadromous salmonids. NMFS Southwest Region, January 1997, 12p. << <http://swr.nmfs.noaa.gov/hcd/fishscrn.pdf> >>.



bull trout may be present, the directing biologist will provide notice to the FWS. This notice will be provided in advance of the operations, and will include an explanation of the unique site conditions or circumstances. Work conducted under a declared emergency (or emergency conditions) will follow established notification protocols under section 7 of the ESA.

Where bull trout and non-listed fish may be present, the directing biologist will ensure that fish capture and removal operations adhere to the following minimum performance measures or expectations:

- 1) Only dip nets and seines composed of soft (non-abrasive) nylon material will be used.
- 2) The operations will not resort to the use of electrofishing equipment unless and until other, less injurious methods have removed most or all of the adult and sub-adult fish (i.e., fish in excess of 300 millimeters); the operations will conduct a *minimum* of three complete passes *without capture* using seines and/or nets prior to the use of electrofishing.
- 3) The operations will confirm success of fish capture and removal before completely dewatering or commencing with other work within the isolated work area; the operations will conduct a minimum of two complete passes without capture using electrofishing equipment.
- 4) Fish will not be held in containers for more than 10 minutes, unless those containers are dark-colored, lidded, and fitted with a portable aerator.
- 5) A plan for achieving efficient return to appropriate habitat will be developed before the capture and removal process.
- 6) Every attempt will be made to release ESA-listed specimens first.

### Seining

Seining will be the preferred method for fish capture. Other methods will be used when seining is not possible, or when/after attempts at seining have proven ineffective. Seines, once pursed, will remain partially in the water while fish are removed with dip nets. Seines with a “bag” minimize handling stress are preferred. Seines with a bag are also preferred where obstructions make access to the water (or deployment/ retrieval of the seine) difficult.

In general, seining will be more effective if fish, especially juvenile fish, are moved (or “flushed”) out from under cover. Methods which may increase effectiveness and/or efficiency include conducting seining operations at dawn or dusk (i.e., during low-light conditions), in conjunction with snorkeling, and/or flushing of the cover. In flowing waters, and especially where flow volume or velocity is high or moderately-high, seines that employ a heavy lead line and variable mesh size are preferred.

Small mesh sizes are more effective across the full range of fish size (and age class), but also increase resistance and can make deployment/ retrieval more difficult in flowing waters. Seines which use a small mesh size in the bag (or body), and a larger, less resistant mesh size in the wings may under some conditions be most effective and efficient.

### Baited Minnow Traps

Baited minnow traps are typically used before and in conjunction with seining. Traps may be left in the isolated work area overnight. Traps will be inspected at least four times daily to remove captured fish and thereby minimize predation within the trap. Traps will be checked more frequently if temperatures are in excess of 15 degrees C.

Predation within the trap may be an unacceptable risk when minnow traps are left in-place overnight; large sculpin and other predators that feed on juvenile fish are typically much more active at night. The directing biologist will consider the need and plan for work outside daylight hours (i.e., inspection and removal) before leaving minnow traps in-place overnight.

### Dip Nets

Dip nets will be used in conjunction with seining. This method is particularly effective when employed during gradual dewatering or flow diversion. To be most effective and to minimize stress and risk of injury to fish (including stranding), the directing biologist will coordinate fish capture operations with plans for dewatering or flow diversion. Plans for dewatering and/or flow diversion will proceed at a measured pace (within constraints), to encourage the volitional downstream movement of fish, and reduce the risk of stranding. The directing biologist shall monitor the dewatering process to insure that water is removed slowly to allow for fish capture and preclude stranding. Plans for dewatering and/or flow diversion will not proceed unless there are sufficient staff and materials on-site to capture and safely remove fish in a timely manner. Generally this will require a minimum of two persons (three if electrofishing), but the directing biologist may find that some sites (especially large or complicated sites) warrant or require a more intensive effort (i.e., additional staffing).

Once netted, fish will remain partially in water until transferred to a bucket, cooler, or holding tank. Dip nets which retain a volume of water (“sanctuary nets”) are preferred. However, sanctuary nets may be ineffective where flow volume or velocity is high or moderately-high (i.e., increased resistance lessens ability to net and capture fish). In addition, where water depths are very shallow and/or fish are concentrated in very small receding pools or coarse substrate, “aquarium” nets may be a better, more effective choice. Use of dip nets in conjunction with snorkeling, flushing of the cover, or around the hours of dawn or dusk (i.e., during low-light conditions), can be effective for capturing fish sheltered below cover.

## Connecting Rod Snakes

Connecting rod snakes may be used to flush fish out of stream crossing structures (i.e., culverts). Connecting rod snakes are composed of wood sections approximately 3 feet in length. Like other cover attractive to fish, culverts (especially long culverts), can present a challenge to fish capture and removal operations. The directing biologist will plan a strategy for focusing and concentrating fish in areas where they can be easily seined and netted, and will take active steps to prevent fish from evading capture. When first implementing plans for work area isolation, fish capture and removal, and dewatering, it may be appropriate to place block nets immediately upstream and/or downstream of culverts to minimize the number of fish that might seek cover within the culvert(s). Once most or all of the fish have been removed from other parts of the work area, the block net placed downstream of the culvert(s) will be removed to encourage volitional downstream movement of fish.

## Electrofishing

Electrofishing will be performed only when other methods of fish capture and removal have proven impracticable or ineffective at removing all fish. The directing biologist will ensure that attempts to seine and/or net fish always precede the use of electrofishing equipment. Larger fish (i.e., adult and sub-adult fish with comparatively longer spine lengths) are more susceptible to electrofishing injury than smaller fish. To minimize the risk of injury (and the number of fish potentially injured), the directing biologist will confirm that other methods have been effective in removing most or all of the adult and sub-adult fish before resorting to the use of electrofishing equipment; see the related performance measure appearing on page 6. As a general rule or performance measure, electrofishing will not be conducted under conditions that offer poor visibility (i.e., visibility of less than 0.5 meter).

The following performance measures will apply to the use of electrofishing equipment as a means of fish capture and removal:

- 1) Electrofishing will only be conducted when a directing biologist with at least 100 hours of electrofishing experience or completion of and/or certification from acceptable training<sup>6</sup> is on-site to conduct or direct all related activities. The directing biologist will be familiar with the principles of electrofishing, including the effects of voltage, pulse width and pulse rate on fish, and associated risk of injury or mortality. The directing biologist will have knowledge regarding galvanotaxis, narcosis and tetany, their relationships to injury/mortality rates, and will have the ability to recognize these responses when exhibited by fish.

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<sup>6</sup> For example, the National Conservation Training Center's *Principles & Techniques of Electrofishing* course.

- 2) The directing biologist will ensure that electrofishing attempts use the minimum voltage, pulse width, and rate settings necessary to achieve the desired response (galvanotaxis). Water conductivity will be measured in the field prior to each electrofishing attempt to determine appropriate settings. Electrofishing methods and equipment will comply with guidelines outlined by the NMFS<sup>7</sup>.
- 3) The initial and maximum settings identified below (Table 1) will serve as guidelines when electrofishing in waters that may support bull trout. Use only DC or pulsed DC current. [Note: some newer, late-model electrofishing equipment includes a “set-up” or initialization function; the directing biologist will have the discretion to use this function as a means to identify proper initial settings.]

Table 1. Guidelines for initial and maximum settings for backpack electrofishing.<sup>8</sup>

	<b>Initial Settings</b>	<b>Conductivity (µS/cm)</b>	<b>Maximum Settings</b>
<b>Voltage</b>	100 V	≤ 300 > 300	800 V 400 V
<b>Pulse Width</b>	500 µs		5 ms
<b>Pulse Rate</b>	15 Hz		60 Hz [ <i>In general, exceeding 40 Hz will injure more fish.</i> ]

Each attempt will begin with low settings for pulse width and pulse rate. If fish present in the area being electrofished do not exhibit a response, the settings will gradually be increased until the appropriate response is achieved (galvanotaxis). The lowest effective settings for pulse width, pulse rate, and voltage will be used to minimize risks to both personnel and fish. Safe implementation is a high priority. The directing biologist will ensure the safety of all individuals assisting with electrofishing attempts; this includes planning for and providing all necessary safety equipment and materials (e.g., insulated waders and gloves, first aid/CPR kit, a current safety plan with emergency contacts and phone numbers, etc.). Only individuals that are trained and familiar with the use of electrofishing equipment will provide direct assistance during electrofishing attempts.

- 4) Electrofishing will not be conducted where spawning adults or redds with incubating eggs may be exposed to the electrical current. As a general rule or performance measure, waters that support bull trout will not be electrofished from October 15 through May 15, and resident waters from November 1 through May

<sup>7</sup> National Marine Fisheries Service. 2000. Guidelines for electrofishing waters containing salmonids listed under the Endangered Species Act. NMFS Northwest Region, June 2000, 5p.  
<< <http://www.nwr.noaa.gov/ESA-Salmon-Regulations-Permits/4d-Rules/upload/electro2000.pdf> >>.

<sup>8</sup> Adapted from NMFS (June 2000) and WDFW Electrofishing Guidelines for Stream Typing (May 2001).

15. If located within a local bull trout population (i.e., that support spawning and rearing<sup>9</sup>), seasonal limitations on the use of electrofishing equipment may be more restrictive; if you have questions, contact the FWS. If more restrictive work windows have been identified through consultation, those windows will apply. The directing biologist will ensure that electrofishing attempts are made only during appropriate times of year, and not where spawning adults or redds with incubating eggs may be exposed to the electrical current.
- 5) An individual will be stationed at the downstream block net(s) during electrofishing attempts to recover stunned fish in the event they are flushed downstream and/or impinged against the block net(s). The nets will also be checked after all electrofishing is complete.
- 6) The operator will use caution to prevent fish from coming into direct contact with the anode. Under most conditions, the zone of potential fish injury extends approximately 0.5 meter from the anode. Netting will not be attached to the anode, as this practice presents an increased risk of direct contact and injury. Extra care will be taken near in-water structures or undercut banks, in shallow waters, or where fish densities are high. Under these conditions, fish are more likely to come into close or direct contact with the anode and/or voltage gradients may be intensified. Re-adjust voltage and other settings to accommodate changing conditions in the field, including channel depth. When electrofishing near undercut banks, overhanging vegetation, large cobble or boulders, or where structures provide cover, fish that avoid capture may be exposed to the electrical current repeatedly. Repeated or prolonged exposures to the electrical current present a higher risk of injury, and therefore galvanotaxis will be used to draw fish out of cover.
- 7) Electrofishing will be conducted in a manner that minimizes harm to fish. Once an appropriate fish response (galvanotaxis) is achieved, the isolated work area will be worked systematically. The number of passes will be kept to a minimum, but is dependent upon the numbers of fish and site characteristics and will be at the discretion of the directing biologist. Do not conduct electrofishing unless there are sufficient staff and materials on-site, to minimize the number of passes required and to locate, net, recover, and release fish in a timely manner. Generally, this will require a minimum of three persons, but the directing biologist may find that some sites (especially large or complicated sites) warrant or require a more intensive effort (i.e., additional staffing). Care will be taken to remove fish from the electrical field immediately and to avoid exposing the same fish repeatedly. Fish will not be held in dip nets while electrofishing is in progress (i.e., while continuing to capture additional fish). [Note: where flow velocity or turbulence is high or moderately-high (e.g., within riffles) it may be difficult to see and net fish; these fish may evade capture (resulting in repeated

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<sup>9</sup> See bull trout draft recovery plans for local population information. This information is available at <http://www.fws.gov/pacific/bulltrout/Recovery.html>.

exposure), or may become impinged on the downstream block net(s); a “frame” net, or small and portable block net approximately 3 feet in width, can be effective under these conditions when held downstream in close proximity to the anode.]

- 8) Carefully observe and document the condition of captured fish. Dark bands on the body and/or extended recovery times are signs of stress or injury. When such signs are noted, settings for the electrofishing unit may require readjustment. The directing biologist will also review and consider changes to the manner in which the electrofishing attempt is proceeding. If adjustments to the electrofishing attempt do not lessen the frequency (or severity) of observed stress, the directing biologist will have the authority to postpone fish capture and removal operations<sup>10</sup>. Each fish must be capable of remaining upright and actively swimming prior to release (see Fish Handling, Holding, and Release).
- 9) Electrofishing will not be conducted when turbidity reduces visibility to less than 0.5 meter, when water conductivity exceeds 350  $\mu\text{S}/\text{cm}$ , or when water temperature is above 18°C or below 4°C.

### **Fish Handling, Holding, and Release**

- Fish will not be sampled or anesthetized, unless for valid purposes consistent with the entity’s section 10 scientific collection permits.
- Fish handling will be kept to the minimum necessary to remove fish from the isolated work area. Fish capture and removal operations will be planned and conducted to minimize the amount and duration of handling. The operations will maintain captured fish in water to the maximum extent possible during seining/netting, handling, and transfer for release.
- Individuals handling fish will ensure that their hands are free of harmful and/or deleterious products, including but not limited to sunscreen, lotion, and insect repellent.
- The operations will ensure that water quality conditions are adequate in the buckets, coolers, or holding tanks used to hold and transfer captured fish. The operations will use aerators to provide for clean, cold, well-oxygenated water, and/or will stage capture, temporary holding, and release to minimize the risks associated with prolonged holding. The directing biologist will ensure that

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<sup>10</sup> If the FWS and/or NMFS have provided an Incidental Take Statement from a Biological Opinion addressing the work (or action), the directing biologist shall ensure limits on take have not been exceeded; if the limits on take are exceeded, or if take is approaching these limits, the directing biologist shall postpone fish capture and removal operations and immediately notify the Federal agency (or agencies) with jurisdiction.

conditions in the holding containers are monitored frequently and operations adjusted appropriately to minimize fish stress. If bull trout will be held for more than a few minutes prior to release, the directing biologist will consider using dark-colored, lidded containers only. Bull trout will not be held in containers for more than 10 minutes, unless those containers are dark-colored, lidded, and fitted with a portable aerator; small coolers meeting this description are preferred over buckets. Bull trout will not be kept in the same holding container or area with aquatic species that may prey on or injure them.

- The operations will provide a healthy environment for captured fish, including low densities in holding containers to avoid effects of overcrowding. Large fish will be kept separate from smaller fish to avoid predation. The operations will use water-to-water transfers whenever possible.
- The release site(s) will be determined by the directing biologist. The directing biologist will consider both site characteristics (e.g., flow, temperature, available refuge, and cover, etc.) and the types of fish captured (e.g., out-migrating smolt, kelt, pre-spawn migrating adult, etc.) when selecting a release site(s). More than one site may be designated to provide for varying needs, and to separate prey-sized fish from larger fish. The directing biologist will consider habitat connectivity, fish habitat requirements, seasonal flow, water temperature, and the duration and extent of planned in-water work when selecting a fish release site(s). If conditions upstream of the isolated work area may become unfavorable during construction, then fish will not be released to an upstream location. However, the directing biologist will also consider whether planned in-water work presents a significant risk of downstream turbidity and sedimentation; fish released to a downstream location may be exposed to these conditions. Site conditions may warrant releasing fish both upstream and downstream, or relocating fish at a greater distance (e.g., thousands of feet or miles), so as to ensure fish are not concentrated in areas where their habitat needs cannot be met. For a fuller discussion of this topic see **Staging and Sequencing of Work**.
- The directing biologist will ensure that each fish is capable of remaining upright and has the ability to actively swim upon release.
- Any ESA-listed fish incidentally killed as a result of fish capture and removal operations will be preserved and delivered to the appropriate authority upon request (see Documentation, p. 14; if applicable, see the reporting requirements of the associated Biological Opinion for the action).
- If the limits on take of ESA-listed species are exceeded (harm or harassment), or if incidental take is approaching and may exceed specified limits, the directing biologist will postpone fish capture and removal operations and immediately notify the Federal agency (or agencies) with jurisdiction. If dewatering or flow diversion is incomplete and still in-progress, the entity will take remedial actions directed at maintaining sufficient quantity and quality of flow and lessening

sources of fish stress and/or injury. If conditions contributing to fish stress and/or injury may worsen before the federal agency with jurisdiction can be contacted, the entity will attempt to move fish to a suitable location near the capture site while keeping fish in water and reducing stress as much as possible.

### **Reintroduction of flow and fish to the isolated work area**

If conducting work in isolation from flowing waters has required placement of a block net(s), fish capture and removal, and temporary dewatering, the directing biologist will ensure that the block net(s) remain in-place until work is complete and conditions are suitable for the reintroduction of fish<sup>5</sup>. Flows will be gradually reintroduced to the isolated work area, so as to prevent channel bed or bank instability, excessive scour, or turbidity and sedimentation. The directing biologist will inspect the work area and downstream reach to ensure no fish are stranded or in distress during reintroduction of flows. If conditions causing or contributing to fish stress and/or injury are observed, the entity will take remedial actions directed at lessening these sources of stress. This may include a more gradual reintroduction of flow, so as to reduce resulting turbidity and sedimentation.

All temporary structures and materials (e.g., block nets, posts, and anchors; bypass flume or culvert; sandbag, sheet pile or similar cofferdam; etc.) will be removed at the completion of work. The directing biologist will document in qualitative terms the final condition of the isolated work area (including temporary bypass). The directing biologist will identify and document any obvious signs of channel bed or bank instability resulting from the work, and will report these conditions to the appropriate staff for remedy. The entity will document any additional actions taken to correct channel instability, and the final condition of the isolated work area (including temporary bypass).

To avoid and minimize the risk of introducing or spreading nuisance or invasive species, aquatic parasites, or disease, the directing biologist will ensure that all equipment and materials are cleaned and dried before transporting them for use at another site or waterbody.

### **DOCUMENTATION**

- The directing biologist will document and maintain accurate records of the operations, including the following: project location, date, methods, personnel, water temperature, conductivity, visibility, electrofishing equipment settings, and other comments, fish species, number, age/size class estimate, condition at release, and release location.
- If at any time, fish are observed in distress, a fish kill occurs, or water quality problems develop (including equipment leaks or spills), the entity will provide immediate notification to the WDFW consistent with any provisions contained in the HPA (or applicable General HPA).



- Bull trout incidentally killed as a result of fish capture and removal operations will be documented with notification provided to the appropriate authority (FWS) within two working days. Initial notifications may consist of a phone call or voice mail message. Initial notifications will be directed to the following: the nearest FWS Law Enforcement Office, and the Washington Fish and Wildlife Office at (360) 753-9440. Any dead specimens will be kept whole and preserved on-ice or frozen until the entity receives a response and further directions from the appropriate authority; if the entity receives no response within 10 working days, the directing biologist will have the discretion to dispose of specimens. Initial notifications will be followed by a second notification in writing. All notifications will provide at a minimum the following: date, time, entity point-of-contact (the directing biologist and/or supervisor), project name (and FWS consultation tracking number), precise location of any incidentally killed or injured and unrecovered fish, number of specimens and species, and cause of death or unrecoverable injury. If the limits on incidental take are exceeded (harm or harassment), the written notification will also include an explanation of the circumstances causing or contributing to observed levels of take.
- The final condition of the isolated work area (including temporary bypass) will be documented in qualitative terms, including any obvious signs of channel bed or bank instability resulting from the work. The entity will document any additional actions taken to correct channel instability, and the final condition of the isolated work area (including temporary bypass).