UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

Refer to:
2004/00104

April 30, 2004

Lawrence C. Evans
Chief, Regulatory Branch
Department of the Army, Corps of Engineers
Portland District
P.O. Box 2946
Portland, OR 97208-2946

Re: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation on the Effects of the City of Cove Water System Improvements Project, Union County, Oregon (Corps No.: 200400034)

Dear Mr. Evans:

Enclosed is a document containing a biological opinion (Opinion) prepared by NOAA's National Marine Fisheries Service (NOAA Fisheries) pursuant to section 7 of the Endangered Species Act (ESA) on the effects of permitting the proposed Water System Improvements Project in the City of Cove, Oregon. In this Opinion, NOAA Fisheries concludes that the proposed action is not likely to jeopardize the continued existence of ESA-listed Snake River (SR) steelhead (*Oncorhynchus mykiss*) or SR spring/summer chinook salmon (*O. tshawytscha*), nor adversely modify designated critical habitat for SR spring/summer chinook salmon. As required by section 7 of the ESA, NOAA Fisheries includes reasonable and prudent measures with nondiscretionary terms and conditions that NOAA Fisheries believes are necessary to minimize the impact of incidental take associated with this action.

This document also contains a consultation on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and its implementing regulations (50 CFR Part 600). NOAA Fisheries concludes that the proposed action may adversely affect designated EFH for chinook salmon and coho salmon (*O. kisutch*). As required by section 305(b)(4)(A) of the MSA, included are conservation recommendations that NOAA Fisheries believes will avoid, minimize, mitigate, or otherwise offset adverse effects on EFH resulting from the proposed action. As described in the enclosed consultation, section 305(b)(4)(B) of the MSA requires that a Federal action agency must provide a detailed response in writing within 30 days of receiving an EFH conservation recommendation.

If you have any questions regarding this letter, please contact Donald Hubner of my staff in the Oregon State Habitat Office at 541.975.1835, ext. 223.

Sincerely,

for Michael R Crouse

D. Robert Lohn
Regional Administrator

cc: Mary Headley, COE
Jeff Zakel, ODFW
Gary Miller, USFWS
Jamie Akers, Anderson·Perry & Associates, Inc.

Endangered Species Act - Section 7 Consultation
Biological Opinion

&

Magnuson-Stevens Fishery Conservation and Management Act
Essential Fish Habitat Consultation

City of Cove Water System Improvements Project
Upper Grande Ronde River Subbasin,
Union County, Oregon
(Corps No.: 200400034)

Agency:	Corps of Engineers
Consultation Conducted By:	NOAA's National Marine Fisheries Service, Northwest Region
Date Issued:	April 30, 2004
Issued by:	for Michael R Crouse _____ D. Robert Lohn Regional Administrator
Refer to:	**2004/00104**

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1. INTRODUCTION

The Endangered Species Act (ESA) of 1973 (16 USC 1531-1544), as amended, establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat on which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with NOAA's National Marine Fisheries Service (NOAA Fisheries) and U.S. Fish and Wildlife Service (together "Services"), as appropriate, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitats. This biological opinion (Opinion) is the product of an interagency consultation pursuant to section 7(a)(2) of the ESA and implementing regulations in 50 CFR 402.

The analysis also fulfills the essential fish habitat (EFH) requirements under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a Federal fisheries management plan. Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (section 305(b)(2)).

The U.S. Army Corps of Engineers (COE), Portland District proposes to permit, under section 404 of the Clean Water Act, the City of Cove Water System Improvements Project (Project). The purpose of the proposed Project is "to improve the City of Cove's water supply, storage, and distribution systems." The administrative record for this consultation is on file at the Oregon State Habitat Office.

1.1 Background and Consultation History

On February 4, 2004, NOAA Fisheries received a letter from the COE with attached Project information and biological assessment (BA) from Anderson·Perry & Associates, Inc. The COE requested ESA section 7 formal consultation with a determination for the proposed Project of "may affect, likely to adversely affect" (LAA) Snake River (SR) steelhead (*Oncorhynchus mykiss*), and "may affect, not likely to adversely affect" (NLAA) SR spring/summer chinook (*O. tshawytscha*).

NOAA Fisheries requested additional information from the COE on February 17, 2004. On February 20, 2004, NOAA Fisheries received the requested additional information. Formal consultation was initiated on that date.

The best information available confirmed the presence of SR spring/summer chinook salmon in Mill Creek.[1] Due to the potential for incidental take, NOAA Fisheries could not concur with

[1] Telephone conversation with Fred Monzyk, ODFW, regarding the presence of chinook salmon in Mill Creek, March 11, 2004.

NLAA determination for SR spring/summer chinook salmon. NOAA Fisheries sent a letter of nonconcurrence to the COE dated March 31, 2004.

1.2 Proposed Action

The proposed Project involves drilling a new well, constructing a new tank-style water reservoir, and installing larger diameter water mainlines, including pressurized water lines, under Mill Creek. The installation of the water lines under Mill Creek is the only component of the proposed action likely to have effects on ESA-listed salmonids.

Instream work will begin approximately July 1, 2004. It is scheduled to take approximately one week to complete and is within the Oregon Department of Fish and Wildlife (ODFW) preferred in-water work period for the area of July 1 to October 15 (ODFW, 2000). Construction will require the use of several types of heavy machinery. However, all instream work will be performed from the top of the streambank and no machinery will enter the water.

The instream construction will require excavating an open trench, 30 feet long, 10 feet wide, and 6 feet deep across the streambed. The work area will be isolated from the active stream flow using concrete barriers, sandbags, plastic sheeting, and a temporary pipe bypass. The diameter of the pipe bypass will be determined at the time of construction so as to properly accommodate stream flow present during the construction period and to provide bi-directional access for any fish in the adjacent stream areas during the construction period.

It is reasonably certain that juvenile SR steelhead will be in Mill Creek during the construction period. It is also possible that some juvenile SR spring/summer chinook salmon may be present. Some of these fish may become stranded when the work area is isolated from stream flow.

On completion of the Project, the trench will be backfilled using the original or similar material, and the streambed and banks will be restored to pre-crossing conditions. The temporary bypass pipe and work area isolation barriers will be removed from the streambed and normal stream flow will be restored. Disturbed vegetation will be replaced with permanent seeding and mulching using native seed mixtures.

<u>Conservation Measures Within Project Design</u>

- All instream work will be accomplished during the in-water work window of July 1 to October 15, for this reach of the Grande Ronde River.
- All construction work shall be confined to the designated area and shall remain clear of nearby wetlands.
- Work will be accomplished in a manner that will minimize riparian vegetation disturbance. Disturbed vegetation shall be replaced with permanent seeding and mulching with seed mixtures of native varieties.
- The contractor will avoid unnecessary disturbance of the creek bank and beds. The contractor shall salvage and stockpile, in an area contained from any stream flows, all

native materials excavated from the creek banks and beds. Excavation materials will be carefully replaced to simulate the adjacent, undisturbed native soils.

- The construction site will be contained by silt fences and straw bale sediment barriers to reduce possible sources of sedimentation when stream flow and potential runoff is expected.
- Flowing water will be diverted through a pipe with a diameter appropriate to accommodate stream flows at the time of construction so trenching will not occur in the actively flowing stream. The channel bottom will be stabilized to prevent erosion before the diversion is removed.
- Any fish trapped or entrained, or otherwise threatened by construction, will be captured and transported outside the action area by an ODFW fish biologist following NOAA Fisheries' guidelines.
- Petroleum- and lubricant-containing equipment will be inspected for leaks on a daily basis. All fuel and lubricants will be stored and refueling operations will be conducted at an upland site at least 150 feet from the ordinary high water mark of Mill Creek. Spill containment materials shall be available on site during utility installation.

2. ENDANGERED SPECIES ACT

2.1 Biological Opinion

2.1.1 Biological Information

<u>Snake River (SR) Steelhead</u>
The SR steelhead evolutionarily significant unit (ESU) was listed as threatened on August 18, 1997 (62 FR43937) and protective regulations were issued under section 4(d) of the ESA on July 10, 2000 (65 FR 42422). The Snake River Basin and the SR steelhead ESU occupy portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Environmental conditions are generally drier and warmer in these areas than in areas occupied by other steelhead ESUs.

The SR steelhead run is considered a summer run based on the timing of adult upstream migration and consists of both A-run fish and B-run fish. A-run fish spend one year in the ocean before returning to spawn while the larger, B-run steelhead spend two years at sea before they return to spawn. Adult SR steelhead enter the Columbia River in the summer and migrate upriver until they spawn between March and May of the following year. The Grande Ronde River is one of the principal basins in the Snake River drainage contributing to steelhead production. The Grande Ronde steelhead run consists primarily of A-run fish.

There are few annual estimates of steelhead returns for specific production areas within the Snake River Basin. Most stream return estimates are extrapolated from returns over the Ice Harbor and Lower Granite Dams. Estimated total (natural + hatchery origin spawners) annual returns steadily declined from approximately 110,000 fish in 1962, to about 12,000 fish in 1974.

This reduction represents an approximately 90% decline of abundance over eight years. Estimated total return steadily climbed to approximately 130,000 spawners by 1986. Returns oscillated, on a three-year cycle, between about 130,000 and 40,000 individuals until 1994 (Busby *et al.* 1996). Returns then fluctuated between 70,000 and 90,000 from 1995 to 1999, and increased to approximately 260,000 fish in 2001 (NOAA 2003). However, the overwhelming majority of these increases are due to returning hatchery-produced fish. It is estimated that natural origin spawners accounted for approximately 15% of these returns (NOAA 2003).

Natural origin returns reached an estimated 14,000 fish in 1975, then steadily climbed to, and held at, close to 27,000 fish for 1985 through 1987. Returns then steadily declined to about 7,000 natural origin spawners in 1994 (Busby *et al.* 1996). Recent counts of natural origin spawners at the Lower Granite Dam increased to approximately 39,000 fish in 2001. However, this is still below the interim recovery target of 53,700 natural origin spawners needed for population recovery of the ESU.

In order for the ESU population to grow, the natural origin population growth rate must exceed 1.0. The ESU's exact population growth rate is not known, but it lies somewhere between best case estimates that assume no hatchery origin fish account for natural production, and worst case estimates that assume both hatchery and wild fish contribute to natural production in proportion to their numbers. Median long-term growth rate estimates range from 0.998 to 0.733. Short-term growth rate estimates range between 1.013 and 0.753 for the ESU (NOAA 2003). Thus, despite recent increases in total steelhead returns to the Snake River Basin, it is likely that the natural origin SR steelhead population is actually decreasing.

<u>Snake River (SR) Spring/Summer Chinook Salmon</u>
The SR spring/summer chinook ESU was listed as threatened, and protective regulations were issued under section 4(d) of the ESA, on April 22, 1992 (57 FR14653). This ESU occupies the Snake River Basin and includes portions of southeastern Washington, northeastern Oregon, and north/central Idaho.

SR spring/summer chinook exhibit a stream-type life history. Juvenile fish mature in fresh water for one year before they migrate to the ocean in the spring of their second year. Adults re-enter the Columbia River in late February and early March after two or three years in the ocean. In high elevation areas, mature fish hold in cool, deep pools until late summer and early fall, when they return to their native streams to begin spawning. Eggs incubate through the fall and winter and emergence begins in the late winter and early spring.

Direct estimates of historical annual SR spring/summer chinook returns are not available. However, according to Matthews and Waples (1991) total annual SR spring/summer chinook production may have exceeded 1.5 million adult fish in the late 1800s. Total returns fell to roughly 100,000 spawners by the late 1960s (Fulton 1968) and were below 10,000 by 1980 (NOAA 2003). Between 1981 and 2000, total returns fluctuated between extremes of 2,400 and 43,000 fish. The 2001 total return increased to over 162,000 adults. This dramatic short-term increase may be more indicative of increasing oscillations between low and high returns than an

indication of long-term improvements in population abundance. It is also important to note that over 82% of these returning adults originated in hatcheries (NOAA 2003).

Natural origin SR spring/summer chinook returns over the Lower Granite Dam fluctuated between 1,800 and 12,500 fish during the period of 1980 to 1999. Despite brief increases in the 1992 and 1993 returns, natural returns were consistently lowest during the1990s. Five-year averages of natural origin returns show a distinct downward trend with time. The five-year natural origin return averages for 1980-1984, 1985-1989, 1990-1994, and 1995-1999, were 9,090, 8,820, 7,380, and 4,810 fish, respectively. Estimated natural origin returns were 7,200 fish in 2000, and 17,000 fish in 2001 (NOAA 2003).

The natural origin SR spring/summer chinook population growth rate must exceed 1.0 for ESU growth. Long-term SR spring/summer chinook population growth rate estimates are below 1.0 and reflect the large population declines seen from the 1960s through the late 1990s. Although natural origin returns in 2000 and 2001 gave rise to positive short-term growth rates, they were still well below the interim abundance target of 41,900 natural origin spawners needed for ESU population recovery (NOAA 2003).

Redd counts for SR spring chinook in the Upper Grande Ronde River parallel the basin-wide trend of decreasing natural origin spawners. Recent redd counts peaked at 305 in 1968, but have steadily declined since then. Between 1984 and 2001, redds fluctuated between 2 and 16 (NOAA 2003).

2.1.2 Evaluating the Proposed Action

The standards for determining jeopardy are set forth in section 7(a)(2) of the ESA as defined by 50 CFR Part 402 (the consultation regulations). In conducting analyses of habitat altering actions under section 7 of the ESA, NOAA Fisheries uses the following steps: (1) Consider the status and biological requirements of the species; (2) evaluate the relevance of the environmental baseline in the action area to the species' current status; (3) determine the effects of the proposed or continuing action on the species; (4) consider cumulative effects; and (5) determine whether the proposed action, in light of the above factors, is likely to appreciably reduce the likelihood of species survival in the wild or adversely modify its critical habitat, or both.

2.1.3 Biological Requirements

Definition of the species' biological requirements within the action area is the first step NOAA Fisheries uses when applying ESA section 7(a)(2) to the listed ESUs considered in this Opinion. Biological requirements are population and habitat characteristics necessary for the listed ESUs to survive and recover to naturally-reproducing population sizes, at which time protection under the ESA would become unnecessary (McElhany *et al.* 2000).

The Project will occur within SR chinook salmon critical habitat as designated October 25, 1999 (64 FR 57399). Freshwater critical habitat includes all waterways, substrates, and adjacent

riparian areas below longstanding, impassable natural barriers (*e.g.*, waterfalls in existence for several hundred years) and identified dams that block access to former habitat.

Essential features of critical habitat for SR chinook salmon are: (1) Substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food (juvenile only), (8) riparian vegetation, (9) space, and (10) safe passage conditions (58 FR 68543 and 64 FR 57399). With the exception of food, all of these essential features of habitat are included in the "matrix of pathways and indicators" (MPI) (NOAA Fisheries 1996). The proper functioning of these habitat features is necessary to support successful adult and juvenile migration, adult holding, spawning, incubation, rearing, and the growth and development of juvenile fish to adulthood. The habitat features most likely to be affected by the proposed project are substrate, water quality, and riparian vegetation.

2.1.4 Environmental Baseline

The environmental baseline is the aggregated effects of all past and ongoing human-caused and natural factors leading to the current status of the species and condition of its habitat within the action area. The "action area" is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402.02). The action area for this consultation extends from the Cemetery Road bridge in Cove, Oregon, to the furthest extent of the turbidity plume, up to one mile downstream from the Project area.

The environmental baseline for Mill Creek was evaluated at the watershed scale to assess the current condition of instream, riparian, and watershed factors that collectively provide properly functioning aquatic habitat essential for the survival and recovery of the species. The results of this MPI-based evaluation are shown in the following table.

Table 1. Matrix of Pathways and Indicators (MPI) Baseline Condition Summary for Mill Creek

Pathways	Indicators	Condition[1]
Water Quality	Individual indicators not addressed specifically	PF
Habitat Access	Physical barriers	FAR
Habitat Elements	Individual indicators not addressed specifically	FAR
Channel Conditions & Dynamics	Width/depth ratios	FAR
	Streambank condition	FAR
	Floodplain connectivity	FAR
Flow/Hydrology	Individual indicators not addressed specifically	FAR
Watershed Condition	Individual indicators not addressed specifically	FAR

[1] The condition of each MPI parameter is indicated as follows:
PF = properly functioning, FAR= functioning at risk, NPF= not properly functioning, U=data unavailable

Habitat access is at risk due to irrigation diversions above and below the Project site and because the upstream intake to a generator station prevents both spawning adults and migrating juveniles from accessing the stream reaches above the intake. The cumulative effects of irrigation diversions, livestock grazing, timber harvest, road construction, mining, and stream channelization have degraded many essential habitat elements. The channel condition and dynamics pathway is "functioning at risk" because the width/depth ratio is 12 (the preferred is <10), because floodplain connectivity is interrupted by the bridge, and because the bridge has altered the streambank. The flow/hydrology pathway has been degraded by the effects of numerous irrigation diversions that reduce stream flows. Watershed conditions have been disturbed by logging, grazing, agricultural activities, and irrigation diversions.

2.1.5 Effects of the Proposed Action

Effects of an action are: "The direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with the action, that will be added to the environmental baseline" (50 CFR 402.02). Direct effects are those that occur during Project activities, and may extend upstream or downstream from the Project site, based on the potential for affecting the species' habitat. Indirect effects are those

that are caused by the proposed action but occur sometime after the action is completed. Interrelated actions are those that are part of a larger action and depend on that larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration (50 CFR 402.02).

Effects of In-water Construction on ESA-Listed Salmonids

Construction activities will require the installation of temporary cofferdams and a creek bypass pipe, operation of heavy machinery, removal of riparian vegetation, and the exposure of bare soil. The in-water and near-water construction activities are expected to cause temporary increases of both sediment input and total suspended solids (TSS) into Mill Creek. Isolation of the work area may also result in the harassment or harm of juvenile SR steelhead and SR spring/summer chinook salmon if they become stranded within the work area and require salvage. Heavy machinery operation in or near the water also has the potential for introducing toxic contaminants into the stream.

Suspended Solids and Sedimentation

Adults and larger juvenile salmonids may be little affected by short pulses of high suspended solid concentrations due to storm and snowmelt runoff (Bjornn and Reiser 1991). However, salmonids have been observed to avoid turbid plumes (DeVore *et al.* 1980, Birtwell *et al.* 1984, McLeay *et al.* 1984, 1987, Sigler *et al.* 1984, Lloyd 1987, Scannell 1988, Servizi and Martens 1991). Gill flaring and feeding changes have been observed in response to pulses of suspended sediment (Berg and Northcote 1985) and chronic exposure can cause physiological stress, increase energy use, and reduce feeding and growth (Redding *et al.* 1987, Lloyd 1987, Servizi and Martens 1991). Newly-emerged salmonid fry may be vulnerable to even moderate amounts of turbidity (Bjornn and Reiser 1991), and high turbidity levels may interfere with feeding and has the potential to injure and even kill adult fish (Spence *et al.* 1996). Conversely, Gregory and Levings (1998) reported that turbid waters may reduce predation from piscivorus fish and birds.

Sedimentation due to suspended solids settling out of the water increases the embeddedness of streambed gravel and may reduce the value of spawning habitat downstream from the source. Redeposited fine sediments may also reduce incubation success by smothering eggs and newly-emerged fry (Bell 1991).

Instream work for this Project is scheduled to take place during the in-water work window for the area, July 1 to October 15. Given the low flows typically present in the project area during this time, the small scale of the Project, and the planned isolation of the work area and excavation materials from the stream flow, sedimentation is expected to be localized and rates are expected to be minimal. The negative impacts of increased sedimentation and TSS on ESA-listed salmonids is expected to be minimal.

Fish Salvage

Direct effects on juvenile SR steelhead and SR spring/summer chinook salmon will occur in the form of harassment, physical harm, or death if a fish salvage operation is necessary to remove them from the action area. An ODFW fish biologist will remove stranded fish from the instream

isolation area by netting, seining, trapping, or electrofishing. The capture and transfer of these fish will create stress and may cause direct physical injury or death. Stress approaching or exceeding the physiological tolerance limits of individual fish can impair reproductive success, growth, resistance to infectious diseases, and may cause mortality (Wedemeyer *et al.* 1990).

Electrofishing is particularly stressful to fish. Harmful effects are detailed by Snyder (2003) and include internal and external hemorrhage, fractured spines, and death. Many factors influence the effects of electrofishing on fish. These include water conductivity and depth, substrate type, and fish size. Additionally, the amount of time taken to complete electrofishing within the sample area, the frequency of sampling through time, crew efficiency, and operator skill have been identified as factors influencing the magnitude of electrofishing effects.

Given the small number of juvenile SR steelhead and SR spring/summer chinook salmon that may be affected by the potential fish salvage operation, the Project is not expected to have population level effects.

Toxic Contamination

Fuels or other contaminants could potentially enter the stream from spills associated with the use of heavy equipment in or near the stream. Fuel and lubricant spills that enter a waterbody directly or through the adjacent riparian zone can injure or kill aquatic organisms. Petroleum-based contaminants, such as fuels, oils, and some hydraulic fluids, contain polycyclic aromatic hydrocarbons (PAHs), which can be acutely toxic to salmonids at high levels of exposure and can also cause chronic lethal and acute and chronic sublethal effects to other aquatic organisms (Neff 1985).

The risk from chemical contamination during in-water work activities will be minimized by limiting in-water work to the period of July 1 through October 15, restricting construction activities to the top of the bank, and by ensuring fueling and servicing operations are conducted at least 150 feet from any running water. The potential for direct mortality of ESA-listed salmonids from chemical contamination should be negligible with these precautions in place.

Effects of In-water Construction on Habitat

The proposed Project will result in some minor short-term, and no foreseeable long-term, negative impacts to SR steelhead and SR spring/summer chinook salmon habitat in Mill Creek. Streambed and banks disturbed by construction will be stabilized before re-establishing stream flow and should not cause any long-term negative impacts. The effects of increased sedimentation are expected to be minimal and no long-term negative impacts on embeddedness are expected from the Project. Although pool frequency will be temporarily impacted by the installation of instream cofferdams, it will return to its pre-construction value when the cofferdams are removed. Construction activities will take place beside an existing road. Disturbance of riparian vegetation will be kept to a minimum and mitigated by replanting the affected area with native species when construction is complete.

2.1.6 Cumulative Effects

"Cumulative effects" are defined in 50 CFR 402.02 as those effects of "future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation."

Several activities that have the potential to impact fish and habitat within the action area are occurring, and are reasonably certain to continue in the future, on private lands within the Mill Creek watershed. These activities include urban growth, timber harvest, grazing, and water withdrawal for irrigation.

Between 1990 and 2000, the population of Union County increased by 3.9%.[2] Thus, NOAA Fisheries assumes that future private and state actions will continue within the action area, but at increasingly higher levels as population density climbs and development pressures on natural resources increase. Similarly, livestock grazing and water withdrawal for irrigation are likely to occur at present or higher levels for the foreseeable future.

2.1.7 Conclusion

NOAA Fisheries has determined that when the effects of the subject action addressed in this Opinion are added to the environmental baseline and cumulative effects occurring in the action area, they are not likely to jeopardize the continued existence of SR steelhead and SR spring/summer chinook salmon. The Project will not result in adverse modification of designated critical habitat for SR chinook salmon.

NOAA Fisheries' conclusions are based on the following considerations: (1) All instream work will occur during the in-water work window for this area, July 1 - October 15; (2) the affected area will be small and instream work will be limited to that described in the BA; (3) the streambanks and bed will be re-stabilized and restored to pre-construction conditions; and (4) the disturbed riparian areas will be replanted with native vegetation. Thus, the proposed action is not expected to impair habitats that are currently functioning properly, appreciably reduce the functioning of already impaired habitats, or retard the long-term progress of impaired habitats toward proper functioning condition essential to the long-term survival and recovery at the population or ESU scale.

2.1.8 Reinitiation of Consultation

As provided in 50 CFR 402.16, reinitiation of formal consultation is required if: (1) The amount or extent of taking specified in the incidental take statement is exceeded, or is likely to be exceeded; (2) new information reveals effects of the action may affect listed species in a way not

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[2] U.S. Census Bureau, State and County Quickfacts, Union County, Oregon. Available at: http://quickfacts.census.gov/qfd/states/41/41061.html

previously considered; (3) the action is modified in a way that causes an effect on listed species that was not previously considered; or (4) a new species is listed or critical habitat is designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operation causing such take must cease, pending conclusion of the reinitiated consultation. This opinion covers the described activities if conducted within 5 years of the signature date, and not thereafter.

2.2 Incidental Take Statement

The ESA at section 9 [16 USC 1538] prohibits take of endangered species. The prohibition of take is extended to threatened anadromous salmonids by section 4(d) rule [50 CFR 223.203]. Take is defined by the statute as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" [16 USC 1532(19)]. Harm is defined by regulation as "an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavior patterns, including, breeding, spawning, rearing, migrating, feeding or sheltering" [50 CFR 222.102]. Harass is defined as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering" [50 CFR 17.3]. Incidental take is defined as "takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant" [50 CFR 402.02]. The ESA at section 7(o)(2) removes the prohibition from any incidental taking that is in compliance with the terms and conditions specified in a section 7(b)(4) incidental take statement [16 USC 1536].

An incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply to implement the reasonable and prudent measures.

2.2.1 Amount or Extent of the Take

The proposed action is reasonably certain to result in incidental take of juvenile SR steelhead and SR spring/summer chinook salmon. NOAA Fisheries is reasonably certain the incidental take described here will occur because: (1) SR steelhead are known to occur in the action area; (2) juvenile SR spring/summer chinook salmon may migrate into the action area from the adjacent stream; and (3) the proposed action is likely to cause death or injury, or impair feeding, breeding, migrating, or sheltering for the listed species.

Some level of incidental take is expected in the form of harassment, injury, or death of juvenile SR steelhead and SR spring/summer chinook salmon during instream work and fish salvage operations. The temporary increase in sediment and turbidity is expected to cause fish to avoid disturbed areas of the stream, both within and downstream of the Project area. Avoidance is also expected due to temporary reductions in riparian vegetation that result from construction

activities. Incidental take, in the form of lethal or sublethal effects, may occur if toxicants are introduced into the water. Incidental take may also occur as harassment or harm if fish salvage operations are required.

NOAA Fisheries expects the habitat-related effects of these actions to cause some low level of incidental take. However, because of the inherent biological characteristics of aquatic species such as SR steelhead and SR spring/summer chinook salmon, the likelihood of discovering take attributable to this action is limited. Take associated with the effects of actions such as these is largely unquantifiable in the short term, and may not be measurable as long-term effects on the species' habitat or population levels. Therefore, the best scientific and commercial data available are not sufficient to enable NOAA Fisheries to estimate a specific amount of incidental take due to those habitat-related effects. In instances such as these, NOAA Fisheries designates the expected level of take as "unquantifiable."

Work area isolation and fish salvage operations are likely to cause quantifiable levels of take. Given the relatively small length of streambed to be dewatered, an estimated juvenile steelhead distribution of approximately 113 individuals per mile within Mill Creek,[3] and the low probability of juvenile chinook presence in the action area, NOAA Fisheries expects few fish to be present in the Project area during implementation. Because few fish are expected to be present, the take of ESA-listed salmonids from work area isolation and fish salvage should not exceed 50 juveniles handled and no more than 2 listed fish should be seriously injured or killed.

This exemption from the take prohibition includes only take caused by the proposed action as described in the BA and above, within the action area as defined in this Opinion.

2.2.2 Effect of Take

In this Opinion, NOAA Fisheries determines that this level of anticipated take is not likely to result in jeopardy to SR steelhead or SR spring/summer chinook.

2.2.3 Reasonable and Prudent Measures

NOAA Fisheries believes that the following reasonable and prudent measures are necessary and appropriate to minimize the impact of incidental taking on the above species. The COE, in respect to their proposed or ongoing activities addressed in this Opinion, shall:

1. Avoid or minimize the amount and extent of take resulting from general construction activities, riparian disturbance, and in-water work required to complete the proposed Project addressed in this Opinion.
2. Avoid or minimize the likelihood of incidental take from any source of toxic contamination from leaks or spills into and within watercourses.

[3] Data available at www.streamnet.org

3. Minimize the amount and extent of incidental take resulting from fish salvage operations.

4. Monitor the effects of the proposed action to confirm this Opinion is achieving its objective of avoiding or minimizing take from permitted actions.

2.2.4 Terms and Conditions

To be exempt from the prohibitions of section 9 of the ESA, the action must be carried out in compliance with the following terms and conditions, which implement the reasonable and prudent measures described above for each category of activity. These terms and conditions are non-discretionary.

1. To implement reasonable and prudent measure #1 (general construction, riparian disturbance, and in-water work), the COE shall ensure that:

    a. Minimum area. Construction impacts are confined to the minimum area necessary to complete the Project.
    b. Timing of in-water work. Work below the bankfull elevation[4] will be completed using the most recent ODFW-preferred in-water work period for the Project area (presently July 1 to October 15).
    c. Cessation of work. Project operations will cease under high flow conditions that may result in inundation of the Project area, except for efforts to avoid or minimize resource damage.
    d. Pre-construction activity. The following actions will be completed before significant[5] alteration of the Project area.
        i. Marking. Flag the boundaries of clearing limits associated with site access and construction to prevent ground disturbance of critical riparian vegetation, wetlands and other sensitive sites beyond the flagged boundary.
        ii. Emergency erosion controls. Ensure that a supply of sediment control materials (*e.g.*, silt fence, straw bales)[6] for emergency erosion control is onsite.
        iii. Temporary erosion controls. All temporary erosion controls will be in place and appropriately installed downslope of Project activity within the riparian area until site restoration is complete.
        iv. General erosion control. Appropriate practices are employed to prevent erosion and sedimentation associated with access roads, stream crossings,

[4] 'Bankfull elevation' means the bank height inundated by a 1.5 to 2-year average recurrence interval and may be estimated by morphological features such average bank height, scour lines and vegetation limits.

[5] 'Significant' means an effect can be meaningfully measured, detected or evaluated.

[6] When available, certified weed-free straw or hay bales will be used to prevent introduction of noxious weeds.

drilling sites, construction sites, borrow pit operations, haul roads, equipment and material storage sites, fueling operations, staging areas, and roads being decommissioned.

v. Inspection of erosion controls. During construction, monitor instream turbidity and inspect all erosion controls daily during the rainy season and weekly during the dry season, or more often as necessary, to ensure the erosion controls are working adequately.[7]

(1) If monitoring or inspection shows that the erosion controls are ineffective, mobilize work crews immediately to make repairs, install replacements, or install additional controls as necessary.

(2) Remove sediment from erosion controls once it has reached 1/3 of the exposed height of the control.

e. Site preparation. Conserve native materials for site restoration.

i. If possible, leave native materials where they are found.

ii. Where vegetation must be removed, such as for equipment access, cut it to ground level and leave the root system intact whenever possible.

iii. If materials are moved, damaged or destroyed, replace them with a functional equivalent during site restoration.

iv. Stockpile any large wood,[8] native vegetation, weed-free topsoil, and native channel material displaced by construction for use during site restoration.

f. Earthwork. Complete earthwork (including drilling, excavation, dredging, filling and compacting) as quickly as possible.

i. Heavy equipment. When heavy equipment will be used, the equipment selected will have the least adverse effects on the environment (*e.g.*, minimally-sized, low ground pressure equipment).

ii. Site stabilization. Stabilize all disturbed areas before any break in work expected to exceed four days.

iii. Source of materials. Obtain boulders, rock, woody materials and other natural construction materials used for the Project from outside the riparian area.

g. Pesticides. Take of ESA-listed species caused by any aspect of pesticide use is not included in the exemption to the ESA take prohibitions provided by this incidental take statement. Pesticide use must be evaluated in an individual

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[7] 'Working adequately' means that Project activities do not increase ambient stream turbidity by more than 10% above background 100 feet below the discharge, when measured relative to a control point immediately upstream from the turbidity causing activity.

[8] For purposes of this Opinion only, 'large wood' means a tree, log, or rootwad big enough to dissipate stream energy associated with high flows, capture bedload, stabilize streambanks, influence channel characteristics, and otherwise support aquatic habitat function, given the slope and bankfull channel width of the stream in which the wood occurs. See Oregon Department of Forestry and Oregon Department of Fish and Wildlife, *A Guide to Placing Large Wood in Streams*, May 1995 (www.odf.state.or.us/FP/RefLibrary/LargeWoodPlacemntGuide5-95.doc).

consultation, although mechanical or other methods may be used to control weeds and unwanted vegetation.

h. Fertilizer. Do not apply surface fertilizer within 50 feet of any stream channel.

2. To implement reasonable and prudent measure #2 (pollution control), the COE shall ensure that:

a. Pollution Control Plan. Prepare and carry out a pollution and erosion control plan to prevent pollution caused by surveying or construction operations. The plan must be available for inspection on request by NOAA Fisheries.

i. Plan Contents. The pollution and erosion control plan will contain the pertinent elements listed below, and meet requirements of all applicable laws and regulations.

(1) The name and address of the party(s) responsible for accomplishment of the pollution and erosion control plan.

(2) Practices to confine, remove and dispose of excess concrete, cement, grout, and other mortars or bonding agents, including measures for washout facilities.

(3) A description of any regulated or hazardous products or materials that will be used for the Project, including procedures for inventory, storage, handling, and monitoring.

(4) A spill containment and control plan with notification procedures, specific cleanup and disposal instructions for different products, quick response containment and cleanup measures that will be available on the site, proposed methods for disposal of spilled materials, and employee training for spill containment.

(5) Practices to prevent construction debris from dropping into any stream or waterbody, and to remove any material that does drop with a minimum disturbance to the streambed and water quality.

ii. Vehicle and material staging. Store construction materials and fuel and operate, maintain, and store vehicles as follows.

(1) To reduce the staging area size and the potential for contamination, store on site only enough supplies and equipment to complete a specific job.

(2) Store fuel and conduct all equipment staging, cleaning, maintenance, and refueling operations in a staging area at least 150 feet away from the creek bank.

(3) Before operation, inspect daily all equipment to be operated within 150 feet of the creek bank. Check for, repair, and clean any fluid leaks before leaving the vehicle staging area. Document inspections in a record that is available for review on request by NOAA Fisheries.

(4) Before operations begin, and as often as necessary, steam clean all equipment that will be used below bankfull elevation until all visible oil, grease, mud, and other contaminants are removed.

(5) Diaper all stationary power equipment (*e.g.*, generators, cranes, stationary drilling equipment) operated within any riparian area to prevent leaks, unless suitable containment is provided to prevent potential spills from entering any stream or waterbody.

b. Floating Boom. Whenever surface water is present, deploy an oil-absorbing, floating boom around any equipment that could leak contaminants.

c. Construction discharge water. Treat all discharge water created by construction (*e.g.*, concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids) as follows.

i. Water quality. Design, build, and maintain facilities to collect and treat all construction discharge water using the best available technology applicable to site conditions. Provide treatment to remove debris, nutrients, sediment, petroleum hydrocarbons, metals and other pollutants likely to be present.

ii. Discharge velocity. If construction discharge water is released using an outfall or diffuser port, velocities may not exceed 4 feet per second, and the maximum size of any aperture may not exceed one inch.

iii. Pollutants. Do not allow pollutants, including green concrete, contaminated water, silt, welding slag, sandblasting abrasive, or grout cured less than 24 hours, to contact any wetland or the 2-year floodplain.

3. To implement reasonable and prudent measure #3 (fish salvage), the COE shall ensure that:

a. Fish screens. Install, operate, and maintain, according to NOAA Fisheries' fish screen criteria,[9] a fish screen on any water intake used for Project construction. This includes pumps used to isolate the in-water work area, but does not include the bypass pipe used to provide bidirectional fish access through the construction site. Screens for water diversions or intakes that will be used for irrigation, municipal or industrial purposes, or any use besides Project construction are not authorized.

b. Capture and release. Fish Handling and Transfer Protocols – Where the capture, removal, and relocation of ESA-listed fish are required, the COE shall ensure that:

[9] National Marine Fisheries Service, *Juvenile Fish Screen Criteria* (revised February 16, 1995) and *Addendum: Juvenile Fish Screen Criteria for Pump Intakes* (May 9, 1996) (guidelines and criteria for migrant fish passage facilities, and new pump intakes and existing inadequate pump intake screens) (http://www.nwr.noaa.gov/1hydrop/hydroweb/ferc.htm).

i. Have an ODFW fisheries biologist experienced with work area isolation and competent to ensure the safe handling of all ESA-listed fish conduct or supervise the operation

ii. Use one, or a combination, of the following methods to most effectively capture ESA-listed fish and minimize harm.

(1) Hand Netting. Collect fish by hand or dip nets, as the area is slowly dewatered.

(2) Seining. Seine using a net with mesh of such a size as to ensure entrapment of the residing ESA-listed fish.

(3) Minnow Trap. Place minnow traps overnight and in conjunction with seining.

(4) Electrofishing. If used, follow NOAA Fisheries guidelines for electrofishing (Appendix A). Note that electrofishing should only be used as a last resort.

iii. Fish Storage and Release. Where the capture, removal, and relocation of ESA-listed fish is required the COE shall ensure that:

(1) Handle captured fish with extreme care and keep them in water to the maximum extent possible during transfer procedures. Use of a sanctuary net is recommended.[10]

(2) Utilize large buckets (five-gallon or greater) and minimize the number of fish stored in each bucket to prevent overcrowding.

(3) Place large fish in buckets separate from smaller prey-sized fish.

(4) Maintain appropriate water temperature in holding buckets and monitor the condition of captured fish.

(5) Release fish in a pool or area that provides cover and flow refuge upstream from the isolated reach after fish have recovered from the stress of capture.

(6) Document all fish injuries or mortalities.

4. To implement reasonable and prudent measure #4 (monitoring), the COE shall ensure that:

a. Instream work documentation. Monitor and document all instream work as necessary to describe the COE's success in meeting the terms and conditions contained in this Opinion.

b. Reporting. Submit an instream construction monitoring report to NOAA Fisheries within one year of Project completion. The construction monitoring report shall include the following information.

i. Project identification

(1) Project name.

[10] A sanctuary net is a net that has a solid bottom bag that allows for the retention of a small amount of water in the net, thus allowing for less potential impact to netted fish from the net mesh.

(2) COE contact person.
(3) Starting and ending dates for work completed.

ii. Photo documentation. Photos of habitat conditions at the Project site before, during, and after Project completion.[11]
(1) Include general views and close-ups showing details of the Project and Project area, including pre and post construction.
(2) Label each photo with date, time, Project name, photographer's name, and a comment about the subject.

iii. Other data. Additional Project-specific data as appropriate.
(1) Work cessation. Dates work ceased due to high flows, if any.
(2) Pollution control. A summary of pollution and erosion control measures used, inspections, any erosion control failures or contaminant releases, and corrective efforts.
(3) Site preparation.
(a) Total cleared area – riparian and upland.
(b) Total new impervious area.
(4) Isolation of in-water work area, capture and release.
(a) Stream conditions before, during, and one week after completion of work area isolation.
(b) Methods of work area isolation and take minimization.
(5) Fish screen. Evidence of compliance with NOAA Fisheries' fish screen criteria.
(6) Fish stranding. The number of fish observed stranded in or below the Project area and any mortality that occurred due to salvage efforts to relocate these fish.
(a) Supervisory fish biologist – name and address.
(b) Method used to capture stranded fish.
(c) Number of each listed species captured.
(d) Location and condition of all fish released.
(e) Any incidence of injury or mortality of listed species.
(7) Fish passage. An assessment of the ability of fish to pass through the Project area during various stream flow conditions.
(8) Site restoration. Photos or other documentation that site restoration performance standards were met.

c. Physical Channel Alteration. Provide information, including photographs, summarizing the effectiveness of the Project design in meeting the bank and streambed restabilization goals. If any Project elements fail, provide information on the effects of this failure on salmonid habitat and stream channel morphology.

[11] Relevant habitat conditions may include characteristics of channels, eroding and stable streambanks in the Project area, riparian vegetation, water quality, flows at base, bankfull and over-bankfull stages, and other visually discernable environmental conditions at the Project area, and upstream and downstream from the Project.

d. Effectiveness monitoring. Gather any other data or analyses the COE deems necessary or helpful to complete an assessment of habitat trends in stream and riparian conditions as a result of this Project.

e. Lethal take. If a sick, injured, or dead specimen of a threatened or endangered species is found, the finder must notify the Vancouver Field Office of NOAA Fisheries Law Enforcement at (360) 418-4246. The finder must take care in handling sick or injured specimens to ensure effective treatment, and in handling dead specimens to preserve biological material in the best possible condition for later analysis of cause of death. The finder is also responsible for following instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not disturbed unnecessarily.

f. Report submission. Submit a copy of the report to the Oregon State Habitat Office of NOAA Fisheries.

Director, Oregon State Habitat Office
Habitat Conservation Division
National Marine Fisheries Service
Attn: 2004/00104
525 NE Oregon Street
Portland, OR 97232

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

3.1 Background

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires the inclusion of EFH descriptions in Federal fishery management plans. In addition, the MSA requires Federal agencies to consult with NOAA Fisheries on activities that would adversely affect EFH.

EFH means those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting the definition of EFH: "Waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.110).

Section 305(b) of the MSA (16 U.S.C. 1855(b)) requires that:

- Federal agencies must consult with NOAA Fisheries on all actions or proposed actions authorized, funded, or undertaken by the agency, that may adversely affect EFH;

- NOAA Fisheries shall provide conservation recommendations for any Federal or state activity that may adversely affect EFH;

- Federal agencies shall, within 30 days after receiving conservation recommendations from NOAA Fisheries, provide a detailed response in writing to NOAA Fisheries regarding the conservation recommendations. The response shall include a description of measures proposed by the agency for avoiding, mitigating or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the conservation recommendations of NOAA Fisheries, the Federal agency shall explain its reason for not following the recommendations.

The MSA requires consultation for all actions that may adversely affect EFH, and does not distinguish between actions within EFH and actions outside EFH. Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside EFH, such as upstream and upslope activities, that may have an adverse effect on EFH. Therefore, EFH consultation with NOAA Fisheries is required by Federal agencies undertaking, permitting or funding activities that may adversely affect EFH, regardless of its location.

3.2 Identification of EFH

The Pacific Fisheries Management Council (PFMC) has designated EFH for three species of Pacific salmon: Chinook (*Oncorhynchus tshawytscha*); coho (*O. kisutch*); and Puget Sound pink salmon (*O.gorbuscha*) (PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other waterbodies currently or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream from certain impassable man-made barriers (as identified by the PFMC), and longstanding, naturally-impassable barriers (*e.g.*, natural waterfalls in existence for several hundred years). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the *Pacific Coast Salmon Plan* (PFMC 1999). Assessment of potential adverse effects on these species' EFH from the proposed action is based on this information.

3.3 Proposed Actions

The proposed action is detailed above in section 1.2 of the ESA portion of this Opinion. The action area includes watersheds within the Upper Grande Ronde River subbasin. This area has been designated as EFH for various life stages of chinook and coho salmon.

3.4 Effects of Proposed Action

The effects on chinook and coho salmon habitat are described in detail in Section 2.2.1 of this document. The proposed action may result in short-term adverse effects on a variety of habitat parameters. These adverse effects are:

1. Riparian disturbance from accessing construction area and construction activities performed from the bank.

2. Increased sedimentation from instream construction activities.

3.5 Conclusion

NOAA Fisheries believes that the proposed action will adversely affect EFH for chinook salmon and coho salmon.

3.6 EFH Conservation Recommendations

Pursuant to section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide EFH conservation recommendations for any Federal or state agency action that may adversely affect EFH. In addition to conservation measures proposed for the project by the COE, all of the reasonable and prudent measures and the terms and conditions contained in sections 2.2.3 and 2.2.4 (respectively) of the ESA portion of this Opinion are applicable to salmon EFH. Therefore, NOAA Fisheries incorporates each of those measures here as EFH conservation recommendations.

3.7 Statutory Response Requirement

The MSA (section 305(b)) and 50 CFR 600.920(j) requires the COE to provide a written response to NOAA Fisheries' EFH conservation recommendations within 30 days of its receipt of this letter. The response must include a description of measures proposed to avoid, mitigate, or offset the adverse impacts of the activity on EFH. If the response is inconsistent with NOAA Fisheries' conservation recommendations, the COE shall explain its reasons for not following the recommendations.

3.8 Supplemental Consultation

The COE must reinitiate EFH consultation with NOAA Fisheries if either the action is substantially revised or new information becomes available that affects the basis for NOAA Fisheries' EFH conservation recommendations (50 CFR 600.920).

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Appendix A. NOAA Fisheries Electrofishing Guidelines (NOAA Fisheries 2000)

ELECTROFISHING GUIDELINES

These guidelines are the suggested protocol for the use of backpack electrofishing equipment in waters containing fish listed under the Endangered Species Act (ESA). These recommendations should be seen as guidelines for developing consistent and safe electrofishing technique. It is hoped that these guidelines will ultimately help improve electrofishing technique in ways which will reduce fish injury and increase electrofishing efficiency.

Purpose and Scope

The purpose of this document is to recommend guidelines for using backpack electrofishing equipment to sample ESA-listed fish. Because electrofishing can kill or severely injure fish, every effort should be made to avoid electrofishing and use snorkeling or other fishery information collection techniques. Where electrofishing is the only suitable sampling method, these guidelines are suggested to help reduce the number of fish severely injured or killed. These guidelines are concerned only with studies that involve electrofishing juvenile or adult salmonids that are not in spawning condition. Electrofishing in the vicinity of adults in spawning condition or operating equipment in the vicinity of redds containing developing eggs is not discussed, as there is no justifiable basis for permitting these activities near listed species. Also, these guidelines do not deal with factors such as temperature or fish handling technique, both of which can significantly affect fish health during an electrofishing session. Nonetheless, all ESA-listed fish must be sampled with extreme care. The field crew must carefully design the sampling sessions to minimize fish stress by working within favorable temperature regimes, using anesthetics when necessary, and minimizing the time the fish are held before release. As with all fieldwork involving live ESA-listed fish, the best science should be used along with an experienced crew and good equipment to minimize handling stress.

Equipment

Equipment should be in good working condition. Operators should go through the manufacturer's preseason checks, adhere to all provisions, and record major maintenance work in a log.

Training

A crew leader having at least 100 hours of electrofishing experience in the field using similar equipment should train the crew. The crew leader’s experience must be documented and available for confirmation; such documentation may be in the form of a logbook. The training should occur before an inexperienced crew begins any electrofishing, and it should be conducted in waters that do **not** contain ESA-listed fish.

The training program must include the following elements:

1. Definitions of basic terminology (*e.g.* galvanotaxis, narcosis, and tetany).

2. An explanation of how electrofishing attracts fish.

3. An explanation of how gear can injure fish and how to recognize signs of injury.

4. A review of these guidelines and the manufacturer's recommendations.

5. A demonstration of the proper use of electrofishing equipment, the role each crew member performs, and basic gear maintenance.

6. A field session where new individuals actually perform each role on the electrofishing crew.

Specific Electrofishing Guidelines

1. To avoid contact with spawning adults or active redds, carefully survey the area to be sampled before beginning electrofishing.

2. Measure conductivity and set voltage as follows:

Conductivity (µmhos/cm)	Voltage
Less than 100	900 to 1100
100 to 300	500 to 800
Greater than 300	150 to 400

3. Only direct current (DC) should be used.

4. Each session should begin with pulse width and rate set to the minimum needed to capture fish. These settings should be gradually increased only to the point where fish are immobilized and captured. Start with pulse width of 500 microseconds and do not exceed 5 milliseconds. Pulse rate should start at 30 Hz and work carefully upwards. In general, exceeding 40 Hz will injure more fish.

5. The zone of potential fish injury is one half meter from the anode. Care should be taken in shallow waters, undercut banks, or where fish can be concentrated because in such areas the fish are more likely to come into close contact with the anode.

6. 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.
7. Crew should carefully observe the condition of the sampled 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. Sampling should be terminated if injuries occur or abnormally long recovery times persist.

8. When the sampling design involves taking scales and measurements, a healthy environment for the stressed fish must be provided and the holding time must be minimized. For these operations, additional crew members who are experienced in holding and processing stressed fish may be necessary.

9. Whenever possible, a block net should be placed below the area being sampled to capture stunned fish that may drift downstream.

10. The electrofishing settings should be recorded in a logbook along with conductivity, temperature, and other variables affecting efficiency. These notes, together with observations on fish condition, will improve technique and form the basis for training new operators.